DOCUMENT RESUME

ED 039 616 24 CG 005 639

AUTHOR	Shaycoft, Marion F.
TITLE	Project TALENT. The High School Years: Growth in Cognitive Skills. Interim Report 3.
INSTITUTION	American Institutes for Research, Palo Alto, Calif.; Pittsburgh Univ., Pa. School of Education.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C. Bureau of Research.
BUREAU NO	BR-5-0606
PUB DATE	30 Jan 67
CONTRACT	OEC-6-10-065
NOTE	365p.
AVAILABLE FROM	Project TALENT, American Institutes for Research, Post Office Box 1113, Palo Alto, California 94302 (Price is $5.00 per copy, postpaid)
EDRS PRICE	EDRS Price MF-$1.50 HC-$18.35
DESCRIPTORS	Ability, Achievement, *Cognitive Development, *Growth Patterns, *High School Students, Performance, *Research Projects, School Role, *Schools, Sex Differences

ABSTRACT

This report, a small segment of Project TALENT, concerns the growth in abilities and achievement of high school students, their schools, and the test battery administered. The population was 7,500 students in grade 12 from 100 public high schools. The findings are derived from analyses of the relationships between the standing of students in grade nine and then in grade 12. Conclusions were that: (1) the amount of growth between grade nine and grade 12 scores is associated with school-taught subjects; (2) the two sexes show different patterns of mental growth; (3) schools affect the performance of students, excluding the differences in individual ability levels; and (4) a sharp distinction between aptitude tests and achievement tests probably does not really exist. Implications for education are in these areas: (1) the disadvantaged child needs remedial efforts before high school; (2) research needs to be undertaken concerning the academic versus the vocational education issue; and (3) research should focus on the ways effective schools differ from the less effective ones. (Author)

CRP-3051
BR-5-0606
PA-24

Project TALENT

THE HIGH SCHOOL YEARS: GROWTH IN COGNITIVE SKILLS

Marion F. Shaycoft

American Institutes for Research
and
School of Education, University of Pittsburgh

1967

PROJECT TALENT

Major Project TALENT Publications

Flanagan, J. C., Dailey, J. T., Shaycoft, Marion F., Orr, D. B., Gorham, W. A., & Goldberg, I. *Designing the study.* (Technical report to the U. S. Office of Education, Cooperative Research Project No. 635.) Washington, D. C.: Project TALENT Office, Univer. of Pittsburgh, 1960.

Flanagan, J. C., Dailey, J. T., Shaycoft, Marion F., Gorham, W. A., Orr, D. B., & Goldberg, I. *The talents of American youth.* Vol. 1. *Design for a study of American youth.* Boston: Houghton Mifflin, 1962.

Flanagan, J. C., Dailey, J. T., Shaycoft, Marion F., Orr, D. B., & Goldberg, I. *Studies of the American high school.* (Final report to the U. S. Office of Education, Cooperative Research Project No. 226.) Washington, D. C.: Project TALENT Office, Univer. of Pittsburgh, 1962.

Shaycoft, Marion F., Dailey, J. T., Orr, D. B., Neyman, C. A., Jr., & Sherman, S. E. *Studies of a complete age group - Age 15.* (Final report to the U. S. Office of Education, Cooperative Research Project No. 635.) Pittsburgh: Project TALENT Office, Univer. of Pittsburgh, 1963.

Flanagan, J. C., Davis, F. B., Dailey, J. T., Shaycoft, Marion F., Orr, D. B., Goldberg, I., & Neyman, C. A., Jr. *The American high-school student.* (Final report to the U. S. Office of Education, Cooperative Research Project No. 635.) Pittsburgh: Project TALENT Office, Univer. of Pittsburgh, 1964.

Flanagan, J. C., Cooley, W. W., Lohnes, P. R., Schoenfeldt, L. F., Holdeman, R. W., Combs, Janet, & Becker, Susan J. *Project TALENT one-year follow-up studies.* (Final report to the U. S. Office of Education, Cooperative Research Project No. 2333.) Pittsburgh: Project TALENT Office, Univer. of Pittsburgh, 1966.

Lohnes, P. R. *Measuring adolescent personality.* (Interim report 1 to the U. S. Office of Education, Cooperative Research Project No. 3051.) Pittsburgh: Project TALENT Office, Univer. of Pittsburgh, 1966.

Hall, C. E. *Three papers in multivariate analysis.* (Interim report 2 to the U. S. Office of Education, Cooperative Research Project No. 3051.) Pittsburgh: Project TALENT Office, American Institutes for Research and Univer. of Pittsburgh, 1967.

Shaycoft, Marion F. *The high school years: Growth in cognitive skills.* (Interim report 3 to the U. S. Office of Education, Cooperative Research Project No. 3051.) Pittsburgh: Project TALENT Office, American Institutes for Research and Univer. of Pittsburgh, 1967.

The High School Years: Growth in Cognitive Skills

Marion F. Shaycoft
Associate Director, Project TALENT

Interim Report 3
Project No. 3051
Contract No. OE-6-10-065

The research reported herein was performed pursuant to a contract with the Office of Education, U. S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

American Institutes for Research

and

School of Education, University of Pittsburgh

1967

FOREWORD

In studying human talents the dimension of growth is an important one. Most studies of the organization of mental abilities have been limited to a single set of measurements taken at one point in time.

The data collected in March of 1960 by the Project TALENT staff represented one large effort to obtain rather extensive data on a representative sample of American high school students.

In 1963 it was proposed that in order to gain some depth in this survey and to obtain a better understanding of the nature of the growth of these variables and their interrelations over time, a sample should be retested.

In this report Miss Marion F. Shaycoft presents the results of this study including a variety of new or newly adapted statistical analysis procedures to clarify insofar as possible the nature of these cognitive variables and their growth during the high school years. This report represents an important contribution to the understanding of the basic cognitive measures on which the future follow-ups of Project TALENT will depend. It also is concerned with some very important problems and issues in education and individual development. Although it does not provide definitive answers to these questions it does make important contributions to improved understanding of student growth and development.

It is hoped that the publication of this report will move us a step closer to the fundamental understanding of measurement and prediction procedures which will assist the young people of the future to identify, develop, and utilize their talents to the fullest extent possible.

John C. Flanagan

30 January 1967

ACKNOWLEDGMENTS

One of the persons to whom this study is most heavily indebted is John C. Flanagan, the Responsible Investigator for Project TALENT, whose foresight in planning several years ago to build a retesting phase into the overall plans for the project made the study reported on here possible. His review of this manuscript and his very constructive suggestions concerning it are much appreciated.

I also wish to express my gratitude to the Director of Project TALENT, William W. Cooley, both for entrusting me with responsibility for this study and for making his help and guidance available when sought. He too read this manuscript and made helpful suggestions on it.

Another staff member from whom I have learned much about multivariate analysis is Paul R. Lohnes, who was also kind enough to review this manuscript. Bary G. Wingersky wrote the computer programs for some of the more complex statistical analyses used in this study. He too, like the persons already mentioned, has provided some stimulating ideas on multivariate analysis. In this area another staff member, Charles E. Hall, has also been very helpful. Others in the data analysis area to whom I am indebted for their help and cooperation are Marilyn S. Wingersky, the Director of Data Processing, and Richard A. Williams, Data Analysis Coordinator.

Former members of the Project TALENT staff who played significant roles in early phases of the study reported on here are Frederick B. Davis, John T. Dailey, and Clinton A. Neyman, Jr.

Other former staff members, whose roles were somewhat more recent, are Arleen M. Lichtenstein, who wrote some of the computer programs, and Judith D. Miller, who, in her capacity as research assistant, carried out or supervised the carrying out of much of the arduous work involved in data analysis, and did it very effectively.

Among current staff members who deserve special mention are our highly competent research assistant, Janet Combs, who performed numerous editorial functions on this report, and Freda K. Womer, whose services as administrative associate smoothed the way at many stages in many ways. Last but by no means least I wish to thank my secretary, Carolyn L. Platek, who typed almost the entire manuscript herself, coping cheerfully and competently with my handwriting and with my predilection for large complex tables and formidable formulas.

For any errors of fact or opinion that may remain in this report despite the efforts of the persons mentioned above and the others who have done their best to prevent errors, the responsibility is of course mine, and mine alone.

Marion F. Shaycoft

30 January 1967

TABLE OF CONTENTS

Part I. INTRODUCTION

Chapter 1. AN OVERVIEW

Chapter 2. DESIGN OF THE RETEST STUDY

Part III. THE STUDENTS AND THE SCHOOLS

Chapter 5. CHANGES IN PERFORMANCE BETWEEN NINTH AND TWELFTH GRADES

Chapter 7. EFFECTIVE AND INEFFECTIVE HIGH SCHOOLS: FACT OR MIRAGE?

Chapter 8. CORRELATES OF CHANGE: A CONSIDERATION CONCOMITANCE AND CAUSATION

Part IV. SUMMARY AND CONCLUSIONS

Chapter 9. SUMMARY AND CONCLUSIONS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

Chapter 1. AN OVERVIEW

This report is concerned with a study that is a small segment of a larger-scale study--Project TALENT. Project TALENT, which provides the basic framework into which the retest study fits, is described in the next section. The description is brief because the project is so fully described elsewhere (Flanagan *et al.*, 1960, 1962a, 1962b, 1964, 1966, Shaycoft *et al.*, 1963).

PROJECT TALENT: AN OVERVIEW

In the seemingly endless debates over the relative merits of large-scale cross-sectional studies and smaller but more intensive longitudinal studies, neither side has a decisive advantage over the other. The balance tilts first one way, then the other, as relative costs are weighed and the questions that each kind of study will answer are compared.

Project TALENT is a cross between the two approaches--and as a result it has most of the important advantages of each. In brief, Project TALENT is a large-scale cross-sectional study, in which almost half a million students in four grades (9-12) in over a thousand secondary schools, public, parochial, and private, in all parts of the country were given a broad-scope battery of tests requiring two full days of testing. But it is also a longitudinal study since the plans call for periodic questionnaire follow-ups of the subjects, for as long as 20 years after high school graduation.

The group tested includes over 400,000 students constituting a probability sample of all students in grades 9, 10, 11, 12 in public and nonpublic secondary schools in the United States in the spring of 1960. In addition, an effort was made at the same time to supplement this sample with a probability sample of all 15-year-olds in the United States, whether or not they happened to be in the grade 9-12 range. The resulting supplementary group of 15-year-olds not in grades 9-12 was also tested at the same time as the main group, in the spring of 1960.

The Project TALENT battery[1] given at that time, included a wide variety of aptitude and achievement tests, sampled information in many areas, both academic and nonacademic, and also included a questionnaire on vocational interests (the Interest Inventory), a personality inventory (the Student Activities Inventory), and a biographical questionnaire (the Student Information Blank) containing nearly 400 questions about the student's background--his school life, his out-of-school activities, his general health, his plans and aspirations, his home, and his family.

Participants are being followed up periodically by questionnaire to find out about their post-high-school studies, jobs, career plans, their marital status, and other aspects of what they have been doing and what they plan to do. Each participant was sent a questionnaire 1 year after his class graduated from high school. Another questionnaire is sent 5 years after high school graduation. (This is the current phase of the follow-up.) It is also planned that questionnaires will be sent 10 and 20 years after high-school graduation.

Although the kinds of research for which the Project TALENT data can be and has been used continue to expand, the original purposes of the project, which still serve to determine its direction and long-range goals, are worth restating. They are:

1. To develop an inventory of human resources--or, more specifically, of the capacities and potentials of the nation's youth.
2. To develop a set of standards for educational and psychological measurement.
3. To develop a comprehensive counseling procedure for guiding students toward various careers.
4. To gain a better understanding of how young people choose their life work.
5. To gain a better understanding of the educational experiences which prepare young people for their life work.

THE RETEST STUDY: AN OVERVIEW

The retest study involves over 10,000 students constituting the entire 12th-grade enrollment in over 100 high schools, in all parts of the country, who were given a full day of testing and for most of whom records were avail-

---

[1] Details about the composition of the TALENT battery are given in Appendix B.

able on the full 2 days of Project TALENT tests and inventories they had completed 3 years earlier, in grade 9.

The size and nationwide character of the sample, the fact that it involves data collected on the same group at two different times a full 3 years apart, and the wide range of aptitudes, abilities, areas of achievement, interests, and background characteristics covered by the battery of tests and inventories invest the resulting body of raw data with an enormous potential for yielding answers to important questions about American high school students and the kinds of changes that may take place in their abilities, achievement levels, interests, plans, and actions during the last 3 years of high school.

Of particular interest in this connection is the potential for going beyond mere description of the nature and magnitude of the changes occurring. Of far more importance, of course, is an understanding of the factors that promote these changes, and the factors that inhibit them. And the data available on the retested students, when suitably analyzed, can yield useful insights into the nature of these factors.

THIS REPORT: AN OVERVIEW

As was implied in the previous section, the purpose of this report and of the study it presents is multi-faceted. Broadly speaking, the purpose first and foremost is to tell us something about the students. Secondly the report is intended to shed some light on the schools; this is indirect light--reflected from the students. In other words, the findings about students from different schools permit us to draw some conclusions about the schools from which they come. The third purpose, which is distinctly subordinate to the other two, is to present some findings about the tests themselves--what they measure, how they measure it, and how well they measure it.

These latter findings are of interest in the present study primarily because they help us to interpret the first two kinds of findings--those about the students and those about the schools. But the findings about the tests also have a somewhat broader purpose since they are relevant not only to the interpretation of the retest results concerning students and schools that are the primary content of the present report, but also, presumably, to any other research, past or future, based on the Project TALENT data.

The findings about the students derive mostly from analyses, both simple and complex, of the relationships between the relative standing of students in some respect in grade 9 and their relative standing in that or some other relevant respect in grade 12. It is perhaps something less than startling that the resultant findings fall in two diametrically opposite categories--similarities between the grade 9 picture and the grade 12 picture, and differences. But it may be surprising that these two categories of findings--the similarities and the differences--either answer or provide clues to the answers to two entirely different kinds of questions. Moreover both kinds of questions are important ones, fraught with significance. The findings about similarities tell us something about how well we can predict, at least 3 years into the future, and what sorts of predictions are most accurate. The findings about differences are in some respects perhaps even more important--because when properly used they give us some clues as to what sorts of intervening occurrences (school practices, for instance) are effective in bringing about desired changes and what sorts have no effect, or worse still, may have actively undesirable effects.

The focus of the present report, as its title implies, is on the cognitive domain--growth in abilities and achievement. Other studies, focusing on other aspects of the retest data, are covered in other reports.[1]

Having discussed the broad purposes of this report in the most general terms possible, let us return to the beginning and survey its content--still in broad terms but chapter by chapter.

Chapter 2 presents the design of the retest study and explains how, basically, it grew out of the study's purposes.

Chapter 3 discusses some of the methodological problems, both statistical and psychometric, growing directly out of the purposes of the study or out of its design, or both. Not only are the problems considered in some detail but in most cases solutions are presented, which are utilized in obtaining the results reported in the later chapters. Not all methodological problems and issues discussed in this report are concentrated in Chapter 3, however. That chapter is limited to a consideration of somewhat general problems--problems that are at least general enough to apply to the substantive research in more

---

[1] See the section at the end of this chapter, entitled "Related Research on the Retest Data."

than one chapter of Part III. (Methodological problems that insofar as the present report is concerned are applicable to only a single chapter are discussed in that chapter, rather than in Chapter 3.)

Part II, which consists of a single chapter, Chapter 4, is concerned with the TALENT battery--not particularly in terms of its content, but in terms, rather, of its internal statistical characteristics. Such matters are considered as test reliability, whether the tests that are supposed to be in effect unspeeded really operate that way, and whether the answer-sheet responses are relatively free of clerical error. Not only are data presented in this chapter that are directly applicable in evaluating the findings presented in Part III of the report, but other data are also presented (other reliability coefficients, for instance) that are not directly relevant to the retest study (though derived from it), but apply instead to analyses of the main body of Project TALENT data as presented in earlier reports, and are also appropriate for use in future analyses of mainline Project TALENT results. The reason these more accurate reliability estimates are presented here rather than in the earlier reports is that they couldn't have been obtained without the retest data--because of hardware improvements that made it feasible to get the retest data on tape in a form that permitted the use of better formulas than could be used with the earlier kind of tape record.[1]

The findings of the study (except for those few areas of findings about the tests themselves, covered in Chapter 4) are presented in Part III of the report. The title of Part III, "The Students and the Schools," is probably self-explanatory. Chapter 5 is an overall survey of the changes in cognitive skills that occur between grades 9 and 12. Both the magnitude of these changes in various areas and their relation to initial level are investigated. The extent to which boys and girls differ in these respects is also considered.

Chapter 6 is based primarily on factor analyses of the grade 9 and grade 12 variables jointly, supplemented by canonical correlation analyses between the variables for the two grades. These Chapter 6 analyses, like most of those for the other chapters, are carried out separately for each sex.

---

[1] For most of the tests in the 1960 Project TALENT testing, the hardware used was such that only total scores could be put on tape--not the individual item responses. Thus the only formula that could be used for estimating the reliability of the tests from these original data was KR-21 (Kuder and Richardson, 1937), a formula with serious limitations.

Chapter 7 seeks to determine whether there are differences among schools in their effects (and in their effectiveness in bringing about desired changes in the students). The chapter is based primarily on discriminant analysis and analysis of variance, both univariate and multivariate. Since Chapter 7 demonstrates that schools do differ in their effects, Chapter 8 attempts to pin down the exact nature of some of the school characteristics that may be responsible for these differences. But in Chapter 8, unlike Chapter 7, the unit of study is the individual student not the school. The modalities used chiefly in Chapter 8 are part and partial correlation and (somewhat less importantly) partial canonical correlation.

Chapter 9, which constitutes Part IV of the report, summarizes the outlines of the study and presents some conclusions that result from an effort to pull together into a single unified whole the separate implications of the various chapters.

RELATED RESEARCH ON THE RETEST DATA

The present report, obviously, doesn't even begin to exhaust the potentialities of the retest data as a source of insights into the nature and etiology of the changes that occur in American youth during the high school years. One major area not within the scope of the present report is analysis of changes in the student's interests, activities, and plans, as reported by him in the Interest Inventory and the Student Information Blank. Although some of these inventory responses have been utilized incidentally in the present study of mental growth, they themselves have not been the central theme of this report. That gap is filled by other studies.

A monograph by William W. Cooley will focus on questions related to the stability of inventoried vocational interests. A major question considered in this monograph is whether or not abilities change during high school to be more consistent with 9th-grade interests or whether interests change during high school to be more consistent with 9th-grade abilities. Multivariate procedures are used to investigate four sets of variables jointly: grade 9 interests, grade 9 abilities, grade 12 interests, and grade 12 abilities. Research hypotheses are explored concerning the degree to which responses to vocational interest inventories are subject to change as the student matures and gains a more realistic picture of his own abilities and motives and those needed for various occupations.

A study has been completed by Charles E. Hall on some of the non-academic changes that teen-agers go through between grades 9 and 12. The results of this research are presented in "Changes in Perceptions of Self, Home, and the Future," which is Section III of *Three Papers in Multivariate Analysis*, a recent report by Hall (1967).

In addition, further work on the cognitive aspects, which are the central theme of the present report, is projected for the future.

Chapter 2. DESIGN OF THE RETEST STUDY

Since the design of a study, ideally, should depend largely on its purposes we shall start out in this chapter with a consideration of the general purposes of the retest study and how they differ from some of the general purposes of the "mainline" Project TALENT study.

PURPOSES OF THE STUDY

The primary purpose of the retest study was to study relationships rather than to develop norms. More specifically, the retest study was intended to permit the investigation of relationships of various characteristics of the student in grade 12 to characteristics these same students possessed 3 years earlier, in grade 9, and also to the events of the intervening 3 years.

This greater interest in relationships than in absolute values (i.e., normative data) was not the result of any feeling that one type of information is intrinsically more important than the other. Rather it was due to a realization that the main Project TALENT sample had been designed with a view to making it as suitable as possible for use in normative studies. (Not only had it been selected in a way that insured that it could be treated as a "probability sample[1]" but it was as representative of the population as feasible, and as large as necessary in order to provide adequate numbers of cases in basically unpopulous categories.) Therefore retesting a subsample of the Project TALENT sample would have been pointless if the new data were to be used primarily for normative purposes. But of course this wasn't the case. As has already been indicated, the retesting had as its

---

[1] This concept of a "probability sample" as it applies to Project TALENT is discussed briefly in *Studies of a Complete Age Group--Age 15* (Shaycoft *et al.*, 1963, pp. 5-7). The design and selection of the Project TALENT sample are discussed in considerable detail in Chapter III of *Designing the Study* (Flanagan *et al.*, 1960) and in somewhat abridged form in Chapter 3 of *Design for a Study of American Youth* (Flanagan *et al.*, 1962).

chief purpose to make it possible to find answers to important questions that couldn't have been studied without retest data based on some of the students in the original TALENT sample.

FACTORS DICTATING FEATURES OF THE DESIGN

Desired Characteristics of the Sample

Because investigation of relationships was a major purpose of the retest study, and because it was considered desirable to be able to have some confidence that the relationships found (or at least most of them) were applicable over a fairly broad segment of the high school population, it was regarded as important to have the retest sample include a wide variety of schools representing as many different strata in all respects as possible. But it wasn't considered essential to form the sample as a "probability sample" with every unit of the population from which it was drawn having a known probability, greater than 0, of being selected, as it would have been for normative purposes.

Desired Characteristics of the Retest Battery

Content. Because of the very broad purposes of the retest study it was felt desirable to have most of the tests and inventories included in their original forms. Exceptions were made in the case of the Preferences Test, the Memory for Sentences Test, the Student Activities Inventory, the Student Information Blank, and the themes. (It was felt that the Preferences Test could not be readministered since the scoring procedure (score equals number of items answered), which had been a carefully guarded secret at the time of the original testing, was now known. Likewise the Student Activities Inventory was considered expendable in the interests of shortening the battery, and the Student Information Blank abridgeable.)

Organization. Although it was not regarded as necessary that everyone in the retest study take all of the tests included, the interest in correlational analyses dictated that for each pair of tests some group taking both should be included, so that it would be possible to obtain correlation coefficients between any pair of variables.

Practical Limitations

As in almost all research studies, practical considerations (such as time available, facilities, and budget) imposed some restrictions. The most important of these was the limitation on testing time required in each participating school. The TALENT battery, as originally administered in 1960, required 2 full days. But only 1 day of retest time per school was deemed feasible, in order to make it comparatively easy for schools to participate.

As for the overall size of the retest sample, it was restricted by practical considerations to roughly 10,000 students.

DETAILS OF THE DESIGN

The Seven Retest Batteries

The Six Basic Retest Batteries. It is probably obvious from the foregoing discussion that if the retest study were to meet all the conditions established as desirable, it would necessarily require a fairly complicated design.

If data were to be provided on all or almost all of the original tests, in their original form, without requiring more than half as much time per student as was originally available, it was clear that participants could not all take the same set of tests. Furthermore, if the complete set of tests were merely divided into two subsets and half the retest students were given one subset and the other half the other, it would be impossible to get correlations between the tests in one set and those in the other. The simplest way to solve this problem was to divide the original 2 days of tests into four subsets, each requiring half a day. Combining any two of these four subsets would yield a full day of testing, and if all possible pairs of subsets were used, each pair being administered in a different set of schools, every test would be given in conjunction with every other, and all correlations would therefore be obtainable.

Each pair of half-day subsets was accordingly organized into a "retest battery." Since there were six such pairs, six basic retest batteries were established. They were designated Batteries A, B, C, D, E, and F.

As an added refinement, it was considered desirable to select one test to be included in all six batteries. This test, if properly chosen, would be useful as a control variable in circumstances where it was necessary to determine the extent to which the groups taking the six batteries were not comparable, or as a basis for making some sort of statistical adjustment to make the groups more nearly comparable. It was felt these purposes would be best served if the test selected were one that was general in character (not a measure of achievement in a specific area) and had high correlation with general academic ability. The Abstract Reasoning Test was chosen for the purpose because it was the shortest of the tests that met the requirements stated above, adding less than 15 minutes to each retest battery. But even this short additional time, combined with the fact that all six batteries had to include time for filling out Record Form Z (the answer sheet containing basic identifying information to make it possible to associate the student's retest record with the record of his original testing in grade 9) would have made the testing-time schedule for the six batteries unduly tight. To allow some leeway, therefore, the tests that were explicitly indicated in the previous section to be regarded as "expendable"--the Preferences Test and the Student Activities Inventory--were eliminated, as was the one additional test, Memory for Sentences, that seemed least needed.

In addition, the Student Information Blank was revised and shortened drastically. (Revisions of the inventory included not only the elimination of a great many items but also the revision of some others and the addition of a few brand-new items.)

The only other change was that one of the two brief "themes" that the students had been required to write in grade 9 was replaced by a theme on a new topic.[1]

Details about these changes are given in Appendix C-1.

---

[1] These themes have not been scored or processed in any other way, since they were not intended for inclusion in the analyses presented in this report. Instead, they have been earmarked for future use in small-scale special-purpose studies. The topics of the themes are shown in Appendix B (for the 1960 testing) and in Appendix C-1 (for the 1963 testing).

The tests included in each of the six basic batteries (and also in a seventh battery, Battery V, explained below) are indicated in Appendix C-2.

Battery V. Battery V was a special battery, requiring 1 day of testing, like the other six, but including a different combination of tests. This battery was designed primarily for use in a special project to collect data in vocational high schools. Strictly speaking, this special project had nothing to do with the retest study, although the testing phases of the two were carried out simultaneously. But ten of the high schools in the vocational-high-school testing were in New York City and therefore had participated in the original Project TALENT testing in 1960 (since all secondary schools in New York City had participated). Since the same students were involved in the retesting in 1963, these ten New York City schools taking retest Battery V could be considered legitimate members of the retest sample, augmenting the number of cases available for certain sub-studies. (They couldn't have been so considered if it had been regarded as important to have a probability sample for the retest study, but as has already been pointed out, it wasn't.) The Battery V cases have therefore been regarded as quite suitable for inclusion in certain of the retest data analyses, while they have been omitted from others. The tests included in Battery V are indicated in Appendix C-2.

The Sample of Schools

The retest study was limited to public secondary schools. For administrative reasons it was considered not feasible to include any schools from the five cities with a population over 1,500,000 (except for the New York City vocational high schools, already mentioned, in which Battery V was given). Except for this exclusion of nonpublic schools and schools in the largest cities, it was considered desirable to have all categories of secondary schools represented in the sample, insofar as possible. To help insure this, a secondary-school taxonomy[1], developed several years ago, was used as the basis

---

[1] This secondary-school taxonomy, which was developed by John T. Dailey, is fully documented in an earlier report in this series (Flanagan *et al.*, 1962, Chapter 4).

of the sample. This taxonomy, which divided public high schools into 17 categories, is described in Appendix G-1. Appendix G-2 shows the number of high schools in each category that were invited to participate in the retest study, and the number that accepted.

Schools in the "basic retest sample" (by which term is meant all retested schools except those in the Battery V vocational group) were assigned one of the six basic retest batteries (A, B, C, D, E, or F). Allocation of the retest batteries among the various schools was guided by the effort to have as many batteries as possible represented in each taxonomy category, and also to have the six batteries more or less equally represented in terms of number of schools and number of students.

SIZE OF SAMPLE

Number of Students and Schools

Total Number in 1963 Testing. Table 2-1 shows the number of vocational and nonvocational high schools taking each retest battery. Appendix G-2 shows the breakdown of these retest battery distributions by taxonomy group.

Table 2-2[1] shows the number of students, classified by retest battery and sex. It will be observed that three sets of numbers are presented in this table; they are designated, respectively "all cases", "matched cases", and "matched complete cases". The designation "all cases" means all students tested in grade 12 in the 1963 retest study.[2] This all-inclusive group contains as a subgroup the "matched cases"--i.e., those students tested in 1963 for whom TALENT records are also available from the 1960 testing. The

---

[1] Table 2-2 contains a column showing the "administration category" of the included tests. This term is explained in a later section of this chapter.

[2] A handful of these students--48 boys (39 matched cases and 9 unmatched) and 25 girls (16 matched and 9 unmatched)--reported they were below grade 12. (Some of these were probably clerical errors in marking the answer sheet.) For all practical purposes the retest sample may be regarded as consisting of grade 12 students.

TABLE 2-1. Number of schools retested

Retest Battery	Number of retest schools		
	Non-vocational	Vocational	Total
A	17	1	18
B	18	1	19
C	19	1	20
D	16	1	17
E	13	1	14
F	18	2	20
Subtotal	101	7	108
V	0	10	10
Total	101	17	118

TABLE 2-2. Number of cases, by sex, for each retest battery

Retest Battery	Administration Categories[a] (of included tests)	Approximate Numbers of Cases[c]								
		All Cases			Matched Cases			Matched Complete Cases[b]		
		Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
A	0, 1, 2	784	831	1615	565	621	1186	466	538	1004
B	0, 1, 3	860	866	1726	582	638	1220	502	583	1085
C	0, 1, 4	1000	985	1985	746	773	1519	687	702	1389
D	0, 2, 3	807	851	1658	571	643	1214	462	534	996
E	0, 2, 4	652	660	1312	538	546	1084	381	412	793
F	0, 3, 4	928	825	1753	646	638	1284	578	586	1164
	Subtotal	5031	5018	10049	3648	3859	7507	3076	3355	6431
V	0, 1, 3a, 4a	199	148	347	84	87	171	73	79	152
	Total	5230	5166	10396	3732	3946	7678	3149	3434	6583

[a] See Table 2-3, for tests included in each administration category.

[b] Cases with retest classification code 0. (See Appendix C-5, for description of this code.)

[c] These counts include a handful of cases who, according to self-report, were in grades below 12. See footnote 2 on page 2-6.

"matched complete cases" are those "matched cases" whose "retest classification code" is 0. (This code is explained in Appendix C-5.)

Number of Matched Cases. It will be observed from Table 2-2 that of the 10,396 cases in the retest study for whom grade 12 TALENT data are available, 7,678 (or approximately 75 percent of them) were also in the 1960 TALENT testing. The missing 25 percent probably consists mostly of students who were in entirely different schools in grade 9. By "entirely different school" is meant not merely a junior high school that normally feeds into the senior high school that was in the retest study, but a totally unrelated school. The fact that 25 percent of the grade 12 cases did not have matching grade 9 records seems quite compatible with what we know about the mobility of the American population. Thus there is reason to believe that the record-matching procedure, which was carried out mostly as a computer operation, supplemented by clerical checks, was quite successful. In a later section of this chapter some of the details of the data-processing procedure will be described.

Unmatched Cases. In a certain sense there are two kinds of "unmatched cases." The first consists of those students with 1963 data for whom no 1960 record is available. These are the cases referred to as the "missing 25 percent" in the previous paragraph, and probably most of them are students who transferred into the school sometime after the spring of 1960. Some of the "missing 25 percent," however, almost certainly are the result of anomalies in the computer-processing operation which prevented matching. The second kind of unmatched case consists of those students who were tested in grade 9 in 1960, in one of the retested schools, but for whom there was apparently no 1963 record. Some of the missing cases of this second kind were probably due to the same kind of computer-processing problems that we surmise may have been responsible for some of the first kind of unmatched case. However it seems reasonable to suppose that most of the second kind of unmatched case are due to transferring to another high school, not in the retest study, and to dropout. There are substantially fewer of the first kind of unmatched case than of the second, and this is quite in line with expectation, because of the addition of the dropouts to the second group.

Cases Available for Each Combination of Tests

Test Administration Categories. For convenience in dealing with the complexities created by the overlapping batteries, the tests were divided into subsets, each consisting of tests that were included in an identical group of retest batteries. These subsets of tests are called "administration categories" in this report. There are eight of them, designated administration categories 0, 1, 2, 3a, 3b, 4a, 4b, and 5.[1]

The composition of these eight categories (i.e., the tests included in them) is shown in Appendix C-3. Table 2-3 shows the number of students, separately by sex, in each of the eight categories. These counts show approximately how many cases are available for any test or inventory.

Battery Overlap. A major purpose of building battery overlap into the design, as has already been indicated, was to make it possible to determine the correlation between any two tests. Table 2-4 shows the approximate number of cases available for direct computation of the correlation between any two variables. In those few cases where direct computation is not possible, indirect computation is.[2]

Table 2-4 is set up in terms of test administration category. In reading it, if one wishes to know how many cases are available for a correlation between R-311 (Arithmetic Reasoning) and R-250 (Reading Comprehension), the first step is to refer back to Table 2-3 or to Appendix C-3, to ascertain what administration categories these two tests are in. It turns out that

---

[1] For certain purposes administration categories 3a and 3b are collapsed into a single category, category 3, and categories 4a and 4b are collapsed into category 4.

[2] For instance if the correlation between R-100 (Administration Category 5) and R-250 (Category 4a) were needed, it could be estimated from the following formula, (which utilizes the fact that R-100 = R-190 + R-192):

$$r_{tc} = \frac{r_{ac}\, s_a + r_{bc}\, s_b}{\sqrt{s_a^{2} + s_b^{2} + 2r_{ab}\, s_a\, s_b}}$$

where a = R-190
b = R-192
t = R-100 = $a + b$
c = R-250

they are in categories 3a and 4a respectively. Turning again to Table 2-4, we see that there are 689 males and 693 females entered in the row-3a-column-4a cell. These are the approximate numbers of cases available for correlating R-311 with R-250.

Appendix C-4 consists of a table organized the same way as Table 2-4, but its cells contain retest batteries instead of numbers of cases. Appendix C-4 thus shows what batteries provide the numbers of cases that Table 2-4 indicates are available. We can see, for instance, that Batteries F and V are the ones that provide the 689 males and 693 females for correlating R-311 with R-250.

A comparison of the numbers of cases shown in Table 2-4 with the Table 2-2 numbers for the appropriate batteries (as indicated in Appendix C-4) shows that the numbers of cases in Table 2-4 are generally a little lower than the corresponding counts of "matched cases" in Table 2-2 but higher than the counts of "matched complete cases." This is quite reasonable since Table 2-4 is limited to matched cases but not all the "matched cases" in Table 2-2 are complete on the variables involved in the correlation, and since, furthermore, some of the Table 2-4 cases available for the correlation do not qualify as "matched complete cases," in view of the fact that they may lack scores on one or more variables not involved in the particular correlation.

Table 2-5 shows the approximate number of cases available for each pair of variables, for use in correlations, when weighted data are to be used. The counts shown in Table 2-5 are unweighted, and thus differ only slightly from the Table 2-4 counts. The essential difference is that Table 2-4 includes Battery V cases while Table 2-5 does not, since Weight Z for all Battery V cases is 0. (Weight Z is described briefly at the end of this chapter and in considerable detail in the next chapter.)

DATA PROCESSING

This section contains a condensed and somewhat simplified account of what was in actuality a very long, complex, and time-consuming series of operations, encompassing everything that lay between the administration of the

TABLE 2-3. Number of 1963 cases available (for both matched and total groups) by sex, for each test

Admin. Category[a]	Test code # [b]	Retest Battery	Number of 1963 cases[c]					
			Matched cases			All cases		
			Boys (1)	Girls (2)	Total (3)	Boys (4)	Girls (5)	Total (6)
0	290	A-F,V	3732	3946	7678	5230	5166	10396
1	101-115, 190	A-C,V	1977	2119	4096	2843	2830	5673
2	131-152, 162, 192, 700, 800'	A,D,E	1674	1810	3484	2243	2342	4585
3a	231-235, 230, 311, 410	B,D,F,V	1883	2006	3889	2794	2690	5484
3b	212, 312, 320, 333, 334, 340	B,D,F	1799	1919	3718	2595	2542	5137
4a	250, 260, 270, 282, 430, 440	C,E,F,V	2014	2044	4058	2779	2618	5397
4b	220, 240, 281, 420	C,E,F	1930	1957	3887	2580	2470	5050
5	172, 100	A	565	621	1186	784	831	1615

[a] The tests administered in 1963 are grouped in "administration categories," according to the specific combination of retest batteries in which they are included.

[b] See Appendix A for an explanation of the test code numbers.

[c] Based on the data of Table 2-2.

TABLE 2-4. Approximate number of matched cases available for correlations between any two variables in the study

NOTE: In the following table, each grade 12 variable is represented by the 1963 "administration category" in which it falls.

	No. of matched cases								
Admin.	Grade 12 variables - 1963								Gr.9
Category[a] →	0	1	2**	3a	3b	4a	4b	5	1960***
Gr.12 variables-1963 ↓				MALES					
0	3525	1862	1525	1775	1696	1902	1823	518	3500
1		1862	518	626	542	785	708	518	1800
2**			1535	526	526	483	483	518	1500
3a				1785	1699	689	610	0*	1800
3b					1706	610	610	0*	1700
4a						1902	1823	0*	1900
4b							1823	0*	1800
5								518	518
Gr. 9 - 1960***									3400-3500
Gr.12 variables-1963				FEMALES					
0	3760	2022	1668	1907	1823	1949	1865	582	3700
1		2022	582	695	613	820	738	582	2000
2**			1686	601	601	496	496	582	1600
3a				1926	1842	693	609	0*	1900
3b					1842	609	609	0*	1800
4a						1949	1865	0*	1900
4b							1865	0*	1800
5								582	582
Gr. 9 - 1960***									3600-3700

---

[a] Table 2-3 shows which tests administered in 1963 fall in each administration category.

[*] No cases are available on which to compute these correlations directly. However this is not a serious lack, since the only variables in administration category 5 are two composites: #100 (Information Total) and #172 (Vocabulary Total).

[**] The numbers of cases available for correlations involving certain SIB items may be considerably smaller than those shown here since not all students taking the SIB answered all items.

[***] These N's are rounded and approximate, since there is considerable variation in N's among the 1960 tests.

TABLE 2-5. Approximate number of matched cases with non-0 Weight Z, available for correlations between any two variables in the study

NOTE: In the following table, each grade 12 variable is represented by the 1963 "administration category" in which it falls.

		No. of matched cases						
		Grade 12 variables - 1963						
	Admin. Category[a]	0	1	2**	3	4	5	Gr. 9 1960***
					MALES			
Gr. 12 variables - 1963	0	3441	1778	1525	1696	1823	518	3400
	1		1778	518	542	708	518	1700
	2**			1535	526	483	518	1500
	3				1699	610	0*	1700
	4					1823	0*	1800
	5						518	518
Gr. 9 - 1960***								3300-3400
					FEMALES			
Gr. 12 variables - 1963	0	3676	1938	1668	1823	1865	582	3600
	1		1938	582	613	738	582	1900
	2**			1686	601	496	582	1600
	3				1842	609	0*	1800
	4					1865	0*	1800
	5						582	582
Gr. 9 - 1960***								3500-3600

---

[a] Table 2-3 shows which tests administered in 1963 fall in each administration category.

*No cases are available on which to compute these correlations directly. However this is not a serious lack, since the only variables in administration category 5 are two composites: #100 (Information Total) and #172 (Vocabulary Total).

**The numbers of cases available for correlations involving certain SIB items may be considerably smaller than those shown here since not all students taking the SIB answered all items.

***These N's are rounded and approximate, since there is considerable variation in N's among the 1960 tests.

retest batteries in 1963 and the completion of a set of tapes containing each student's item responses and test scores in 1963 together with his complete 1960 TALENT record.

Tape Preparation

Putting the Raw Data on Tape. As part of the administration of the tests, each student was assigned a six-digit retest identification number, which was position-coded on all his answer sheets, along with his name. Sex and date of birth were also position-coded on one answer sheet, and father's first name and mother's maiden name on another. The answer sheets were put through an optical scanner, and all item responses and position-coded identifying information were put on tape[1]. The fact that individual item responses were put on tape represented an important innovation, as far as Project TALENT was concerned, since this had not been feasible in the original TALENT testing. In 1960 the answer sheets containing most of the tests had been processed on a scoring machine, which put test scores on IBM cards, instead of item responses on tape.

Merging the Retest Tapes. Since each student used two, three, four, or five answer sheets (depending on which battery he took) the records for the various answer sheets had to be merged. This was done on an IBM-7070, matching on retest identification number and name. An effort was made to resolve minor discrepancies by a clerical operation which sometimes involved inspection of the answer sheets.

Merging the Retest Data with the 1960 Data. The merged retest records were matched with the tapes containing the 1960 TALENT data, and another merging operation was carried out, in much the same way, and with the same kinds of clerical checks, as the merging of several retest answer sheet records with each other. One major difference was that in merging the retest records with the original 1960 records, testing number was no longer available as a basis of matching, so that there was a heavier dependence on name matching, with all the problems that that entails. The initial computer

---

[1] This phase of the data-processing was carried out by the Measurement Research Center, in Iowa City.

operation for merging 1960 and 1963 data was based primarily on matching of name, date of birth, sex, and school. Secondary criteria were father's first name and mother's maiden name. In matching on the basis of schools, junior high schools that were feeder schools for a senior high school that was retested were treated as matching schools. After this initial matching operation, and clerical clean-up, additional computer searches for matching records were undertaken, in which the 1960 file was searched for students whose records matched except for school but who had been in a nearby school in 1960. This meant that any public, parochial, or private school in the same community as the retested school, or any school in a community adjacent to the one in which the retested school was located, was considered to be a "matching school" for the purpose of locating 1960 records corresponding to 1963 records. Through expedients of this sort and extensive clerical checks it was possible to match about three-quarters of the grade 12 retest records with corresponding 1960 TALENT records[1]. As has been indicated this percentage is sufficiently high that it seems reasonable to suppose that 1960 TALENT records were found for almost all of the students tested in 1963 who had also been tested 3 years earlier.

Scoring. All scoring of the 1963 data was done by computer. The IBM-7070 was used. Systematic spot-checking, done clerically, insured that reasonable standards of accuracy were being met.

Subsequent Data-Processing Operations

To facilitate data analysis, certain new variables and codes were added to the tapes. Chief among these were "Retest Weight Z" and the "Retest Classification Code."

Retest Weight Z. This is a weight for each student. It is applied in data-analysis operations when it seems desirable to make data from several batteries somewhat more comparable than they would be if differential weights were not applied. Weight Z is described in detail in Chapter 3, where its rationale is presented.

---

[1] Throughout this report, the term "matched cases" is used in the interest of brevity, to indicate cases for whom both 1960 and 1963 records are available (though not necessarily complete for either year). These "matched cases" are the ones whose classification code (described in Appendix C-5) is 0, 1, or 3.

Retest Classification Code. The function of this one-digit code is to facilitate selection of cases meeting certain specifications, for inclusion in a particular data-analysis operation. Appendix C-5 shows what the code is. It will be noted that classification codes 0, 1, and 3 represent "matched cases" while codes 2 and 4 represent unmatched cases. Code 0 represents the category called "matched complete cases," for which counts are shown in Table 2-2.

Chapter 3. TECHNICAL PROBLEMS[1]

This chapter is concerned with certain technical problems and theoretical considerations in the areas of measurement, data analysis, and interpretation of results. These are very broad, sweeping terms that may sound all-inclusive; but the scope of the chapter is considerably narrower, since it is concerned primarily with problems which are particularly relevant to this retest research because of either the design of the study or its general purpose.

Technical problems that bear on only one sub-study within this general study are discussed in the chapter dealing with that sub-study. For instance Chapter 6, which is concerned in large part with the outcomes of a set of factor analyses, contains a discussion of factor analysis theory and methodology.

The three main topics of the present chapter are:

1. Problems in achieving comparability of data obtained from different retest batteries (and therefore from different groups of students).
2. Estimating individual correlation coefficients and obtaining comprehensive correlation matrices that are consistent and accurate, when a tremendous proportion of some of the raw data is missing.
3. The measurement of change.

Of these three topics, the first two arise as a direct consequence of the design of the study--or to be more specific, as a direct consequence of the organization of the tests into a large number of partially overlapping batteries, with different sets of schools taking different batteries. Although this expedient was undoubtedly necessary because of practical exigencies, inevitably it created technical problems in data analysis--and thus

---

[1] It is suggested that readers interested in the substantive results and not at all in methodological matters skip this chapter (and perhaps much of the next one as well).

produced the need to solve these problems. The solutions are discussed in this chapter.

The last of the three topics (i.e., the measurement of change) is discussed in the present chapter because it is directly relevant to the general purpose or central theme of the entire study.

COMPARABILITY OF DATA FOR THE SIX RETEST BATTERIES

The Problem

In Chapter 2 is a description of how it was necessary to split the original TALENT battery into pieces, recombine the pieces in various ways to form six overlapping "retest batteries," A, B, C, D, E, and F, (seven if Battery V is included) and then to split the retest schools into groups, each to take a different retest battery. It is probably quite apparent that though a set-up as complex as this was necessary for many reasons, it brought with it some inherent difficulties. Perhaps the major problem lay in the fact that the groups taking the six retest batteries could not be chosen in such a way as to be directly comparable.

A Solution: Differential Weights

To help solve the problem pointed out above, a system for weighting cases differentially was developed. What made it possible to develop these weights was the fact that the Abstract Reasoning Test had been included in all batteries. The Abstract Reasoning Test is a measure of general mental ability, and as such, is correlated with many other tests in the battery. The correlations are moderate, undoubtedly being somewhat restricted as a result of the Abstract Reasoning Test's brevity and consequent rather modest reliability. Nevertheless, despite the fact that the correlations are not high, they are high enough that it is reasonable to suppose that two groups that are alike in regard to Abstract Reasoning scores are more likely to be similar in regard to scores on other variables than are groups that differ substantially in Abstract Reasoning scores.

The principle followed, accordingly, was to weight cases in such a way that within a sex, all six of the groups taking one of the six basic retest batteries (A, B, C, D, E, or F) would have identical percentage distributions on Abstract Reasoning score (R-290). The weight applied to each case to produce these results is called Retest Weight Z. It is a function of three things: the student's sex, the student's Abstract Reasoning score, and the retest battery. The percentage distributions for males or for females, after weighting, were not only to be identical for all six basic batteries but they were also to be identical to the percentage distribution for the six groups combined, unweighted. In order not to have the weights make any major change in the proportion of cases represented by any battery-and-sex combination, the Z weights for each such combination were scaled so that the total weighted number of cases would equal the original unweighted N.

It was decided to apply the procedure only to the six basic retest batteries (A, B, C, D, E, and F) and to assign a weight of 0 to all Battery V cases. The reason for this decision was that since the Battery V schools were all vocational high schools and all in New York City, any efforts to make them equivalent to more heterogeneous groups of schools, which include both academic and vocational high schools, in all parts of the country, would be self-defeating.

The procedure for determining Weight Z for each possible combination of retest battery, sex, and Abstract Reasoning score is presented in Appendix H-1. Development of the weights was based on the entire group of approximately 10,000 Battery A-F cases (not just the matched cases).

Table 3-1 shows, separately for each sex, the distribution of Abstract Reasoning scores for each of the six basic batteries. All cases are included. The distributions are unweighted. But when expressed in terms of proportion, the weighted distributions for each of the six batteries separately and for all batteries combined would of course be identical (except for rounding) to the Table 3-1 distributions for the six batteries combined. This is an automatic outcome of the way the weights were derived.

Table 3-2 shows the corresponding distributions separately for each battery, but based on matched cases only. Both unweighted distributions and weighted distributions are presented in Table 3-2. A comparison of the unweighted and weighted distributions makes it apparent that the six battery groups are more similar when the weights are used than when they aren't.

TABLE 3-1. Distribution of Abstract Reasoning scores (R-290) by sex

Based on <u>all</u> basic retest cases (batteries A-F), grade 12, <u>unweighted</u>

R-290	No. of Cases (for each Battery)												Batteries A-F Combined[a]			
	MALE						FEMALE						No. of Cases		Percent of Cases[b]	
	A	B	C	D	E	F	A	B	C	D	E	F	M	F	M	F
15	25	21	27	13	17	19	15	5	9	13	9	11	122	62	2.5	1.3
14	47	55	65	46	39	46	43	42	44	44	38	27	298	238	6.0	4.8
13	93	84	99	77	73	89	89	73	86	62	52	72	515	434	10.4	8.8
12	85	121	139	99	103	101	107	111	128	118	87	103	648	654	13.0	13.2
11	116	122	135	124	97	146	109	126	116	120	98	132	740	701	14.9	14.1
10	103	135	147	134	83	116	111	118	164	109	88	111	718	701	14.4	14.1
9	89	87	106	85	76	108	87	97	109	118	86	99	551	596	11.1	12.0
8	69	80	88	64	51	92	76	87	98	84	46	77	444	468	8.9	9.5
7	53	48	59	50	38	73	53	57	67	47	51	62	321	337	6.5	6.8
6	36	25	41	34	22	49	41	35	51	30	38	36	207	231	4.2	4.7
5	25	35	31	16	16	23	26	45	38	27	27	31	146	194	2.9	3.9
4	15	17	26	12	18	19	30	31	26	15	13	18	107	133	2.2	2.7
3	16	13	13	9	3	10	17	15	17	19	8	9	64	85	1.3	1.7
2	6	7	4	9	5	5	15	10	10	4	8	9	36	56	.7	1.1
1	1	7	8	1	1	1	5	8	6	6	4	1	19	30	.4	.6
0	4	1	9	3	7	7	5	6	11	1	7	5	31	35	.6	.7
Total	783	858	997	776	649	904	829	866	980	817	660	803	4967	4955	100.0	100.0
Mean	9.90	9.94	9.89	9.97	10.08	9.74	9.56	9.36	9.42	9.73	9.55	9.60	9.91	9.53	9.91	9.53
S.D.	2.97	2.90	3.02	2.74	2.91	2.84	3.14	3.05	3.01	2.81	3.02	2.81	2.90	2.98	2.90	2.98

---

[a] These are unweighted distributions, but the distributions obtained by using weight Z are identical to them (within rounding error).

[b] The <u>weighted</u> percentage distributions for each battery (A-F) separately are identical to these (within rounding error).

TABLE 3-2. Distribution of Abstract Reasoning scores (R-290), by sex, based on matched cases

(Based on grade 12 retest data, both unweighted and weighted)

R-290	Percentage of cases														
	MALES							FEMALES							
	A	B	C	D	E	F	V	A	B	C	D	E	F	V
	UNWEIGHTED Percentage Distribution														
15	3.5	3.1	3.2	2.1	2.8	2.4	2.4	2.4	.5	.9	1.9	1.5	1.6	
14	6.9	6.2	6.3	6.6	7.1	6.2	2.4	6.0	5.5	5.2	5.8	5.9	3.7	
13	12.7	10.9	10.8	10.2	12.0	10.7	10.7	11.3	9.1	9.1	8.4	9.0	9.7	2.2
12	9.7	15.3	14.4	13.9	16.6	11.5	7.1	13.5	11.8	14.8	15.1	14.3	13.2	6.7
11	16.3	13.9	14.5	15.9	15.7	15.6	20.2	13.7	15.9	11.4	14.8	16.7	17.7	10.0
10	13.2	15.9	14.8	17.3	12.6	12.8	17.8	14.5	13.3	17.4	14.3	12.5	13.9	12.2
9	11.7	9.5	10.6	11.1	11.2	10.4	16.7	9.7	10.7	10.8	14.0	12.0	11.8	6.7
8	8.7	7.8	8.2	7.9	6.4	10.4	10.7	8.9	10.7	9.5	9.8	6.8	9.0	15.6
7	6.0	5.9	5.9	5.5	6.0	7.7	6.0	6.3	6.4	6.6	5.0	7.3	7.7	21.1
6	3.2	3.1	3.5	3.9	3.2	6.2	1.2	3.9	3.9	4.0	3.5	5.5	3.9	8.9
5	3.4	2.9	3.1	1.8	1.9	2.6	1.2	2.9	4.9	3.1	2.6	3.7	3.2	4.4
4	1.4	2.1	2.4	1.6	2.1	1.9		3.5	3.3	2.5	1.6	1.6	2.1	6.7
3	1.9	1.6	1.2	.9	.6	.6	2.4	1.5	1.7	2.2	2.1	.7	1.3	3.3
2	.9	.7	.3	1.1	.9	.3		1.1	.9	.8	.3	.9	.6	1.1
1		.9	.1			.2		.5	.6	.5	.6	.5		1.1
0	.5	.2	.7	.2	.9	.5	1.2	.3	.8	1.2	.2	1.1	.6	
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mean	10.1	10.1	10.1	10.2	10.3	9.9	9.9	9.9	9.5	9.6	9.9	9.8	9.8	7.9
S.D.	2.9	2.9	2.9	2.7	2.8	2.8	2.5	3.0	3.0	3.0	2.8	3.0	2.8	2.6
N	565	580	744	560	535	627	84	620	638	768	621	546	621	90
	A	B	C	D	E	F		A	B	C	D	E	F	
	WEIGHTED Percentage Distribution														
15	2.7	3.1	2.9	3.1	2.6	2.8		1.7	1.1	1.2	1.5	1.4	1.5	
14	6.9	5.8	5.8	6.7	7.1	7.3		5.6	5.4	5.6	5.2	4.9	5.3	
13	11.1	11.5	11.2	10.7	11.1	11.2		9.2	9.5	9.1	9.7	10.0	9.5	
12	11.7	14.0	13.4	14.2	13.7	13.4		13.8	12.1	14.9	13.8	14.4	13.6	
11	16.5	14.4	15.9	14.9	15.7	14.3		14.7	15.4	13.6	14.3	16.0	15.3	
10	14.6	14.5	14.4	14.5	14.3	14.4		15.3	13.8	14.7	15.2	13.3	14.3	
9	11.5	10.3	11.0	11.3	10.6	9.6		11.1	11.5	11.7	11.7	11.1	11.6	
8	8.9	7.4	8.3	8.6	7.3	9.1		9.2	10.1	9.0	9.0	9.2	8.9	
7	5.8	6.8	6.4	5.5	6.6	6.1		6.7	6.6	6.6	5.9	6.4	6.8	
6	2.9	4.4	3.5	3.7	4.0	4.7		3.7	4.5	3.6	4.4	4.5	4.1	
5	3.1	2.1	2.9	2.6	2.3	3.0		3.6	3.7	3.1	3.1	3.6	3.3	
4	1.6	2.3	2.0	2.2	1.6	1.9		2.6	2.5	2.5	2.3	2.2	2.5	
3	1.2	1.3	1.2	1.0	1.7	.7		1.3	1.7	2.2	1.5	1.0	2.0	
2	.9	.6	.5	.7	.9	.4		.7	.9	.9	.7	.8	.6	
1		.4	.1			.7		.5	.4	.5	.5	.5		
0	.6	1.1	.5	.3	.5	.4		.3	.8	.8	1.2	.7	.7	
Total	100.0	100.0	100.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0	100.0	
Mean	10.1	10.0	10.1	10.2	10.1	10.1		9.8	9.6	9.7	9.7	9.8	9.8	
S.D.	2.8	3.0	2.8	2.8	2.9	2.9		2.8	2.9	3.0	3.0	2.9	2.9	
Weighted N	562	584	747	559	533	630		620	638	768	620	545	618	

CORRECTING CORRELATION COEFFICIENTS FOR MISSING DATA

The Problem

As is obvious from an inspection of Table 2-4 (and sections C-2 to C-4 of Appendix C) only about one-sixth of the students taking the basic retest batteries, A, B, C, D, E, and F, are available for direct inclusion in the group when certain correlation coefficients are being computed. For instance in the case of certain pairs of tests, both tests were taken only by the Battery A group of students; for other pairs of tests, it was Battery B; for others, Battery C; etc. Thus not only is there necessarily a tremendous amount of missing data but there is zero overlap between the groups available for inclusion in certain correlation coefficients and the groups available for inclusion in others. For instance only 1,155 cases (542 boys and 613 girls, taking Battery B) have scores on both Mathematics Information (R-106) and Advanced High School Mathematics (R-333). And for the correlation between the latter test and Visualization in Three Dimensions (R-282) an entirely different group consisting of 1,219 students (610 boys and 609 girls taking Battery F) is available. Thus since there is nobody in the retest group who could be included in both these correlation coefficients, the three variables involved could not all be included in the same correlation matrix if the usually desirable restriction were imposed that only those cases for whom scores are available on all the variables in a matrix are to be included in it. This meant, of course, that since correlation matrices were needed to analyze the data adequately, it was necessary to abandon the restriction that only complete cases should be included. But in using correlation coefficients, as soon as one goes beyond the simple first step of regarding each correlation coefficient as a separate statistic, having nothing much to do with any other correlation coefficient, and tries to compare two, it is obviously imperative that the coefficients compared be based on the same group of cases or else on groups that can reasonably be regarded as equivalent.

And when one moves beyond simple direct comparison of correlation coefficients and begins to regard an entire matrix as a coherent set of data that may be treated as a unit in applying the procedures of multivariate analysis, the problems are multiplied. A correlation matrix not based on a single complete set of scores must be regarded with considerable suspicion. And when the extent of missing data is as vast as in the case of the present study, researchers familiar with the pitfalls for the unwary in multivariate analysis could be expected to be vastly suspicious of multivariate analysis performed on correlation matrices in which each coefficient is based on whatever cases are available for that pair of variables. Such matrices, in fact, might very well be termed pseudo-matrices--and in the interests of brevity that is exactly what we shall call them.

Matrices are termed "inconsistent" if there is no possible set of real data that could have produced them.[1] Quite apart from the obvious undesirability of using matrices (or any other kind of data, for that matter) that are so blatantly and basically inaccurate, their use in multivariate analysis (and in certain univariate approaches as well) can lead to mathematical difficulties for which there is no logical solution. Thus it is absolutely essential that the basic matrix used in multivariate analysis be a consistent one.

In addition to the requirement of consistency, it is also desirable, of course, that the matrix be as <u>accurate</u> as possible. Consistency is a necessary but not sufficient condition for accuracy. The appropriate procedure, therefore, is first to try to get as accurate an estimate as one reasonably can of each correlation in the matrix, and only after this has been done, to test the matrix for consistency. Even with the precaution of obtaining the best estimates one can of each correlation, the matrix may still turn out to be slightly inconsistent. (It seems extremely unlikely that with a good estimation procedure it would turn out to be <u>grossly</u> inconsistent.) In the event that the test of matrix consistency reveals any inconsistency, it should be possible with minimal modifications of the correlation coefficients composing it to convert it to a consistent matrix.

The Solution: A Two-Part Approach

To meet the needs outlined above, the author of this report has developed a mathematical procedure for modifying a pseudo-matrix to obtain a matrix

---

[1] The technical name that mathematicians use for an inconsistent matrix of this sort is "non-Gramian matrix."

which is believed to be a closer approximation of what would have been obtained if the missing data had not been missing.

In the previous section, where the nature of the problem was outlined, its twofold nature was pointed out. The first of the two aspects is the need to obtain as good estimates as possible of the individual correlation coefficients. The second aspect, necessary only if an entire matrix is involved, rather than a few scattered individual correlation coefficients, is to apply a test for consistency to the matrix resulting from the first stage, and if the matrix proves inconsistent, to modify it slightly in order to make it consistent. Since the problem is twofold, so is the solution, the first part, of course, being to estimate the individual correlation coefficients and the second being to make the matrix consistent if it isn't.

When only a single correlation coefficient is of concern (as it might be if the problem were to validate a single test against a single criterion), only the first part of the solution is relevant.

When the missing data occur in a multivariate score matrix, and the problem is to obtain not just a single correlation coefficient but an entire correlation matrix, suitable for use in multiple correlation and in multivariate procedures such as factor analysis, multiple discriminant analysis, and multivariate analysis of variance, the second part of the solution must be superimposed on the first, in order to insure that the matrix will be consistent. It may be worth mentioning that in a few situations (which didn't occur in the present study) the second part of the solution might be relevant and the first part inapplicable. An example of this could occur if an entire correlation matrix, based on complete cases only, were to be corrected for attenuation, since this might produce an inconsistent matrix from an originally consistent one.

Thus there could be occasion to use either part of the solution independently of the other, and the method is readily applicable to such separate use.

This report contains the first operational use of either part of the new procedure. Presentation of the derivation, which is a long and rather complex one, is not feasible here. Since it will be documented in detail elsewhere, only the barest description of the procedure, together with a fairly full statement of the assumptions underlying it, will be presented at this point.

Stage 1. Correcting the Individual Correlation Coefficients

The first stage of the procedure for correcting any individual correlation coefficient consists in obtaining an ordinary Pearson product-moment correlation coefficient for all available observations. The procedure for modifying this coefficient to correct for missing data involves the use of all cases having data for either or both of the variables to be correlated.

The assumptions that are inherent in the derivation and underlie the procedure are:

1. That the relation between the two variables is essentially linear.
2. That the standard error of estimate is uniform throughout the range (i.e., that the complete bivariate distribution is homoscedastic).
3. That cases with a missing score on one of the two variables are a random sample of the corresponding array of scores on the other variable.

It should be understood that nowhere in the derivation, either explicitly or implicitly, are any of the following common assumptions made:

1. That the cases for whom scores are available on both variables are a random sample of the total group.
2. That for either <u>one</u> of the variables the cases for whom scores are available are a random sample of the total group.
3. That the hypothetical bivariate distribution for the total group is normal.
4. That the actual bivariate distribution for the cases having scores on both variables is normal.
5. That the distribution of either of the individual variables is normal, either for all cases having a score on the variable or for the cases having scores on both variables.
6. That the distribution is truncated on either variable. (In other words it is not necessary that the cases with missing

scores on one variable constitute a block at one or the other end of the distribution on the other variable.)

7. That the cases with missing scores constitute a block of adjacent cases on either variable.

Stage 2. Insuring Matrix Consistency

The test for consistency is to check whether the matrix is free of negative eigenvalues. If the matrix turns out to be inconsistent the procedure for converting it to a consistent one is applicable primarily when the inconsistency is only slight--in other words when only comparatively few of the eigenvalues are negative and those few not numerically large.

If the matrix were grossly inconsistent, the procedure would be inapplicable because the assumption that departures from consistency were due primarily to sampling errors would then presumably become untenable.

The second-stage solution consists in algebraic manipulation of the matrix in such a way that the few negative eigenvalues are changed to 0 (thus producing a singular matrix) with minimal changes in the other eigenvalues and the correlations constituting the matrix. The singularity of the resulting consistent matrix is not a disadvantage since presumably only a matrix very close to singularity would be likely to be pushed over to the "inconsistent" side of the dividing line between consistent and inconsistent matrices, as a result of missing data.

THE MEASUREMENT OF CHANGE

A knotty technical issue, one in which many educational researchers have become entangled, is the deceptively simple-sounding problem of how to measure change.

Raw Differences *vs.* Adjusted Differences

It has become an article of faith among many researchers that it is technically unsound, when investigating growth or any other kind of change occurring between one time and another, to pay much attention to raw differences between measures obtained on the two occasions. Statistically knowledgeable researchers have pointed out, quite properly, that raw differences are sometimes and for some purposes misleading, since gains in score between the initial and final testing tend to be negatively correlated with initial score. Another contingent of researchers has not only accepted the view described above, but has accepted it uncritically, in somewhat distorted form. Therefore misconceptions on the topic are widespread.

Because the study of growth and change is the central theme of the research reported in this study it seems advisable to make clear at the outset the viewpoint on measurement of differences and of change that has guided this research. It would be presumptuous to imply that in a few brief paragraphs it is possible to summarize the solution to all aspects of this problem. It isn't. Whole books have been written on the problem--and they have helped materially to shed light on it. For instance there is Thorndike's excellent study on *The Concepts of Over- and Underachievement* (Thorndike, 1963). The volume edited by Harris on *Problems in Measuring Change*, which presents papers on many different aspects of the problem, investigated from many different viewpoints (and resulting, in some cases, in apparently conflicting conclusions), is another very helpful volume even though the differences of opinion it embodies preclude its providing any one definitive answer. Davis, in his textbook *Educational Measurements and Their Interpretation* (Davis, 1964, Chapter 10), provides some fresh insights and some useful formulas that are not very well known.

The problem has too many ramifications for any single simple statement to summarize the solution to all aspects and all variants of the issue. Nevertheless, since the problems in the present study are relatively simple ones, not involving <u>all</u> aspects and <u>all</u> variants of the issue, an effort to describe briefly the single viewpoint that has resulted in the multiple methodological approaches used in this study seems worth undertaking.

Let us start by reiterating that the notion that raw differences are sometimes misleading is perfectly correct. There <u>is</u> a tendency towards negative correlation between gains and initial score. As a matter of fact unless the variance of the scores is considerably greater on the second occasion than the first, the correlation between initial score and gain will necessarily be negative when the correlation between initial and final score is positive but not perfect--the usual situation of course. But even with the normally expected positive correlation between initial and final score, negative correlation between initial score and gain is not inevitable. A large increase in standard deviation can counteract the pull towards the negative side of the correlation scale.

All this can be seen from the formula for the correlation between initial score and gain:

$$r_{AG} = \frac{r_{AB}\sigma_B - \sigma_A}{\sigma_G} \qquad (1)$$

where A = initial raw score
B = final raw score
G = gain = B - A

When σ_A and σ_B are equal, the formula reduces to:

$$r_{AG} = -\sqrt{\frac{1 - r_{AB}}{2}} \qquad (2)$$

which is necessarily negative, of course.

Another rather widespread misconception is that the tendency of gains to be negatively correlated with initial measure is caused by failure of the measures used to be perfectly reliable. A look at formula 1 above makes it clear that this is not the case, since reliability coefficients do not even enter into the formula, when the same initial measure that was used in computing gains is used in the correlation between gains and initial score. Where two parallel initial measures are available one can be used in computing gains and the other as the variable to be correlated with gains, thus "correcting for unreliability," in which case the relevant formula becomes:

$$r_{A'G} = \frac{r_{AB}\sigma_B - r_{AA}\sigma_A}{\sigma_G} \qquad (3)$$

It is clear that even this correction would not often change a negative correlation between initial score and gain to a positive one if the standard deviations of the initial and final measures were about equal, since in the usual situation r_{AB} would be considerably lower than the reliability (r_{AA}) of the initial score.

Furthermore, and quite apart from the problem of test reliability or unreliability, none of the foregoing discussion implies that if, for instance, students in schools that score low in grade 9 were to show larger gains by grade 12 than students in schools where the grade 9 scores are fairly high, this finding should be regarded as a trivial one, that is caused merely by the workings of correlation and of formula 1 or 3. The habit of interpreting results of this sort as if the correlation coefficient existed before the scores and caused them to behave in accordance with it rather than merely describing the way they behave is more prevalent than it should be. Along with this goes the habit of explaining away possibly important results as being "caused by regression," as if regression were some sort of demonic causative agency operating in a goal-directed way, to make negative correlations sprout where positive ones might otherwise be expected.

"Regression" is merely a description of the phenomenon--a description that helps explain it. In no sense is it a cause of the phenomenon.

In this report, therefore, both approaches will be used. Raw gains will be investigated in seeking the answers to certain questions and gains "corrected for regression"--in other words residual gains after subtraction of the amount of gain that would be predicted on the basis of initial score--will be used where this approach is the appropriate one.

Perhaps all this can be summarized by saying there is no single best procedure because there is not just a single kind of question to be answered. In this research we shall attempt to have the questions that are to be answered serve as determining factors in choosing the methodology to be used.

Obtaining Adjusted Measures

Granted that there are questions about growth or change that can best be answered if a partial correlation or covariance analysis procedure is used in which the data are adjusted for initial score, the question is how. More specifically, should the raw gains themselves (i.e., the raw differences between initial and final score) be corrected for covariance with the initial score, or should it be the final score that receives this treatment? In other words what variable should be studied--final score (after adjustment) or gains (after the same kind of adjustment)?

The answer to this question is that it doesn't make the slightest difference--because they are identical. In fact this equivalence can be generalized even further. Residual gain and residual final score are equal even when more than one variable is used as a covariate.[1] It doesn't matter how many covariates there are, for this equivalence still to apply, as long as the same set is used for the residual final scores and the residual gains scores, and as long as <u>one</u> of the covariates is the initial score on the variable under consideration. This is an important consideration in the case of the present study since in studying gains corrected for initial status, it seems advisable to define initial status not merely as grade 9 score on the variable in question but as a complex consisting not only of that score but also of grade 9 scores on a large number of other variables that might have a significant effect on growth.

Throughout this report the type of analysis referred to above is sometimes referred to as analysis of gains corrected for covariance (or analysis of residual gains) and sometimes as analysis of final scores corrected for covariance (or analysis of residual final scores). The reader is asked to bear in mind that they mean the same thing.

What Kind of Instruments to Measure Change?

We have been concerned with the problem of how to compute differences in measuring change. A somewhat different though related problem is how to set up the score scales used to determine initial and final score. Is it possible to do it in such a way that the units are "equal" at all parts of the scale? And even more basically, can we be sure the psychometric instrument is measuring the same function at all levels? Thorndike has summarized both these problems cogently in a recent paper:

> "...change scores are very sensitive creatures, very responsive to changes in score scale and to changes in the function being measured. So perhaps we need to modify the earlier conclusion ... that only a small fraction of the gain in later competence can be thought of as arising from a continuation of early growth trends. Perhaps it must be concluded that, unless and until scales are developed that are truly homogeneous in the functions that they tap at all levels and are truly expressed in equal units, we will have to forego serious attempts to give a quantitative answer to the simple but tantalizing question: To what extent will the children who have grown rapidly in intellect up to the present moment continue to grow rapidly in the future?" (Thorndike, 1966, p. 127)

---

[1] The proof is presented in Appendix H-2.

The problems he points out haven't been completely solved in Project TALENT--or, for that matter, anyplace else, so far as we know. We certainly are in no position to assert, and defend the assertion, that our scales measure "equal units" throughout. Nor can we assert *a priori* that the same fundamental skills are involved at all levels in our test scales. As a matter of fact, we can be reasonably sure they aren't. It is perhaps one of the basic attributes of growth in mental abilities (and other kinds of abilities too) that it involves changes in approach, the utilization of new approaches, or the bringing of old, well-established skills to bear on a task to which they had not previously been applied. Certainly the adult who reads competently does not do it in precisely the same way as the 6-year-old who is just learning to read. It is not a case of the adult performing just like the 6-year-old, only more so. Likewise the person who happens to have learned that the square of 14 is 196 and is reasonably skilled in arithmetic can determine the square of 1.4 almost instantly without going through the laborious process of multiplying by 4, multiplying by 1, offsetting the second product properly, adding them, counting the decimal places in multiplier and multiplicand, adding them, and marking off the proper number of decimal places in the final product.

Fortunately, however, this problem is not a basic one as far as our study is concerned. The tests in the TALENT battery are more concerned with functional skills and knowledge that the student has acquired than with the "atoms" that unite to form them. We are concerned with such questions as: "How well does the student read? How good is he at math? How much does he know about science? About social studies?" We are far more interested, in the present study, in investigating questions about how <u>well</u> the student reads than questions about <u>how</u> he reads. What we want to know is how well the student comprehends what he reads and how fast he can read with comprehension, not how many eye movements he makes. When we delimit our problem thus, the question of homogeneous functions throughout the scale diminishes in importance. (In Chapter 6 we do take some first steps to investigate it, however. In that chapter we present factor analyses based on grade 9 scores and grade 12 scores on the same tests. This permits us to get some idea of whether and how the factorial composition of performance on these tests changes in the 3-year interval.)

As for the related problem of "equal units" at all parts of the scale, it remains a problem! And it is a matter that affects the reliability of measures of change. Difference scores are notoriously unreliable, particularly when the difference between correlated variables is involved--as it almost always must be if the study of change is to be meaningful. But as we shall see in Chapter 4, even though we have not rescaled the test scores in an effort to make the units "equal," the raw score differences do, for the most part, tend to have a degree of reliability adequate for research use. And this is especially true in the case of the longer scales such as those measuring reading and mathematics skills.

Chapter 4. NEW FINDINGS ABOUT THE BATTERY

This chapter is concerned more directly with the TALENT battery itself, both in its original version and as administered in 1963 for the retest study, than with inferences about the students who took it or the schools where it was taken. The purpose of this concern is twofold: first, to provide data that will be of use in interpreting the findings about the retested students and schools presented in Part III of this report (Chapters 5 - 8); and second, to provide data that will be useful in planning, carrying out, and interpreting research to be done in the future that uses as a base the main TALENT sample, tested in 1960.

DEGREE OF SPEEDEDNESS OF THE TESTS

In administering any large test battery on a large-scale basis it is virtually a necessity to have specific time limits, even for tests that are essentially unspeeded. In such cases the time limits ideally would be generous enough to permit everyone to finish or at least to have time to try all the items that he was capable of answering correctly. Most of the tests in the battery were intended to function this way. The only explicit exceptions were two tests that were intended to be partially speeded, in other words to permit those students to finish who had a very good mastery of the ability being tested, and four tests that were deliberately designed to be so highly speeded that nobody would be able to finish. The two partially speeded tests are Disguised Words (Scale 220) and Visualization in Two Dimensions (Scale 281). The four fully speeded tests are Arithmetic Computation (Scale 410), Table Reading (Scale 420), Clerical Checking (Scale 430), and Object Inspection (Scale 440).

Tables 4-1 through 4-5 give some idea of the extent to which the students were able to finish the various "unspeeded" and "partially speeded" tests. The first three of these tables provide data on the Interest Inventory and on all of the tests except the four fully speeded ones (Scales 410, 420, 430, and 440). Tables 4-4 and 4-5 provide supplementary information on the information and interest scales.

TABLE 4-1. Number and proportion of test items completed, and percentage of students completing test; by sex
Based on grade 12 students (matched cases, weighted by Weight Z)

	n**	Number of items completed				Proportion of items completed				% of students completing test		Weighted N***		Retest batteries included
		Mean		S.D.		Mean		S.D.						
		M	F	M	F	M	F	M	F	M	F	M	F	
190. Info I	252	250.2	251.4	10.1	5.1	.993	.998	.040	.020	93.6	96.7	1880	2008	A-C
192. Info II	143	134.2	137.0	16.8	13.5	.938	.958	.117	.094	65.5	75.0	1657	1754	ADE
212. Mem. for Wds.	24	22.7	23.1	3.8	3.5	.948	.963	.158	.146	76.7	85.1	1858	1920	BDF
220. Disguised Wds.	30	23.5	23.9	7.1	6.8	.783	.796	.237	.227	31.5	31.4	1929	1968	CEF
230. English	113	112.0	112.3	8.1	7.7	.991	.994	.072	.068	95.7	97.5	1858	1920	BDF
240. Wd. Functions	24	23.4	23.7	3.1	2.2	.976	.988	.129	.092	93.0	95.3	1929	1968	CEF
250. Rdg. Comp.	48	46.4	46.7	5.6	4.9	.966	.973	.117	.102	85.5	85.8	1929	1968	CEF
260. Creativity	20	19.6	19.7	2.0	1.9	.979	.983	.100	.095	89.7	89.0	1929	1968	CEF
270. Mech. Reas.	20	19.6	19.4	1.8	2.0	.980	.969	.090	.100	88.5	81.5	1929	1968	CEF
281. Vis. in 2 Dim.	24	20.1	18.0	4.4	4.7	.838	.751	.183	.196	35.9	18.7	1929	1968	CEF
282. Vis. in 3 Dim.	16	15.7	15.8	1.6	1.6	.984	.986	.100	.100	93.4	94.6	1929	1968	CEF
290. Abst. Reas.	15	14.8	14.8	1.7	1.6	.987	.988	.113	.107	97.2	97.0	3710	3863	A-F
340. Mathematics	54	52.6	52.8	6.2	4.8	.974	.978	.115	.089	83.3	81.6	1858	1920	BDF
311. Math I	16	15.9	15.9	*	*	.992	.996	*	*	99.0	99.6	1858	1920	BDF
312. Math II	24	23.6	23.8	*	*	.984	.990	*	*	97.3	98.1	1858	1920	BDF
333. Math III	14	13.0	13.0	*	*	.928	.927	*	*	83.3	81.6	1858	1920	BDF
700. Interest Inv.	205	200.6	203.2	15.3	9.8	.978	.991	.075	.048	86.3	94.2	1661	1754	ADE

*Data not available.

**n = number of items in test.

***Unweighted N's are about equal to weighted N's.

Table 4-1 shows the mean and standard deviation of both the number and proportion of items completed on each test. The percentages of students completing the test are also shown. The distributions on which these data are based were weighted by Retest Weight Z in order to make the results as comparable as possible for tests in different combinations of retest batteries. Tables 4-2 and 4-3 are based on the same distributions, weighted in the same way, as Table 4-1. Table 4-2 shows selected percentile points on the distribution of number of items completed (i.e., the L score[1]) for 14 variables. Separate percentiles are shown for each sex. Table 4-3 shows essentially the same data as Table 4-2, but with the L-scores (which represent <u>number</u> of items completed) converted to proportion of items completed. Table 4-4 shows the percentage of students completing each scale of the Information Test and the Interest Inventory.

As has been indicated, only two of the tests (Scales 220 and 281) included in Tables 4-1 through 4-3 were definitely intended to function as partially speeded tests. It is clear from the first three tables that on almost all the other tests--the ones that were intended to be essentially unspeeded--most of the students had time to finish or nearly finish. The principal exceptions were Information Part II and to a lesser extent Memory for Words. There were a sizable number of students who didn't finish the Mathematics Test, but it is clear from Table 4-1 that this was due almost entirely to not finishing Math III, Advanced High School Mathematics. Since the Math III test was designed for that segment of the student body that had had college-preparatory mathematics courses beyond grade 9, it seems likely that the apparent failure to finish this test was due in most cases to deliberate omission of the items.

The reason sizable groups of students fail to complete Information Part II and Memory for Words is not quite clear,[2] particularly in the case of Information II, which was finished by a larger percentage of the national sample

---

[1] See Appendix A.

[2] The Memory for Words Test was designed to be parallel to the Paired Associates Test of J. B. Carroll's *Psi-Lambda Foreign Language Aptitude Battery* (by arrangement with the author). Accordingly it was made identical in length and used the same time limits.

TABLE 4-2. L-scores (last item completed) corresponding to selected percentiles Based on grade 12 students (matched cases, weighted by Retest Weight Z)*

Percentile**	Number of items completed													
	L-190 Info. I	L-192 Info. II	L-212 Mem. for Wds.	L-220 Disg. Wds.	L-230 Eng.	L-240 Wd. Funct.	L-250 Rdg. Comp.	L-260 Creat.	L-270 Mech. Reas.	L-281 Vis. 2 Dim.	L-282 Vis. 3 Dim.	L-290 Abst. Reas.	L-340 Math	L-700 Int. Inv.
MALES														
60				27.6						22.7				
50				25.1						21.1				
40				22.5						19.8				
30		137.8		20.1						18.3				
25		132.1		18.9						17.3				
20		125.4	23.3	17.7						16.4				
15		118.0	21.8	16.4						15.4			53.0	
10		108.4	19.9	14.4			43.1	19.9	19.2	14.2			51.6	190.5
5	244.5	96.1	16.5	11.5		21.3	36.2	17.0	17.2	12.2	15.0		46.8	171.3
4	236.5	91.8	14.6	10.6	112.7	19.8	34.0	16.0	16.7	11.6	14.2		44.0	162.5
3	230.3	90.0	12.7	7.5	111.0	18.0	32.5	15.2	16.0	11.2	13.3		40.2	158.5
2	221.0	83.0	9.0	.9	97.6	14.0	29.7	13.6	15.0	10.0	12.4	14.2	37.2	144.5
1	205.5	71.5	.7	.5	80.7	2.5	25.0	10.5	12.7	8.0	9.5	.8	16.5	122.6
Mean	250.2	134.2	22.7	23.5	112.0	23.4	46.4	19.6	19.6	20.1	15.7	14.8	52.6	200.6
S.D.	10.1	16.8	3.8	7.1	8.1	3.1	5.6	2.0	1.8	4.4	1.6	1.7	6.2	15.3
FEMALES														
80										23.2				
75										22.1				
70										21.3				
60				27.6						19.7				
50				25.3						18.2				
40				23.3						16.7				
30				21.2						15.4				
25		143.0		19.8						14.7				
20		134.3		18.6						13.9				
15		126.3		17.2					18.7	12.8			52.7	
10		116.5	21.9	15.5			43.7	19.8	17.6	11.9			50.8	
5		104.8	18.4	12.1			41.0	18.4	16.2	10.3	15.6		47.4	198.5
4		102.6	16.8	11.4		23.3	37.3	17.9	15.8	9.9	14.7		46.3	191.5
3	251.7	100.3	14.5	8.5		21.6	35.5	16.8	15.2	9.4	14.0	15.0	43.3	182.7
2	247.0	94.5	10.7	.8	112.4	19.0	32.3	15.2	14.1	8.7	12.6	14.0	40.2	171.5
1	229.5	86.0	.8	.4	89.0	14.5	26.5	10.5	12.0	7.3	11.2	1.0	29.5	143.5
Mean	251.4	137.0	23.1	23.9	112.3	23.7	46.7	19.7	19.4	18.0	15.8	14.8	52.8	203.2
S.D.	5.1	13.5	3.5	6.8	7.7	2.2	4.9	1.9	2.0	4.7	1.6	1.6	4.8	9.8

---

*Based on the same distributions as Table 4-1. The numbers of cases on which these data are based are shown in Table 4-1.

**Percentage of students not completing the indicated number of items.

TABLE 4-3. Proportion of items completed, corresponding to selected percentiles
Based on grade 1[illegible] students (matched cases, weighted by Retest Weight Z)*

Percentile**	Proportion of items completed													
	190 Info. I	192 Info. II	212 Mem. for Wds.	220 Disg. Wds.	230 Eng.	240 Wd. Funct.	250 Rdg. Comp.	260 Creat.	270 Mech. Reas.	281 Vis. 2 Dim.	282 Vis. 3 Dim.	290 Abst. Reas.	340 Math	700 Int. Inv.
							MALES							
60				.920						.946				
50				.837						.880				
40				.750						.826				
30		.964		.670						.763				
25		.924		.630						.721				
20		.877	.971	.590						.684				
15		.825	.908	.547						.642			.982	
10		.758	.829	.480			.898	.995	.960	.592			.956	.929
5	.970	.672	.688	.383		.888	.754	.850	.860	.509	.938		.867	.836
4	.938	.642	.608	.353	.997	.825	.708	.800	.835	.484	.888		.815	.793
3	.914	.629	.529	.250	.982	.750	.677	.760	.800	.467	.831		.745	.773
2	.877	.580	.375	.030	.864	.583	.619	.680	.750	.417	.775	.947	.689	.705
1	.815	.500	.029	.017	.714	.104	.521	.525	.635	.334	.594	.053	.306	.598
Mean	.993	.938	.948	.783	.991	.976	.966	.979	.980	.838	.984	.987	.974	.978
S.D.	.040	.117	.158	.237	.072	.129	.117	.100	.090	.183	.100	.113	.115	.075
							FEMALES							
80										.967				
75										.922				
70										.888				
60				.920						.821				
50				.843						.759				
40				.777						.696				
30				.707						.642				
25		1.000		.660						.613				
20		.939		.620						.580				
15		.883		.573					.935	.534			.976	
10		.814	.913	.517			.910	.990	.880	.496			.941	
5		.733	.767	.403			.854	.920	.810	.430	.975		.878	.968
4		.717	.701	.380		.972	.777	.895	.790	.413	.919		.857	.934
3	.999	.701	.605	.283		.901	.739	.840	.760	.392	.875	1.000	.802	.891
2	.981	.661	.446	.027	.995	.792	.673	.760	.705	.363	.788	.933	.745	.837
1	.911	.601	.033	.013	.788	.605	.552	.525	.600	.304	.700	.067	.546	.700
Mean	.998	.958	.963	.796	.994	.988	.973	.983	.969	.751	.986	.988	.978	.991
S.D.	.020	.094	.146	.227	.068	.092	.102	.095	.100	.196	.100	.107	.089	.048

---

*Based on the same distributions as Tables 4-1 and 4-2. The numbers of cases on which these data are based are shown in Table 4-1.

**Percentage of students not completing the indicated proportion of the items.

TABLE 4-4. Percentage of students completing each scale of Information Test and Interest Inventory Based on grade 12 students (matched cases, weighted by Weight Z)*

Information I Scales	n**	Last item no.	% of students finishing		Information II Scales	n**	Last item no.	% of students finishing		Interest Inventory Scales	n**	Last item no.	% of students finishing	
			M	F				M	F				M	F
101 Screen	12	252	93.6	96.7	131 Art	12	390	69.8	77.9	701 Phy.,math	16	180	93.4	97.4
102 Voc. I	21	238	95.8	98.5	132 Law	9	388	71.7	79.0	702 Bio.,med.	8	181	93.2	97.3
103 Lit.	24	241	95.2	98.4	133 Health	9	381	78.0	83.7	703 Pub.serv.	11	205	86.3	94.2
104 Music	13	250	94.6	97.8	134 Engin.	6	393	66.4	76.0	704 Lit.,ling	16	197	88.5	95.1
105 Soc.St	24	249	94.8	97.8	135 Arch.	6	374	82.5	87.3	705 Soc.serv.	12	178	93.8	97.6
106 Math	23	242	95.1	98.3	136 Journ.	3	361	89.4	93.7	706 Artistic	7	200	87.7	94.8
107 Phy.Sc	18	239	95.5	98.4	137 For.Trav	5	368	86.3	90.3	707 Musical	5	198	88.2	95.0
108 Bio.Sc	11	235	96.1	98.7	138 Military	7	389	70.7	78.5	708 Sports	8	203	87.3	94.6
109 Sci.At	10	144	99.7	99.9	139 Acct,...	10	386	73.5	80.2	709 Hunt,fish	3	188	90.7	96.4
110 Aer-sp	10	237	95.9	98.5	140 Prac.Kn.	4	382	76.9	82.8	710 Bus.mgmt.	14	195	88.9	95.3
111 Elec.	20	244	95.0	98.2	141 Clerical	3	395	65.5	75.0	711 Sales	6	183	92.3	96.9
112 Mech.	19	236	96.1	98.5	142 Bible	15	385	74.4	81.1	712 Comput.	10	179	93.6	97.5
113 Farm.	12	224	97.8	99.3	143 Colors	3	353	93.4	96.8	713 Office	7	165	95.8	98.4
114 Ho.Ec.	21	245	95.0	98.2	144 Etiq.	2	379	78.9	84.8	714 Mech,tech	15	192	89.7	95.9
115 Sports	14	243	95.1	98.2	145 Hunting	5	365	87.8	92.2	715 Skill.Tr.	18	193	89.3	95.7
					146 Fishing	5	383	76.6	82.3	716 Farming	7	204	86.8	94.5
190 Total	252	252	93.6	96.7	147 Outdoor	9	392	67.9	76.6	717 Labor	10	168	95.6	98.3
					148 Photo.	3	373	83.1	87.4					
					149 Games	5	387	72.8	79.5					
					150 Theater	8	394	66.0	75.9					
					151 Foods	4	380	78.3	84.0					
					152 Misc.	10	391	68.9	77.3					
					192 Total	143	395	65.5	75.0					
					162 Vocab II	9	354	92.9	96.3					

---

*Based on the same distributions as Table 4-1.

**n = number of items in test.

of grade 12 students tested in 1960 (Flanagan *et al.*, 1964, Tables 2-3 and 2-4). Because of the unexpectedly larger percentage of students in 1963 that didn't reach the end of this test, the mean number of items completed on each subscale was determined. The results are shown in Table 4-5. It is clear from this table that the average amount completed was well over 90 percent of the items, in the case of most of the Information II subscales. And in the case of some of the subscales, notably Vocabulary II, the mean was very close to 100 percent of the items.

On the tests included in Tables 4-1 through 4-3 other than the four exceptions mentioned above (Disguised Words, Visualization in Two Dimensions, Memory for Words, and Information Part II), almost all the students finished --or if they didn't it was because they chose not to, and not because they didn't have time. Furthermore on many of the tests the items had been arranged systematically in order of difficulty (from easiest to hardest) so that even the very few students who didn't finish were likely to have reached all the items they would have been able to answer. Thus even in the rare cases when the last item the student answered was nowhere near the end of the test it seems likely that it was not because he didn't have time to finish but rather because he chose not to attempt the more difficult items.

The extremely high percentage of students finishing the test and the fact that on most tests virtually all of them came very close to finishing is important for another reason; it means we can get sound estimates of reliability of these tests by using the split-half procedure.

Researchers who would like to be able to draw some conclusions about the adequacy of the time limits,not merely for the retest sample but for the main Project TALENT sample as well,will probably want to know how much alike the main sample of grade 12 students and the retest sample are. The answer is that they are very similar indeed. In Table 4-9, we see that the grade 12 mean for boys is 32.93 and for girls it is 34.13, on the Reading Comprehension Test. These values are not far from the means shown in the norms table in an earlier Project TALENT report, *The American High-School Student*, (Flanagan *et al.*, 1964, Table 3-2, Part 52, p. 3-52). Those means, based on the same cases as the Project TALENT percentile norms for the national sample, are 33.02 for grade 12 boys and 33.56 for grade 12 girls. The

TABLE 4-5. Average number and proportion of items reached in each scale of Information Test, Part II

Based on grade 12 students (matched cases, weighted by Weight Z)**

	Information Scale	n*	Average number of items reached		Average proportion of items reached	
			M	F	M	F
131	Art	12	11.2	11.5	.937	.958
132	Law	9	8.4	8.6	.938	.957
133	Health	9	8.6	8.7	.956	.971
134	Engineering	6	5.5	5.6	.910	.938
135	Architecture	6	5.8	5.8	.958	.973
136	Journalism	3	2.9	2.9	.960	.977
137	Foreign travel	5	4.8	4.9	.966	.978
138	Military	7	6.5	6.6	.927	.950
139	Acct., busin., sales	10	9.4	9.6	.943	.961
140	Practical knowledge	4	3.7	3.8	.930	.952
141	Clerical	3	2.6	2.7	.863	.907
142	Bible	15	14.2	14.5	.949	.966
143	Colors	3	2.9	3.0	.977	.987
144	Etiquette	2	1.8	1.8	.895	.925
145	Hunting	5	4.8	4.9	.970	.982
146	Fishing	5	4.7	4.8	.936	.956
147	Outdoor activ. (other)	9	8.4	8.6	.929	.951
148	Photography	3	2.8	2.9	.940	.957
149	Games (sedentary)	5	4.6	4.7	.920	.944
150	Theater, ballet	8	7.3	7.5	.909	.937
151	Foods	4	3.8	3.8	.938	.958
152	Miscellaneous	10	9.3	9.5	.929	.953
192	Information II Total	143	134.2	137.0	.938	.958
162	Vocabulary II	9	8.8	8.9	.981	.991

---

[*] n = number of items in test.

[**] Based on the same cases as Table 4-4.

standard deviations are also quite similar for the two groups. The results are similar for other tests as well, but Reading Comprehension has been singled out for explicit discussion here because students who read poorly are among those most likely to have trouble getting to the end of a test.

Thus it would appear that the retest data on adequacy of time limits are quite generalizable to the main Project TALENT sample. It must be borne in mind, of course, that these data are directly applicable only to grade 12 students. The situation could conceivably be a little different in the lower grades.

RELIABILITY OF THE TESTS[1]

Importance of the Problem

Need for Accurate Reliability Estimates. In a study such as the present one, where the findings depend largely on correlational relationships and complex analyses of the interrelations among the correlations, it is imperative that the reliability coefficients corresponding to the data be borne in mind. Where we are trying to find out something about the nature and pattern of growth of abilities, for instance, and find that the correlation between the grade 9 score and the grade 12 score on a particular test is low, is it because the underlying ability that the test is intended to measure is one that basically has little stability over the 3-year interval between grades 9 and 12 or is it merely because the test has poor reliability in one or both of the grades tested?

For most of the Project TALENT tests, the retest study provided the first opportunity to get sound reliability estimates based on a Project TALENT sample. Previously, for many of the tests, the only way reliability could be estimated was by the KR-21 formula, since only total scores were available, not half-test scores or responses to individual items, so that better procedures such as split-half or even KR-20 could not be used. (The

---

[1] Readers interested in substantive results and not at all in methodological matters should probably skip most of this section. However they might find it helpful to examine the reliability coefficients in Table 4-8 (and possibly those in columns 5 and 6 of Table 4-7 as well). General familiarity with these reliability coefficients will prove helpful in interpreting properly the substantive data presented in subsequent chapters.

KR-20 formula in the present context is regarded as somewhat inferior to split-half, since the assumptions it requires are more numerous and usually less plausible than the split-half assumptions, but it is greatly superior to KR-21, which tends to underestimate the reliability of unspeeded tests systematically and in some cases grossly.[1]) The reason reliability estimation procedures that couldn't be used on data from the original 1960 TALENT testing were possible for the retest data was that by 1963 better equipment for reading and processing the answer sheets had become available. The electronic scoring machine that determined raw scores and punched them into cards had been replaced by an optical scanner that put each item response on tape. In *The American High-School Student* (Flanagan *et al.*, 1964, Chapter 2) considerable attention was devoted to the problem of getting estimates of reliability by a collection of somewhat makeshift procedures, because for most of the tests the kind of data needed for use of a really satisfactory procedure was not available. Now it <u>is</u>--at least for grade 12.

It was possible to take advantage of the availability of the item response data, not only to get good estimates of reliability for the grade 12 retest data but also, by means of the correction-for-range formula, to estimate what the reliability coefficients obtained by these better methods would have been on the "norms group" used as the basis for most of the research reported on in *The American High-School Student* (Flanagan *et al.*, 1964). The possibility of doing this is a real advantage, in view of the fact that where reliability coefficients are being used it is essential that they be appropriate for the group. This is particularly true when they are being used in conjunction with other correlation coefficients, as in correction for attenuation or in estimating the reliability of a composite score from the reliability coefficients and standard deviation of the components and the intercorrelations among them. In such a case the reliability coefficient should be equivalent insofar as possible to what would have been obtained for the group on which the correlation coefficient is based.

---

[1] This problem was discussed at some length in *The American High-School Student* (Flanagan *et al.*, 1964, Chapter 2, pp. 2-12 to 2-18, and Appendix D-1).

How Important Are High Reliability Coefficients? The discussion immediately preceding has been concerned entirely with the importance of having accurate reliability estimates based on appropriate groups. No stress whatever has been placed on having high reliability coefficients. That omission was quite deliberate, since in a battery designed solely for research use, as the TALENT battery was, where there is no intention of using individual scores on individual tests for individual guidance or for making administrative decisions about the individual student, while there is no disadvantage in high reliability, gaining it at the expense of the coverage of the battery is disadvantageous. It is a well-known psychometric principle that it is better to secure broad coverage of abilities, by having numerous comparatively short tests, the reliabilities of which are only moderate, or even low (though of course significantly and substantially greater than 0), than to cover just a very few abilities, each of which is measured by a very long and accordingly very reliable test. (Even in a battery intended for operational use--for vocational guidance, for instance--rather than solely for research, the same principle of not sacrificing coverage to bolster individual test reliability often applies, since decisions made on the basis of test results would be more likely to be based on composite scores, which can be extremely reliable even though the component tests have only moderate reliability, than on a single test.) If the research based on the short tests indicates that a certain kind of test is a valid predictor of success in a particular area or a valid measure of an ability, it is always possible to develop a longer test of the same sort later on, for operational use.

Need to Determine the Reliability of Differences. As was pointed out a couple of paragraphs ago, it is sometimes necessary to obtain estimates of the reliability coefficients of composite scores. One especially important class of such composite scores is the difference score--for instance the difference between a grade 9 score and the corresponding grade 12 score. It was pointed out in Chapter 3 that the very low reliability usually obtained for difference scores has been a stumbling block in the measurement of change. This being the case, it is important to be able to get reasonably good estimates of just how low (or high) the reliability coefficients for these difference scores are.

Desirability of Determining the Reliability of Residual Scores. Whenever analysis of variance with covariate control is being carried out or when part or partial correlations are being obtained, it is helpful, in interpreting the results, to know the reliability of residual scores--i.e., the reliability of scores on a variable after that part that is explainable in terms of another variable (or set of variables) has been subtracted.

Methodological Considerations in Determining Test Reliability

CHOICE OF BASIC METHOD

Single Administration *vs.* Parallel Forms *vs.* Test-Retest. Parallel forms of the TALENT tests were not available, and the test-retest method of determining reliability coefficients was neither sound for the tests concerned nor feasible from a practical standpoint. The chief reason the test-retest method would have been wholly unsatisfactory is that short-term memory would have resulted in gross overestimates of test reliability. Elimination of the parallel-forms method and the test-retest method from consideration meant that it was necessary to resort to some procedure for obtaining reliability estimates from a single administration of a single form of the test. Fortunately this sort of procedure not only was a practical necessity but also had some important theoretical advantages. For use in a study of retest data based on a single form of the tests, a reliability coefficient based on that same single form is probably more generally suitable than a coefficient based on parallel forms.

Split-Half *vs.* Kuder-Richardson. There are basically only two categories of reliability estimation procedures based on a single administration of a single form--the split-half approach and the Kuder-Richardson approach--although each has several versions and variants.

As has already been implied, the author considers the split-half procedure preferable, by a considerable margin, to any of the Kuder-Richardson formulas, all of which require assumptions that are numerous, restrictive, and known to be inapplicable to the TALENT data.

Suitability of Split-Half Procedure. Of course there are some applications for which either the split-half or the Kuder-Richardson approach is totally inapplicable. Highly speeded tests are a case in point. As a matter of fact, if a test is even slightly speeded (and even when this speeding is not part of the test rationale but rather is an unintended by-product of practical necessities that result in a too short time allowance) careful consideration must be given to such matters as the effect that the speeding and the manner of splitting the test have, before deciding whether split-half coefficients overestimate the test's reliability substantially, and whether this error is sufficiently small that the estimates are still useful.

Fortunately, as is brought out in the section on speededness at the beginning of this chapter almost all of the tests that were designed to function as essentially unspeeded tests function that way, with 85 percent or more of the students finishing, and with the average student finishing at least 97 percent (and for most tests closer to 100 percent) of the items.

Of the two main exceptions, Memory for Words and Information II, the former is irrelevant in the present context, since sound reliability estimates could not be determined for it anyhow, for quite another reason. When an entire test depends on a single learning task, as the Memory for Words Test does, there is no way of getting wholly defensible reliability estimates for it since the items are not experimentally independent and cannot be split in any way that will produce experimentally independent halves; all items are linked by being dependent on the examinee's success with the same learning task--in this case memorizing the English translations of a list of words in a simulated foreign language. Furthermore, when the learning task is a novel one, as the Memory for Words task may be to a certain extent, even parallel forms wouldn't be the solution since the second encounter with a formerly unfamiliar task is different from the first encounter with it.

That leaves Information II as the only test for which the percentage incomplete (though not really large) is substantial enough to cast doubt on reliability estimates that would otherwise be firm. The possibility remains, however, that even though an accurate estimate of reliability is elusive for the Information II Total, the reliability of some of the subscales may be quite readily determinable. This possibility depends primarily on the fact that the completion rate differs for the various subscales, because not all of them have items near the end of Information II.

Let us look, therefore, at the percentages of students finishing each Information II scale (shown in Table 4-4) and the mean number and proportion of items finished (shown in Table 4-5). Considering these two sets of data jointly, it would appear that several of the Information II subscales are only negligibly speeded. Listed in roughly ascending order of apparent speededness they are:

1.	R-162	Vocabulary II
2.	R-143	Color Information
3.	R-145	Hunting Information
4.	R-136	Journalism Information
5.	R-137	Foreign Travel Information
6.	R-135	Architecture Information
7.	R-133	Health Information
8.	R-142	Bible Information

The first five of the scales listed above may be considered to be in effect unspeeded for both sexes. The last items for these scales are sufficiently far from the end of the test (Item 395) that almost everyone reached them. For females only, the sixth of the scales above (R-135) also seems not to be speeded.

A second consideration that may modify the effects of speededness on a test's split-half reliability coefficient is the manner of splitting the test. Putting alternate items in each half raises the computed reliability coefficient, while putting the first 50 percent of the items in one half and the remaining 50 percent in the other half reduces it. Any kind of splitting procedure somewhere between these two extremes presumably has an effect somewhere between. Table 4-7 contains a column which shows the manner in which each test was split. The only Information II scales for which the alternating item procedure was not used were Theater and Ballet Information (R-150) and Vocabulary II (R-162). Thus the Theater and Ballet Information scale should probably join the list of Information II variables for which the split-half procedure gives a fairly accurate estimate of reliability. (The Vocabulary II scale already heads that list since there is empirical evidence that for all practical purposes it is essentially unspeeded.)

Choice of Correction Formula. Having settled on the split-half procedure as the basic method to be used in determining the reliability of the TALENT tests and having considered the problem of which tests it can be used with, the remaining methodological consideration in this area is the choice of correction formula to adjust half-test reliability to the reliability of a full-length test. Although the Spearman-Brown formula is certainly the most widely used procedure for this purpose, it is this investigator's opinion that Angoff formula 16 is superior on theoretical grounds (Angoff, 1953). The assumptions it requires are entirely reasonable, and are less numerous and less restrictive than the Spearman-Brown assumptions, at least one of which (i.e., the assumption that the two halves have equal standard deviations) is usually inconsistent with the empirical data. The Angoff formula has therefore been used consistently for split-half coefficients reported in this chapter.

ADAPTATION TO OTHER SAMPLES

As was pointed out earlier in this chapter, after good estimates of a test's reliability have been obtained for a known and describable group, it is important to modify them to fit the group to which they are to be applied. For this purpose the conventional correction-for-range formula[1] is the method to be used. As for the "known and describable group" to be used as the starting point for this procedure of generating reliability coefficients, the group of matched retest cases, with each case given equal weight, seemed convenient and suitable and was therefore selected for the role of "seminal group." Split-half reliability coefficients were accordingly obtained for this group, separately for each sex and also combined, and are shown in Table 4-6. The corresponding reliability coefficients for the total retest group are also shown in this table, for comparison. They differ little from the values for the matched cases. Table 4-6 also shows the means and standard

---

[1] The formula is

$$r_B = 1 - \frac{\sigma_A^2}{\sigma_B^2} (1 - r_A) \qquad (1)$$

where σ_A = standard deviation for group A

σ_B = standard deviation for group B

r_A = reliability for group A

r_B = reliability for group B

TABLE 4-6. Split-half reliability coefficients (corrected by Angoff Formula #16) for grade 12 retest cases; also corresponding means and standard deviations[a]

		No. of items	Method of splitting test[b]	r_{ii}						Mean						Standard deviation (s)					
				Matched cases			All cases			Matched cases			All cases			Matched cases			All cases		
				M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
	Info I																				
R-101	Screening	12	Alt.	.792	.620	.737	.782	.647	.741	11.48	11.68	11.58	11.40	11.64	11.52	1.19	.82	1.02	1.26	.88	1.10
R-102	Vocabulary I	21	Cont.	.777	.780	.783	.786	.784	.788	14.46	13.15	13.78	14.14	12.89	13.52	3.72	4.13	3.99	3.82	4.16	4.04
R-103	Literature	24	Cont.	.821	.812	.815	.819	.819	.818	14.92	14.88	14.90	14.53	14.58	14.55	4.73	4.77	4.75	4.80	4.84	4.82
R-104	Music	13	Cont.	.758	.724	.743	.745	.733	.740	6.54	7.07	6.82	6.34	6.86	6.60	3.09	2.87	2.99	3.04	2.94	3.00
R-105	Social Studies	24	Cont.	.836	.804	.827	.840	.814	.833	17.43	15.48	16.42	16.95	15.13	16.04	4.99	4.78	4.98	5.12	4.89	5.09
R-106	Math	23	Cont.	.900	.890	.901	.898	.888	.898	12.05	8.87	10.40	11.44	8.58	10.01	6.38	5.87	6.33	6.33	5.74	6.21
R-107	Phys. Science	18	Cont.	.842	.783	.834	.839	.788	.833	11.16	8.15	9.60	10.74	7.89	9.32	4.27	4.05	4.42	4.32	4.06	4.43
R-108	Biol. Science	11	Cont.	.621	.596	.630	.641	.609	.642	7.03	5.93	6.46	6.82	5.82	6.32	2.18	2.26	2.29	2.27	2.28	2.33
R-109	Sci. Attitude	10	Cont.	.558	.521	.539	.567	.524	.546	6.74	6.73	6.73	6.60	6.61	6.61	1.91	1.86	1.88	1.93	1.88	1.91
R-110	Aero-Space	10	Cont.	.672	.481	.680	.672	.476	.680	5.85	3.55	4.66	5.71	3.47	4.59	2.43	1.92	2.46	2.45	1.89	2.46
R-111	Elec.	20	Cont.	.834	.632	.835	.831	.600	.830	11.28	6.12	8.61	11.12	6.01	8.57	4.63	3.12	4.69	4.65	3.04	4.69
R-112	Mech.	19	Cont.	.706	.606	.770	.715	.604	.773	13.54	8.63	11.00	13.35	8.46	10.91	3.16	3.06	3.96	3.26	3.06	4.00
R-113	Farming	12	Cont.	.621	.650	.645	.657	.658	.661	8.46	7.74	8.09	8.22	7.59	7.90	2.17	2.38	2.31	2.31	2.42	2.39
R-114	Home Economics	21	Cont.	.499	.640	.714	.512	.648	.718	9.22	13.56	11.47	9.03	13.36	11.19	2.99	3.25	3.81	3.01	3.32	3.84
R-115	Sports	14	Cont.	.748	.613	.753	.758	.614	.756	9.11	6.23	7.62	8.80	6.01	7.41	2.84	2.56	3.06	2.93	2.58	3.09
R-190	Total	252	Comp.	.973	.966	.972	.965	.960	.965	159.27	137.78	148.30	155.20	134.90	145.06	38.61	35.56	38.59	39.33	36.02	39.05
	Info II																				
R-131	Art†	12	Alt.	.677	.663	.673	.683	.682	.685	6.87	7.39	7.13	6.81	7.27	7.04	2.55	2.53	2.55	2.56	2.60	2.59
R-132	Law†	9	Alt.	.594	.540	.572	.621	.559	.596	5.79	5.37	5.58	5.72	5.29	5.50	1.84	1.78	1.82	1.88	1.81	1.86
R-133	Health†	9	Alt.	.613	.547	.594	.619	.576	.609	6.26	6.82	6.55	6.16	6.73	6.44	1.87	1.63	1.77	1.91	1.70	1.83
R-134	Engineering†	6	Alt.	.401	.344	.390	.425	.351	.408	3.50	3.05	3.27	3.46	2.97	3.22	1.15	1.23	1.21	1.16	1.24	1.23
R-135	Architecture††	6	Alt.	.435	.369	.403	.436	.393	.415	2.84	2.87	2.85	2.79	2.84	2.81	1.41	1.33	1.37	1.40	1.35	1.38
R-136	Journalism	3	Alt.	.536	.442	.488	.530	.472	.500	2.06	2.08	2.07	2.02	2.04	2.03	.92	.89	.90	.93	.91	.92
R-137	Foreign Travel	5	Alt.	.547	.501	.529	.533	.518	.532	3.12	2.82	2.97	3.07	2.75	2.91	1.30	1.30	1.31	1.31	1.33	1.33
R-138	Military†	7	Alt.	.471	.364	.446	.486	.349	.451	3.06	2.40	2.72	3.04	2.37	2.70	1.44	1.31	1.41	1.45	1.31	1.42
R-139	Acct., Bus., Sales†	10	Alt.	.597	.610	.600	.598	.630	.611	5.54	5.78	5.66	5.45	5.67	5.56	1.97	1.94	1.96	1.96	2.00	1.98
R-140	Practical Knowledge†	4	Alt.	.408	.171	.310	.426	.213	.338	3.23	3.35	3.29	3.22	3.32	3.27	.85	.72	.79	.87	.74	.81
R-141	Clerical†	3	Alt.	.470	.380	.488	.463	.411	.495	2.00	2.52	2.27	1.96	2.49	2.23	.87	.67	.81	.88	.69	.83
R-142	Bible†	15	Alt.	.777	.783	.780	.782	.781	.782	7.68	8.12	7.91	7.59	8.03	7.81	3. 7	3.39	3.43	3.47	3.38	3.43
R-143	Colors	3	Alt.	.248	.420	.418	.218	.429	.401	1.16	1.81	1.49	1.16	1.77	1.47	.87	.94	.96	.87	.95	.96
R-144	Etiquette†	2	Alt.	.101	.170	.162	.103	.184	.166	.99	1.31	1.16	.97	1.27	1.12	.67	.69	.70	.67	.70	.70
R-145	Hunting	5	Alt.	.423	.061	.433	.413	.078	.435	2.53	1.19	1.84	2.50	1.17	1.83	1.26	.95	1.30	1.26	.95	1.30
R-146	Fishing†	5	Alt.	.529	.091	.449	.535	.099	.461	2.06	1.08	1.55	2.04	1.05	1.54	1.35	.94	1.26	1.35	.94	1.26
R-147	Outdoor Activities†	9	Alt.	.543	.443	.492	.550	.445	.499	5.36	4.89	5.12	5.27	4.81	5.04	1.82	1.80	1.82	1.83	1.80	1.83
R-148	Photography††	3	Alt.	.125	-.340	-.004	.169	-.386	.034	1.38	1.47	1.43	1.36	1.44	1.40	.68	.60	.64	.69	.61	.65
R-149	Games (sedentary)	5	Alt.	.288	.239	.263	.292	.246	.268	2.58	2.25	2.41	2.55	2.22	2.39	1.16	1.04	1.11	1.17	1.04	1.12
R-150	Theater, Ballet	8	Cont.	.591	.588	.600	.591	.603	.606	4.35	5.00	4.68	4.29	4.88	4.59	1.74	1.74	1.77	1.74	1.78	1.78
R-151	Foods†	4	Alt.	.395	.392	.409	.401	.402	.415	1.35	1.81	1.59	1.35	1.79	1.57	1.01	.99	1.02	1.01	.99	1.02
R-152	Miscellaneous†	10	Alt.	.600	.445	.524	.608	.473	.541	5.19	5.00	5.09	5.11	4.88	4.99	1.90	1.61	1.76	1.93	1.64	1.79
R-192	Total†	143	Comp.	.948	.932	.941	.953	.942	.948	78.93	78.35	78.63	77.89	77.06	77.47	20.93	18.38	19.67	21.33	19.02	20.20
R-162	Vocabulary II	9	Cont.	.716	.597	.666	.718	.621	.677	6.62	6.87	6.75	6.50	6.74	6.62	2.11	1.80	1.96	2.16	1.89	2.03

TABLE 4-6 (continued)

		No.of items	Method of splitting test^b	r_{ii}						Mean						Standard deviation (s)					
				Matched cases			All cases			Matched cases			All cases			Matched cases			All cases		
				M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
R-172	Vocab. Total (I+II)	30	Cont.	.854	.838	.847	.866	.871	.867	21.07	20.02	20.54	20.88	19.87	20.35	5.56	5.78	5.69	5.71	5.97	5.87
R-190	Info. I Total	252	Comp.	.973	.966	.972	.965	.960	.965	159.27	137.78	148.30	155.20	134.90	145.06	38.61	35.56	38.59	39.33	36.02	39.05
R-192	Info. II Total †	143	Comp.	.948	.932	.941	.953	.942	.948	78.93	78.35	78.63	77.89	77.06	77.47	20.93	18.38	19.67	21.33	19.02	20.20
R-100	Info. Total (I+II)	395	Comp.	.981	.976	.980	.982	.979	.981	238.19	216.12	226.93	237.47	216.42	226.59	59.66	53.60	57.33	60.66	55.39	58.92
R-212	Memory for Words*	24	Alt.	.878	.895	.890	.879	.896	.891	12.39	14.51	13.47	11.91	14.11	12.98	5.89	6.05	6.07	5.86	6.08	6.06
R-220	Disguised Words	30								16.41	18.05	17.24	15.92	17.74	16.81	7.59	7.61	7.64	7.57	7.59	7.63
	English																				
R-231	Spelling	16	Alt.	.738	.664	.727	.744	.672	.737	9.37	11.07	10.24	9.13	10.97	10.02	3.22	2.76	3.11	3.23	2.81	3.17
R-232	Capitalization	33	Cont.	.905	.910	.908	.919	.915	.918	29.02	30.23	29.64	28.64	30.01	29.30	5.02	4.22	4.67	5.49	4.50	5.08
R-233	Punctuation	27	Alt.	.809	.818	.823	.814	.822	.828	17.70	19.88	18.81	17.25	19.59	18.38	4.79	4.46	4.76	4.87	4.55	4.86
R-234	English Usage	25	Alt.	.668	.658	.668	.659	.654	.664	16.73	17.65	17.20	16.44	17.53	16.96	3.60	3.35	3.50	3.64	3.36	3.55
R-235	Effective Exp.	12	Alt.	.705	.640	.681	.696	.640	.679	8.80	9.39	9.10	8.58	9.31	8.93	2.46	2.17	2.34	2.52	2.20	2.40
R-230	English Total	113	Comp.	.931	.928	.933	.935	.930	.937	81.62	88.22	84.99	80.03	87.41	83.60	14.99	13.68	14.71	15.61	13.99	15.30
R-240	Word Functions	24	Alt.	.850	.867	.862	.850	.863	.860	11.33	12.98	12.16	10.96	12.66	11.80	5.56	5.62	5.65	5.54	5.63	5.65
R-250	Reading Comprehension	48	Passage	.924	.922	.919	.924	.920	.919	32.52	33.55	33.04	31.60	32.84	32.20	10.84	9.94	10.40	10.93	10.14	10.57
R-260	Creativity	20	Alt.	.818	.771	.800	.820	.773	.802	11.44	10.34	10.88	10.97	10.02	10.51	4.44	4.01	4.26	4.48	4.03	4.30
R-270	Mechanical Reasoning	20	Alt.	.836	.750	.848	.838	.753	.848	14.15	9.61	11.86	13.77	9.40	11.65	3.90	3.72	4.44	4.03	3.72	4.46
R-282	Vis. in 3 dimensions	16	Alt.	.788	.719	.767	.801	.729	.778	10.32	8.97	9.64	10.10	8.77	9.45	3.37	3.10	3.30	3.44	3.15	3.37
R-290	Abstract Reasoning	15	Alt.	.734	.743	.740	.745	.756	.752	10.03	9.62	9.82	9.78	9.40	9.59	2.93	3.01	2.98	3.03	3.09	3.07
	Math																				
R-311	I.Arith.Reasoning	16	Alt.	.783	.768	.778	.785	.767	.778	9.84	8.97	9.39	9.44	8.76	9.11	3.70	3.67	3.71	3.74	3.67	3.72
R-312	II.Intr.h.s.math	24	Alt.	.892	.847	.874	.886	.843	.870	12.34	10.98	11.65	11.94	10.76	11.37	5.59	4.88	5.28	5.52	4.78	5.20
R-320	Math I + II	40	Alt.	.914	.889	.904	.910	.885	.900	22.17	19.95	21.04	21.56	19.73	20.67	8.57	7.75	8.26	8.53	7.65	8.16
R-333	III.Adv.h.s.math	14	Alt.	.783	.695	.754	.765	.675	.737	4.41	3.45	3.92	4.22	3.34	3.79	3.12	2.54	2.88	3.03	2.48	2.81
R-334	H.S.Math(I + II)	38	Alt.	.917	.880	.904	.914	.875	.901	16.74	14.43	15.56	16.16	14.10	15.16	8.16	6.84	7.60	8.02	6.69	7.47
R-340	Math Total (I+II+III)	54	Alt.	.930	.906	.921	.928	.902	.919	26.58	23.39	24.95	25.77	23.07	24.46	11.03	9.58	10.43	10.89	9.44	10.30

[a] These statistics are based on unweighted data. The numbers of cases are approximately the same as those shown in columns (1) to (6) of Table 2-3.

[b] Method of splitting test for split-half reliability coefficients.

"Alt." means that each half consists of alternate items. (The odd-even split is an example of this.)

"Cont." means that an a priori split based on item content is used.

"Passage" means that (for the Reading Comprehension Test) the unit used in splitting the test is the passage. The passage together with all its items goes into a single half. (Alternate passages are not necessarily in alternate halves.)

"Comp." means that the test is a composite of several parts and is therefore split the same way as its components.

† The reliability coefficients for these variables could theoretically be overestimates since not everyone had time to finish.

†† The above footnote applies, except for females.

*The reliability coefficients for this test are probably overestimates since the two halves of the test are not experimentally independent.

deviations for the groups on which the reliability coefficients are based. The reliability coefficients for the matched group are also repeated in columns 1 and 2 of Table 4-7, for convenience in comparing them with the other values shown in that table.

Any investigator who wishes to use the formula shown in the footnote on page 4-15 in order to adjust a split-half reliability coefficient obtained on the retest data to some other group in which he is interested should use as r_A and σ_A the appropriate reliability coefficient and standard deviation shown in Table 4-6 and as σ_B the standard deviation for his group.[1] This formula was used to get estimates of the grade 12 split-half reliability coefficients based on the national sample on which the norms presented in *The American High-School Student* (Flanagan *et al.*, 1964, Chapter 3, Table 3-2) are based. These reliability coefficients are shown in Table 4-7, columns 5 and 6. (The standard deviations used in their computation are shown in columns 14-17.)

Groups on Which Reliability Coefficients for Retest Data Should Be Based. Reliability coefficients can and should be obtained for many different groups, of course, but what sorts of groups give suitable reliability coefficients for use in connection with the retest data? All retest cases? Matched cases only? Weighted by Weight Z?[2] Unweighted? The answer is that since we want to be able to compare grade 9 and grade 12 data the reliability coefficients for the two grades should be based on the same cases. That means matched cases. And since we want comparability among tests we should weight the cases by Weight Z in order to make tests in different sets of retest batteries as comparable as possible. Accordingly, the correction-for-range procedure was used to adjust the reliability coefficients in Table 4-6 based on matched case data (grade 12 cases, unweighted) to the corresponding grade 9 and grade 12 values based on weighted matched cases. The resulting

---

[1] If his group is small, so that there would be a substantial difference between the sample standard deviation and the square root of the unbiased population variance estimate, the formula calls for the latter.

[2] See Chapter 3 for a discussion of Weight Z--its nature and purpose.

reliability estimates are shown in columns 1-4 of Table 4-8. The standard deviations for the weighted groups to which these reliabilities correspond and which were used to compute them are shown in columns 9-12 of Table 4-9, columns 3-6 of which contain the corresponding means.

DETERMINING THE RELIABILITY OF DIFFERENCE SCORES AND RESIDUAL SCORES

Reliability of Difference Scores. The reliability of raw score differences may be determined from the following formula:

$$r_{DD} = \frac{r_{11}s_1^2 + r_{22}s_2^2 - 2r_{12}s_1s_2}{s_1^2 + s_2^2 - 2r_{12}s_1s_2} \qquad (2)$$

where the subscript 1 represents grade 9,
the subscript 2 represents grade 12, and
D represents the raw score difference.

Raw score differences between grade 9 scores and grade 12 scores are important when one is interested in amount of gain (or loss) that occurs during the interval.

Differences between standard scores, in contrast, are important when one is interested in the change in a student's relative status within his group. The formula for the reliability of standard score differences is:

$$r_{dd} = r_{(z_2 - z_1)(z_2 - z_1)} = \frac{r_{11} + r_{22} - 2r_{12}}{2 - 2r_{12}} \qquad (3)$$

The notation is the same as for formula 2 above; and d equals standard score difference.

Reliability of Residual Scores. The following formula is useful for estimating the reliability of the grade 12 residual score on a test after the part predicted from the corresponding grade 9 score is subtracted.

$$r_{\delta\delta} = \frac{r_{22} + r_{11}\, r_{12}^2 - 2r_{12}^2}{1 - r_{12}^2} \qquad (4)$$

In this formula δ represents the residual. The other notation is the same as for formula 2 above. Formula 4 is the one Thorndike derives (Thorndike, 1963, p. 70) for reliability of a discrepancy score.

TABLE 4-7. Comparison of various methods of estimating reliability coefficients for Grade 12 scores both for retest data (1963) and for original norms groups (1960)

				Grade 12 reliability coefficient													Standard deviation (s)			
				1963 Gr.12 retest matched cases				1960 Grade 12 norms group (computed by correcting 1963 reliability for range)				Based more directly on 1960 norms group[a]					Grade 12 retest matched cases (1963)		1960 Gr.12 norms group[b]	
		No. of items	Method of splitting test[c]	Split-half Angoff 16		KR(21)		From Angoff 16		From KR(21)		KR(21)		Other method						
														Method	r_{ii}					
				M	F	M	F	M	F	M	F	M	F		M	F	M	F	M	F
				(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
	Info I																			
R-101	Screening	12	Alt.	.792	.620	.711	.585	.757	.616	.662	.580	.695	.608				1.19	.82	1.10	.81
R-102	Vocabulary I	21	Cont.	.777	.780	.709	.747	.778	.768	.710	.733	.700	.725				3.72	4.13	3.73	4.02
R-103	Literature	24	Cont.	.821	.812	.780	.784	.817	.810	.776	.782	.766	.773				4.73	4.77	4.68	4.74
R-104	Music	13	Cont.	.758	.724	.714	.659	.749	.741	.703	.680	.700	.687				3.09	2.87	3.03	2.96
R-105	Social Studies	24	Cont.	.836	.804	.843	.792	.835	.817	.843	.806	.831	.801				4.99	4.78	4.98	4.95
R-106	Math	23	Cont.	.900	.890	.898	.880	.892	.863	.890	.850	.886	.848				6.38	5.87	6.14	5.25
R-107	Phys. Science	18	Cont.	.842	.783	.813	.771	.848	.775	.821	.758	.814	.763				4.27	4.05	4.36	3.94
R-108	Biol. Science	11	Cont.	.621	.596	.513	.509	.665	.601	.570	.515	.568	.514				2.18	2.26	2.32	2.27
R-109	Sci. Att.	10	Cont.	.558	.521	.441	.403	.539	.521	.418	.403	.385	.375				1.91	1.86	1.87	1.86
R-110	Aero-Space	10	Cont.	.672	.481	.654	.418	.686	.390	.669	.316	.660	.398				2.43	1.92	2.48	1.77
R-111	Elec.	20	Cont.	.834	.632	.811	.593	.827	.529	.802	.479	.797	.495				4.63	3.12	4.53	2.76
R-112	Mech.	19	Cont.	.706	.606	.644	.523	.735	.618	.678	.538	.677	.542				3.16	3.06	3.32	3.10
R-113	Farming	12	Cont.	.621	.650	.512	.563	.635	.677	.530	.596	.533	.595				2.17	2.38	2.21	2.48
R-114	Home Economics	21	Cont.	.499	.640	.442	.573	.512	.626	.456	.556	.461	.549				2.99	3.25	3.03	3.19
R-115	Sports	14	Cont.	.748	.613	.651	.509	.740	.595	.640	.486	.627	.484				2.84	2.56	2.79	2.50
R-190	Total	252	Comp.	.973	.966	.968	.960	.971	.962	.966	.956	.961	.949				38.61	35.56	37.51	33.86
	Info II																			
R-131	Art †	12	Alt.	.677	.663	.597	.605	.678	.678	.599	.622	.591	.609	KR-20	.664	.668	2.55	2.53	2.55	2.58
R-132	Law †	9	Alt.	.594	.540	.437	.354	.574	.542	.410	.358	.391	.331	"	.536	.504	1.84	1.78	1.80	1.78
R-133	Health †	9	Alt.	.613	.547	.511	.426	.625	.608	.528	.503	.514	.465	"	.555	.515	1.87	1.63	1.90	1.75
R-134	Engin.†	6	Alt.	.401	.344	**	.008	.425	.368	**	.043	-.059	.052	"	.350	.274	1.15	1.23	1.18	1.25
R-135	Arch.††	6	Alt.	.435	.369	.292	.182	.415	.337	.267	.141	.259	.134	"	.395	.347	1.41	1.33	1.38	1.30
R-136	Journalism	3	Alt.	.536	.442	.346	.275	.554	.480	.372	.325	.349	.317	"	.465	.381	.92	.89	.93	.92
R-137	Foreign Travel	5	Alt.	.547	.501	.380	.344	.589	.554	.438	.414	.437	.427	"	.538	.510	1.30	1.30	1.36	1.38
R-138	Military †	7	Alt.	.471	.364	.201	.091	.500	.327	.246	.038	.263	.079	"	.457	.304	1.44	1.31	1.48	1.27
R-139	Acct.,Bus.,Sales †	10	Alt.	.597	.610	.400	.394	.612	.649	.422	.455	.421	.454	"	.568	.580	1.97	1.94	2.00	2.05
R-140	Practical Kn. †	4	Alt.	.408	.171	.193	**	.412	.307	.200	.108	.274	.088	"	.419	.311	.85	.72	.86	.79
R-141	Clerical †	3	Alt.	.470	.380	.178	.123	.432	.400	.121	.154	.133	.262	"	.305	.331	.87	.67	.84	.68
R-142	Bible †	15	Alt.	.777	.783	.737	.723	.761	.773	.718	.711	.711	.707	"	.753	.753	3.47	3.39	3.34	3.32
R-143	Colors	3	Alt.	.248	.420	.083	.283	.313	.423	.162	.286	.177	.307	"	.247	.375	.87	.94	.91	.94
R-144	Etiquette †	2	Alt.	.101	.170	**	.096	.133	.212	**	.141	-.144	.104	"	.075	.135	.67	.69	.68	.71
R-145	Hunting	5	Alt.	.423	.061	.265	**	.434	**	.280	**	.285	-.075	"	.458	.026	1.26	.95	1.27	.91
R-146	Fishing †	5	Alt.	.529	.091	.421	.064	.479	.089	.360	.063	.352	.078	"	.463	.111	1.35	.94	1.29	.94
R-147	Outdoor Act. †	9	Alt.	.543	.443	.390	.346	.521	.436	.361	.338	.352	.326	"	.468	.403	1.82	1.80	1.78	1.78
R-148	Photography ††	3	Alt.	.125	.000	**	**	.240	.000	**	**	-.628	-1.204	"	.236	.141	.68	.60	.73	.64
R-149	Games(sedentary)	5	Alt.	.288	.239	.097	**	.282	.141	.090	**	.087	-.330	"	.345	.168	1.16	1.04	1.16	.98
R-150	Theater, Ballet	8	Cont.	.591	.588	.390	.431	.598	.616	.400	.470	.404	.481	"	.576	.614	1.74	1.74	1.75	1.80
R-151	Foods †	4	Alt.	.395	.392	.156	**	.447	.492	.229	.145	.274	.213	"	.429	.491	1.01	.99	1.05	1.08
R-152	Miscellaneous †	10	Alt.	.600	.445	.346	.036	.552	.466	.267	.072			"	.472	.427	1.90	1.61	1.80	1.64
R-192	Total †	143	Comp.	.948	.932	.929	.911	.942	.933	.922	.912	.917	.902	"	.936	.927	20.93	18.38	19.96	18.53
R-162	Vocab.II	9	Cont.	.716	.597	.680	.561	.723	.660	.688	.629	.661	.596	"	.664	.594	2.11	1.80	2.13	1.96
R-172	Vocab.Total(I+II)	30	Cont.	.854	.838	.817	.816	.849	.822	.811	.798	.808	.801				5.56	5.78	5.46	5.52
R-190	Info I Total	252	Comp.	.973	.966	.968	.960	.971	.962	.966	.956	.961	.949				38.61	35.56	37.51	33.86
R-192	Info II Total †	143	Comp.	.948	.932	.929	.911	.942	.933	.922	.912	.917	.902	"	.936	.927	20.93	18.38	19.96	18.53
R-100	Info Total(I+II)	395	Comp.	.981	.976	.977	.971	.979	.974	.974	.968	.972	.964				59.66	53.60	55.91	50.95

TABLE 4-7 (continued)

				Grade 12 reliability coefficient													Standard deviation (s)			
				1 9 6 3 Gr.12 retest matched cases				1960 Grade 12 norms group (computed by correcting 1963 reliability for range)				Based more directly on 1960 norms group [a]					Grade 12 retest matched cases (1963)		1960 Gr.12 norms group[b]	
				Split-half Angoff 16		KR(21)		From Angoff 16		From KR(21)		KR(21)		Other method						
		No. of items	Method of splitting test[c]	M	F	M	F	M	F	M	F	M	F	Method	r_{ii} M	r_{ii} F	M	F	M	F
				(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
R-212	Memory for Wds.	24	Alt.	.878*	.895*	.863*	.880*	.852*	.881*	.834*	.864*	.825*	.852*				5.89	6.05	5.34	5.69
	English																			
R-231	Spelling	16	Alt.	.738	.664	.666	.589	.700	.665	.618	.590	.608	.589				3.22	2.76	3.00	2.76
R-232	Capitalization	33	Cont.	.905	.910	.888	.884	.877	.867	.856	.829	.860	.825				5.02	4.22	4.42	3.47
R-233	Punctuation	27	Alt.	.809	.818	.763	.765	.793	.809	.743	.754	.740	.746				4.79	4.46	4.60	4.36
R-234	English Usage	25	Alt.	.668	.658	.596	.559	.650	.631	.574	.525	.578	.538				3.60	3.35	3.50	3.23
R-235	Effect. Exp.	12	Alt.	.705	.640	.669	.618	.650	.574	.608	.548	.614	.558				2.46	2.17	2.26	2.00
R-230	English Total	113	Comp.	.931	.928	.916	.911	.921	.916	.904	.895	.896	.887	Reliab. of sum	.904	.894	14.99	13.68	14.06	12.58
R-240	Word Functions	24	Alt.	.850	.867	.842	.846	.841	.872	.832	.852	.831	.853				5.56	5.62	5.39	5.73
R-250	Reading Comp.	48	Passage	.924	.922	.930*	.917*	.919	.920	.925*	.915*	.925*	.914*	Split-half	.859	.838	10.84	9.94	10.48	9.81
R-260	Creativity	20	Alt.	.818	.771	.791	.725	.799	.754	.768	.705	.757	.703				4.44	4.01	4.22	3.87
R-270	Mechanical Reas.	20	Alt.	.836	.750	.766	.674	.852	.736	.789	.656	.778	.659				3.90	3.72	4.11	3.63
R-282	Vis.in 3 dimen.	16	Alt.	.788	.719	.722	.628	.796	.729	.732	.642	.721	.641				3.37	3.10	3.43	3.16
R-290	Abstract Reason.	15	Alt.	.734	.743	.656	.664	.744	.733	.669	.652	.655	.638				2.93	3.01	2.98	2.96
	Math																			
R-311	I.Arith.Reason.	16	Alt.	.783	.768	.772	.754	.779	.751	.768	.736	.766	.729				3.70	3.67	3.67	3.54
R-312	II.Intr.h.s.math	24	Alt.	.892	.847	.843	.782	.893	.846	.845	.780	.846	.783				5.59	4.88	5.63	4.85
R-320	Math I + II	40	Alt.	.914	.889	.891	.860	.915	.884	.893	.854	.890	.848	Reliab. of sum	.893	.853	8.57	7.75	8.64	7.59
R-333	III.Adv.h.s.math	14	Alt.	.783	.695	.742	.642	.773	.632	.731	.569	.727	.590				3.12	2.54	3.05	2.31
R-334	H.S.Math(II+III)	38	Alt.	.917	.880	.889	.840	.918	.871	.890	.828	.885	.823	Reliab. of sum	.891	.831	8.16	6.84	8.22	6.60
R-340	Math Total (I+II+III)	54	Alt.	.930	.906	.913	.883	.932	.898	.915		.908	.863	Reliab. of sum	.915	.874	11.07	9.58	11.14	9.23

[a] From The American High School Student (Flanagan et al., 1964), Table 2-5

[b] From The American High School Student (Flanagan et al., 1964), Table 3-1

[c] Method of splitting test for split-half reliability coefficients

"Alt." means that each half consists of alternate items. (The odd-even split is an example of this.)
"Cont." means that an a priori split based on item content is used.
"Passage" means that (for the Reading Comprehension Test) the unit used in splitting the test is the passage. The passage together with all its items goes into a single half. (Alternate passages are not necessarily in alternate halves.)
"Comp." means that the test is a composite of several parts and is therefore split the same way as its components.

* These values may be overestimates to at least a slight degree since KR(21) is inappropriate for tests in which the items are not experimentally independent, and since split-half methods are also inappropriate for them except in cases where the test can be split in such a way that the two halves are experimentally independent. (It was possible to do this in the case of R-250, Reading Comprehension, by splitting the test on the basis of entire passages, rather than items.)

** The computed value was negative but should be regarded as having a lower limit of 0 since negative reliability coefficients are logically impossible.

† Values in columns 1-8 could theoretically be overestimates since not everyone had time to finish.

†† Values in columns 1, 3, 5, and 7 could theoretically be overestimates since not everyone had time to finish.

TABLE 4-8. Reliability coefficients for grade 9 scores, grade 12 scores, raw and standard score differences, and grade 12 residual scores

(Based on matched retest cases[a], weighted by weight Z)

			SPLIT-HALF RELIABILITY COEFFICIENT										Unweighted N	
			Grade 9[b]		Grade 12[b]		Raw score difference[c]		Stand.-score difference[d]		Grade 12[e] residual			
		No.of items	M (1)	F (2)	M (3)	F (4)	M (5)	F (6)	M (7)	F (8)	M (9)	F (10)	M (11)	F (12)
	Information I													
R-102	Vocabulary I	21	.786	.748	.776	.776	.155	.001	.154	-.008	.243	.109	1761	1917
R-103	Literature	24	.762	.704	.823	.808	.305	.218	.271	.133	.389	.289	1761	1917
R-104	Music	13	.720	.715	.760	.718	.088	-.095	.076	-.095	.203	.028	1761	1917
R-105	Social Studies	24	.854	.814	.833	.799	.393	.052	.386	.048	.443	.125	1761	1917
R-106	Mathematics	23	.749	.710	.899	.891	.591	.592	.381	.364	.529	.536	1761	1917
R-107	Physical Science	18	.787	.711	.841	.782	.293	.145	.256	.107	.363	.249	1761	1917
R-108	Biological Science	11	.652	.552	.601	.589	-.022	-.113	-.031	-.117	.088	.066	1761	1917
R-109	Scientific Attitude	10	.594	.520	.559	.504	.058	-.013	.055	-.013	.188	.144	1761	1917
R-110	Aero.-Space	10	.650	.292	.665	.481	-.044	-.126	-.046	-.165	.098	.125	1761	1917
R-111	Elec.	20	.763	.447	.833	.637	.362	.218	.319	.169	.438	.406	1761	1917
R-112	Mechanics	19	.728	.504	.706	.595	.198	-.042	.196	-.060	.296	.150	1761	1917
R-113	Farming	12	.659	.686	.602	.626	.016	-.113	.005	-.131	.121	-.020	1761	1917
R-114	Home Economics	21	.407	.648	.500	.630	-.230	-.023	-.245	-.025	-.002	.107	1761	1917
R-115	Sports	14	.765	.508	.741	.594	.164	-.120	.159	-.138	.250	.076	1761	1917
	Information II													
R-131	Art	12	.653	.640	.669	.662	.088	-.038	.087	-.041	.225	.109	1461	1591
R-132	Law	9	.567	.436	.590	.539	.104	.084	.103	.071	.261	.282	1461	1591
R-133	Health	9	.673	.684	.598	.541	.268	.200	.256	.155	.342	.220	1461	1591
R-134	Engineering	6	.487	.377	.392	.351	.052	-.081	.043	-.082	.160	.091	1461	1591
R-135	Architecture	6	.287	.212	.443	.365	-.000	-.088	-.020	-.104	.231	.158	1461	1591
R-138	Military	7	.418	.157	.470	.363	-.060	-.090	-.064	-.117	.142	.172	1461	1591
R-139	Acct.,Bus.,Sales	10	.515	.520	.599	.606	.178	.109	.167	.096	.351	.287	1461	1591
R-140	Practical Knowledge	4	.607	.470	.386	.194	.101	-.092	.035	-.158	.088	-.097	1461	1591
R-142	Bible	15	.741	.743	.774	.780	.088	.018	.078	.004	.197	.124	1461	1591
R-145	Hunting	5	.359	.000	.419	.075	-.275	-.259	-.279	-.264	-.041	-.042	1461	1591
R-146	Fishing	5	.432	.014	.524	.088	-.116	-.239	-.130	-.241	.099	-.023	1461	1591
R-147	Outdoor Activ.(other)	9	.564	.452	.533	.443	.043	-.119	.041	-.119	.182	.063	1461	1591
R-150	Theater; Ballet	8	.522	.523	.596	.583	-.041	-.178	-.054	-.187	.144	.016	1461	1591
R-162	Vocabulary II	9	.748	.715	.709	.599	.265	.142	.258	.096	.344	.171	1461	1591
R-212	Memory for Words	24	.816*	.856*	.871*	.888*	.698*	.721*	.684*	.713*	.764*	.775*	1679	1806
	English													
R-231	Spelling	16	.672	.659	.721	.638	.168	.145	.157	.143	.300	.263	1686	1817
R-232	Capitalization	33	.840	.862	.840	.888	.759	.822	.759	.820	.799	.862	1686	1817
R-233	Punctuation	27	.763	.788	.788	.800	.344	.340	.339	.339	.441	.430	1686	1817
R-234	English Usage	25	.596	.586	.631	.606	.193	.203	.191	.202	.341	.347	1686	1817
R-235	Effective Expression	12	.708	.633	.669	.622	.437	.292	.434	.291	.510	.406	1686	1817
R-240	Word Functions	24	.801	.854	.850	.866	.562	.581	.546	.580	.638	.642	1794	1839
R-250	Reading Comprehension	48	.920	.924	.923	.915	.727	.650	.727	.648	.762	.679	1795	1839
R-260	Creativity	20	.748	.699	.816	.764	.535	.433	.516	.420	.628	.546	1795	1839
R-270	Mechanical Reasoning	20	.839	.701	.829	.746	.515	.241	.514	.232	.575	.362	1795	1839
R-282	Vis. in 3 Dimensions	16	.767	.684	.784	.712	.439	.262	.438	.259	.530	.386	1795	1839
R-290	Abstract Reasoning	15	.746	.734	.717	.731	.382	.330	.379	.330	.461	.428	3382	3628
	Mathematics													
R-311	I.Arith.Reasoning	16	.739	.696	.771	.758	.305	.170	.299	.148	.413	.291	1686	1817
R-312	II.Intro. h.s. Math.	24	.795	.756	.890	.845	.583	.448	.495	.388	.607	.513	1686	1817
R-333	III.Adv. h.s. Math.	14	.200	.136	.786	.696	.585	.481	.342	.312	.730	.668	1676	1807

[a] For each variable all cases were used that had scores for both grade 9 and grade 12.

[b] Obtained from the split-half coefficients in Table 4-7, columns 1-2, by means of formula 1.

[c] From formula 2.

[d] From formula 3.

[e] From formula 4.

*These reliability coefficients are probably overestimates. (See footnote for Table 4-7.)

TABLE 4-9. Correlation between grades, and raw score means and standard deviations, corresponding to reliability coefficients in Table 4-8

(Based on matched retest cases[a] weighted by weight Z)

			r between grades[b]		MEAN						STANDARD DEVIATION (s)						Unweighted N	
					Gr. 9		Gr. 12		Raw score difference		Gr. 9		Gr. 12		Raw score difference			
		No. of items	M (1)	F (2)	M (3)	F (4)	M (5)	F (6)	M (7)	F (8)	M (9)	F (10)	M (11)	F (12)	M (13)	F (14)	M (15)	F (16)
	Information I																	
R-102	Vocabulary I	21	.741	.764	11.97	10.67	14.57	13.34	2.60	2.67	3.80	3.86	3.71	4.09	2.70	2.74	1761	1917
R-103	Literature	24	.715	.718	10.72	10.48	15.05	15.12	4.33	4.64	4.11	3.80	4.75	4.72	3.40	3.31	1761	1917
R-104	Music	13	.719	.741	5.64	6.21	6.60	7.18	.96	.97	2.87	2.82	3.10	2.84	2.25	2.04	1761	1917
R-105	Social Studies	24	.745	.797	14.57	12.60	17.57	15.68	3.00	3.08	5.29	4.91	4.94	4.72	3.67	3.07	1761	1917
R-106	Mathematics	23	.716	.686	7.93	7.05	12.24	9.16	4.31	2.11	4.03	3.61	6.35	5.88	4.47	4.30	1761	1917
R-107	Physical Science	18	.750	.716	9.67	7.84	11.25	8.37	1.58	.53	3.69	3.51	4.26	4.04	2.86	2.88	1761	1917
R-108	Biological Science	11	.638	.615	5.95	4.88	7.15	6.03	1.20	1.15	2.28	2.14	2.13	2.24	1.88	1.92	1761	1917
R-109	Scientific Attitude	10	.552	.519	5.48	5.52	6.78	6.82	1.30	1.30	1.99	1.86	1.91	1.83	1.85	1.81	1761	1917
R-110	Aero.-Space	10	.673	.474	4.59	2.76	5.92	3.64	1.33	.88	2.35	1.64	2.40	1.92	1.93	1.84	1761	1917
R-111	Elec.	20	.703	.449	8.56	5.55	11.25	6.25	2.69	.70	3.87	2.54	4.61	3.14	3.34	3.03	1761	1917
R-112	Mechanics	19	.648	.575	11.14	7.18	13.56	8.79	2.42	1.61	3.28	2.72	3.15	3.02	2.70	2.66	1761	1917
R-113	Farming	12	.628	.696	7.61	6.90	8.57	7.91	.96	1.01	2.28	2.51	2.12	2.30	1.90	1.89	1761	1917
R-114	Home Economics	21	.561	.648	7.74	11.80	9.29	13.75	1.55	1.95	2.75	3.29	2.99	3.21	2.70	2.73	1761	1917
R-115	Sports	14	.706	.605	7.57	5.10	9.21	6.41	1.64	1.31	2.94	2.27	2.80	2.50	2.20	2.13	1761	1917
	Information II																	
R-131	Art	12	.629	.665	5.59	5.91	6.96	7.39	1.37	1.48	2.46	2.44	2.52	2.52	2.15	2.03	1461	1591
R-132	Law	9	.530	.448	4.38	3.96	5.86	5.35	1.48	1.39	1.78	1.61	1.83	1.78	1.75	1.78	1461	1591
R-133	Health	9	.510	.541	5.18	5.60	6.36	6.82	1.18	1.22	2.04	1.95	1.84	1.62	1.92	1.73	1461	1591
R-134	Engineering	6	.414	.412	3.03	2.49	3.52	3.03	.49	.54	1.24	1.26	1.14	1.24	1.30	1.35	1461	1591
R-135	Architecture	6	.378	.356	2.28	2.33	2.86	2.85	.58	.52	1.25	1.19	1.42	1.32	1.49	1.43	1461	1591
R-138	Military	7	.477	.338	2.16	1.64	3.12	2.39	.96	.75	1.38	1.14	1.44	1.31	1.44	1.41	1461	1591
R-139	Acct., Bus., Sales	10	.468	.517	4.04	4.02	5.61	5.75	1.57	1.73	1.79	1.75	1.97	1.94	1.95	1.82	1461	1591
R-140	Practical Knowledge	4	.478	.423	2.79	2.95	3.26	3.35	.47	.40	1.04	.90	.84	.73	.98	.89	1461	1591
R-142	Bible	15	.737	.761	6.61	6.84	7.85	8.09	1.24	1.25	3.22	3.12	3.44	3.36	2.42	2.25	1461	1591
R-145	Hunting	5	.523	.239	2.10	1.05	2.54	1.18	.44	.13	1.20	.89	1.26	.96	1.20	1.14	1461	1591
R-146	Fishing	5	.538	.235	1.67	.98	2.09	1.07	.42	.09	1.23	.91	1.34	.94	1.24	1.14	1461	1591
R-147	Outdoor Activ.(other)	9	.529	.506	4.66	4.18	5.41	4.88	.75	.70	1.87	1.81	1.80	1.79	1.78	1.79	1461	1591
R-150	Theater; Ballet	8	.582	.623	3.44	4.05	4.41	4.97	.97	.92	1.61	1.61	1.75	1.73	1.54	1.45	1461	1591
R-162	Vocabulary II	9	.634	.620	5.26	5.71	6.70	6.86	1.44	1.15	2.24	2.14	2.08	1.81	1.85	1.75	1461	1591
R-212	Memory for Words	24	.504	.554	10.24	11.71	12.46	14.70	2.22	2.99	4.79	5.18	5.72	5.88	5.29	5.26	1679	1806
R-220	Disguised Words	30	.585	.607	12.86	14.14	16.57	18.14	3.71	4.00	6.15	6.35	7.52	7.58	6.35	6.27	1795	1840
	English																	
R-231	Spelling	16	.640	.590	7.96	9.26	9.63	11.19	1.67	1.93	2.87	2.74	3.12	2.66	2.55	2.45	1686	1817
R-232	Capitalization	33	.337	.305	28.45	29.64	29.52	30.41	1.07	.77	3.87	3.40	3.86	3.78	4.46	4.25	1686	1817
R-233	Punctuation	27	.660	.688	16.07	17.81	18.23	20.16	2.16	2.35	4.30	4.13	4.55	4.25	3.65	3.32	1686	1817
R-234	English Usage	25	.522	.493	15.53	16.46	16.99	17.81	1.46	1.35	3.26	3.04	3.41	3.12	3.26	3.10	1686	1817
R-235	Effective Expression	12	.451	.474	7.78	8.35	8.99	9.46	1.21	1.11	2.48	2.15	2.33	2.12	2.52	2.19	1686	1817
R-240	Word Functions	24	.615	.667	8.70	10.18	11.50	13.10	2.80	2.92	4.82	5.35	5.55	5.61	4.59	4.48	1794	1839
R-250	Reading Comprehension	48	.712	.771	26.62	28.14	32.93	34.13	6.31	5.99	10.56	10.07	10.71	9.56	8.07	6.65	1795	1839
R-260	Creativity	20	.549	.537	8.33	7.80	11.61	10.58	3.28	2.78	3.77	3.50	4.41	3.95	3.92	3.60	1795	1839
R-270	Mechanical Reasoning	20	.658	.640	11.88	8.25	14.28	9.84	2.40	1.59	3.93	3.41	3.82	3.69	3.21	3.02	1795	1839
R-281	Vis. in 2 Dimensions	24	.492	.571	13.14	11.15	16.18	13.59	3.04	2.44	5.70	5.51	5.43	5.55	5.61	5.12	1795	1839
R-282	Vis. in 3 Dimensions	16	.601	.592	8.59	7.86	10.44	9.09	1.85	1.23	3.21	2.92	3.34	3.06	2.93	2.70	1795	1839
R-290	Abstract Reasoning	15	.568	.601	8.75	8.51	10.15	9.74	1.40	1.23	3.00	2.96	2.84	2.95	2.72	2.64	3382	3628
	Mathematics																	
R-311	I.Arith.Reasoning	16	.650	.679	7.98	7.65	10.14	9.18	2.16	1.53	3.38	3.20	3.60	3.59	2.93	2.74	1686	1817
R-312	II.Intro. h.s. Math.	24	.688	.674	10.08	10.24	12.75	11.01	2.67	.77	4.06	3.87	5.54	4.85	4.03	3.63	1686	1817
R-333	III.Adv. h.s. Math.	14	.229	.152	2.46	2.31	4.58	3.46	2.12	1.15	1.63	1.51	3.14	2.54	3.19	2.75	1676	1807
F-410	Arithmetic Computation	72	.465	.461	25.14	30.42	34.15	36.46	9.01	6.04	20.14	16.21	19.94	17.28	20.73	17.42	1686	1817
F-420	Table Reading	72	.155	.241	6.26	8.53	11.74	12.97	5.48	4.44	10.10	7.74	10.71	6.50	13.53	8.83	1789	1839
F-430	Clerical Checking	74	.270	.278	16.72	23.57	28.18	34.06	11.46	10.49	19.83	17.73	17.18	15.90	22.46	20.27	1773	1829
F-440	Object Inspection	40	.287	.407	19.48	20.94	24.31	25.15	4.83	4.21	8.44	7.30	8.68	7.30	10.22	7.95	1761	1815

[a] Based on the same cases as Table 4-8.

[b] From Tables I-1 and I-2 in Appendix I.

STANDARD ERRORS OF MEASUREMENT

Although we have elected in the interests of convenience to discuss standard errors of measurement under the general heading "Reliability of the Tests" the reader is urged to bear in mind that standard errors of measurement should be considered neither "better" than reliability coefficients nor substitutes for them, in evaluating a test. Their sole function is to aid in interpreting scores, by providing a scale which expresses amount of score unreliability in terms of the same units as the scores themselves.

The standard errors of measurement have been computed from the general formula:

$$\sigma_{\text{meas}_x} = \sigma_x\sqrt{1 - r_{xx}} \qquad (5)$$

where x may be a raw score, standard score, difference score, or any other kind of measure. The only restriction is that σ_x and r_{xx} must be based on the same (or essentially equivalent) groups.

The standard error of measurement of the difference between standard scores for grades 9 and 12 reduces to:

$$\sigma_{\text{meas}_{z_2 - z_1}} = \sqrt{2 - r_{11} - r_{22}} \qquad (6)$$

The notation is the same as for formulas 2 and 3 above.

Results

FINDINGS ON RELIABILITY

Reliability of Test Scores for Retest Group. For reasons already explained, columns 1-4 of Table 4-8 contain the most useful estimates of the reliability of test scores within a single grade (9 or 12), for the retest group. As might be expected, the grade 12 coefficients turn out to be of about the same order of magnitude as the ones in columns 1 and 2 of Table 4-7. Inspection of the coefficients in columns 1-4 of Table 4-8 reveals that all of the long tests have excellent reliability and that even for the shorter tests reliability is generally quite good when length is taken into account. A notable exception is Photography Information (R-148) which has poor reliability for both sexes but particularly for girls. The poor reliability is undoubtedly due to the fact that one of the three items not only was extremely difficult but had a distractor that turned out to be unusually attractive throughout the range of ability, for reasons discussed in *The American High-School Student*, Chapter 3 (Flanagan *et al.*, 1964, p. 3-114). The low reliability of the Etiquette Information scale (R-144) is of course due primarily to its brevity (only two items) but it is also due partly to the fact that one of the items proved extremely difficult, especially for the boys, while the other item was moderately easy. (The difference in difficulty levels between the two items reduced the phi coefficient between them, which represented the half-test reliability.)

The few other variables for which the reliability is extremely low are almost all ones in areas where the students' knowledge is typically so scanty that responses are likely to be based largely on guessing. Hunting Information (R-145) and Fishing Information (R-146) for grade 9 girls are instances. For the same reason, the reliability coefficient is a lot lower for girls than for boys on Aeronautics and Space Information (R-110) and Electrical-Electronic Information (R-111), and for boys than for girls on Home Economics Information (R-114).

Lack of knowledge, with consequent extensive guessing and restriction of range, also explains the low 9th-grade reliability coefficients for Math III (R-333), which tests mastery of mathematical concepts not usually taught until after grade 9.

Alternative Sources of Information about Test Reliability. Reliability coefficients, as computed, are not the only source of information about a test's reliability. Under some circumstances other statistics may give even better though less direct information about it. Consider, for instance, the fact that except for sampling errors a test's reliability cannot be lower than the square of any correlation involving that test, and the related fact that (again except for sampling errors) the communality of a test included in a factor analysis cannot exceed its reliability. Table 6-6 shows communality estimates based on approximately the same cases as the Table 4-8 reliability coefficients, and weighted the same way. In some cases the communality estimates turn out to be enough higher to suggest that the test may be considerably more reliable than its computed reliability coefficient suggests. Hunting Information (R-145) for grade 12 girls is a case in point. Its computed reliability coefficient for this group is only .075 (column 4 of Table 4-8). It seems improbable that a variable whose reliability is really that low could have a communality as high as .477, virtually all of it composed of factors that look plausible and have reasonable interpretations. This is presumably a case where the internal consistency is not really a sound estimate of reliability, since the individual items themselves are probably somewhat more reliable than homogeneous. (Item reliability and inter-item homogeneity are not always exactly synonymous.)

Correlations corrected for attenuation constitute an even better clue concerning lower bounds of a test's reliability. If the correlation corrected for attenuation goes over 1, it means that either the raw correlation is an overestimate or the reliability coefficient of at least one of the two variables correlated is an underestimate. In columns 3-4 of Table 5-3 are the correlations between corresponding grade 9 and grade 12 variables corrected for attenuation. Several of these corrected correlations for scales in the Information Test are greater than 1, suggesting that the reliability coefficients for the information scales tend to be underestimates.

Reliability of Test Scores for Norms Group: Grade 12. For reasons already explained, the coefficients shown in columns 5 and 6 of Table 4-7 are the best estimates currently available of the reliability of the grade 12 scores for the group on which the TALENT norms presented in *The American High-School Student* (Flanagan *et al.*, 1964, Chapter 3) are based. (The reliability coefficients in columns 5-6 turn out to be quite close to the ones in columns 1-2.)

Reliability of Difference Scores. Columns 5-6 of Table 4-8 show the reliability of the differences between grade 9 raw scores and corresponding grade 12 scores. The means and standard deviations of these difference scores are shown in Table 4-9, in columns 7-8 and 13-14 respectively. Columns 7-8 of Table 4-8 show the reliability coefficients for the difference between standard scores. The correlations between grades are shown in columns 1-2 of Table 4-9. As was to be expected in view of the substantial correlations between grade 9 and grade 12 scores on most of the tests, most of the reliability coefficients for difference scores were low. But many were substantial and some were surprisingly high. Among the latter were Reading Comprehension (R-250), Word Functions in Sentences (R-240), Math Information (R-106), Math II (R-312), and Math III (R-333). Capitalization (R-232) has very high reliability coefficients for difference scores, but this is probably an artifact, due, perhaps, to some sort of distortion caused by a grossly skewed distribution of scores.

For almost every test, differences between standard scores (columns 7-8) have roughly the same reliability as differences between raw scores (columns 5-6). Some of the math variables constitute the chief exception. For those variables the reliability of raw score differences tends to be substantially higher than that of standard score differences.

It has already been indicated (in the paragraph headed "Alternative Sources of Information about Test Reliability") that the computed values of the reliability coefficients for the information scales (at least for many of them if not all) tend to be underestimates. For any scales in this category whose reliability coefficients for either grade 9 or grade 12 or both are underestimates the reliability coefficients for difference scores tend likewise to be underestimates. This is true both for raw-score and standard-score differences.

Reliability of Residual Scores. The residual twelfth-grade scores (after subtracting the component predictable from ninth-grade score on the same test) turned out to be considerably more reliable than either the raw-score differences or the standard-score differences. Almost all of these residual-score reliability coefficients (shown in columns 9-10 of Table 4-8) appear to be significantly greater than 0 (although the author knows of no formula for an exact test of significance suitable for reliability coefficients determined the way these were). The fact that the residual scores turn out to have such substantial reliability is gratifying since most of the research reported on in Chapters 7 and 8 involves residuals of one kind or another.

Furthermore, as has already been indicated, many of the reliability coefficients shown for the various information scales and for difference scores on them are probably underestimates. The same conclusion applies to the reliability coefficients for residual scores on these variables.

Standard Errors of Measurement. Standard errors of measurement are presented in Table 4-10, for grade 9 scores, grade 12 scores, and raw-score differences. They are all based on the weighted retest cases, and are computed from the appropriate reliability coefficients and standard deviations in columns 1-8 of Table 4-8 and 9-14 of Table 4-9.

EMPIRICAL FINDINGS ON METHODOLOGY

Comparison of KR-21 and Split-Half Coefficients. In order to provide some notion, based on empirical data, of the amount of distortion produced by the use of the KR-21 formula, KR-21 coefficients corresponding to the split-half coefficients in Table 4-7 also appear in that table. Columns 3-4 and 7-8 show KR-21 values corresponding directly to split-half coefficients. It is clear that the KR values are systematically, and in some cases substantially, lower than the corresponding split-half estimates. This is of course in accordance with expectation. KR-21 can be expected to underestimate the reliability (of unspeeded tests) unless the items are all of identical difficulty and identical reliability, and unless the item intercorrelations equal the item reliabilities--a most improbable set of assumptions for most tests. The sole case where the KR-21 coefficient is higher than the corresponding split-half value is for the Reading Comprehension Test (R-250), for which KR-21 is spuriously increased by the fact that items based on the same reading passage are not experimentally independent. (This difficulty does not apply to the split-half reliability because the manner of splitting the test controls it.) The KR-21 coefficient on this test happens to be higher than the split-half value for males but not for females, even though it is of course subject to the same spurious increase for females as for males.

Comparison of Split-Half Coefficients with Values Obtained by Other Procedures. Where coefficients obtained by methods other than KR-21 were originally obtained for the norms group (as presented in Table 2-5 of Flanagan *et al.*, 1964) they too are shown in Table 4-7 (in columns 12-13). These coefficients are mostly either split-half coefficients based on the experimental form of the test and corrected for number of items and range, or KR-20's. The details are explained in the original report (Flanagan *et al.*, 1964, Chapter 2). In Table 4-7 of the present report, it will be seen that the values

TABLE 4-10. Standard errors of measurement for various kinds of scores

			σ^{*}_{meas}			
		No.of items	Within-grade (9 and 12)		For raw score difference	
			M	F	M	F
	Information I					
R-102	Vocabulary I	21	1.76	1.94	2.48	2.74
R-103	Literature	24	2.00	2.07	2.84	2.93
R-104	Music	13	1.52	1.51	2.15	2.04
R-105	Social Studies	24	2.02	2.12	2.86	2.99
R-106	Mathematics	23	2.02	1.94	2.86	2.75
R-107	Physical Science	18	1.70	1.89	2.40	2.66
R-108	Biological Science	11	1.35	1.44	1.88	1.92
R-109	Scientific Attitude	10	1.27	1.29	1.80	1.81
R-110	Aero.-Space	10	1.39	1.38	1.93	1.84
R-111	Electricity and Electronics	20	1.88	1.89	2.67	2.68
R-112	Mechanics	19	1.71	1.92	2.42	2.66
R-113	Farming	12	1.34	1.41	1.88	1.89
R-114	Home Economics	21	2.12	1.95	2.70	2.73
R-115	Sports	14	1.42	1.59	2.01	2.13
	Information II					
R-131	Art	12	1.45	1.47	2.05	2.03
R-132	Law	9	1.17	1.21	1.66	1.70
R-133	Health	9	1.17	1.10	1.64	1.55
R-134	Engineering	6	.89	1.00	1.27	1.35
R-135	Architecture	6	1.06	1.05	1.49	1.43
R-138	Military	7	1.05	1.05	1.44	1.41
R-139	Acct., Bus., Sales	10	1.25	1.22	1.87	1.72
R-140	Practical Knowledge	4	.66	.66	.93	.89
R-142	Bible	15	1.64	1.58	2.31	2.23
R-145	Hunting	5	.96	.89	1.20	1.14
R-146	Fishing	5	.92	.90	1.24	1.14
R-147	Outdoor Activities (other)	9	1.23	1.34	1.74	1.79
R-150	Theater; Ballet	8	1.11	1.12	1.54	1.45
R-162	Vocabulary II	9	1.12	1.15	1.59	1.62
R-212	Memory for Words	24	2.06	1.97	2.91	2.78
	English					
R-231	Spelling	16	1.65	1.60	2.33	2.27
R-232	Capitalization	33	1.54	1.26	2.19	1.79
R-233	Punctuation	27	2.10	1.90	2.96	2.70
R-234	English Usage	25	2.07	1.96	2.93	2.77
R-235	Effective Expression	12	1.34	1.30	1.89	1.84
R-240	Word Functions	24	2.15	2.05	3.04	2.90
R-250	Reading Comprehension	48	2.99	2.79	4.22	3.94
R-260	Creativity	20	1.89	1.92	2.67	2.71
R-270	Mechanical Reasoning	20	1.58	1.86	2.24	2.63
R-282	Visualization in 3 Dimensions	16	1.55	1.64	2.20	2.32
R-290	Abstract Reasoning	15	1.51	1.53	2.14	2.16
	Mathematics					
R-311	I. Arithmetic Reasoning	16	1.72	1.77	2.44	2.50
R-312	II. Intro. h.s. Math.	24	1.84	1.91	2.60	2.70
R-333	III. Adv. h.s. Math.	14	1.45	1.40	2.06	1.98

*Based on the data of Tables 4-8 and 4-9.

in columns 5-6 are a little higher, in most cases, than the corresponding values in columns 12-13, obtained by other means. The exceptions are trivial.

Empirical Check on Correction for Range. To obtain a notion based on empirical data, of just how good the correction-for-range procedure on which we are leaning so heavily is, the KR-21 estimates in Table 4-7, columns 7-8, obtained by this procedure for the 1960 norms group may be compared with the corresponding KR-21 values in columns 9-10, which were obtained directly from the 1960 norms data. This comparison suggests that the correction-for-range procedure is very good indeed. The values it gives (columns 7-8) are almost identical to those obtained by direct computation (columns 9-10).

CLERICAL ACCURACY AND CONSCIENTIOUSNESS OF EXAMINEES

One matter of concern in any program involving tests and questionnaires is whether the students approach the task conscientiously, and try to answer as carefully and as accurately as they can. The circumstances of the retest administration provided an unusually good opportunity to check this point, at least with respect to the students' approach to questionnaires such as the Student Information Blank. And as far as students' attitude towards tests is concerned, the Screening scale (R-101) of the Information Test was developed for the explicit purpose of checking on this very point, among others (Flanagan *et al.*, 1960, Chapter VII, pp. 30-34).

Manner of Response to Tests

The Screening scale consists of a dozen items which were intentionally made so easy that anyone who can read and write simple English should have no difficulty with any of them. Therefore 12th-grade students who answer items incorrectly have probably made a clerical error in marking the answer sheet. Students who mark answer sheets carelessly or are unusually prone to clerical error would be among those most likely to get something less than a perfect score on the Screening scale. About 25 percent of the boys and 18 percent of the girls fall in this category, according to Table 4-11, which shows the percentage distribution of Screening scores, based on matched cases.

If we subtract from the percentages who failed to get perfect scores on the Screening Test the percentages (shown in Table 4-4) that failed to finish, we are left with at least 19 percent of the boys and 15 percent of the girls making at least one actual error on the Screening Test. This is a palpable amount of error, but quite in line with what is to be expected of human beings, and certainly not large enough to cast doubt on findings based on the results of the retesting.

Of course results from the Clerical Checking Test also attest to the prevalence of clerical inaccuracy, but those results are not quite so relevant as the Screening scale data to what we are talking about here. The greater relevance of the Screening scale is due to the fact that unlike the Clerical Checking Test, it measures performance under essentially unspeeded conditions. The Clerical Checking Test, on the other hand, imposes a very stringent (and deliberately stingy) time limit.

As for the amount of inaccuracy revealed by the Screening Test data, it is reassuring to note that the percentage distributions shown in Table 4-11 are almost identical with the corresponding distributions for the national sample of 12th-graders tested in 1960 (as shown in Table 3-4 of *The American High-School Student*, Flanagan *et al.*, 1964). This, together with the general similarity between grade 12 results in 1960 and 1963 on most other tests in the TALENT battery, suggests that being required by their schools to participate in Project TALENT a second time did not result in uncooperativeness, blatant carelessness, or any other attitudinal change that affected test performance noticeably.

Manner of Response to Inventories

The SIB administered in 1963 was much shorter than the 1960 version; it contained only 158 items instead of the original 394. But practical considerations dictated that the original answer sheet format, set up for 394 items, had to be retained in the 1963 testing. As a result of the varying number of options for different items, some items were in positions where the number of answer spaces printed didn't match the number of options for the item. As a matter of fact, the new SIB contained 52 such items, with fewer options than answer spaces. These 52 items were used as the basis for "goof scores,"

TABLE 4-11. Percentage distribution of Screening scores (R-101) Based on retest matched cases, weighted by Weight Z

R-101 Score	Percent M	Percent F
12	74.8	81.9
11	14.4	12.1
10	2.9	2.6
9	3.3	2.2
8	3.1	.8
7	.8	.3
6	.4	.1
5		
4	.1	
3		
2		
1	.1	
0	.1	
Total	100.0	100.0
M*	11.5	11.7
σ*	1.2	.8
N**	1950	2091

*Weighted

**Unweighted

determined for each student who took the SIB in 1963. A student's "goof scores" are measures of the extent to which he marked answer spaces corresponding to nonexistent options.

The term "goof score" was assigned to these variables as a working label, presumably on an interim basis, pending the arrival of an inspiration as to a name that would be equally descriptive but somewhat more formal. But, since inspiration didn't materialize, the name "goof score" stuck. And that is why it is the name used in this report!

The procedure for determining the goof scores is described in Appendix D-2, Section 2. Appendix F consists in a general discussion of them and their implications, and a presentation of empirical findings.

If a student marked either a part or all of his answers to the SIB at random he would probably have high goof scores, as he likewise would if he were exceptionally careless. As pointed out in Appendix F, almost all of the SIB's with high goof scores can be eliminated from specific analyses where it seems desirable to do so, by eliminating cases that have a "goof-1" score (X-801') greater than 0. However for most analyses this would be unnecessarily costly in terms of cases. It would reduce the number of cases available for the analyses by over 40 percent, which would generally be undesirable since many accurately marked responses would be thrown out to get rid of a very few inaccurate ones. But even so, conceivably it could be worthwhile for some analyses where the N is large enough that even a drastic reduction in it is not serious enough to outweigh the advantages of eliminating inaccurate data.

Another possible approach, mentioned briefly in Appendix F, is to eliminate cases from the analyses not on the basis of goof-1 scores but instead on the basis of "goof-responses" to the first four of the ten items going into it (Items 57-60). This somewhat less stringent approach is less costly in terms of loss of cases, but of course it is also less efficient in purifying the data.

On the other hand elimination of <u>any</u> sizable group of cases on the basis of invalid responses to early items in the SIB, in situations where the only SIB items to be used in the data analysis are late ones, would be most clearly justifiable if selection of an invalid response were a random event occurring with a probability approximately proportional to the reciprocal of the number of answer spaces for the item. But this doesn't happen. If it did, we wouldn't have had the phenomenon, already mentioned, of having the first four of the 52 items be among the ones more likely to have invalid responses than other items for which the same opportunity existed.

Furthermore, as pointed out in Appendix F there is a decrease, rather than an increase, in the occurrence of goof responses towards the end of the inventory. Quite evidently, boredom, fatigue, and indifference toward the end are not playing any important role in the goof responses. Errors on the first encounters with items entering into the goof scores are by far the most prevalent ones. The students cope with the situation better on the later items where they are familiar with it. This further emphasizes the fact that throwing out later responses because an initial one is invalid may be wasteful of valid data.

Those are the pros and cons of eliminating cases from analyses on the basis of goof scores (or some similar criterion). Any investigator who happens to be using retest SIB data in his study will have to make a decision on the basis of the nature and purpose of his study and the specific kinds of analyses he happens to be doing.

Evaluation of Effect on Present Study

The effect on the present study of the problem discussed above (inaccuracies in answer-sheet marking) seems to be virtually nil, for at least two reasons. In the first place, there is no evidence that a problem of any magnitude exists in regard to the cognitive tests, or, for that matter, in regard to anything except the 1963 SIB. And the present study concentrates almost exclusively on the cognitive tests. The only part of it in which items from the 1963 SIB are involved is in the Chapter 8 analyses.

This brings us to the second reason the problem of errors in answer-sheet marking doesn't affect the present study in any important way. Even where items from the 1963 SIB are used (i.e., Chapter 8) only a small set of them are used, for most of which there is no reason to expect undue error since they are not among the 52 having excess answer spaces. And the rather small proportion of cases having invalid responses on the one "goof item" that was included would automatically have been eliminated from all the data analyses on which Chapter 8 is based.

SUMMARY

This chapter has been concerned with three main topics--(1) the degree of speededness, if any, of the tests (and Interest Inventory), (2) the reliability of the tests, and (3) the degree to which responses on tests and inventories are subject to answer-sheet-marking errors. The first and third of these topics are important not only in their own right but also because they have bearing on the second topic, test reliability.

Findings and Conclusions

1. Speededness of Tests. Most of the tests turned out to be speeded (or unspeeded) to just about the degree that was specified in the original test rationale. The chief exception was the Information Test, Part II, which turned out to be a little more speeded for the retest group in 1963 (though not for the original grade 12 norms group in 1960) than had been intended. Distortion caused by this is probably not great, however.

2. Answer-Sheet-Marking Errors. Although there is of course some clerical error in marking answer sheets, its frequency of occurrence appears to be fairly low. On the Student Information Blank a substantial number of students apparently made some errors because of confusion induced by the fact that as a result of revision of the SIB some of the items had fewer options than there were answer spaces on the answer sheet. Most such errors can be eliminated from data analyses by eliminating certain cases on the basis of a few easily definable criteria. A consideration of the pros and cons of this data-purification procedure results in the very tentative conclusion that for most purposes its disadvantages probably outweigh its advantages. In any event there is no reason to believe the present study has been affected, since the problem doesn't apply to any of the cognitive tests and since only very limited use was made of SIB items, and in such a way that students with dubious responses would almost certainly have been eliminated by the procedure used.

3. Test Reliability. Reliability coefficients for the matched retest cases are shown in Table 4-8, both for grade 9 and for grade 12. Table 4-7, in columns 5-6, presents reliability coefficients for the grade 12 norms group, tested in 1960. All these results suggest that the tests on the whole have very satisfactory reliability coefficients in relation to test length. As a matter of fact there is some evidence, in the research results presented in Chapters 5, 6, and 7, that despite all efforts to get accurate estimates, some of the reliability coefficients reported in the present chapter are underestimates of the true values to a very substantial extent. This phenonemon seems particularly prevalent in the case of the information scales.

4. Reliability of Difference Scores. Reliability coefficients for differences between correlated scores tend to be low. But some of the TALENT tests turned out to have surprisingly high reliabilities for the differences between grade 9 scores and grade 12 scores. Reading Comprehension, Word Functions in Sentences, and some of the mathematics tests were among those having the highest reliabilities for difference scores.

5. Reliability of Residual Scores. Residual twelfth-grade scores (after eliminating the component predictable from ninth-grade scores on the same test) are considerably more reliable than difference scores. Residual scores on almost all the tests turn out to have useful degrees of reliability.

Recommendations on Methodological Matters

This chapter devotes considerable attention to methodological matters, particularly in connection with the computation of reliability coefficients. A list of the decisions and conclusions reached follows.

1. The kind of reliability coefficient that is best depends in part on the nature of the test (e.g., whether it is speeded or not, whether the items are all experimentally independent or not, and whether retesting with the same form after a short interval of time gives scores that are experimentally independent of the original ones).

2. The kind of reliability coefficient that is best also depends in part on the purpose for which it is to be used. In the case of the present study, reliability coefficients are needed for use in helping interpret the results obtained in a retest study in which the same forms of the same tests are used for retesting after a 3-year interval as were used originally.

3. In view of the above purpose, the best kind of reliability coefficient to obtain for those tests that are essentially unspeeded is a split-half coefficient, adjusted by means of Angoff formula #16.

4. Adjustment of reliability coefficients by means of the correction-for-range procedure whenever the group for which results are to be interpreted is not the one on which the reliability coefficients are based is strongly recommended. This recommendation is supported by the presentation of empirical data that show that the correction-for-range formula produces very accurate estimates.

Significance of the Findings

The results reported in this chapter have bearing on the research presented later in this report. In particular, the reliability of the various tests and derived scores (difference scores, etc.) is directly relevant in interpreting almost all of the research reported in subsequent chapters.

This chapter, unlike the remaining ones, has been concerned primarily with the tests rather than with the students or the schools. However Chapter 5 ("Changes in Performance between Ninth and Twelfth Grades") and Chapter 6 ("The Organization of Mental Abilities") also contain some material that may be viewed as providing new insights about the tests. But the alternative approach of regarding this material as primarily providing new insights about the students seems preferable--which is why that material is in Chapter 5 instead of here in Chapter 4.

Chapter 5. CHANGES IN PERFORMANCE BETWEEN NINTH AND TWELFTH GRADES

In this chapter we shall take a look at the changes in performance that occur between grades 9 and 12 in various areas. Among the questions to which we shall seek answers are the following. How much change has occurred? In what direction? In what areas? How much do boys and girls differ in these respects? Is the amount of growth correlated with the starting point (grade 9 score, in this case)? Is it possible to distinguish empirically between measures of "aptitude" and measures of "achievement"?

Basic Data. All data presented in this chapter are based on the data of Tables 4-8 and 4-9; thus, in effect, the data for each test are based on all students having both grade 9 and grade 12 scores for that test.

Amount of Growth

Table 5-1 shows the mean differences between grade 9 and grade 12 scores, and the ratio of the mean difference to its standard deviation, to its standard error of measurement, and to the standard error of measurement of its raw score. The first of these three ratios is in columns 3-4, the second in columns 5-6, and the third in columns 7-8.

It should be clearly understood that none of these three kinds of ratios is a critical ratio, since their denominators are not standard errors of means. They are standard deviations of observed raw scores or of raw score differences (either for the group of students in the case of columns 3-4, or for the probability distribution of a single typical student's scores, taking error of measurement into account, in the case of the column 5-6 and column 7-8 values). There is no intention here of testing the differences between means for significance. It is quite unnecessary to do that formally since it is obvious from the magnitude of the gains relative to their standard deviations and from the size of the groups that all of the mean gains are significantly different from 0.

The function of the ratios in Table 5-1 is to express mean gains in terms of a scale based on a standard of individual gains, in order to impart some degree of comparability to mean gains for different tests. In the column 3-4

TABLE 5-1. Analysis of mean differences between grade 9 and grade 12 raw scores

(Based on matched retest cases, weighted by Weight Z)[a]

		No. of items	$\overline{D}$ (Mean raw score gain)		$\overline{D}/\sigma_D$		$\overline{D}/\sigma_{meas_D}$		$\overline{D}/\sigma_{meas_{9 \text{ or } 12}}$	
			M (1)	F (2)	M (3)	F (4)	M (5)	F (6)	M (7)	F (8)
	Information I									
R-102	Vocabulary I	21	2.60	2.67	.96	.97	1.05	.98	1.48	1.38
R-103	Literature	24	4.33	4.64	1.27	1.40	1.53	1.58	2.16	2.24
R-104	Music	13	.96	.97	.43	.48	.45	.48	.63	.64
R-105	Social Studies	24	3.00	3.08	.82	1.00	1.05	1.03	1.49	1.45
R-106	Mathematics	23	4.31	2.11	.96	.49	1.51	.77	2.13	1.09
R-107	Physical Science	18	1.58	.53	.55	.18	.66	.20	.93	.28
R-108	Biological Science	11	1.20	1.15	.64	.60	.64	.60	.89	.80
R-109	Scientific Attitude	10	1.30	1.30	.70	.72	.72	.72	1.02	1.01
R-110	Aeronautics and Space	10	1.33	.88	.69	.48	.69	.48	.96	.64
R-111	Electricity and Electronics	20	2.69	.70	.80	.23	1.01	.26	1.43	.37
R-112	Mechanics	19	2.42	1.61	.90	.60	1.00	.60	1.42	.84
R-113	Farming	12	.96	1.01	.50	.53	.51	.53	.72	.72
R-114	Home Economics	21	1.55	1.95	.57	.71	.57	.71	.73	1.00
R-115	Sports	14	1.64	1.31	.74	.62	.82	.62	1.15	.82
	Information II									
R-131	Art	12	1.37	1.48	.64	.73	.67	.73	.94	1.01
R-132	Law	9	1.48	1.39	.84	.78	.89	.82	1.26	1.15
R-133	Health	9	1.18	1.22	.61	.70	.72	.79	1.01	1.11
R-134	Engineering	6	.49	.54	.38	.40	.39	.40	.55	.54
R-135	Architecture	6	.58	.52	.39	.36	.39	.36	.55	.50
R-138	Military	7	.96	.75	.67	.53	.67	.53	.91	.71
R-139	Acct., Bus., Sales	10	1.57	1.73	.80	.95	.84	1.01	1.26	1.42
R-140	Practical Knowledge	4	.47	.40	.48	.45	.51	.45	.71	.61
R-142	Bible	15	1.24	1.25	.51	.56	.54	.56	.76	.79
R-145	Hunting	5	.44	.13	.37	.11	.37	.11	.46	.15
R-146	Fishing	5	.42	.09	.34	.08	.34	.08	.46	.10
R-147	Outdoor Activities (other)	9	.75	.70	.42	.39	.43	.39	.61	.52
R-150	Theater; Ballet	8	.97	.92	.63	.63	.63	.63	.87	.82
R-162	Vocabulary II	9	1.44	1.15	.78	.66	.91	.71	1.29	1.00
R-212	Memory for Words	24	2.22	2.99	.42	.57	.76	1.08	1.08	1.52
R-220	Disguised Words	30	3.71	4.00	.58	.64				
	English									
R-231	Spelling	16	1.67	1.93	.66	.79	.72	.85	1.01	1.21
R-232	Capitalization	33	1.07	.77	.24	.18	.49	.43	.69	.61
R-233	Punctuation	27	2.16	2.35	.59	.71	.73	.87	1.03	1.24
R-234	English Usage	25	1.46	1.35	.45	.44	.50	.49	.71	.69
R-235	Effective Expression	12	1.21	1.11	.48	.51	.64	.60	.90	.85
R-240	Word Functions	24	2.80	2.92	.61	.65	.92	1.01	1.30	1.42
R-250	Reading Comprehension	48	6.31	5.99	.78	.90	1.50	1.52	2.12	2.15
R-260	Creativity	20	3.28	2.78	.84	.77	1.23	1.02	1.74	1.45
R-270	Mechanical Reasoning	20	2.40	1.59	.75	.53	1.07	.60	1.52	.85
R-281	Visualization in 2 Dimensions	24	3.04	2.44	.54	.48				
R-282	Visualization in 3 Dimensions	16	1.85	1.23	.63	.46	.84	.53	1.19	.75
R-290	Abstract Reasoning	15	1.40	1.23	.52	.47	.66	.57	.93	.80
	Mathematics									
R-311	I. Arithmetic Reasoning	16	2.16	1.53	.74	.56	.88	.61	1.26	.86
R-312	II. Intro. h.s. Math.	24	2.67	.77	.66	.21	1.03	.28	1.45	.40
R-333	III. Adv. h.s. Math.	14	2.12	1.15	.66	.42	1.03	.58	1.46	.82
F-410	Arithmetic Computation	72	9.01	6.04	.44	.35				
F-420	Table Reading	72	5.48	4.44	.40	.50				
F-430	Clerical Checking	74	11.46	10.49	.51	.52				
F-440	Object Inspection	40	4.83	4.21	.47	.53				

---

[a] Based on the data of Tables 4-8 and 4-9.

data the scale used is the standard deviation of all members of the group on which the table is based. In the column 7-8 data the scale is the hypothetical standard deviation among all the scores a single individual might obtain on the variable, taking due account of the fact that test scores are not completely reliable. In columns 5-6, the scale is the standard deviation of all the raw score differences between grade 9 and grade 12 scores that a single student might obtain.

The column 3-4, 5-6, and 7-8 data are not variants of the same thing; they serve quite different functions. Columns 5-6, for example, tell us that on most tests the amount of gain in score that the average person achieves is quite sizable in comparison with its error of measurement. Columns 3-4 and 7-8 give us some complementary information.

In order to understand the significance of these data better, let us consider the results for just one test, Reading Comprehension (R-250). Table 5-1, column 2, tells us that the average raw score gain between grades 9 and 12 was 6 points for the girls. But what does this really mean? Is 6 points a large gain? A trivial gain? To interpret it properly we should express it in terms of some sort of standard unit. For instance when the standard error of measurement is used as a unit the difference equals 1.5 units (Table 5-1, column 6). Figure 5-1 shows this graphically. The left-hand curve represents what the hypothetical distribution of all the differences between an infinite number of grade 9 raw scores on Reading Comprehension and the corresponding grade 12 raw scores would be for a single typical student if the true difference were 0 and if due account were taken of errors of measurement by using the standard error of measurement of the difference as the standard deviation. The right-hand curve differs in that though it still represents a hypothetical distribution, its central point is the actual mean gain, which equals about 1.5 standard-error-of-measurement-of-the-difference units. (In other words when expressed in terms of standard-error-of-measurement units, the original raw score difference, 6.0 points, is converted to 1.5 points.) Note the fact that there is considerable separation between the two curves, suggesting a relative gain of considerable magnitude.

Figure 5-2 shows the significance of the same raw score gain, 6 points (on R-250, for girls) in slightly different terms. In this graph the left-hand curve again represents what a hypothetical distribution of gains would look like if their mean were 0. In this case, however, instead of being the distribution of all of the score differences a single student hypothetically

FIGURE 5-1. Distribution of D/σ_{meas_D} (for R-250, females)*

Curve I (left-hand curve) would apply if true difference (D_∞) for typical student were 0.

Curve II (right-hand curve) uses $\overline{D}$ as the mean. This is the true difference (D_∞) of the typical student.

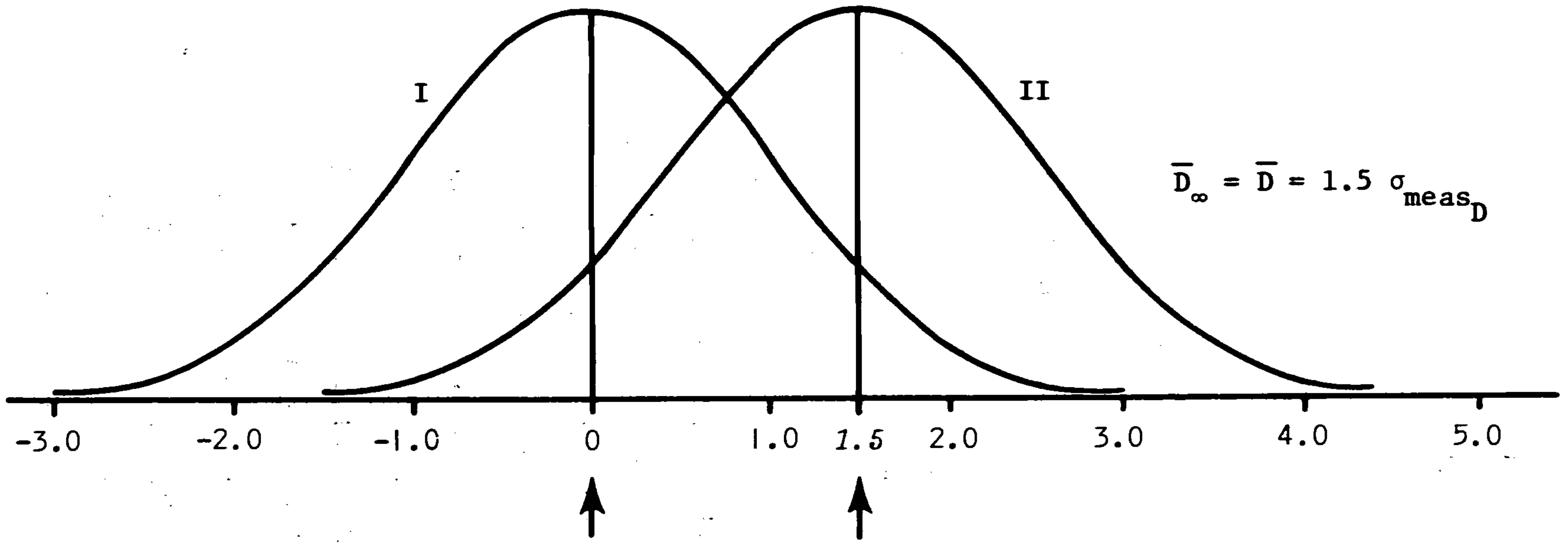


FIGURE 5-2. Distribution of D/σ_D (for R-250, females)*

Curve III (left-hand curve) would apply if mean difference were 0.

Curve IV (right-hand curve) uses actual mean difference.

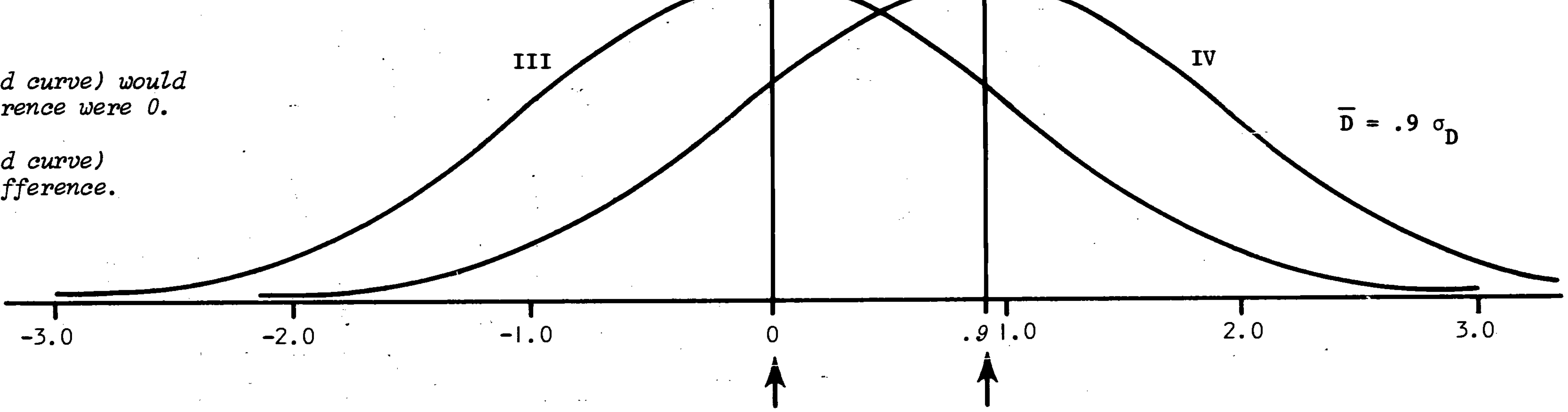
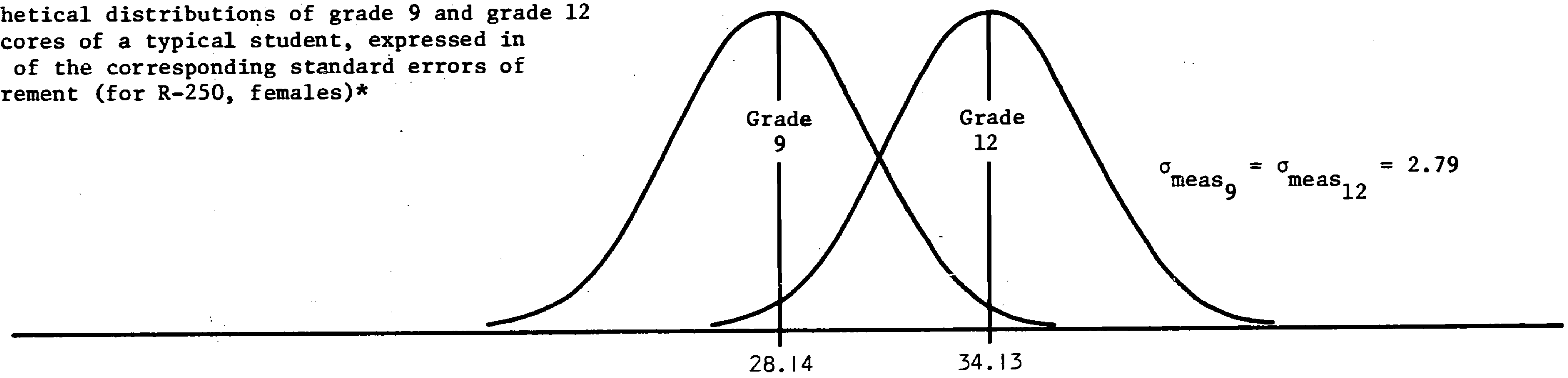


FIGURE 5-3. Hypothetical distributions of grade 9 and grade 12 raw scores of a typical student, expressed in terms of the corresponding standard errors of measurement (for R-250, females)*



---

*Figures 5-1, 5-2, and 5-3 are all based on data from Tables 5-1 and 4-9.

might get, it is a representation of what the distribution of difference scores for the entire sample of students would look like if the mean difference were 0. But it isn't. The mean difference is actually 6.0 raw score points, which, when expressed in terms of standard-deviation-of-the-difference units, is converted to .9 such units. The right-hand curve in Figure 5-2 represents the distribution of differences, using their actual mean and standard deviation, 6.0 and (from Table 4-9) 6.7 respectively, but reduced to standard deviation units so that they become respectively .9 (as indicated above) and 1.0. Again the important thing to note is that the two curves in Figure 5-2 are quite well separated, indicating that the mean difference is substantially different from 0.

The column 7-8 data are perhaps even more helpful in giving us an idea of the meaning of the differences that have been found. Figure 5-3 corresponds to the column 8 data (for the same test, and the same group, as Figures 5-1 and 5-2). The left-hand curve represents a probability distribution of the typical student's grade 9 score while the right-hand curve corresponds to the same student's grade 12 score, so that Figure 5-3 shows graphically the growth in reading ability manifested by the typical girl between grades 9 and 12. It is clear from the graph that there is real growth, not mere measurement error.

Thus the data in columns 3-4, 5-6, and 7-8 of Table 5-1 tell us that on most tests the magnitude of individual gains tends to be substantial in relation to the variation among them. In other words the average gain is not merely "statistically significant" (i.e., significantly different from 0); it is also large enough to be "important" or "meaningful." And that is what really counts in interpreting data of the sort under consideration (i.e., magnitude of differences) when the numbers of cases are large enough and the variables measured with sufficient precision that most differences turn out to be statistically significant.

In past TALENT reports we have often pointed out that variation among the students in a grade is vastly greater than variation among grade means. And this is still true, of course. But it is encouraging ("refreshing" might be a better word) to be able for once to report changes between grades in terms which make it clear that growth <u>does</u> occur and that its magnitude is appreciable. The average student <u>is</u> learning--he <u>is</u> expanding his mental capabilities.

Table 5-2, presents the mean differences between grades 9 and 12 expressed in still another kind of unit--standard deviation of raw scores for grade 9 boys or girls (whichever is appropriate). This means that the gains are expressed in terms of a kind of standard score scale, with separate scales set up for boys and girls. The separate scaling for boys and girls has the advantage of making comparison among different tests a little more straightforward than it would be if an overall standard deviation had been used for this purpose. It should be borne in mind, however, that it precludes use of these standard scores for comparisons between the sexes. Thus in using Table 5-2 to draw comparisons between boys and girls, columns 1 and 2 are the ones to use. Columns 5 and 6 are intended primarily for comparisons among tests.

Inspection of columns 5 and 6 reveals that for boys the largest gains are for Math III (R-333), information in math (R-106), literature (R-103), accounting, business, and sales (R-139), law (R-132), and the Creativity Test (R-260). Girls show their largest gains in about the same fields, with the exception of Math Information (R-106), which drops considerably. For both sexes the gain in Abstract Reasoning is almost half a standard deviation. Areas in which gains are substantially higher than this seem to be mostly the ones in which course work and other activities are likely to be fairly extensive during high school. Creativity is perhaps the most conspicuous exception to this generalization. Gains on it are quite large even though it is not an area in which much formal instruction is likely in the typical high school.

Other Findings

Sex Differences in Score Gains. As has been suggested, both boys and girls show substantial growth in various kinds of knowledge and skill between grades 9 and 12. Table 5-3 shows (in terms of t-tests of the significance of the difference between boys' gains and girls' gains in various areas) that the two sexes show somewhat different patterns of mental growth.

Boys seem to acquire significantly more information than girls in many areas, including mathematics, physical science, aeronautics and space, electricity and electronics, mechanics, and sports; they also make significantly

TABLE 5-2. Raw score gains, grade 9 standard deviations, and ratio of former to latter (Based on Matched Retest Cases, Weighted by Weight Z)[a]

			$\bar{D}$ (Mean raw score gain)		s_9 (Standard deviation)		$\bar{D}/s_9$ Gain expressed as standard sc.	
		No.of items	M (1)	F (2)	M (3)	F (4)	M (5)	F (6)
	Information I							
R-102	Vocabulary I	21	2.60	2.67	3.80	3.86	.68	.69
R-103	Literature	24	4.33	4.64	4.11	3.80	1.05	1.22
R-104	Music	13	.96	.97	2.87	2.82	.33	.34
R-105	Social Studies	24	3.00	3.08	5.29	4.91	.57	.63
R-106	Mathematics	23	4.31	2.11	4.03	3.61	1.07	.58
R-107	Physical Science	18	1.58	.53	3.69	3.51	.43	.15
R-108	Biological Science	11	1.20	1.15	2.28	2.14	.53	.54
R-109	Scientific Attitude	10	1.30	1.30	1.99	1.86	.65	.70
R-110	Aeronautics and Space	10	1.33	.88	2.35	1.64	.57	.54
R-111	Electricity and Electronics	20	2.69	.70	3.87	2.54	.70	.28
R-112	Mechanics	19	2.42	1.61	3.28	2.72	.74	.59
R-113	Farming	12	.96	1.01	2.28	2.51	.42	.40
R-114	Home Economics	21	1.55	1.95	2.75	3.29	.56	.59
R-115	Sports	14	1.64	1.31	2.94	2.27	.56	.58
	Information II							
R-131	Art	12	1.37	1.48	2.46	2.44	.56	.61
R-132	Law	9	1.48	1.39	1.78	1.61	.83	.86
R-133	Health	9	1.18	1.22	2.04	1.95	.58	.63
R-134	Engineering	6	.49	.54	1.24	1.26	.40	.43
R-135	Architecture	6	.58	.52	1.25	1.19	.46	.44
R-138	Military	7	.96	.75	1.38	1.14	.70	.66
R-139	Acct., Bus., Sales	10	1.57	1.73	1.79	1.75	.88	.99
R-140	Practical Knowledge	4	.47	.40	1.04	.90	.45	.44
R-142	Bible	15	1.24	1.25	3.22	3.12	.39	.40
R-145	Hunting	5	.44	.13	1.20	.89	.37	.15
R-146	Fishing	5	.42	.09	1.23	.91	.34	.10
R-147	Outdoor Activities (other)	9	.75	.70	1.87	1.81	.40	.39
R-150	Theater; Ballet	8	.97	.92	1.61	1.61	.60	.57
R-162	Vocabulary II	9	1.44	1.15	2.24	2.14	.64	.54
R-212	Memory for Words	24	2.22	2.99	4.79	5.18	.46	.58
R-220	Disguised Words	30	3.71	4.00	6.15	6.35	.60	.63
	English							
R-231	Spelling	16	1.67	1.93	2.87	2.74	.58	.70
R-232	Capitalization	33	1.07	.77	3.87	3.40	.28	.23
R-233	Punctuation	27	2.16	2.35	4.30	4.13	.50	.57
R-234	English Usage	25	1.46	1.35	3.26	3.04	.45	.44
R-235	Effective Expression	12	1.21	1.11	2.48	2.15	.49	.52
R-240	Word Functions	24	2.80	2.92	4.82	5.35	.58	.55
R-250	Reading Comprehension	48	6.31	5.99	10.56	10.07	.60	.59
R-260	Creativity	20	3.28	2.78	3.77	3.50	.87	.79
R-270	Mechanical Reasoning	20	2.40	1.59	3.93	3.41	.61	.47
R-281	Visualization in 2 Dimensions	24	3.04	2.44	5.70	5.51	.53	.44
R-282	Visualization in 3 Dimensions	16	1.85	1.23	3.21	2.92	.58	.42
R-290	Abstract Reasoning	15	1.40	1.23	3.00	2.96	.47	.42
	Mathematics							
R-311	I. Arithmetic Reasoning	16	2.16	1.53	3.38	3.20	.64	.48
R-312	II. Intro. h.s. Math.	24	2.67	.77	4.06	3.87	.66	.20
R-333	III. Adv. h.s. Math.	14	2.12	1.15	1.63	1.51	1.30	.76
F-410	Arithmetic Computation	72	9.01	6.04	20.14	16.21	.45	.37
F-420	Table Reading	72	5.48	4.44	10.10	7.74	.54	.57
F-430	Clerical Checking	74	11.46	10.49	19.83	17.73	.58	.59
F-440	Object Inspection	40	4.83	4.21	8.44	7.30	.57	.58

[a] Based on the data of Table 4-9.

TABLE 5-3. Analysis of sex differences in raw score gains

(Based on matched retest cases, weighted by Weight Z)[a]

			$\bar{D}$ (Mean raw score gain)		$\bar{D}_M-\bar{D}_F$	t
		No. of items	M (1)	F (2)	(3)	(4)
	Information I					
R-102	Vocabulary I	21	2.60	2.67	- .07	- .8
R-103	Literature	24	4.33	4.64	- .31	- 2.8**
R-104	Music	13	.96	.97	- .01	- .1
R-105	Social Studies	24	3.00	3.08	- .08	- .7
R-106	Mathematics	23	4.31	2.11	2.20	15.2***
R-107	Physical Science	18	1.58	.53	1.05	14.9***
R-108	Biological Science	11	1.20	1.15	.05	.8
R-109	Scientific Attitude	10	1.30	1.30	.00	.0
R-110	Aeronautics and Space	10	1.33	.88	.45	7.2***
R-111	Electricity and Electronics	20	2.69	.70	1.99	18.9***
R-112	Mechanics	19	2.42	1.61	.81	9.2***
R-113	Farming	12	.96	1.01	- .05	- .8
R-114	Home Economics	21	1.55	1.95	- .40	- 4.5***
R-115	Sports	14	1.64	1.31	.33	4.6***
	Information II					
R-131	Art	12	1.37	1.48	- .11	- 1.5
R-132	Law	9	1.48	1.39	.09	1.4
R-133	Health	9	1.18	1.22	- .04	- .6
R-134	Engineering	6	.49	.54	- .05	- 1.0
R-135	Architecture	6	.58	.52	.06	1.1
R-138	Military	7	.96	.75	.21	4.1***
R-139	Acct., Bus., Sales	10	1.57	1.73	- .16	- 2.3*
R-140	Practical Knowledge	4	.47	.40	.07	2.1*
R-142	Bible	15	1.24	1.25	- .01	- .1
R-145	Hunting	5	.44	.13	.31	- 7.3***
R-146	Fishing	5	.42	.09	.33	7.7***
R-147	Outdoor Activities (other)	9	.75	.70	.05	.8
R-150	Theater; Ballet	8	.97	.92	.05	.9
R-162	Vocabulary II	9	1.44	1.15	.29	4.4***
R-212	Memory for Words	24	2.22	2.99	- .77	- 4.3***
R-220	Disguised Words	30	3.71	4.00	- .29	- 1.4
	English					
R-231	Spelling	16	1.67	1.93	- .26	- 3.1**
R-232	Capitalization	33	1.07	.77	.30	2.0*
R-233	Punctuation	27	2.16	2.35	- .19	- 1.6
R-234	English Usage	25	1.46	1.35	.11	1.0
R-235	Effective Expression	12	1.21	1.11	.10	1.3
R-240	Word Functions	24	2.80	2.92	- .12	- .8
R-250	Reading Comprehension	48	6.31	5.99	.32	1.3
R-260	Creativity	20	3.28	2.78	.50	4.0***
R-270	Mechanical Reasoning	20	2.40	1.59	.81	7.8***
R-281	Visualization in 2 Dimensions	24	3.04	2.44	.60	3.4***
R-282	Visualization in 3 Dimensions	16	1.85	1.23	.62	6.6***
R-290	Abstract Reasoning	15	1.40	1.23	.17	2.7**
	Mathematics					
R-311	I. Arithmetic Reasoning	16	2.16	1.53	.63	6.6***
R-312	II. Intro. h.s. Math.	24	2.67	.77	1.90	14.7***
R-333	III. Adv. h.s. Math.	14	2.12	1.15	.97	9.6***
F-410	Arithmetic Computation	72	9.01	6.04	2.97	4.6***
F-420	Table Reading	72	5.48	4.44	1.04	2.7**
F-430	Clerical Checking	74	11.46	10.49	.97	1.4
F-440	Object Inspection	40	4.83	4.21	.62	2.0*

[a] Based on the data of Tables 4-8 and 4-9.

*Significant at .05 level.
**Significant at .01 level.
***Significant at .001 level.

larger score gains than girls on several aptitude tests, including Creativity, Mechanical Reasoning, Visualization in Three Dimensions, and Abstract Reasoning; and in all areas of mathematics achievement.

Some of the areas in which girls show significantly larger gains than boys are Literature Information, Memory for Words, Spelling, and of course Home Economics Information.

For almost all of these variables the sex showing the larger average gain between grades 9 and 12 is also the one with the higher mean score in grade 9. (Literature Information is about the only exception.)

Correlation between Grade 9 and Grade 12 Scores. Correlations between corresponding grade 9 and grade 12 variables were presented in Table 4-9. These same coefficients are shown in Table 5-4, where their values after correction for attenuation[1] are also shown, in the columns headed $r_{9_\infty 12_\infty}$ (columns 3-4). As was mentioned in Chapter 4, a few of the correlations between grade 9 and grade 12 after correction for attenuation exceed unity, suggesting that the reliability coefficients for these tests may be underestimates. (These correlations in excess of unity occur only in the case of the Information Test--but for about half of its scales.) Nevertheless the fact that the correlations between information scores in grades 9 and 12 corrected for attenuation tend to be generally so high, particularly in subjects not part of the regular high school curriculum, is significant. It underlines the fact that except in areas where formal instruction is received in different amounts by different students (e.g., mathematics) the amount of information a student has been able to acquire and is sufficiently interested to acquire and retain is an excellent indicator of what his status in this respect will be three years later. Mathematics Information (R-106) is among the information scales with the lowest corrected correlations.

For most of the aptitude and achievement tests (other than the scales of the Information Test), the correlations corrected for attenuation are considerably lower than unity, their median being about .78.

---

[1] Correlations corrected for attenuation are estimates of the correlation coefficients that would be obtained if measures with perfect reliability were available. The conventional correction procedure, i.e., division by the square roots of the reliability coefficients, was used.

TABLE 5-4. Correlation of grade 9 scores with corresponding grade 12 scores and with raw score gain (Based on matched retest cases, weighted by Weight Z)[a]

		No. of items	$r_{9,12}$		$r_{9_\infty 12_\infty}$		r_{9D}		$r_{9_\infty D_\infty}$	
			M	F	M	F	M	F	M	F
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Information I									
R-102	Vocabulary I	21	.741	.764	.95	1.00	-.09	.09	-.25	3.17
R-103	Literature	24	.715	.718	.90	.95	.08	.22	.16	.55
R-104	Music	13	.719	.741	.97	1.03	.07	.04	.29	.00*
R-105	Social Studies	24	.745	.797	.88	.99	-.23	-.08	-.39	- .37
R-106	Mathematics	23	.716	.686	.87	.86	.34	.34	.51	.53
R-107	Physical Science	18	.750	.716	.92	.96	.10	.14	.21	.43
R-108	Biological Science	11	.638	.615	1.02	1.08	-.07	.10	.00*	.00*
R-109	Scientific Attitude	10	.552	.519	.96	1.01	-.07	-.01	-.37	.00*
R-110	Aeronautics and Space	10	.673	.474	1.02	1.26	.04	.23	.00*	.00*
R-111	Electricity and Electronics	20	.703	.449	.88	.84	.09	.09	.16	.29
R-112	Mechanics	19	.648	.575	.90	1.05	-.13	.14	-.34	.00*
R-113	Farming	12	.628	.696	1.00	1.06	-.09	-.06	-.88	.00*
R-114	Home Economics	21	.561	.648	1.24	1.01	.21	-.02	.00*	.00*
R-115	Sports	14	.706	.605	.94	1.10	-.12	.17	-.35	.00*
	Information II									
R-131	Art	12	.629	.665	.95	1.02	-.01	.06	-.04	.00*
R-132	Law	9	.530	.448	.92	.92	-.02	.05	-.09	.28
R-133	Health	9	.510	.541	.80	.89	-.23	-.26	-.53	- .72
R-134	Engineering	6	.414	.412	.94	1.13	-.10	.03	-.64	.00*
R-135	Architecture	6	.378	.356	1.06	1.28	.12	.15	.00*	.00*
R-138	Military	7	.477	.338	1.08	1.42	.08	.19	.00*	.00*
R-139	Acct., Bus., Sales	10	.468	.517	.84	.92	.00	.05	.00	.22
R-140	Practical Knowledge	4	.478	.423	.99	1.40	-.24	-.13	-.94	.00*
R-142	Bible	15	.737	.761	.97	1.00	.06	.11	.24	.92
R-145	Hunting	5	.523	.239	1.35	.00*	.19	.20	.00*	.00*
R-146	Fishing	5	.538	.235	1.13	6.70	.15	.18	.00*	.00*
R-147	Outdoor Activities (other)	9	.529	.506	.96	1.13	-.06	.05	-.37	.00*
R-150	Theater; Ballet	8	.582	.623	1.04	1.13	.12	.16	.00*	.00*
R-162	Vocabulary II	9	.634	.620	.87	.95	-.19	-.23	-.43	- .73
R-212	Memory for Words	24	.504	.554			-.19	-.22		
R-220	Disguised Words	30	.585	.607			-.28	-.28		
	English									
R-231	Spelling	16	.640	.590	.92	.91	.03	-.10	.08	- .31
R-232	Capitalization	33	.337	.305	.40	.35	-.44	-.42	-.55	- .50
R-233	Punctuation	27	.660	.688	.85	.87	-.08	-.10	-.15	- .19
R-234	English Usage	25	.522	.493	.85	.83	-.05	-.08	-.15	- .23
R-235	Effective Expression	12	.451	.474	.66	.76	-.28	-.16	-.50	- .38
R-240	Word Functions	24	.615	.667	.74	.78	-.10	-.18	-.14	- .26
R-250	Reading Comprehension	48	.712	.771	.77	.84	-.26	-.29	-.32	- .38
R-260	Creativity	20	.549	.537	.70	.74	-.10	-.09	-.16	- .16
R-270	Mechanical Reasoning	20	.658	.640	.79	.88	-.24	-.01	-.37	- .02
R-281	Visualization in 2 Dimensions	24	.492	.571			-.54	-.46		
R-282	Visualization in 3 Dimensions	16	.601	.592	.78	.85	-.16	-.07	-.27	- .16
R-290	Abstract Reasoning	15	.568	.601	.78	.82	-.23	-.15	-.43	- .31
	Mathematics									
R-311	I. Arithmetic Reasoning	16	.650	.679	.86	.94	-.05	.08	-.11	.22
R-312	II. Intro. h.s. Math.	24	.688	.674	.82	.84	.14	.10	.21	.16
R-333	III. Adv. h.s. Math.	14	.229	.152	.58	.49	.12	.07	.36	.26
F-410	Arithmetic Computation	72	.465	.461			-.52	-.47		
F-420	Table Reading	72	.155	.241			-.62	-.70		
F-430	Clerical Checking	74	.270	.278			-.68	-.66		
F-440	Object Inspection	40	.287	.407			-.58	-.54		

[a] Based on the data of Tables 4-8 and 4-9.

*Correlations corrected for attenuation are considered equal to 0 if either of the relevant reliability coefficients is 0 (or negative).

Correlation between Grade 9 Score and Raw Score Gain. Along with the correlations between grade 9 and grade 12, Table 5-4 also shows the correlation between initial score (grade 9 score) and raw score gain (grade 12 score minus grade 9 score), both before and after correction for attenuation r_{9D} and $r_{9_{\infty}D_{\infty}}$ respectively)[1]. The correlations between initial score and gain tend to be close to zero before correction, and are often negative; and the ones that aren't close to zero after correction for attenuation are almost certainly negative. Again a major exception is Mathematics Information (R-106) for which the correlation is not only positive but sizable (about .5 after correction for attenuation).

The fact that many of the correlations are negative is of course in line with expectation in view of the tendency noted in Chapter 3 for this to occur on a somewhat artifactual basis.

Aptitude *vs*. Achievement

Strictly as a convenience we have been using the label "aptitude test" to apply to almost all of the tests except Information, English, Mathematics (especially Math II and III), and occasionally Reading Comprehension. Some of these latter measures (English and Mathematics in particular) have been referred to as achievement tests. Behind this use of the terms "aptitude" and "achievement," however, has been the recognition that the distinction is a shadowy one--and at best artificial. The results presented in the present chapter--particularly those under the heading "Correlation between Grade 9 and Grade 12 Scores"--point up the fact that no sharp distinction can be drawn, on an empirical basis, between those tests that function as "aptitude measures" and those that function as "achievement measures." This conclusion follows

---

[1] The raw correlation before correction for attenuation--i.e., r_{9D}--was obtained by means of formula 3 in Chapter 3.

from the fact that most of the tests of the type that have traditionally been called aptitude measures (e.g., Visualization in Three Dimensions, R-282) have lower correlations between grade 9 and grade 12 scores after correction for attenuation, than tests in which "achievement," as the term is commonly understood, is an important element--for instance such teachable areas as information about art. Instead of regarding some tests as always measures of an "aptitude" and others as always measures of some kind of "achievement" it is probably better to base the choice of a term "aptitude test" or "achievement test" on how and for what purpose the test is being used. The same test may serve as an aptitude measure (to predict future achievement) or as an achievement measure (to measure past achievement)--depending entirely on the context.

This problem of whether it is ever possible to draw any sharp distinction between aptitude measures and achievement measures is considered further in Chapters 7 and 8, where additional empirical data bearing on the question are presented.

Chapter 6. THE ORGANIZATION OF MENTAL ABILITIES

In the last chapter we looked at the relationship between grade 9 scores and grade 12 scores <u>on the same test</u>. In the present chapter we expand the area of inquiry to include interrelations <u>among different tests</u>, as well.

OBTAINING CONSISTENT CORRELATION MATRICES

Procedural Sequence

In order to investigate the problem of the organization of mental abilities, two correlation matrices were needed (one for males and one for females), involving as many as possible of the variables for both grade 9 and grade 12. This necessitated combining the groups taking retest batteries A, B, C, D, E, and F into one "super-group"--with all the incomplete data that that implies.[1] The method used was that described in Chapter 3 under the heading "Correcting Correlation Coefficients for Missing Data." To reduce the magnitude of the problems created by missing data, each case was weighted by retest weight Z (also described in Chapter 3). This was done to help make the initial groups to be combined in a matrix (i.e., the groups taking the six retest batteries) as similar as possible, by making them exactly equivalent with respect to one very important dimension, score on the Abstract Reasoning Test (R-290). The purposes of this weighting were (1) to reduce to a minimum the likelihood that major adjustments in the correlations would be necessary in order to get consistent matrices, and (2) to make the correlation matrices as close as possible to what they would have been if complete cases had been available on which to base them.

Ninety-nine variables were selected for inclusion in the matrices: 49 aptitude and achievement test scores for grade 9, the same 49 for grade 12,

---

[1] The necessity of dividing the TALENT battery into "retest batteries" organized in such a way that no participant in the retest study took more than half the original battery on the second occasion is discussed in Chapter 2.

and socioeconomic index.[1] These 99 variables are identified in Tables 6-1a and 6-1b. Table 6-1a shows Matrix 1A, the final correlation matrix for the males, and Table 6-1b shows Matrix 1B, the final correlation matrix for the females.

The first stage in obtaining the final consistent matrices shown in Tables 6-1a and 6-1b was to obtain a matrix in which each correlation was based on all cases having complete data for the pair of variables correlated. In this initial matrix, cases were weighted by Retest Weight Z. These matrices based on complete pairs are shown in Appendix I (Table I-1 for males and Table I-2 for females). (They are called pseudo-matrices as a reminder that the correlation coefficients throughout are neither based on the same set of cases nor adjusted to correct for this.)

The second stage was to correct the individual correlation coefficients for missing data. (The resulting matrices, which are referred to in this chapter as the "intermediate matrices," are not reproduced in this report, since they serve no function themselves, except as a transition step from the initial matrices of Appendix I to the final consistent matrices of Tables 6-1a and 6-1b.)

The third stage was to test the intermediate matrices for internal consistency, and since both the one for males and the one for females turned out to be slightly inconsistent (having at least one negative eigenvalue), to go through the procedure for adjusting them to make them consistent. The resulting matrices are the final ones, shown in Tables 6-1a and 6-1b.

Evidence Concerning Effectiveness of Procedure

The various methodological innovations used to obtain these final matrices appear to have worked well. The end-products, two internally consistent matrices, were achieved with only very slight adjustments, after the initial correction had been made for missing data. In the intermediate matrices, only two of the 99 eigenvalues for the males and one for the

---

[1] The socioeconomic index (designated P*801) is described in Appendix E.

females were negative, and even those were numerically small; and of course after the adjustment to make the matrices consistent even these few negative eigenvalues were eliminated. The fact that the negative eigenvalues were so few and so close to zero is evidence that the initial correction-for-missing-data procedure produces intermediate matrices which, even though they may be slightly inconsistent, do tend to be consistent or nearly so. Details about the eigenvalues are summarized in Table 6-2.

Furthermore the differences between the intermediate matrices and the final consistent matrices were negligible, the largest such difference for the males being only .0148. (This was for the correlation between grade 12 scores on R-250 and R-281.) The fact that these differences were so very small demonstrates that the procedure for adjusting an inconsistent matrix to make it consistent succeeds in accomplishing this with only minimal changes in the correlations.

Comparison of the initial matrices (in Appendix I) with the final matrices (in Table 6-1) reveals that these differences too are quite small. Again considering only the data for males (since this was the set for which the intermediate matrix had the largest negative eigenvalue), the largest difference between corresponding correlation coefficients in Table I-1 and Table 6-1a is only .0598 (representing an increase from .2878 to .3476 in the coefficient of correlation between grade 12 scores for R-232 and F-430). The fact that the changes are so small, and also the fact that even the initial matrices were almost consistent (as shown in Table 6-2 by the fact that for each of these matrices only one small eigenvalue was negative) are regarded as evidence that the use of weight Z was effective in reducing to a minimum whatever distortions there might be in the original matrices (the ones shown in Appendix I) that are due to missing data.

The fact that a coordinated set of methodological innovations was used successfully for two separate matrices (males and females) provides considerable empirical evidence of the effectiveness of these procedures, which produced almost all of the data on which the present chapter is based.

TABLE 6-1a. Consistent^{a} matrix of correlation among 99 variables (aptitude information, achievement, socioeconomic index)

Matrix 1A. Based on <u>males</u> (matched cases only)^{b}

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
Information Test	1. R-102 63 Vocab. I		.7381	.6598	.7420	.7149	.7536	.6494	.6103	.6951	.6506	.5845	.4978.
	2. R-103 63 Literature	.7381		.6888	.7478	.6731	.6953	.6062	.5430	.6057	.5103	.3949	.4175
	3. R-104 63 Music	.6598	.6888		.6277	.6058	.6123	.5049	.4850	.5600	.5066	.3903	.3381
	4. R-105 63 Soc. Stud.	.7420	.7478	.6277		.6590	.7327	.6225	.5432	.6243	.5508	.4548	.4647
	5. R-106 63 Math	.7149	.6731	.6058	.6590		.7747	.5534	.5212	.5908	.6126	.3930	.3295
	6. R-107 63 Phys. Sci.	.7536	.6953	.6123	.7327	.7747		.6563	.5455	.6906	.7326	.5064	.4246
	7. R-108 63 Bio. Sci.	.6494	.6062	.5049	.6225	.5534	.6563		.4968	.5606	.5518	.4910	.4738
	8. R-109 63 Scient.Att	.6103	.5430	.4850	.5432	.5212	.5455	.4968		.5077	.4721	.4403	.3572
	9. R-110 63 Aero-Spaca	.6951	.6057	.5600	.6243	.5908	.6906	.5606	.5077		.6443	.5493	.4000
	10. R-111 63 Electronic	.6506	.5103	.5066	.5508	.6126	.7326	.5518	.4721	.6443		.6251	.4070
	11. R-112 63 Mechanica	.5845	.3949	.3903	.4548	.3930	.5064	.4910	.4403	.5493	.6251		.4922
	12. R-113 63 Farming	.4978	.4175	.3381	.4647	.3295	.4246	.4738	.3572	.4000	.4070	.4922	
	13. R-114 63 Home Ec.	.4989	.4383	.4456	.4359	.4070	.4719	.4477	.3970	.4479	.4589	.4288	.3471
	14. R-115 63 Sporta	.5537	.5610	.5061	.6019	.5270	.4938	.3893	.4391	.4559	.3381	.3071	.3173
	15. R-131 63 Art	.6229	.6604	.6158	.6043	.5377	.5769	.5366	.4719	.5552	.4521	.3819	.3368
	16. R-132 63 Law	.6127	.6091	.5333	.6572	.5064	.5641	.5164	.4890	.5574	.4749	.4416	.3976
	17. R-133 63 Health	.6207	.5859	.4899	.6000	.5145	.5879	.5303	.4328	.4878	.4803	.4251	.4551
	18. R-134 63 Engin.	.5174	.4498	.3841	.4906	.3902	.5128	.4333	.3707	.4846	.4935	.5094	.4250
	19. R-135 63 Arch.	.5388	.5220	.4744	.5105	.4652	.4867	.4279	.3552	.4624	.4247	.3477	.3054
	20. R-138 63 Military	.4789	.5199	.4827	.4791	.4360	.4498	.3531	.3027	.4477	.3612	.2781	.1974
	21. R-139 63 Acct,Busi.	.6047	.5191	.4730	.5571	.4978	.5084	.4460	.4705	.5194	.4599	.4207	.3599
	22. R-140 63 Prac.Knowl	.5082	.4872	.4112	.5108	.3995	.4113	.3722	.3284	.3937	.3539	.3596	.3250
	23. R-142 63 Bible	.5774	.6258	.5258	.6035	.5250	.5991	.5326	.4312	.4803	.4129	.2738	.3787
	24. R-145 63 Hunting	.1605	.0807	.0701	.1056	.0700	.1575	.2622	.0756	.1791	.2612	.3522	.3624
	25. R-146 63 Fishing	.3595	.2526	.2009	.2636	.2270	.2690	.3333	.1979	.2952	.2864	.3658	.3504
	26. R-147 63 Outdoor	.6145	.5335	.4076	.5568	.5182	.5300	.4569	.4336	.5056	.4935	.5290	.4161
	27. R-150 63 Theater	.6344	.6038	.5815	.5819	.5164	.5533	.4388	.4377	.5463	.4316	.3679	.3935
	28. R-162 63 Vocab. II	.7182	.6305	.5893	.6711	.5732	.6209	.5357	.4872	.5770	.4846	.4656	.4229
	29. R-212 63 Mem. Words	.3893	.3969	.3309	.3637	.3979	.3667	.2954	.2578	.2355	.2759	.1603	.2057
	30. R-220 63 Disg. Wds.	.5062	.4951	.4740	.3970	.5000	.4662	.3493	.3643	.3648	.3645	.2250	.1860
English Test	31. R-231 63 Spelling	.4133	.4729	.3842	.4460	.4746	.4214	.3335	.3223	.2692	.2176	.1416	.2477
	32. R-232 63 Capital.	.3048	.3227	.2550	.3392	.2866	.2876	.2350	.2720	.2144	.1961	.1837	.2346
	33. R-233 63 Punct.	.5300	.5373	.4722	.5291	.6039	.5230	.3975	.3938	.3658	.3548	.2468	.2656
	34. R-234 63 Eng. Usage	.4607	.4793	.4306	.4520	.4682	.4331	.3621	.3436	.3737	.3390	.3231	.3073
	35. R-235 63 Eff. Exp.	.4799	.4462	.3883	.4164	.4128	.4169	.3667	.3760	.3268	.3082	.2896	.2770
	36. R-240 63 Word.Funct	.5351	.5441	.5055	.5125	.6348	.5692	.3957	.4348	.4204	.3989	.2430	.2947
	37. R-250 63 Rdg. Compr	.7117	.6841	.6149	.6972	.6155	.6653	.6209	.5903	.5979	.5263	.4649	.4925
	38. R-260 63 Creativity	.6143	.5499	.5365	.5392	.5727	.5852	.5067	.4884	.5580	.5865	.4936	.4040
	39. R-270 63 Mech.Reas	.5303	.4414	.4247	.4574	.4973	.5525	.4598	.4876	.5740	.5799	.5546	.4320
	40. R-281 63 Vis. 2 Dim	.4046	.3351	.3141	.3532	.4042	.4120	.3265	.3585	.4026	.4111	.3960	.2610
	41. R-282 63 Vis. 3 Dim	.4438	.3793	.3529	.3742	.4451	.4712	.3834	.4022	.4634	.4650	.4413	.2931
	42. R-290 63 Abst.Reas	.5018	.4463	.4140	.4610	.5575	.5257	.4113	.4205	.4313	.4487	.3686	.2998
Math Test	43. R-311 63 Arith.Reas	.5744	.4962	.4082	.5194	.6149	.5585	.4266	.4808	.4082	.4635	.4085	.3359
	44. R-312 63 Int.HSMath	.5827	.5320	.4665	.5794	.8081	.6356	.4501	.4303	.4306	.4795	.3232	.2435
	45. R-333 63 Adv.HSMath	.4926	.5117	.4561	.4760	.7538	.5645	.3795	.3835	.4336	.4096	.2035	.1952
	46. F-410 63 Arith.Comp	.2918	.2373	.1886	.3176	.3420	.2849	.1954	.2380	.1547	.2063	.1809	.2422
	47. F-420 63 Table Read	.2832	.2507	.2376	.2752	.2760	.2713	.1506	.2449	.2245	.2332	.1992	.1625
	48. F-430 63 Cler.Check	.3340	.3293	.2761	.3088	.3336	.3202	.2067	.2472	.2307	.2481	.1845	.1861
	49. F-440 63 Obj.Insp.	.2761	.2224	.1933	.2283	.2076	.2529	.1735	.2640	.2852	.2576	.2827	.1743
Information Test	50. R-102 60 Vocab. I	.7378	.6493	.6199	.6229	.6478	.6771	.5654	.5224	.6269	.6014	.4839	.3778
	51. R-103 60 Literature	.6055	.7052	.6150	.5760	.5473	.5587	.4844	.4180	.5183	.4384	.2795	.2639
	52. R-104 60 Music	.5537	.5746	.7097	.4831	.5213	.5041	.4000	.3927	.4746	.4216	.3006	.2429
	53. R-105 60 Soc. Stud.	.6598	.6777	.5882	.7376	.6369	.6620	.5471	.4874	.5608	.5139	.3720	.3302
	54. R-106 60 Math	.5838	.5683	.5218	.5425	.7109	.6197	.4595	.4342	.5018	.4933	.3309	.2568
	55. R-107 60 Phys. Sci.	.6220	.5915	.5177	.5987	.6353	.7425	.5600	.4482	.5639	.6137	.3956	.3300
	56. R-108 60 Bio. Sci.	.5643	.5364	.4635	.5442	.5330	.5758	.6347	.4181	.5140	.4901	.4357	.3942
	57. R-109 60 Scient.Att	.5072	.4376	.3984	.4420	.4235	.4421	.3764	.5444	.4132	.3946	.3453	.2824
	58. R-110 60 Aero-Spaca	.5657	.5168	.5173	.5000	.5160	.5714	.4807	.4152	.6617	.5685	.4331	.2774
	59. R-111 60 Electronic	.5399	.4320	.4324	.4443	.5112	.5929	.4683	.4018	.5460	.7013	.4872	.2883
	60. R-112 60 Mechanics	.5587	.4016	.4238	.4217	.4467	.4834	.4404	.3951	.5133	.5844	.6427	.3881
	61. R-113 60 Farming	.4939	.4305	.3711	.4376	.3927	.4427	.4708	.3675	.4206	.4356	.4401	.6200
	62. R-114 60 Home Ec.	.4293	.3808	.3992	.3725	.3907	.4126	.3648	.3206	.3677	.4048	.3528	.2717
	63. R-115 60 Sports	.4875	.4868	.4899	.5095	.5136	.4362	.3204	.3731	.3977	.3005	.2312	.2287
	64. R-131 60 Art	.5700	.5845	.5616	.5181	.4869	.5115	.4303	.4037	.4808	.4502	.3456	.2552
	65. R-132 60 Law	.5103	.5109	.4739	.4915	.4804	.4832	.4060	.4054	.4760	.4225	.3247	.2368
	66. R-133 60 Health	.5600	.5396	.5039	.5054	.5275	.5378	.4508	.3974	.4785	.4516	.3440	.2980
	67. R-134 60 Engin.	.4487	.3828	.3723	.3941	.3904	.4224	.3474	.3216	.4237	.4460	.3853	.2690
	68. R-135 60 Arch.	.3511	.3570	.3360	.3273	.3101	.3173	.2744	.2316	.3128	.2947	.2196	.1767
	69. R-138 60 Military	.4296	.4559	.4611	.4136	.4100	.3861	.2910	.3114	.3996	.3393	.2449	.1656
	70. R-139 60 Acct,Busi.	.4751	.4656	.4402	.4438	.4699	.4446	.3464	.3558	.4043	.4169	.3255	.2368
	71. R-140 60 Prac.Knowl	.4919	.4531	.4565	.4522	.4365	.4326	.3675	.3566	.4058	.3863	.3255	.2414
	72. R-142 60 Bible	.4797	.5549	.4839	.4903	.4594	.4563	.4257	.3466	.3980	.3556	.2573	.3123
	73. R-145 60 Hunting	.1635	.0896	.0362	.1263	.0643	.1605	.2442	.1101	.1542	.1769	.2913	.3127
	74. R-146 60 Fishing	.2453	.1746	.1873	.1750	.1815	.2093	.2690	.1526	.2355	.2135	.2419	.2373
	75. R-147 60 Outdoor	.5524	.4926	.4707	.4672	.5035	.5017	.4199	.4237	.4639	.4711	.3996	.2959
	76. R-150 60 Theater	.5302	.5395	.5304	.4513	.4690	.4621	.3643	.3864	.4730	.3888	.2921	.2307
	77. R-162 60 Vocab. II	.6492	.5989	.5839	.5523	.5891	.5820	.4570	.4610	.5360	.5177	.4115	.3070
	78. R-212 60 Mem. Words	.3771	.3820	.3711	.3674	.4106	.3745	.2787	.2410	.2684	.2675	.1632	.1908
	79. R-220 60 Diag. Wds.	.5226	.5230	.4977	.4449	.5124	.4813	.3707	.3795	.3884	.3728	.2755	.2576
English Test	80. R-231 60 Spelling	.4098	.4239	.3998	.3902	.4567	.3925	.2560	.2745	.2794	.2541	.1509	.2231
	81. R-232 60 Capital.	.3159	.2941	.2934	.3262	.3106	.2913	.2191	.2209	.2361	.2360	.1959	.1900
	82. R-233 60 Punct.	.5305	.4968	.4671	.4948	.5911	.5323	.3894	.4213	.3903	.4249	.2881	.2816
	83. R-234 60 Eng. Usage	.4685	.4225	.4121	.4209	.4442	.4292	.3651	.3583	.3757	.3699	.2983	.2886
	84. R-235 60 Eff. Exp.	.4101	.3796	.3415	.3664	.3918	.3646	.2956	.3540	.2985	.3044	.2531	.2356
	85. R-240 60 Word.Funct	.4448	.4724	.4324	.4386	.5798	.4798	.3649	.3635	.3658	.3735	.2254	.2272
	86. R-250 60 Rdg. Compr	.6888	.6665	.6060	.6442	.6418	.6398	.5316	.5292	.5789	.5149	.3922	.3618
	87. R-260 60 Creativity	.5235	.4638	.4467	.4370	.4856	.4847	.4102	.3882	.4864	.4833	.3907	.2748
	88. R-270 60 Mech.Reas	.5261	.3979	.4080	.4251	.5017	.5376	.4377	.4019	.5260	.6083	.5063	.3392
	89. R-281 60 Vis. 2 Dim	.3082	.2502	.2392	.2580	.3367	.3081	.2022	.2447	.2904	.3153	.2475	.1979
	90. R-282 60 Vis. 3 Dim	.3653	.3116	.3182	.3139	.4199	.4021	.3000	.3012	.3704	.4429	.3213	.2004
	91. R-290 60 Abst.Reas	.4265	.3585	.3731	.3883	.5009	.4597	.3367	.3763	.3765	.3984	.2834	.2227
Math Test	92. R-311 60 Arith.Reas	.5513	.4817	.4489	.5135	.6233	.5718	.4268	.4534	.4477	.4773	.3492	.2910
	93. R-312 60 Int.HSMath	.5312	.5342	.4758	.5104	.6776	.5661	.3940	.4343	.4147	.4271	.2748	.2563
	94. R-333 60 Adv.HSMath	.1466	.1318	.1644	.1431	.1948	.1701	.1354	.1271	.1318	.1419	.0776	.0516
	95. F-410 60 Arith.Comp	.2977	.2530	.2681	.3086	.3228	.3001	.1795	.2274	.2009	.2066	.1532	.1761
	96. F-420 60 Table Read	.2084	.1787	.1724	.2041	.2160	.1855	.1144	.1678	.1550	.1419	.1011	.1264
	97. F-430 60 Cler.Check	.1881	.1961	.2052	.1775	.2294	.1855	.0981	.1510	.1509	.0945	.0475	.0984
	98. F-440 60 Obj.Insp.	.1549	.1777	.1431	.1447	.1803	.1772	.1194	.1762	.1532	.1232	.1262	.0882
	99. P*801 60 Socioecon.	.3725	.3648	.3925	.2831	.4053	.3480	.2241	.2683	.3177	.2989	.2162	.0698

TABLE 6-1a (continued)

13	14	15	16	17	18	19	20	21	22	23	24	25	Variable
.4989	.5537	.6229	.6127	.6207	.5174	.5388	.4789	.6047	.5082	.5774	.1605	.3595	1. R-102 63
.4383	.5610	.6604	.6091	.5859	.4498	.5220	.5199	.5191	.4872	.6258	.0857	.2526	2. R-103 63
.4456	.5061	.6158	.5333	.4899	.3841	.4744	.4827	.4730	.4112	.5258	.0701	.2009	3. R-104 63
.4359	.6019	.6043	.6572	.6000	.4906	.5105	.4791	.5571	.5108	.6035	.1056	.2636	4. R-105 63
.4070	.5270	.5377	.5064	.5145	.3902	.4652	.4360	.4978	.3995	.5250	.0700	.2270	5. R-106 63
.4719	.4938	.5769	.5641	.5879	.5128	.4867	.4498	.5084	.4113	.5991	.1575	.2690	6. R-107 63
.4477	.3893	.5366	.5164	.5303	.4333	.4279	.3531	.4460	.3722	.5326	.2622	.3333	7. R-108 63
.3970	.4391	.4719	.4890	.4328	.3707	.3552	.3027	.4705	.3284	.4312	.0756	.1979	8. R-109 63
.4479	.4559	.5552	.5574	.4878	.4846	.4624	.4477	.5194	.3937	.4803	.1791	.2952	9. R-110 63
.4589	.3381	.4521	.4749	.4803	.4935	.4247	.3612	.4599	.3539	.4129	.2612	.2864	10. R-111 63
.4268	.3071	.3819	.4416	.4251	.5094	.3477	.2781	.4207	.3596	.2738	.3522	.3658	11. R-112 63
.3471	.3173	.3368	.3976	.4551	.4250	.3054	.1974	.3599	.3250	.3787	.3624	.3504	12. R-113 63
	.3231	.4617	.4206	.4530	.4096	.4071	.2927	.4011	.3383	.3742	.1754	.2109	13. R-114 63
.3231		.5024	.4784	.4798	.3707	.3995	.4254	.4252	.4329	.4251	.0951	.2778	14. R-115 63
.4617	.5024		.5682	.5651	.4614	.4922	.4952	.5075	.4811	.5163	.0972	.2447	15. R-131 63
.4206	.4784	.5682		.5081	.4443	.4066	.4995	.5475	.4990	.5162	.1500	.2590	16. R-132 63
.4530	.4798	.5651	.5081		.4725	.3788	.4335	.5053	.5249	.4740	.1687	.3044	17. R-133 63
.4096	.3707	.4614	.4443	.4725		.3405	.3341	.4213	.4521	.3762	.2381	.3260	18. R-134 63
.4071	.3995	.4922	.4066	.3788	.3405		.3707	.3615	.2989	.4095	.1111	.2076	19. R-135 63
.2927	.4254	.4952	.4995	.4335	.3341	.3707		.3972	.3829	.4542	.1054	.2009	20. R-138 63
.4011	.4252	.5075	.5475	.5053	.4213	.3615	.3972		.4732	.4363	.1103	.2381	21. R-139 63
.3383	.4329	.4811	.4990	.5249	.4521	.2989	.3829	.4732		.4044	.1211	.2644	22. R-140 63
.3742	.4251	.5163	.5162	.4740	.3762	.4095	.4542	.4363	.4044		.1110	.2239	23. R-142 63
.1754	.0951	.0972	.1500	.1687	.2381	.1111	.1054	.1103	.1211	.1110		.4063	24. R-145 63
.2109	.2778	.2447	.2590	.3044	.3260	.2076	.2009	.2381	.2644	.2239	.4063		25. R-146 63
.4405	.4734	.5065	.5233	.5047	.4744	.4112	.4113	.4458	.5004	.4438	.2056	.3679	26. R-147 63
.4405	.4945	.6102	.5334	.5153	.4139	.4382	.4643	.5102	.4839	.4983	.0990	.2271	27. R-150 63
.4663	.5355	.6451	.6299	.6383	.4863	.4158	.4503	.6503	.5300	.5229	.1505	.2985	28. R-162 63
.1883	.2612	.2873	.2880	.2428	.1790	.1925	.2637	.2533	.2788	.3402	.0179	.1018	29. R-212 63
.2799	.3334	.4018	.2514	.2772	.1798	.2319	.2579	.2464	.1377	.3367	.0632	.0833	30. R-220 63
.1870	.3207	.4349	.3628	.3663	.2221	.2381	.3700	.3614	.3581	.3722	-.0185	.1781	31. R-231 63
.2266	.2609	.2303	.2703	.2338	.1944	.1438	.2858	.2252	.3055	.2392	.0085	.0866	32. R-232 63
.2574	.3614	.4469	.4475	.4569	.2966	.2665	.4109	.4287	.3622	.4452	.0155	.1691	33. R-233 63
.2309	.3104	.4731	.4203	.4159	.2458	.2686	.3500	.3893	.3310	.4223	.0430	.1549	34. R-234 63
.2378	.2849	.3797	.3785	.3363	.2780	.2637	.2974	.3332	.3011	.3587	.0321	.1338	35. R-235 63
.3013	.4023	.3894	.3493	.3608	.2089	.3815	.3410	.3106	.2239	.3969	-.0031	.1886	36. R-240 63
.4295	.5153	.5276	.5007	.5247	.3519	.5120	.4242	.4229	.3621	.5011	.1242	.2479	37. R-250 63
.4151	.3924	.4500	.3398	.3944	.2875	.3954	.3041	.3079	.2838	.3882	.1452	.1859	38. R-260 63
.3928	.2817	.3930	.3342	.3608	.2862	.3494	.2520	.3037	.2715	.3181	.1915	.2481	39. R-270 63
.3251	.2357	.1836	.1626	.1101	.1117	.1589	.0944	.1398	.0903	.1314	.0468	.0587	40. R-281 63
.3482	.2212	.3499	.2346	.3320	.2136	.3568	.2062	.2684	.2738	.2489	.0565	.1355	41. R-282 63
.3045	.3326	.3614	.3340	.3163	.2753	.2982	.2867	.3012	.2668	.3522	.0568	.1565	42. R-290 63
.3436	.3640	.4618	.4832	.4350	.3596	.2835	.4056	.4766	.4048	.4180	.0506	.2166	43. R-311 63
.2924	.4719	.4887	.4575	.4388	.3147	.3222	.3935	.4035	.3547	.3761	-.0115	.1443	44. R-312 63
.2675	.4078	.4122	.4110	.3331	.3144	.3635	.3419	.3556	.2858	.3185	-.0036	.1845	45. R-333 63
.1524	.2955	.2478	.2016	.2455	.2306	.1064	.2820	.2474	.2726	.2474	-.0231	.1403	46. F-410 63
.2024	.2327	.1195	.1396	.1642	.1500	.0906	.1114	.2152	.2521	.1226	.0380	.0764	47. F-420 63
.1901	.2542	.2483	.1423	.1762	.1120	.1717	.1848	.1636	.0939	.1454	.0784	.0613	48. F-430 63
.1902	.1941	.1924	.0784	.2203	.1887	.1561	.1087	.2227	.1949	.0849	.0115	.1112	49. F-440 63
.4172	.4657	.6052	.5574	.5409	.4556	.4781	.4634	.4780	.4184	.5385	.1348	.3419	50. R-102 60
.3423	.4075	.5829	.4820	.4637	.3327	.4646	.4777	.4174	.3514	.5291	.0706	.2262	51. R-103 60
.3605	.3973	.5151	.4236	.4069	.2872	.4213	.4095	.3868	.3177	.4687	.0174	.1558	52. R-104 60
.3574	.5104	.6080	.5671	.5146	.4331	.4880	.5150	.4974	.4248	.5637	.0918	.2487	53. R-105 60
.3351	.4163	.5062	.4647	.4407	.3562	.4361	.3810	.4318	.3422	.4628	.0641	.2198	54. R-106 60
.3550	.3908	.5093	.4543	.4758	.3709	.4219	.3682	.3937	.3294	.4781	.1064	.2715	55. R-107 60
.3687	.3397	.4815	.4778	.4517	.3695	.3847	.3833	.3805	.3185	.4386	.1915	.3538	56. R-108 60
.2970	.3360	.4041	.4074	.3632	.3164	.3190	.3181	.3720	.2927	.3765	.1175	.2212	57. R-109 60
.3584	.3774	.4986	.4627	.4157	.3426	.4026	.4075	.3960	.3040	.4246	.1281	.2524	58. R-110 60
.3658	.2514	.4139	.3841	.3896	.3465	.3509	.2951	.3858	.2372	.3459	.1033	.2006	59. R-111 60
.3982	.2894	.4261	.4190	.4039	.4124	.3410	.3142	.3971	.3107	.2971	.2554	.3403	60. R-112 60
.3433	.2899	.3713	.3983	.3724	.3581	.3069	.2883	.3515	.2858	.3715	.2824	.3024	61. R-113 60
.5566	.2903	.3889	.3318	.3346	.3289	.2818	.2424	.3527	.2712	.2899	.1625	.2149	62. R-114 60
.2574	.6992	.4305	.4104	.3990	.3018	.3344	.4109	.3503	.3402	.3672	.0204	.2296	63. R-115 60
.3672	.3777	.6354	.4648	.4461	.3797	.4448	.4282	.4228	.3809	.4535	.0717	.2278	64. R-131 60
.3189	.3640	.4752	.5257	.3983	.3497	.3484	.4166	.3976	.3391	.4410	.0978	.2037	65. R-132 60
.3482	.3801	.5024	.4760	.5133	.3672	.3664	.4040	.4221	.3782	.4375	.0893	.2426	66. R-133 60
.3055	.2966	.3931	.3444	.3768	.4079	.2934	.2782	.3381	.3011	.3043	.1314	.2377	67. R-134 60
.2224	.2370	.3294	.2312	.2489	.2103	.3792	.2159	.2590	.1681	.2702	.0210	.1325	68. R-135 60
.2157	.3310	.4157	.3721	.3169	.2608	.3468	.4749	.3400	.2904	.3932	.0648	.1600	69. R-138 60
.3147	.3400	.4468	.4430	.3798	.3371	.3570	.3344	.4647	.3612	.3855	.0991	.2159	70. R-139 60
.3150	.3519	.4559	.3808	.4088	.3483	.2925	.3192	.3810	.4784	.3453	.0339	.2063	71. R-140 60
.2644	.3373	.4476	.4107	.3338	.2963	.3441	.3867	.3632	.2964	.7313	.0885	.1946	72. R-142 60
.1379	.0720	.0986	.1189	.1615	.1948	.0770	.1030	.1215	.1360	.0900	.5199	.3408	73. R-145 60
.1884	.1689	.1476	.1588	.1960	.1907	.1203	.1351	.1510	.1390	.1616	.2937	.5314	74. R-146 60
.3310	.3963	.4480	.4299	.4198	.3857	.3532	.3446	.4152	.3909	.3640	.1442	.2632	75. R-147 60
.3445	.3840	.5214	.4281	.4047	.3364	.3548	.4065	.3963	.3608	.3893	.0564	.1742	76. R-150 60
.3750	.4278	.5796	.5366	.4966	.4103	.4216	.4470	.5244	.4320	.4868	.0954	.2820	77. R-162 60
.1675	.2913	.2893	.2758	.2455	.1645	.2236	.2133	.2310	.1577	.3017	.0200	.1441	78. R-212 60
.2808	.3896	.4689	.3612	.4215	.2828	.3216	.3504	.3403	.3787	.4049	.0817	.2181	79. R-220 60
.2056	.3487	.3654	.3296	.3284	.2052	.2568	.3275	.2792	.2827	.3601	.0425	.1830	80. R-231 60
.1953	.2887	.3692	.3258	.3716	.3052	.2729	.3059	.3151	.3185	.3317	-.0037	.1716	81. R-232 60
.2698	.3727	.4105	.3793	.4199	.3178	.3240	.3514	.3704	.3307	.4215	.0181	.1818	82. R-233 60
.2721	.3091	.3937	.3770	.3585	.3089	.3115	.3307	.3604	.2981	.3858	.1342	.2203	83. R-234 60
.2287	.3181	.3632	.3158	.3125	.2624	.2570	.2805	.2999	.2508	.3277	.0466	.1435	84. R-235 60
.2431	.3454	.3575	.3130	.3366	.2349	.3028	.2936	.2984	.2050	.3957	-.0035	.1500	85. R-240 60
.3837	.4693	.5825	.5232	.5088	.4071	.4719	.4802	.4729	.3967	.5594	.1327	.3012	86. R-250 60
.3447	.3048	.4674	.3828	.3762	.3421	.3647	.3584	.4014	.3316	.3683	.1300	.2375	87. R-260 60
.3431	.2586	.3992	.3506	.3832	.3661	.3439	.2785	.3247	.2782	.3217	.2016	.2520	88. R-270 60
.1989	.1706	.2120	.1840	.2269	.1929	.1806	.1493	.1741	.1807	.1165	.0897	.1075	89. R-281 60
.2574	.1453	.2819	.2394	.2560	.2311	.2803	.2187	.2308	.1849	.2275	.1118	.1456	90. R-282 60
.2539	.2875	.3485	.2898	.2816	.2639	.2968	.2281	.2782	.2302	.3176	.0485	.1218	91. R-290 60
.3151	.3856	.4003	.4491	.3869	.3253	.3632	.3575	.4402	.2848	.4154	.0698	.2244	92. R-311 60
.2998	.4025	.4392	.4307	.3996	.3124	.3795	.3654	.3861	.3243	.4333	.0482	.1990	93. R-312 60
.0924	.1262	.1357	.1325	.1148	.0757	.1176	.0522	.0659	.0742	.0637	.0008	.0874	94. R-333 60
.1791	.2984	.2259	.2003	.2153	.2078	.1607	.1923	.2224	.2027	.2063	.0313	.1338	95. F-410 60
.1312	.1993	.1384	.1522	.1502	.1405	.0727	.1144	.1690	.1940	.1073	-.0344	.0798	96. F-420 60
.0774	.1917	.1464	.1290	.1340	.0867	.1159	.1427	.1465	.1668	.1267	-.0479	.0461	97. F-430 60
.1089	.1072	.1283	.0949	.1120	.0905	.0981	.0786	.0932	.1347	.0601	.0526	.0812	98. F-440 60
.2122	.2803	.3335	.2849	.2743	.2012	.2713	.2634	.2884	.2233	.2005	-.0563	.0834	99. P*801 60

TABLE 6-1a (continued)

	Variable	26	27	28	29	30	31	32	33	34	35	36	37
Information Test	1. R-102 63 Vocab. I	.6145	.6344	.7182	.3893	.5062	.4133	.3048	.5300	.4607	.4799	.5351	.7117
	2. R-103 63 Literature	.5335	.6038	.6305	.3969	.4951	.4729	.3227	.5373	.4793	.4462	.5441	.6841
	3. R-104 63 Music	.4676	.5815	.5893	.3309	.4740	.3842	.2550	.4722	.4306	.3883	.5055	.6149
	4. R-105 63 Soc. Stud.	.5568	.5819	.6711	.3637	.3970	.4460	.3392	.5291	.4520	.4164	.5125	.6972
	5. R-106 63 Math	.5182	.5164	.5732	.3979	.5000	.4746	.2866	.6039	.4682	.4128	.6348	.6155
	6. R-107 63 Phys. Sci.	.5300	.5533	.6209	.3667	.4662	.4214	.2876	.5230	.4331	.4169	.5692	.6653
	7. R-108 63 Bio. Sci.	.4569	.4388	.5357	.2954	.3493	.3335	.2350	.3975	.3621	.3667	.3957	.6209
	8. R-109 63 Scient.Att	.4336	.4377	.4872	.2578	.3643	.3223	.2720	.3938	.3436	.3760	.4348	.5903
	9. R-110 63 Aero-Space	.5056	.5463	.5770	.2355	.3648	.2692	.2144	.3658	.3737	.3268	.4204	.5979
	10. R-111 63 Electronic	.4935	.4316	.4846	.2759	.3645	.2176	.1961	.3548	.3390	.3062	.3989	.5263
	11. R-112 63 Mechanics	.5290	.3679	.4656	.1603	.2250	.1416	.1837	.2468	.3231	.2896	.2430	.4649
	12. R-113 63 Farming	.4161	.3935	.4229	.2057	.1860	.2477	.2346	.2656	.3074	.2770	.2947	.4925
	13. R-114 63 Home Ec.	.4405	.4405	.4663	.1883	.2799	.1870	.2246	.2574	.2309	.2378	.3013	.4295
	14. R-115 63 Sports	.4734	.4945	.5355	.2612	.3334	.3207	.2609	.3614	.3104	.2847	.4023	.5153
	15. R-131 63 Art	.5065	.6102	.6451	.2873	.4018	.4349	.2303	.4469	.4731	.3717	.3894	.5276
	16. R-132 63 Law	.5233	.5334	.6299	.2880	.2514	.3628	.2703	.4475	.4203	.3785	.3493	.5007
	17. R-133 63 Health	.5047	.5153	.6383	.2428	.2772	.3663	.2338	.4569	.4159	.3363	.3608	.5247
	18. R-134 63 Engin.	.4744	.4139	.4863	.1790	.1798	.2221	.1944	.2966	.2458	.2780	.2089	.3519
	19. R-135 63 Arch.	.4112	.4382	.4158	.1925	.2319	.2381	.1438	.2665	.2686	.2637	.3815	.5120
	20. R-138 63 Military	.4113	.4643	.4503	.2637	.2579	.3700	.2858	.4109	.3500	.2974	.3410	.4242
	21. R-139 63 Acct,Busi.	.4458	.5102	.6503	.2533	.2464	.3614	.2252	.4287	.3393	.3332	.3106	.4229
	22. R-140 63 Prac.Knowl	.5004	.4839	.5300	.2788	.1377	.3581	.3055	.3622	.3310	.3011	.2239	.3621
	23. R-142 63 Bible	.4438	.4983	.5229	.3402	.3367	.3722	.2392	.4452	.4223	.3587	.3969	.5011
	24. R-145 63 Hunting	.2056	.0990	.1505	.0179	.0632	-.0185	.0085	.0155	.0430	.0321	-.0031	.1242
	25. R-146 63 Fishing	.3679	.2271	.2985	.1018	.0833	.1781	.0866	.1691	.1549	.1338	.1886	.2479
	26. R-147 63 Outdoor		.4739	.5819	.2940	.2241	.3553	.2106	.3656	.3425	.3483	.3244	.4806
	27. R-150 63 Theater	.4739		.6146	.2831	.4170	.4357	.2706	.4264	.4327	.3382	.3815	.5149
	28. R-162 63 Vocab. II	.5819	.6146		.2812	.3882	.4574	.2705	.4946	.5032	.4059	.4026	.5775
	29. R-212 63 Mem. Words	.2940	.2831	.2812		.3514	.3846	.3011	.4500	.3574	.3226	.4845	.4708
	30. R-220 63 Disg. Wds.	.2241	.4170	.3882	.3514		.5151	.4287	.5182	.4569	.4436	.4703	.5095
English Test	31. R-231 63 Spelling	.3553	.4357	.4574	.3846	.5151		.4265	.5683	.5047	.4475	.5132	.4746
	32. R-232 63 Capital.	.2106	.2706	.2705	.3011	.4287	.4265		.5001	.4351	.4088	.4473	.5310
	33. R-233 63 Punct.	.3656	.4264	.4946	.4500	.5182	.5683	.5001		.6034	.5551	.6542	.5991
	34. R-234 63 Eng. Usage	.3425	.4327	.5032	.3574	.4569	.5047	.4351	.6034		.5155	.4433	.5333
	35. R-235 63 Eff. Exp.	.3483	.3382	.4059	.3226	.4436	.4475	.4088	.5551	.5155		.4645	.5332
	36. R-240 63 Word.Funct	.3244	.3815	.4026	.4845	.4703	.5132	.4473	.6542	.4433	.4645		.6409
	37. R-250 63 Rdg. Compr	.4806	.5149	.5775	.4708	.5095	.4746	.5310	.5991	.5333	.5332	.6409	
	38. R-260 63 Creativity	.3778	.3950	.4413	.3680	.4667	.3545	.4006	.4649	.4156	.4347	.5042	.6390
	39. R-270 63 Mech.Reas	.4297	.3313	.3704	.3323	.4067	.2304	.3462	.4205	.3408	.3480	.4123	.5225
	40. R-281 63 Vis. 2 Dim	.1814	.1479	.2185	.1802	.3391	.1206	.2311	.2274	.1246	.2256	.3098	.3628
	41. R-282 63 Vis. 3 Dim	.3305	.2674	.3429	.2924	.3278	.1734	.3031	.3587	.2326	.3058	.4407	.4692
	42. R-290 63 Abst.Reas	.3247	.3234	.3859	.3518	.4069	.3057	.3336	.4920	.3718	.3893	.5053	.5335
Math Test	43. R-311 63 Arith.Reas	.4134	.3987	.5539	.3789	.4629	.4343	.3873	.6106	.4904	.4977	.5312	.6165
	44. R-312 63 Int.HSMath	.4001	.3837	.5084	.4241	.5031	.5140	.3588	.6467	.4969	.4445	.6553	.6235
	45. R-333 63 Adv.HSMath	.3310	.3444	.3924	.3639	.4226	.4270	.2839	.5449	.3446	.3577	.6178	.5149
	46. F-410 63 Arith.Comp	.2444	.2655	.3157	.2519	.3137	.3485	.3350	.3693	.3143	.3009	.2993	.3596
	47. F-420 63 Table Read	.1543	.1684	.1509	.0814	.2360	.0731	.1803	.1119	.0905	.1749	.2028	.2249
	48. F-430 63 Cler.Check	.1289	.2039	.2158	.2050	.4212	.2540	.3476	.2804	.2230	.2370	.2721	.2980
	49. F-440 63 Obj.Insp.	.2170	.1817	.2017	.2235	.2578	.1125	.1740	.1736	.1063	.1832	.2200	.2270
Information Test	50. R-102 60 Vocab. I	.5332	.5821	.6336	.3895	.5147	.4332	.3028	.5341	.4679	.4254	.5216	.6317
	51. R-103 60 Literature	.4180	.5397	.5074	.3688	.4668	.4303	.2728	.4665	.4287	.3961	.4769	.5629
	52. R-104 60 Music	.3666	.5209	.4685	.2853	.4563	.3556	.2357	.4038	.3662	.3318	.4399	.4983
	53. R-105 60 Soc. Stud.	.4867	.5326	.5885	.3822	.4331	.4469	.3094	.5140	.4573	.4123	.5023	.6103
	54. R-106 60 Math	.4406	.4735	.4977	.3558	.4240	.4225	.2458	.5273	.3979	.3620	.5515	.5138
	55. R-107 60 Phys. Sci.	.4291	.4331	.5065	.3479	.4237	.4126	.2688	.4947	.3927	.3519	.5065	.5746
	56. R-108 60 Bio. Sci.	.4586	.4455	.4621	.3132	.3459	.3553	.2500	.4244	.3864	.3378	.4089	.5154
	57. R-109 60 Scient.Att	.3695	.3846	.4200	.2804	.3466	.3021	.2734	.4187	.3646	.3570	.3787	.4869
	58. R-110 60 Aero-Space	.4418	.4706	.4586	.2352	.3618	.2640	.2006	.3596	.3466	.3059	.3861	.4897
	59. R-111 60 Electronic	.3760	.3631	.4386	.2182	.3361	.2397	.1493	.3424	.2940	.2771	.3243	.4196
	60. R-112 60 Mechanics	.4542	.4039	.5072	.1991	.3545	.2551	.2184	.3349	.3372	.2862	.3090	.4669
	61. R-113 60 Farming	.3846	.3695	.4155	.2571	.2791	.2825	.2494	.3297	.3389	.3014	.3027	.4443
	62. R-114 60 Home Ec.	.3261	.3524	.3819	.1973	.2679	.2598	.2027	.2861	.2652	.2317	.2936	.3631
	63. R-115 60 Sports	.3960	.4503	.4359	.3081	.3425	.3502	.2633	.3971	.3361	.3216	.4056	.4713
	64. R-131 60 Art	.3981	.5434	.5237	.3130	.4454	.3730	.2718	.4334	.3930	.3864	.4183	.5162
	65. R-132 60 Law	.3757	.4433	.4512	.2639	.3282	.2991	.2190	.3782	.3509	.3112	.3860	.4533
	66. R-133 60 Health	.4198	.4941	.5149	.2955	.4048	.3922	.2770	.4080	.3816	.3326	.4299	.4980
	67. R-134 60 Engin.	.3688	.3602	.4192	.2231	.3148	.2656	.2048	.3201	.2776	.2553	.3178	.4026
	68. R-135 60 Arch.	.2359	.2791	.2579	.1944	.2432	.2209	.1500	.2620	.2402	.2266	.2803	.3155
	69. R-138 60 Military	.3332	.4173	.3797	.1974	.2912	.2547	.1742	.3188	.2715	.2566	.3294	.3663
	70. R-139 60 Acct,Busi.	.3525	.4093	.4559	.2584	.3150	.3034	.2185	.3732	.3298	.3021	.3775	.4210
	71. R-140 60 Prac.Knowl	.3881	.4181	.4794	.2528	.3457	.3215	.2716	.4093	.3510	.3093	.3435	.4406
	72. R-142 60 Bible	.3483	.4127	.4103	.3149	.2847	.3215	.2463	.4202	.3413	.3253	.4247	.4764
	73. R-145 60 Hunting	.2291	.1034	.1462	.0447	.0428	.0459	.0559	.0829	.0842	.0981	.0396	.1325
	74. R-146 60 Fishing	.2208	.1449	.1841	.1075	.1062	.1099	.0892	.1308	.1384	.1254	.1281	.1986
	75. R-147 60 Outdoor	.5335	.4434	.4747	.2704	.3518	.3152	.2586	.3869	.3339	.3268	.3867	.4790
	76. R-150 60 Theater	.3620	.5810	.4601	.2774	.4146	.3564	.2529	.3999	.3682	.3317	.3823	.4631
	77. R-162 60 Vocab. II	.4886	.5727	.6410	.3428	.4780	.4287	.2996	.4893	.4248	.3947	.4822	.5619
	78. R-212 60 Mem. Words	.2329	.2733	.3193	.5128	.3270	.3232	.2164	.3568	.2937	.2725	.3760	.3509
	79. R-220 60 Disg. Wds.	.3746	.4702	.4592	.3398	.5852	.4684	.2809	.4534	.4363	.3623	.4342	.4579
English Test	80. R-231 60 Spelling	.3195	.3857	.3828	.3083	.4388	.6381	.2919	.4479	.4017	.3371	.4338	.4088
	81. R-232 60 Capital.	.3638	.3263	.3830	.3316	.2541	.3998	.3805	.4695	.3891	.4083	.3175	.3813
	82. R-233 60 Punct.	.3701	.4184	.4505	.3764	.4405	.4938	.3575	.6572	.4691	.4309	.5496	.5191
	83. R-234 60 Eng. Usage	.3933	.3944	.4578	.2956	.4028	.4002	.2962	.4775	.5225	.4364	.4108	.4667
	84. R-235 60 Eff. Exp.	.3083	.3641	.3758	.2567	.3127	.3160	.2551	.3991	.3606	.4538	.3811	.4292
	85. R-240 60 Word.Funct	.2881	.3830	.3448	.3476	.4111	.4345	.2557	.5329	.4353	.3706	.6115	.4744
	86. R-250 60 Rdg. Compr	.4893	.5607	.5833	.4260	.5112	.4742	.3519	.5584	.4841	.4721	.5597	.6995
	87. R-260 60 Creativity	.3977	.4644	.4503	.3116	.3779	.3160	.2475	.4087	.3849	.3524	.4053	.4975
	88. R-270 60 Mech.Reas	.4057	.3586	.4154	.2465	.3660	.1742	.2142	.3798	.3027	.2892	.3799	.4447
	89. R-281 60 Vis. 2 Dim	.2035	.2270	.2403	.2083	.2669	.1075	.1815	.2569	.1688	.1847	.2683	.2730
	90. R-282 60 Vis. 3 Dim	.2708	.2230	.2938	.2032	.2550	.1139	.1458	.2894	.1722	.2156	.3511	.3414
	91. R-290 60 Abst.Reas	.3141	.2988	.3450	.3196	.3243	.2580	.2622	.4278	.3014	.3214	.4132	.4359
Math Test	92. R-311 60 Arith.Reas	.3766	.4050	.4737	.3229	.3952	.3679	.2666	.5228	.3820	.3928	.5460	.5419
	93. R-312 60 Int.HSMath	.4162	.4291	.4512	.3606	.3933	.4494	.2981	.5549	.3969	.3805	.5738	.5207
	94. R-333 60 Adv.HSMath	.0848	.0714	.0895	.0884	.1218	.0777	.0440	.1384	.0791	.0618	.1537	.1513
	95. F-410 60 Arith.Comp	.2162	.2249	.2484	.1983	.1987	.2638	.2005	.2643	.2218	.2463	.2999	.3130
	96. F-420 60 Table Read	.1366	.1702	.1779	.1605	.1437	.2099	.2138	.2339	.1721	.2184	.2039	.1983
	97. F-430 60 Cler.Check	.1081	.1666	.1400	.2040	.2369	.3191	.2136	.2571	.2014	.2216	.2481	.2186
	98. F-440 60 Obj.Insp.	.1011	.1182	.1247	.0872	.1551	.1006	.0876	.1043	.0823	.0697	.1560	.1320
	99. P*801 60 Socioecon.	.3230	.3219	.3540	.1372	.3128	.1738	.1426	.2714	.2357	.2306	.3204	.3169

TABLE 6-1a (continued)

38	39	40	41	42	43	44	45	46	47	48	49	50	Variable
43	.5303	.4046	.4438	.5018	.5744	.5827	.4926	.2918	.2832	.3340	.2761	.7378	1. R-102 63
99	.4414	.3351	.3793	.4463	.4962	.5320	.5117	.2373	.2507	.3293	.2724	.6493	2. R-103 63
65	.4247	.3141	.3529	.4140	.4082	.4665	.4561	.1686	.2376	.2761	.1933	.6199	3. R-104 63
92	.4574	.3532	.3742	.4610	.5194	.5794	.4760	.3176	.2752	.3088	.2283	.6229	4. R-105 63
27	.4973	.4042	.4451	.5575	.6149	.8081	.7538	.3420	.2760	.3336	.2076	.6478	5. R-106 63
52	.5525	.4120	.4712	.5257	.5585	.6356	.5645	.2849	.2713	.3202	.2529	.6771	6. R-107 63
67	.4598	.3265	.3834	.4113	.4266	.4501	.3795	.1964	.1506	.2067	.1735	.5654	7. R-108 63
84	.4876	.3585	.4022	.4205	.4808	.4303	.3835	.2380	.2449	.2472	.2640	.5224	8. R-109 63
80	.5740	.4026	.4634	.4313	.4082	.4306	.4336	.1547	.2245	.2307	.2852	.6269	9. R-110 63
65	.5799	.4111	.4650	.4487	.4635	.4795	.4096	.2063	.2332	.2481	.2576	.6014	10. R-111 63
36	.5546	.3960	.4413	.3686	.4085	.3232	.2035	.1809	.1932	.1845	.2827	.4839	11. R-112 63
40	.4320	.2610	.2931	.2998	.3359	.2435	.1952	.2422	.1625	.1861	.1743	.3778	12. R-113 63
51	.3928	.3251	.3482	.3045	.3436	.2924	.2675	.1524	.2024	.1901	.1902	.4172	13. R-114 63
24	.2817	.2357	.2212	.3326	.3640	.4719	.4078	.2955	.2327	.2542	.1941	.4657	14. R-115 63
00	.3930	.1836	.3499	.3614	.4618	.4887	.4122	.2478	.1195	.2483	.1924	.6052	15. R-131 63
98	.3342	.1626	.2346	.3340	.4832	.4575	.4110	.2016	.1396	.1423	.0784	.5574	16. R-132 63
44	.3608	.1101	.3320	.3163	.4350	.4388	.3331	.2455	.1642	.1762	.3203	.5409	17. R-133 63
75	.2862	.1117	.2136	.2753	.3596	.3147	.3144	.2306	.1500	.1120	.1887	.4556	18. R-134 63
54	.3494	.1589	.3568	.2982	.2835	.3222	.3635	.1064	.0906	.1717	.1561	.4781	19. R-135 63
41	.2520	.0944	.2062	.2867	.4056	.3935	.3419	.2820	.1114	.1048	.1087	.4634	20. R-138 63
79	.3037	.1398	.2884	.3012	.4766	.4035	.3556	.2474	.2132	.1636	.2227	.4780	21. R-139 63
38	.2715	.0903	.2738	.2668	.4048	.3547	.2858	.2726	.2521	.0939	.1949	.4184	22. R-140 63
82	.3181	.1314	.2489	.3522	.4180	.3761	.3185	.2474	.1226	.1454	.0849	.5385	23. R-142 63
52	.1915	.0468	.0565	.0568	.0506	-.0115	-.0036	-.0231	.0380	.0784	.0115	.1348	24. R-145 63
59	.2481	.0587	.1355	.1565	.2166	.1443	.1845	.1403	.0764	.0613	.1112	.3419	25. R-146 63
78	.4297	.1814	.3305	.3247	.4134	.4001	.3310	.2444	.1543	.1289	.2170	.5332	26. R-147 63
50	.3313	.1479	.2674	.3234	.3987	.3837	.3444	.2655	.1684	.2039	.1817	.5821	27. R-150 63
13	.3704	.2185	.3429	.3859	.5539	.5084	.3924	.3157	.1509	.2158	.2017	.6336	28. R-162 63
80	.3323	.1802	.2924	.3518	.3789	.4241	.3639	.2519	.0814	.2050	.2235	.3895	29. R-212 63
67	.4067	.3391	.3278	.4069	.4629	.5031	.4226	.3137	.2360	.4212	.2578	.5147	30. R-220 63
45	.2304	.1206	.1734	.3057	.4343	.5140	.4270	.3485	.0731	.2540	.1125	.4332	31. R-231 63
06	.3462	.2311	.3031	.3336	.3873	.3588	.2839	.3350	.1803	.3476	.1740	.3028	32. R-232 63
49	.4205	.2274	.3587	.4920	.6106	.6467	.5449	.3693	.1119	.2804	.1736	.5341	33. R-233 63
56	.3408	.1246	.2326	.3718	.4904	.4960	.3946	.3143	.0905	.2230	.1063	.4679	34. R-234 63
47	.3480	.2256	.3058	.3893	.4977	.4445	.3577	.3009	.1749	.2370	.1892	.4254	35. R-235 63
42	.4123	.3098	.4407	.5053	.5312	.6553	.6178	.2993	.2028	.2721	.2200	.5216	36. R-240 63
90	.5225	.3628	.4692	.5335	.6165	.6235	.5149	.3596	.2249	.2980	.2270	.6317	37. R-250 63
	.5716	.4081	.4816	.4814	.4914	.4920	.4226	.2558	.1725	.2519	.2601	.5504	38. R-260 63
16		.5060	.5885	.5762	.5192	.4901	.4010	.2703	.1652	.2154	.3196	.4705	39. R-270 63
81	.5060		.5009	.4280	.2438	.2795	.2221	.1770	.1830	.2353	.3534	.3005	40. R-281 63
16	.5885	.5009		.5556	.4203	.4205	.3592	.2174	.2388	.2077	.3831	.3795	41. R-282 63
14	.5762	.4280	.5556		.5359	.5239	.4236	.3308	.2326	.2741	.2988	.4411	42. R-290 63
14	.5192	.2438	.4203	.5359		.6825	.5484	.3893	.1283	.1753	.1614	.5661	43. R-311 63
20	.4901	.2795	.4205	.5239	.6825		.7376	.4035	.1464	.2[illegible]5	.1726	.5727	44. R-312 63
26	.4010	.2221	.3592	.4236	.5484	.7376		.3021	.0887	.1735	.1406	.4830	45. R-333 63
58	.2703	.1770	.2174	.3308	.3893	.4035	.3021		.2972	.2891	.2201	.2929	46. F-410 63
25	.1652	.1830	.2388	.2326	.1283	.1464	.0887	.2972		.4034	.3516	.1371	47. F-420 63
19	.2154	.2353	.2077	.2741	.1753	.2915	.1735	.2891	.4034		.3172	.2365	48. F-430 63
01	.3196	.3534	.3831	.2988	.1614	.1726	.1406	.2201	.3516	.3172		.1745	49. F-440 63
04	.4705	.3005	.3795	.4411	.5661	.5727	.4830	.2929	.1371	.2365	.1745		50. R-102 60
22	.3299	.2151	.3077	.3569	.4577	.4844	.4617	.1981	.1398	.2211	.1258	.6806	51. R-103 60
25	.3221	.2316	.2796	.3286	.3905	.4311	.3926	.1923	.1199	.2215	.1231	.6133	52. R-104 60
27	.3694	.2288	.3248	.4105	.5440	.5987	.5083	.3043	.1168	.2312	.1056	.7222	53. R-105 60
09	.3839	.2884	.3653	.4315	.5702	.6506	.6206	.2643	.1334	.1911	.1246	.6450	54. R-106 60
73	.4764	.2790	.3707	.4236	.5113	.5631	.4987	.2494	.1436	.2463	.1436	.6886	55. R-107 60
30	.3931	.1986	.3217	.3395	.4478	.4586	.4244	.2148	.0255	.1252	.1229	.6236	56. R-108 60
33	.3687	.2019	.2931	.3518	.4820	.4772	.3788	.2191	.0734	.1354	.0929	.5482	57. R-109 60
34	.4411	.2467	.3393	.3575	.3992	.4079	.3986	.1608	.1002	.1498	.1323	.6324	58. R-110 60
25	.4558	.2676	.3346	.3214	.4339	.4224	.3678	.1567	.0928	.1768	.1119	.5949	59. R-111 60
82	.4509	.2524	.3225	.3201	.4273	.3499	.2866	.2094	.0848	.1517	.1303	.6102	60. R-112 60
59	.3590	.1896	.2080	.2713	.4076	.3492	.2905	.2443	.0557	.1134	.0571	.5228	61. R-113 60
26	.3169	.1803	.2189	.2413	.3428	.3148	.2661	.1536	.0985	.1249	.0918	.4810	62. R-114 60
58	.2340	.1723	.1880	.3212	.4402	.5040	.4526	.3037	.1631	.2138	.1341	.5418	63. R-115 60
72	.3421	.2393	.2998	.3417	.4307	.4345	.3567	.2389	.1177	.2181	.1348	.6256	64. R-131 60
14	.2944	.1644	.2534	.2948	.4016	.4263	.3395	.2180	.0737	.1529	.0682	.5558	65. R-132 60
07	.3121	.1523	.2358	.3254	.4174	.4337	.3650	.2670	.1232	.2023	.1032	.5980	66. R-133 60
48	.3459	.1950	.2432	.2909	.3855	.3517	.2932	.2323	.0604	.1242	.1167	.5029	67. R-134 60
09	.2167	.1430	.2137	.2220	.2790	.2808	.2623	.1504	.0914	.1118	.0681	.3954	68. R-135 60
46	.2416	.1197	.2945	.2316	.3343	.3406	.2977	.1622	.0693	.1455	.0654	.4579	69. R-138 60
63	.2951	.1863	.2528	.3005	.4553	.4238	.3524	.2288	.1098	.1706	.0965	.5505	70. R-139 60
66	.2941	.1886	.2579	.3207	.4193	.4027	.3277	.2452	.1612	.1910	.1803	.5127	71. R-140 60
55	.2907	.1558	.2508	.3069	.3963	.3740	.3253	.2067	.0875	.1335	.0535	.5085	72. R-142 60
79	.1464	.0310	.0926	.0713	.1330	.0556	.0467	.0930	.0022	.0257	.0549	.1524	73. R-145 60
49	.1589	.0846	.1113	.1121	.1720	.1565	.1376	.1006	-.0240	.0499	.0463	.2712	74. R-146 60
38	.3732	.2117	.2696	.3337	.4283	.4493	.3622	.2572	.0989	.1524	.1701	.5724	75. R-147 60
80	.2867	.1935	.2198	.2949	.3808	.3922	.3386	.2121	.1169	.1803	.1007	.5879	76. R-150 60
05	.3776	.2288	.3206	.3834	.5158	.5098	.4270	.2647	.1047	.2236	.1354	.6827	77. R-162 60
71	.2537	.1849	.2144	.2903	.3258	.3792	.3308	.1797	.0960	.2007	.0966	.3913	78. R-212 60
03	.3487	.2238	.2610	.3624	.4153	.4672	.4016	.2923	.1628	.2456	.1797	.5446	79. R-220 60
25	.1810	.1261	.1804	.2816	.3544	.4506	.4001	.2885	.1452	.2515	.1123	.4617	80. R-231 60
28	.2263	.1372	.1815	.2869	.4465	.4707	.3608	.3163	.1325	.1511	.1185	.3972	81. R-232 60
87	.3662	.2503	.3155	.4348	.5490	.6073	.5161	.3493	.1279	.2330	.1185	.5430	82. R-233 60
83	.3376	.1782	.2437	.3438	.4530	.4446	.3921	.2714	.1223	.1529	.1459	.4938	83. R-234 60
05	.2712	.1896	.2461	.3311	.3923	.3847	.3223	.2294	.0917	.1273	.1086	.4215	84. R-235 60
97	.3198	.2330	.2985	.3813	.4668	.5680	.5598	.2713	.1360	.2250	.1183	.4876	85. R-240 60
22	.4356	.2499	.3634	.4599	.5655	.5919	.5143	.3064	.1395	.2721	.1476	.7164	86. R-250 60
08	.4222	.2817	.3819	.4097	.4798	.4498	.3782	.2086	.1069	.1973	.1648	.5752	87. R-260 60
83	.6548	.4117	.3217	.4766	.4642	.4359	.3973	.1716	.1047	.1605	.2274	.5144	88. R-270 60
15	.3930	.4792	.3896	.3458	.2811	.2916	.2416	.1998	.1277	.1764	.2553	.2930	89. R-281 60
01	.4846	.4070	.5990	.4578	.3575	.3709	.3380	.1213	.0833	.0901	.2004	.3601	90. R-282 60
07	.4582	.3721	.4339	.5674	.4985	.5015	.4268	.2576	.1243	.1664	.2144	.4266	91. R-290 60
75	.4325	.2766	.3918	.4568	.6508	.6263	.5436	.3064	.1211	.1821	.1152	.5845	92. R-311 60
15	.4059	.2914	.3865	.4717	.5718	.6914	.6247	.3357	.1719	.2207	.1226	.5592	93. R-312 60
93	.1328	.0993	.1472	.1280	.1541	.2022	.2256	.0674	.0645	.0417	.0361	.1749	94. R-333 60
36	.1957	.1691	.2110	.2689	.3500	.3424	.2496	.4782	.1176	.1704	.1436	.2949	95. F-410 60
65	.1610	.1458	.1766	.1986	.2382	.2400	.1749	.2803	.1514	.1562	.1404	.1856	96. F-420 60
61	.1209	.1154	.1564	.1948	.2097	.2722	.2228	.2879	.1764	.2657	.1731	.2090	97. F-430 60
29	.1516	.1828	.2022	.1767	.0973	.1408	.0962	.1372	.1396	.1601	.2754	.1235	98. F-440 60
93	.2504	.1827	.2174	.2830	.3228	.330	.3187	.1303	.1441	.1766	.1266	.4127	99. P*801 60

TABLE 6-1a (continued)

	Variable	51	52	53	54	55	56	57	58	59	60	61	62
Information Test	1. R-102 63 Vocab. I	.6055	.5537	.6598	.5838	.6220	.5643	.5072	.5657	.5399	.5587	.4939	.4293
	2. R-103 63 Literature	.7052	.5746	.6777	.5683	.5915	.5364	.4376	.5168	.4320	.4016	.4365	.3808
	3. R-104 63 Music	.6150	.7097	.5882	.5218	.5177	.4635	.3984	.5173	.4324	.4238	.3711	.3992
	4. R-105 63 Soc. Stud.	.5760	.4831	.7376	.5425	.5987	.5442	.4420	.5000	.4443	.4217	.4376	.3725
	5. R-106 63 Math	.5473	.5213	.6369	.7109	.6353	.5330	.4235	.5160	.5112	.4467	.3927	.3907
	6. R-107 63 Phys. Sci.	.5587	.5041	.6620	.6197	.7425	.5758	.4421	.5714	.5929	.4834	.4427	.4126
	7. R-108 63 Bio. Sci.	.4844	.4000	.5471	.4595	.5600	.6347	.3764	.4807	.4683	.4404	.4708	.3648
	8. R-109 63 Scient.Att	.4180	.3927	.4874	.4342	.4482	.4181	.5444	.4152	.4018	.3951	.3675	.3206
	9. R-110 63 Aero-Space	.5183	.4746	.5608	.5018	.5639	.5140	.4132	.6617	.5460	.5133	.4206	.3677
	10. R-111 63 Electronic	.4384	.4216	.5139	.4933	.6137	.4901	.3946	.5685	.7013	.5844	.4356	.4048
	11. R-112 63 Mechanics	.2795	.3006	.3720	.3309	.3956	.4357	.3453	.4331	.4872	.6427	.4401	.3528
	12. R-113 63 Farming	.2639	.2429	.3302	.2568	.3300	.3942	.2824	.2774	.2883	.3081	.6200	.2717
	13. R-114 63 Home Ec.	.3423	.3605	.3574	.3351	.3550	.3687	.2970	.3584	.3658	.3982	.3433	.5566
	14. R-115 63 Sports	.4075	.3973	.5104	.4163	.3908	.3397	.3360	.3774	.2514	.2894	.2899	.2903
	15. R-131 63 Art	.5829	.5151	.6080	.5062	.5093	.4815	.4041	.4986	.4139	.4261	.3713	.3889
	16. R-132 63 Law	.4820	.4236	.5671	.4647	.4543	.4778	.4074	.4627	.3841	.4190	.3983	.3318
	17. R-133 63 Health	.4637	.4069	.5146	.4407	.4758	.4517	.3632	.4157	.3896	.4039	.3724	.3346
	18. R-134 63 Engin.	.3327	.2872	.4331	.3562	.3709	.3695	.3164	.3426	.3465	.4124	.3581	.3289
	19. R-135 63 Arch.	.4646	.4213	.4880	.4361	.4219	.3847	.3190	.4026	.3509	.3410	.3069	.2818
	20. R-138 63 Military	.4777	.4095	.5150	.3810	.3682	.3833	.3181	.4075	.2951	.3142	.2883	.2424
	21. R-139 63 Acct,Busi.	.4174	.3868	.4974	.4318	.3937	.3805	.3720	.3960	.3858	.3971	.3515	.3527
	22. R-140 63 Prac.Knowl	.3514	.3177	.4248	.3422	.3294	.3185	.2927	.3040	.2372	.3107	.2858	.2712
	23. R-142 63 Bible	.5291	.4687	.5637	.4628	.4781	.4386	.3765	.4246	.3459	.2971	.3715	.2899
	24. R-145 63 Hunting	.0706	.0174	.0918	.0641	.1064	.1915	.1175	.1281	.1033	.2554	.2824	.1675
	25. R-146 63 Fishing	.2262	.1558	.2487	.2198	.2715	.3538	.2212	.2524	.2006	.3403	.3024	.2149
	26. R-147 63 Outdoor	.4180	.3666	.4867	.4406	.4291	.4586	.3695	.4418	.3760	.4542	.3846	.3261
	27. R-150 63 Theater	.5397	.5209	.5326	.4735	.4331	.4455	.3846	.4706	.3631	.4039	.3695	.3524
	28. R-162 63 Vocab. II	.5074	.4685	.5885	.4977	.5065	.4621	.4200	.4586	.4386	.5072	.4155	.3819
	29. R-212 63 Mem. Words	.3688	.2853	.3822	.3558	.3479	.3132	.2804	.2352	.2182	.1991	.2571	.1973
	30. R-220 63 Disg. Wds.	.4668	.4563	.4331	.4240	.4237	.3459	.3466	.3618	.3361	.3545	.2791	.2679
English Test	31. R-231 63 Spelling	.4303	.3556	.4469	.4225	.4126	.3553	.3021	.2640	.2397	.2551	.2825	.2598
	32. R-232 63 Capitel.	.2728	.2357	.3094	.2458	.2688	.2500	.2734	.2006	.1493	.2184	.2494	.2027
	33. R-233 63 Punct.	.4665	.4038	.5140	.5273	.4947	.4244	.4187	.3596	.3424	.3349	.3297	.2861
	34. R-234 63 Eng. Usage	.4287	.3662	.4573	.3979	.3927	.3864	.3646	.3466	.2940	.3372	.3389	.2652
	35. R-235 63 Eff. Exp.	.3961	.3318	.4123	.3620	.3519	.3378	.3570	.3059	.2771	.2862	.3014	.2317
	36. R-240 63 Word.Funct	.4769	.4399	.5023	.5515	.5065	.4089	.3787	.3861	.3243	.3090	.3027	.2936
	37. R-250 63 Rdg. Compr	.5629	.4983	.6103	.5138	.5746	.5154	.4869	.4897	.4196	.4669	.4443	.3631
	38. R-260 63 Creativity	.4622	.4525	.4527	.4509	.5073	.4330	.4233	.4634	.4625	.4882	.3759	.3526
	39. R-270 63 Mech.Reas	.3299	.3221	.3694	.3839	.4764	.3931	.3687	.4411	.4556	.4509	.3590	.3169
	40. R-281 63 Vis. 2 Dim	.2151	.2316	.2288	.2884	.2790	.1986	.2019	.2467	.2676	.2524	.1896	.1803
	41. R-282 63 Vis. 3 Dim	.3077	.2796	.3248	.3653	.3707	.3217	.2931	.3393	.3346	.3225	.2080	.2189
	42. R-290 63 Abst.Reas	.3569	.3286	.4105	.4315	.4236	.3395	.3518	.3575	.3214	.3201	.2713	.2413
Math Test	43. R-311 63 Arith.Reas	.4577	.3905	.5440	.5402	.5113	.4478	.4820	.3992	.4339	.4273	.4076	.3428
	44. R-312 63 Int.HSMath	.4844	.4311	.5987	.6506	.5631	.4586	.4372	.4079	.4224	.3499	.3492	.3148
	45. R-333 63 Adv.HSMath	.4617	.3926	.5083	.6206	.4987	.4244	.3788	.3986	.3678	.2866	.2905	.2661
	46. F-410 63 Arith.Comp	.1981	.1923	.3043	.2643	.2434	.2148	.2191	.1608	.1567	.2094	.2443	.1536
	47. F-420 63 Table Read	.1398	.1199	.1168	.1334	.1436	.0255	.0734	.1002	.0928	.0848	.0557	.0985
	48. F-430 63 Cler.Check	.2211	.2215	.2312	.1911	.2463	.1252	.1354	.1498	.1768	.1517	.1134	.1249
	49. F-440 63 Obj.Insp.	.1258	.1231	.1056	.1246	.1436	.1229	.0929	.1323	.1119	.1303	.0571	.0918
Information Test	50. R-102 60 Vocab. I	.6806	.6133	.7222	.6450	.6886	.6236	.5482	.6324	.5949	.6102	.5228	.4810
	51. R-103 60 Literature		.6296	.6907	.5882	.5957	.5608	.4513	.5473	.4562	.4439	.4193	.4078
	52. R-104 60 Music	.6296		.6013	.5639	.5126	.4674	.3954	.5066	.4294	.4221	.3816	.3987
	53. R-105 60 Soc. Stud.	.6907	.6013		.6338	.6791	.5974	.5021	.5718	.5086	.4983	.4861	.4374
	54. R-106 60 Math	.5882	.5639	.6338		.6181	.5162	.4500	.5247	.4911	.4446	.3857	.4036
	55. R-107 60 Phys. Sci.	.5957	.5126	.6791	.6181		.6032	.4564	.5998	.6350	.5125	.4723	.4261
	56. R-108 60 Bio. Sci.	.5608	.4674	.5974	.5162	.6032		.4582	.5319	.4863	.4876	.4935	.3888
	57. R-109 60 Scient.Att	.4513	.3954	.5021	.4500	.4564	.4582		.4189	.3961	.4264	.3693	.3165
	58. R-110 60 Aero-Space	.5473	.5066	.5718	.5247	.5998	.5319	.4189		.5612	.5198	.4005	.3725
	59. R-111 60 Electronic	.4562	.4294	.5086	.4911	.6350	.4863	.3961	.5612		.5791	.4108	.3975
	60. R-112 60 Mechanics	.4439	.4221	.4983	.4446	.5125	.4876	.4264	.5198	.5791		.5069	.4383
	61. R-113 60 Farming	.4193	.3816	.4861	.3857	.4723	.4935	.3693	.4005	.4108	.5069		.3913
	62. R-114 60 Home Ec.	.4078	.3987	.4374	.4036	.4261	.3888	.3165	.3725	.3975	.4383	.3913	
	63. R-115 60 Sports	.5062	.4773	.5784	.4971	.4410	.4014	.3974	.4107	.3028	.3604	.3448	.3331
	64. R-131 60 Art	.6176	.5572	.6009	.5062	.5300	.4697	.4270	.5279	.4417	.4609	.3927	.3966
	65. R-132 60 Law	.5341	.4520	.5618	.4655	.4651	.4278	.3952	.4650	.4025	.4022	.3397	.3335
	66. R-133 60 Health	.5439	.4942	.5882	.4915	.5274	.4902	.4220	.4533	.4137	.4623	.4342	.4007
	67. R-134 60 Engin.	.3953	.3868	.4474	.4058	.4506	.4029	.3520	.4241	.4441	.4723	.3537	.3514
	68. R-135 60 Arch.	.4239	.3873	.4002	.3634	.3440	.3095	.2366	.3384	.2899	.2864	.2485	.2762
	69. R-138 60 Military	.4845	.4403	.4993	.4211	.3992	.3450	.3030	.4171	.3379	.3218	.2483	.2550
	70. R-139 60 Acct,Busi.	.4739	.4422	.5347	.4767	.4658	.4227	.3777	.4366	.4001	.4333	.3546	.3696
	71. R-140 60 Prac.Knowl	.4406	.3940	.4910	.4043	.4193	.3674	.3673	.3807	.3389	.4132	.3178	.3365
	72. R-142 60 Bible	.5353	.4590	.5362	.4403	.4486	.4329	.3777	.4022	.3248	.3200	.3805	.2893
	73. R-145 60 Hunting	.1017	.0682	.1164	.0645	.1540	.2088	.1359	.1460	.1506	.2633	.2912	.1425
	74. R-146 60 Fishing	.1970	.1512	.2082	.1789	.2343	.2979	.2242	.2313	.1923	.2883	.2548	.1928
	75. R-147 60 Outdoor	.4862	.4296	.5415	.4758	.4929	.4617	.4268	.4766	.4349	.4657	.3988	.3855
	76. R-150 60 Theater	.5635	.5319	.5317	.4755	.4635	.4080	.3813	.4794	.3771	.4164	.3550	.3660
	77. R-162 60 Vocab. II	.6124	.5635	.6469	.5701	.5697	.5253	.4616	.5360	.4853	.5159	.4420	.4191
	78. R-212 60 Mem. Words	.3857	.3482	.3811	.3888	.3657	.3236	.2824	.2736	.2678	.2444	.2643	.2229
	79. R-220 60 Disg. Wds.	.5092	.4642	.4707	.4790	.4345	.3966	.3802	.3924	.3357	.[illegible]836	.3458	.3081
English Test	80. R-231 60 Spelling	.4354	.3829	.4443	.4642	.3996	.3334	.2987	.3082	.2584	.[illegible]731	.2967	.2437
	81. R-232 60 Capitel.	.3414	.3100	.4030	.3426	.3619	.3003	.3069	.2653	.2460	.2974	.2837	.2451
	82. R-233 60 Punct.	.4722	.4440	.5372	.5562	.5066	.4348	.4188	.4030	.3802	.3712	.3669	.3157
	83. R-234 60 Eng. Usage	.4113	.3582	.4559	.4239	.4077	.3976	.3724	.3618	.3201	.3767	.3586	.2908
	84. R-235 60 Eff. Exp.	.3606	.3112	.3847	.3708	.3455	.3192	.3687	.3021	.2600	.3061	.2787	.2355
	85. R-240 60 Word.Funct	.4575	.4264	.4904	.5645	.4619	.4028	.3490	.3758	.3450	.2785	.2935	.2627
	86. R-250 60 Rdg. Compr	.6653	.5875	.7043	.6158	.6247	.5861	.5375	.5651	.4931	.5009	.4827	.4205
	87. R-260 60 Creativity	.4856	.4497	.4799	.4975	.4821	.4395	.4003	.4897	.4729	.4797	.3713	.3749
	88. R-270 60 Mech.Reas	.3658	.3639	.4182	.4596	.4901	.4400	.3737	.4911	.5241	.5026	.3723	.3203
	89. R-281 60 Vis. 2 Dim	.2208	.2067	.2247	.2817	.2598	.2020	.2231	.2354	.2613	.2551	.2045	.1929
	90. R-282 60 Vis. 3 Dim	.2885	.2853	.3175	.3913	.3596	.2979	.2717	.3436	.3516	.3176	.2359	.2395
	91. R-290 60 Abst.Reas	.3675	.3407	.4225	.4793	.4215	.3479	.3751	.3616	.3422	.3160	.2877	.2664
Math Test	92. R-311 60 Arith.Reas	.4766	.4330	.5658	.6068	.5504	.4652	.4667	.4434	.4575	.4347	.3859	.3437
	93. R-312 60 Int.HSMath	.5128	.4784	.5687	.6807	.5323	.4385	.4129	.4227	.3961	.3726	.3394	.3356
	94. R-333 60 Adv.HSMath	.1787	.1523	.1586	.2561	.1711	.1248	.1244	.1541	.1473	.1295	.0896	.1095
	95. F-410 60 Arith.Comp	.2343	.2257	.3135	.2841	.2527	.1978	.2295	.1742	.1711	.1867	.2224	.1848
	96. F-420 60 Table Read	.1520	.1500	.1797	.1492	.1634	.1423	.1536	.1099	.0960	.1166	.1398	.1225
	97. F-430 60 Cler.Check	.2086	.1861	.2078	.2261	.1851	.1416	.1723	.1372	.0926	.1082	.1241	.1196
	98. F-440 60 Obj.Insp.	.1232	.1191	.0973	.1010	.0980	.0969	.1010	.0956	.0640	.1032	.0617	.0808
	99. P*801 60 Socioecon.	.3814	.3841	.3765	.3733	.3202	.2598	.2883	.3348	.2967	.2838	.1740	.2200

TABLE 6-1a (continued)

63	64	65	66	67	68	69	70	71	72	73	74	75	Variable
.4875	.5700	.5103	.5600	.4487	.3511	.4296	.4751	.4919	.4797	.1635	.2453	.5524	1. R-102 63
.4868	.5845	.5109	.5396	.3828	.3570	.4559	.4656	.4531	.5549	.0896	.1746	.4926	2. R-103 63
.4099	.5616	.4739	.5039	.3723	.3360	.4611	.4402	.4565	.4839	.0362	.1873	.4707	3. R-104 63
.5098	.5181	.4915	.5054	.3941	.3273	.4136	.4438	.4522	.4903	.1263	.1750	.4672	4. R-105 63
.5136	.4869	.4804	.5275	.3904	.3101	.4100	.4699	.4365	.4594	.0643	.1815	.5035	5. R-106 63
.4362	.5115	.4832	.5378	.4224	.3173	.3861	.4446	.4326	.4563	.1605	.2093	.5017	6. R-107 63
.3204	.4303	.4060	.4508	.3474	.2744	.2910	.3464	.3675	.4257	.2442	.2690	.4199	7. R-108 63
.3731	.4037	.4054	.3974	.3216	.2316	.3114	.3558	.3566	.3466	.1101	.1526	.4237	8. R-109 63
.3977	.4808	.4760	.4785	.4237	.3128	.3996	.4043	.4058	.3980	.1542	.2355	.4639	9. R-110 63
.3005	.4502	.4225	.4516	.4460	.2947	.3393	.4169	.3863	.3556	.1769	.2135	.4711	10. R-111 63
.2312	.3456	.3247	.3440	.3853	.2196	.2449	.3255	.3255	.2573	.2913	.2419	.3996	11. R-112 63
.2287	.2552	.2368	.2980	.2690	.1767	.1656	.2368	.2414	.3723	.3127	.2373	.2959	12. R-113 63
.2574	.3672	.3189	.3482	.3055	.2224	.2157	.3147	.3150	.2644	.1379	.1884	.3310	13. R-114 63
.6992	.3777	.3640	.3801	.2966	.2370	.3310	.3400	.3519	.3373	.0720	.1689	.3963	14. R-115 63
.4305	.6354	.4752	.5024	.3931	.3274	.4157	.4468	.4559	.4476	.0986	.1476	.4480	15. R-131 63
.4104	.4648	.5257	.4760	.3444	.2312	.3721	.4430	.3808	.4107	.1189	.1588	.4299	16. R-132 63
.3990	.4461	.3983	.5133	.3768	.2489	.3169	.3798	.4088	.3338	.1615	.1960	.4198	17. R-133 63
.3018	.3797	.3497	.3672	.4079	.2103	.2608	.3371	.3483	.2963	.1948	.1907	.3857	18. R-134 63
.3344	.4448	.3464	.3664	.2934	.3792	.3468	.3570	.2925	.3441	.0770	.1203	.3532	19. R-135 63
.4109	.4282	.4166	.4040	.2782	.2159	.4749	.3344	.3192	.3867	.1030	.1351	.3446	20. R-138 63
.3503	.4228	.3976	.4221	.3381	.2590	.3400	.4647	.3810	.3632	.1215	.1510	.4152	21. R-139 63
.3402	.3809	.3391	.3782	.3011	.1681	.2904	.3612	.4784	.2964	.1360	.1390	.3909	22. R-140 63
.3672	.4535	.4410	.4375	.3043	.2702	.3932	.3855	.3453	.7313	.0900	.1616	.3640	23. R-142 63
.0204	.0717	.0978	.0893	.1314	.0230	.0648	.0991	.0339	.0885	.5199	.2937	.1442	24. R-145 63
.2296	.2278	.2037	.2426	.2377	.1325	.1600	.2159	.2063	.1946	.3408	.5314	.2632	25. R-146 63
.3960	.3981	.3757	.4198	.3688	.2359	.3332	.3525	.3881	.3483	.2291	.2208	.5335	26. R-147 63
.4503	.5434	.4433	.4941	.3602	.2791	.4173	.4093	.4181	.4127	.1034	.1449	.4434	27. R-150 63
.4359	.5237	.4512	.5149	.4192	.2579	.3797	.4559	.4794	.4103	.1462	.1841	.4747	28. R-162 63
.3081	.3130	.2639	.2955	.2231	.1944	.1974	.2584	.2528	.3149	.0447	.1075	.2704	29. R-212 63
.3425	.4454	.3282	.4048	.3148	.2432	.2912	.3150	.3457	.2847	.0428	.1062	.3518	30. R-220 63
.3502	.3730	.2991	.3922	.2656	.2209	.2547	.3034	.3215	.3215	.0459	.1099	.3152	31. R-231 63
.2633	.2718	.2190	.2770	.2048	.1500	.1742	.2185	.2716	.2463	.0559	.0892	.2586	32. R-232 63
.3971	.4334	.3782	.4080	.3201	.2620	.3188	.3732	.4093	.4202	.0829	.1308	.3869	33. R-233 63
.3361	.3930	.3509	.3816	.2776	.2402	.2715	.3298	.3510	.3413	.0842	.1384	.3339	34. R-234 63
.3216	.3864	.3112	.3326	.2553	.2266	.2566	.3021	.3093	.3253	.0981	.1254	.3268	35. R-235 63
.4056	.4183	.3860	.4299	.3178	.2803	.3294	.3775	.3435	.4247	.0396	.1281	.3867	36. R-240 63
.4713	.5162	.4533	.4980	.4026	.3155	.3663	.4210	.4406	.4764	.1325	.1986	.4790	37. R-250 63
.3258	.4672	.3814	.4207	.3948	.2809	.3346	.3763	.3666	.3755	.1479	.1949	.3938	38. R-260 63
.2340	.3421	.2944	.3121	.3459	.2167	.2416	.2951	.2941	.2907	.1464	.1589	.3732	39. R-270 63
.1723	.2393	.1644	.1523	.1950	.1430	.1197	.1863	.1886	.1558	.0310	.0846	.2117	40. R-281 63
.1880	.2998	.2534	.2358	.2432	.2137	.1945	.2528	.2579	.2508	.0926	.1113	.2696	41. R-282 63
.3212	.3417	.2948	.3254	.2909	.2220	.2316	.3005	.3207	.3069	.0713	.1121	.3337	42. R-290 63
.4402	.4307	.4016	.4174	.3855	.2790	.3343	.4553	.4192	.3963	.1330	.1720	.4283	43. R-311 63
.5040	.4345	.4263	.4337	.3517	.2808	.3406	.4238	.4027	.3740	.0556	.1565	.4493	44. R-312 63
.4526	.3567	.3395	.3650	.2932	.2623	.2977	.3524	.3277	.3253	.0467	.1376	.3622	45. R-333 63
.3037	.2389	.2180	.2670	.2323	.1504	.1622	.2288	.2452	.2067	.0930	.1006	.2572	46. F-410 63
.1631	.1177	.0737	.1232	.0604	.0914	.0693	.1098	.1612	.0875	.0022	-.0240	.0989	47. F-420 63
.2138	.2181	.1529	.2023	.1242	.1118	.1455	.1706	.1910	.1335	.0257	.0499	.1524	48. F-430 63
.1341	.1348	.0682	.1032	.1167	.0681	.0654	.0965	.1803	.0535	.0549	.0463	.1701	49. F-440 63
.5418	.6256	.5558	.5980	.5029	.3954	.4579	.5505	.5127	.5085	.1524	.2712	.5724	50. R-102 60
.5062	.6176	.5341	.5439	.3953	.4239	.4845	.4739	.4406	.5353	.1017	.1970	.4862	51. R-103 60
.4773	.5572	.4520	.4942	.3868	.3873	.4403	.4422	.3940	.4590	.0682	.1512	.4296	52. R-104 60
.5784	.6009	.5618	.5882	.4474	.4002	.4993	.5347	.4910	.5362	.1164	.2082	.5415	53. R-105 60
.4971	.5062	.4655	.4915	.4058	.3634	.4211	.4767	.4043	.4403	.0645	.1789	.4758	54. R-106 60
.4410	.5300	.4651	.5274	.4506	.3440	.3992	.4658	.4193	.4486	.1540	.2343	.4929	55. R-107 60
.4014	.4697	.4278	.4902	.4029	.3095	.3450	.4227	.3674	.4329	.2088	.2979	.4617	56. R-108 60
.3974	.4270	.3952	.4220	.3520	.2366	.3030	.3777	.3673	.3777	.1359	.2242	.4268	57. R-109 60
.4107	.5279	.4650	.4533	.4241	.3384	.4171	.4366	.3807	.4022	.1460	.2313	.4766	58. R-110 60
.3028	.4417	.4025	.4137	.4441	.2899	.3379	.4001	.3389	.3248	.1506	.1923	.4349	59. R-111 60
.3604	.4609	.4022	.4623	.4723	.2864	.3218	.4333	.4132	.3200	.2633	.2883	.4657	60. R-112 60
.3448	.3927	.3397	.4342	.3537	.2485	.2483	.3546	.3178	.3805	.2912	.2548	.3988	61. R-113 60
.3331	.3966	.3335	.4007	.3514	.2762	.2550	.3696	.3365	.2893	.1425	.1928	.3855	62. R-114 60
	.4295	.4266	.4445	.3154	.2861	.4012	.4069	.4044	.3588	.0922	.1973	.4370	63. R-115 60
.4295		.5184	.5722	.4513	.3957	.4389	.5001	.5039	.4850	.1143	.2190	.5014	64. R-131 60
.4266	.5184		.4753	.3643	.3026	.4233	.4849	.4311	.4657	.1402	.1860	.4477	65. R-132 60
.4445	.5722	.4753		.4631	.3253	.3703	.4979	.5029	.4467	.1422	.2282	.5099	66. R-133 60
.3154	.4513	.3643	.4631		.2890	.2868	.3800	.4340	.3296	.1611	.2058	.4478	67. R-134 60
.2861	.3957	.3026	.3253	.2890		.3099	.3088	.2737	.3292	.0604	.1668	.3185	68. R-135 60
.4012	.4389	.4233	.3703	.2868	.3099		.3947	.3254	.3805	.0519	.1502	.3599	69. R-138 60
.4069	.5001	.4849	.4979	.3800	.3088	.3947		.4366	.4182	.1291	.1940	.4427	70. R-139 60
.4044	.5039	.4311	.5029	.4340	.2737	.3254	.4366		.3963	.1176	.2082	.5038	71. R-140 60
.3588	.4850	.4657	.4467	.3296	.3292	.3805	.4182	.3963		.1378	.2082	.4047	72. R-142 60
.0922	.1143	.1402	.1422	.1611	.0604	.0519	.1291	.1176	.1378		.3162	.2048	73. R-145 60
.1973	.2190	.1860	.2282	.2058	.1668	.1502	.1940	.2082	.2082	.3162		.2715	74. R-146 60
.4370	.5014	.4477	.5099	.4478	.3185	.3599	.4427	.5038	.4047	.2048	.2715		75. R-147 60
.4405	.5590	.4826	.4963	.3828	.3472	.4175	.4858	.4425	.4109	.0658	.1548	.4556	76. R-150 60
.5016	.6533	.5852	.6383	.4808	.3802	.4400	.6390	.5304	.4981	.1401	.2441	.5908	77. R-162 60
.3055	.3259	.2801	.3230	.2519	.2281	.2365	.2615	.2550	.3017	.0593	.1374	.2667	78. R-212 60
.4230	.4649	.3757	.4561	.3220	.3059	.3349	.3591	.3821	.3791	.1019	.1971	.4052	79. R-220 60
.3770	.3647	.3346	.4126	.2559	.2441	.2902	.3093	.2881	.3261	.0543	.1412	.3133	80. R-231 60
.3598	.3564	.2878	.3553	.2909	.1988	.2401	.2869	.3357	.2984	.0667	.1423	.3335	81. R-232 60
.4131	.4387	.3935	.4506	.3561	.2697	.3292	.4061	.3932	.4100	.0696	.1584	.4159	82. R-233 60
.3662	.3854	.3567	.4046	.2908	.2395	.2951	.3665	.3366	.3545	.1267	.1596	.3610	83. R-234 60
.3346	.3576	.3278	.3505	.2769	.1887	.2413	.3114	.2980	.2983	.1054	.1184	.3356	84. R-235 60
.3785	.3992	.3642	.4021	.3155	.2712	.3201	.3576	.3049	.4138	.0458	.1141	.3689	85. R-240 60
.5194	.6185	.5458	.5925	.4792	.3742	.4469	.5284	.5075	.5547	.1579	.2483	.5697	86. R-250 60
.3626	.4925	.4134	.4357	.3926	.3215	.3594	.4224	.3839	.3807	.1526	.2095	.4538	87. R-260 60
.2925	.3848	.3328	.3429	.3856	.2577	.2552	.3377	.3284	.2966	.1948	.2197	.4184	88. R-270 60
.2001	.2491	.2061	.2041	.1998	.1755	.1542	.2050	.2134	.1738	.1033	.0969	.2458	89. R-281 60
.1902	.3076	.2463	.2317	.2568	.1985	.2012	.2491	.2170	.2235	.0791	.1050	.2810	90. R-282 60
.3377	.3387	.2926	.3025	.2976	.2285	.2474	.2975	.3064	.2696	.0658	.1115	.3473	91. R-290 60
.4378	.4496	.4298	.4434	.3797	.3045	.3467	.4611	.3836	.4051	.0978	.1794	.4335	92. R-311 60
.4633	.4499	.4162	.4565	.3572	.2948	.3482	.4225	.3698	.4068	.0629	.1329	.4308	93. R-312 60
.1652	.1438	.1315	.1176	.1067	.1338	.1188	.1350	.1117	.1512	.0216	.0717	.1390	94. R-333 60
.2917	.2349	.2363	.2643	.2226	.1469	.1625	.2319	.2880	.2153	.0392	.0954	.2554	95. F-410 60
.1745	.1567	.1506	.1802	.1339	.0622	.1067	.1829	.2085	.1262	.0452	.0563	.1714	96. F-420 60
.2182	.2015	.1745	.2091	.1336	.1353	.1407	.1575	.1925	.1554	.0157	.0868	.1633	97. F-430 60
.1003	.1460	.0953	.1098	.0981	.0622	.0452	.0928	.1519	.0531	.0528	.0924	.1336	98. F-440 60
.3236	.3344	.2809	.3312	.2471	.2169	.2590	.2983	.2705	.2189	-.0045	.0621	.3482	99. P*801 60

TABLE 6-1a (continued)

	Variable	76	77	78	79	80	81	82	83	84	85	86	87
Information Test	1. R-102 63 Vocab. I	.5302	.6492	.3771	.5226	.4098	.3159	.5305	.4685	.4101	.4448	.6888	.5235
	2. R-103 63 Literature	.5395	.5989	.3820	.5230	.4239	.2941	.4968	.4225	.3796	.4724	.6665	.4638
	3. R-104 63 Music	.5304	.5839	.3711	.4977	.3998	.2934	.4671	.4121	.3415	.4324	.6060	.4467
	4. R-105 63 Soc. Stud.	.4513	.5523	.3674	.4449	.3902	.3262	.4948	.4209	.3664	.4386	.6442	.4370
	5. R-106 63 Math	.4690	.5891	.4106	.5124	.4567	.3106	.5911	.4442	.3918	.5798	.6418	.4856
	6. R-107 63 Phys. Sci.	.4621	.5820	.3745	.4813	.3925	.2913	.5323	.4292	.3646	.4798	.6398	.4847
	7. R-108 63 Bio. Sci.	.3643	.4570	.2787	.3707	.2560	.2191	.3894	.3651	.2956	.3649	.5316	.4102
	8. R-109 63 Scient.Att	.3864	.4610	.2410	.3795	.2745	.2209	.4213	.3583	.3540	.3635	.5292	.3882
	9. R-110 63 Aero-Space	.4730	.5360	.2684	.3884	.2794	.2361	.3903	.3757	.2985	.3658	.5789	.4864
	10. R-111 63 Electronic	.3888	.5177	.2675	.3728	.2541	.2360	.4249	.3699	.3044	.3735	.5149	.4833
	11. R-112 63 Mechanics	.2921	.4115	.1632	.2755	.1509	.1959	.2881	.2983	.2531	.2254	.3922	.3907
	12. R-113 63 Farming	.2307	.3070	.1908	.2576	.2231	.1900	.2816	.2886	.2356	.2272	.3618	.2748
	13. R-114 63 Home Ec.	.3445	.3750	.1675	.2808	.2056	.1953	.2698	.2721	.2287	.2431	.3837	.3447
	14. R-115 63 Sports	.3840	.4278	.2913	.3896	.3487	.2887	.3727	.3091	.3181	.3454	.4693	.3048
	15. R-131 63 Art	.5214	.5796	.2893	.4689	.3654	.3692	.4105	.3937	.3632	.3575	.5825	.4674
	16. R-132 63 Law	.4281	.5366	.2758	.3612	.3296	.3258	.3793	.3770	.3158	.3130	.5232	.3828
	17. R-133 63 Health	.4047	.4966	.2455	.4215	.3284	.3716	.4199	.3585	.3125	.3366	.5088	.3762
	18. R-134 63 Engin.	.3364	.4103	.1645	.2828	.2052	.3052	.3178	.3089	.2624	.2349	.4071	.3421
	19. R-135 63 Arch.	.3548	.4216	.2236	.3216	.2568	.2729	.3240	.3115	.2570	.3028	.4719	.3647
	20. R-138 63 Military	.4065	.4470	.2133	.3504	.3275	.3059	.3514	.3307	.2805	.2936	.4802	.3584
	21. R-139 63 Acct,Busi.	.3963	.5244	.2310	.3403	.2792	.3151	.3704	.3604	.2999	.2984	.4729	.4014
	22. R-140 63 Prac.Knowl	.3608	.4320	.1577	.3787	.2827	.3185	.3307	.2981	.2508	.2050	.3967	.3316
	23. R-142 63 Bible	.3893	.4868	.3017	.4049	.3601	.3317	.4215	.3858	.3277	.3957	.5594	.3683
	24. R-145 63 Hunting	.0564	.0954	.0200	.0817	.0425	-.0037	.0181	.1342	.0466	-.0035	.1327	.1300
	25. R-146 63 Fishing	.1742	.2820	.1441	.2181	.1830	.1716	.1818	.2203	.1435	.1500	.3012	.2375
	26. R-147 63 Outdoor	.3620	.4886	.2329	.3746	.3195	.3638	.3701	.3933	.3083	.2881	.4893	.3977
	27. R-150 63 Theater	.5810	.5727	.2733	.4702	.3857	.3263	.4184	.3944	.3641	.3830	.5607	.4644
	28. R-162 63 Vocab. II	.4601	.6410	.3193	.4592	.3828	.3830	.4505	.4578	.3758	.3448	.5833	.4503
	29. R-212 63 Mem. Words	.2774	.3428	.5128	.3398	.3083	.3316	.3764	.2956	.2567	.3476	.4260	.3116
	30. R-220 63 Disg. Wds.	.4146	.4780	.3270	.5852	.4388	.2541	.4405	.4028	.3127	.4111	.5112	.3779
English Test	31. R-231 63 Spelling	.3564	.4287	.3232	.4684	.6381	.3998	.4938	.4002	.3160	.4345	.4742	.3160
	32. R-232 63 Capital.	.2529	.2996	.2164	.2809	.2919	.3805	.3575	.2962	.2551	.2557	.3519	.2475
	33. R-233 63 Punct.	.3999	.4893	.3568	.4534	.4479	.4695	.6572	.4775	.3991	.5329	.5584	.4087
	34. R-234 63 Eng. Usage	.3682	.4248	.2937	.4363	.4017	.3891	.4691	.5225	.3606	.4353	.4841	.3849
	35. R-235 63 Eff. Exp.	.3317	.3947	.2755	.3623	.3371	.4083	.4309	.4364	.4538	.3706	.4721	.3524
	36. R-240 63 Word.Funct	.3823	.4822	.3760	.4342	.4338	.3175	.5496	.4108	.3811	.6115	.5597	.4053
	37. R-250 63 Rdg. Compr	.4631	.5619	.3509	.4579	.4088	.3813	.5191	.4667	.4292	.4744	.6995	.4975
	38. R-260 63 Creativity	.4180	.4705	.3071	.4003	.3025	.2728	.4387	.3683	.3605	.3897	.5522	.5408
	39. R-270 63 Mech.Reas	.2867	.3776	.2537	.3487	.1810	.2263	.3662	.3376	.2712	.3198	.4356	.4222
	40. R-281 63 Vis. 2 Dim	.1935	.2288	.1849	.2238	.1261	.1372	.2503	.1782	.1896	.2330	.2499	.2817
	41. R-282 63 Vis. 3 Dim	.2198	.3206	.2144	.2610	.1804	.1815	.3155	.2437	.2461	.2985	.3634	.3819
	42. R-290 63 Abst.Reas	.2949	.3834	.2903	.3624	.2816	.2869	.4348	.3438	.3311	.3813	.4599	.4097
Math Test	43. R-311 63 Arith.Reas	.3808	.5158	.3258	.4153	.3544	.4465	.5490	.4530	.3923	.4668	.5655	.4798
	44. R-312 63 Int.HSMath	.3922	.5098	.3792	.4672	.4586	.4707	.6073	.4446	.3847	.5680	.5919	.4498
	45. R-333 63 Adv.HSMath	.3386	.4270	.3308	.4016	.4001	.3608	.5161	.3921	.3223	.5598	.5143	.3782
	46. F-410 63 Arith.Comp	.2121	.2647	.1797	.2923	.2885	.3163	.3493	.2714	.2294	.2713	.3064	.2086
	47. F-420 63 Table Read	.1169	.1047	.0960	.1628	.1452	.1325	.1279	.1223	.0917	.1360	.1395	.1069
	48. F-430 63 Cler.Check	.1803	.2236	.2007	.2456	.2515	.1511	.2330	.1529	.1273	.2250	.2721	.1973
	49. F-440 63 Obj.Insp.	.1007	.1354	.0966	.1797	.1123	.1185	.1185	.1459	.1086	.1183	.1476	.1648
Information Test	50. R-102 60 Vocab. I	.5879	.6827	.3913	.5446	.4617	.3972	.5430	.4938	.4215	.4876	.7164	.5752
	51. R-103 60 Literature	.5635	.6124	.3857	.5092	.4354	.3414	.4722	.4113	.3606	.4575	.6653	.4856
	52. R-104 60 Music	.5319	.5635	.3482	.4642	.3829	.3100	.4440	.3582	.3112	.4264	.5875	.4497
	53. R-105 60 Soc. Stud.	.5317	.6469	.3811	.4707	.4443	.4030	.5372	.4559	.3847	.4904	.7043	.4799
	54. R-106 60 Math	.4755	.5701	.3888	.4790	.4642	.3426	.5562	.4239	3708	.5645	.6158	.4975
	55. R-107 60 Phys. Sci.	.4635	.5697	.3657	.4345	.3996	.3619	.5066	.4077	.3455	.4619	.6247	.4821
	56. R-108 60 Bio. Sci.	.4080	.5253	.3236	.3966	.3334	.3003	.4348	.3976	.3192	.4028	.5861	.4395
	57. R-109 60 Scient.Att	.3813	.4616	.2874	.3802	.2987	.3069	.4188	.3724	.3687	.3490	.5375	.4003
	58. R-110 60 Aero-Space	.4794	.5360	.2735	.3924	.3082	.2653	.4030	.3618	.3021	.3758	.5651	.4897
	59. R-111 60 Electronic	.3771	.4853	.2678	.3357	.2584	.2460	.3802	.3201	.2600	.3450	.4931	.4729
	60. R-112 60 Mechanics	.4164	.5159	.2444	.3836	.2731	.2974	.3712	.3767	.3061	.2785	.5009	.4797
	61. R-113 60 Farming	.3550	.4420	.2643	.3458	.2967	.2837	.3669	.3586	.2787	.2935	.4827	.3713
	62. R-114 60 Home Ec.	.3660	.4191	.2229	.3081	.2437	.2451	.3157	.2908	.2355	.2627	.4205	.3749
	63. R-115 60 Sports	.4405	.5016	.3055	.4230	.3770	.3598	.4131	.3662	.3346	.3785	.5194	.3626
	64. R-131 60 Art	.5590	.6533	.3259	.4649	.3647	.3564	.4387	.3854	.3576	.3992	.6185	.4925
	65. R-132 60 Law	.4826	.5852	.2801	.3757	.3346	.2878	.3935	.3567	.3278	.3642	.5458	.4134
	66. R-133 60 Health	.4963	.6383	.3230	.4561	.4126	.3553	.4506	.4046	.3505	.4021	.5925	.4357
	67. R-134 60 Engin.	.3828	.4808	.2519	.3220	.2559	.2909	.3561	.2908	.2769	.3155	.4792	.3926
	68. R-135 60 Arch.	.3472	.3802	.2281	.3059	.2441	.1988	.2697	.2395	.1887	.2712	.3742	.3215
	69. R-138 60 Military	.4175	.4400	.2365	.3349	.2902	.2401	.3292	.2951	.2413	.3201	.4469	.3594
	70. R-139 60 Acct,Busi.	.4858	.6390	.2615	.3591	.3093	.2869	.4061	.3665	.3114	.3576	.5284	.4224
	71. R-140 60 Prac.Knowl	.4425	.5304	.2550	.3821	.2881	.3357	.3932	.3366	.2980	.3049	.5075	.3839
	72. R-142 60 Bible	.4109	.4981	.3017	.3791	.3261	.2984	.4100	.3545	.2983	.4138	.5547	.3807
	73. R-145 60 Hunting	.0658	.1401	.0593	.1019	.0543	.0667	.0696	.1267	.1054	.0458	.1579	.1526
	74. R-146 60 Fishing	.1548	.2441	.1374	.1971	.1412	.1423	.1584	.1596	.1184	.1141	.2483	.2095
	75. R-147 60 Outdoor	.4556	.5908	.2667	.4052	.3133	.3335	.4159	.3610	.3356	.3689	.5697	.4538
	76. R-150 60 Theater		.6259	.2921	.4496	.3800	.3099	.4203	.3727	.3260	.3820	.5741	.4455
	77. R-162 60 Vocab. II	.6259		.3612	.5162	.4269	.3696	.5217	.4489	.4070	.4559	.6751	.5061
	78. R-212 60 Mem. Words	.2921	.3612		.3402	.3521	.2821	.3929	.3113	.2713	.3592	.4260	.2991
	79. R-220 60 Disg. Wds.	.4496	.5162	.3402		.4970	.3553	.4990	.4716	.3527	.4502	.5746	.4615
English Test	80. R-231 60 Spelling	.3800	.4269	.3521	.4970		.3853	.5346	.4338	.3506	.4318	.4955	.3313
	81. R-232 60 Capital.	.3099	.3696	.2821	.3553	.3853		.4714	.4190	.3508	.3242	.4517	.3272
	82. R-233 60 Punct.	.4203	.5217	.3929	.4990	.5346	.4714		.5353	.4537	.5630	.6056	.4408
	83. R-234 60 Eng. Usage	.3727	.4489	.3113	.4716	.4338	.4190	.5353		.4507	.4076	.5293	.3951
	84. R-235 60 Eff. Exp.	.3260	.4070	.2713	.3527	.3506	.3508	.4537	.4507		.3716	.5045	.3692
	85. R-240 60 Word.Funct	.3820	.4559	.3592	.4502	.4318	.3242	.5630	.4076	.3716		.5836	.4565
	86. R-250 60 Rdg. Compr	.5741	.6751	.4260	.5746	.4955	.4517	.6056	.5293	.5045	.5836		.6231
	87. R-260 60 Creativity	.4455	.5061	.2991	.4615	.3313	.3272	.4408	.3951	.3692	.4565	.6231	
	88. R-270 60 Mech.Reas	.3302	.4254	.2469	.4115	.2191	.3007	.4133	.3758	.3177	.3948	.5247	.5152
	89. R-281 60 Vis. 2 Dim	.2028	.2631	.1591	.3039	.1394	.1886	.2670	.2278	.2074	.2624	.3115	.3223
	90. R-282 60 Vis. 3 Dim	.2397	.3132	.2029	.2825	.1405	.1977	.3322	.2481	.2298	.3348	.3844	.4126
	91. R-290 60 Abst.Reas	.3118	.3875	.2931	.3492	.2652	.3133	.4574	.3436	.3564	.4255	.5035	.4360
Math Test	92. R-311 60 Aritn.Reas	.4035	.5343	.3561	.4249	.4103	.3818	.5729	.4720	.4234	.5382	.6027	.4964
	93. R-312 60 Int.HSMath	.4309	.5174	.3849	.4415	.4719	.3962	.6087	.4484	.3992	.5800	.5982	.4641
	94. R-333 60 Adv.HSMath	.1347	.1397	.1540	.1521	.1477	.1119	.1747	.1179	.0957	.1845	.1544	.1650
	95. F-410 60 Arith.Comp	.2470	.2807	.1981	.2337	.3059	.2933	.3368	.2850	.2866	.2762	.3546	.2244
	96. F-420 60 Table Read	.1603	.2002	.0923	.2029	.1824	.1998	.2300	.1900	.1903	.1789	.2385	.1852
	97. F-430 60 Cler.Check	.1883	.2188	.1614	.3351	.2967	.1884	.2703	.1931	.1877	.2467	.2788	.1965
	98. F-440 60 Obj.Insp.	.0936	.1291	.0953	.2033	.0838	.0980	.1343	.0936	.1176	.1274	.1555	.1808
	99. P*801 60 Socioecon.	.3371	.3742	.1831	.2729	.2021	.1991	.2715	.2571	.2175	.2928	.3563	.3065

TABLE 6-1a (continued)

88	89	90	91	92	93	94	95	96	97	98	99	Variable
.5261	.3082	.3693	.4265	.5513	.5312	.1466	.2977	.2084	.1881	.1549	.3725	1. R-102 63
.3979	.2502	.3116	.3585	.4817	.5342	.1318	.2530	.1787	.1961	.1777	.3648	2. R-103 63
.4080	.2392	.3142	.3731	.4489	.4798	.1644	.2681	.1724	.2052	.1431	.3925	3. R-104 63
.4251	.2580	.3139	.3883	.5135	.5104	.1431	.3086	.2041	.1775	.1447	.2831	4. R-105 63
.5017	.3367	.4199	.5069	.6233	.6776	.1948	.3228	.2160	.2294	.1803	.4053	5. R-106 63
.5376	.3081	.4021	.4597	.5718	.5661	.1701	.3001	.1855	.1855	.1772	.3480	6. R-107 63
.4377	.2022	.3000	.3367	.4268	.3940	.1354	.1795	.1144	.0981	.1194	.2241	7. R-108 63
.4019	.2447	.3012	.3763	.4534	.4343	.1271	.2274	.1678	.1510	.1762	.2683	8. R-109 63
.5260	.2904	.3704	.3765	.4477	.4147	.1318	.2009	.1550	.1509	.1532	.3177	9. R-110 63
.6083	.3153	.4429	.3984	.4773	.4271	.1419	.2066	.1419	.0945	.1232	.2989	10. R-111 63
.5063	.2475	.3213	.2834	.3492	.2748	.0776	.1532	.1011	.0475	.1262	.2162	11. R-112 63
.3392	.1779	.2004	.2227	.2910	.2563	.0516	.1761	.1264	.0984	.0882	.0698	12. R-113 63
.3431	.1989	.2574	.2539	.3151	.2998	.0924	.1791	.1312	.0774	.1089	.2122	13. R-114 63
.2586	.1706	.1453	.2875	.3856	.4025	.1262	.2984	.1993	.1917	.1072	.2803	14. R-115 63
.3992	.2120	.2819	.3485	.4003	.4392	.1357	.2259	.1384	.1464	.1283	.3335	15. R-131 63
.3506	.1840	.2394	.2898	.4491	.4307	.1325	.2003	.1522	.1290	.0949	.2849	16. R-132 63
.3832	.2269	.2560	.2816	.3869	.3996	.1148	.2153	.1502	.1340	.1120	.2743	17. R-133 63
.3661	.1929	.2311	.2639	.3253	.3124	.0757	.2078	.1405	.0867	.0905	.2012	18. R-134 63
.3439	.1806	.2603	.2968	.3632	.3795	.1176	.1607	.0727	.1159	.0981	.2713	19. R-135 63
.2785	.1493	.2187	.2281	.3575	.3654	.0522	.1923	.1144	.1427	.0786	.2634	20. R-138 63
.3247	.1741	.2308	.2782	.4402	.3861	.0659	.2224	.1690	.1465	.0932	.2884	21. R-139 63
.2782	.1807	.1849	.2302	.2848	.3243	.0742	.2027	.1940	.1668	.1347	.2233	22. R-140 63
.3217	.1165	.2275	.3176	.4154	.4333	.0637	.2063	.1073	.1267	.0601	.2005	23. R-142 63
.2016	.0897	.1118	.0485	.0698	.0482	.0008	.0313	-.0344	-.0479	.0526	-.0563	24. R-145 63
.2520	.1075	.1456	.1218	.2244	.1990	.0874	.1338	.0798	.0461	.0812	.0834	25. R-146 63
.4057	.2035	.2708	.3141	.3766	.4162	.0848	.2162	.1366	.1081	.1011	.3230	26. R-147 63
.3586	.2270	.2230	.2988	.4050	.4291	.0714	.2249	.1702	.1666	.1182	.3219	27. R-150 63
.4154	.2403	.2938	.3450	.4737	.4512	.0895	.2484	.1779	.1400	.1247	.3540	28. R-162 63
.2465	.2083	.2032	.3196	.3229	.3606	.0884	.1983	.1605	.2040	.0872	.1372	29. R-212 63
.3660	.2669	.2550	.3243	.3952	.3933	.1218	.1987	.1437	.2369	.1551	.3128	30. R-220 63
.1742	.1075	.1139	.2580	.3679	.4494	.0777	.2638	.2099	.3191	.1006	.1738	31. R-231 63
.2142	.1815	.1458	.2622	.2666	.2981	.0440	.2005	.2138	.2136	.0876	.1426	32. R-232 63
.3798	.2569	.2894	.4278	.5228	.5549	.1384	.2643	.2339	.2571	.1043	.2714	33. R-233 63
.3027	.1688	.1722	.3014	.3820	.3969	.0791	.2218	.1721	.2014	.0823	.2357	34. R-234 63
.2892	.1847	.2156	.3214	.3928	.3805	.0618	.2463	.2184	.2216	.0897	.2306	35. R-235 63
.3799	.2683	.3511	.4132	.5460	.5738	.1537	.2999	.2039	.2481	.1560	.3204	36. R-240 63
.4447	.2730	.3414	.4359	.5419	.5207	.1513	.3130	.1983	.2186	.1320	.3169	37. R-250 63
.4783	.3215	.3901	.4007	.4775	.4415	.1293	.2636	.1665	.1561	.1529	.2793	38. R-260 63
.6548	.3930	.4846	.4582	.4325	.4059	.1328	.1957	.1610	.1209	.1516	.2504	39. R-270 63
.4117	.4792	.4070	.3721	.2766	.2914	.0993	.1691	.1458	.1154	.1828	.1827	40. R-281 63
.5217	.3896	.5990	.4339	.3918	.3865	.1472	.2110	.1766	.1564	.2022	.2174	41. R-282 63
.4766	.3458	.4578	.5674	.4568	.4717	.1280	.2689	.1986	.1948	.1767	.2830	42. R-290 63
.4642	.2811	.3575	.4985	.6508	.5718	.1541	.3500	.2382	.2097	.0973	.3228	43. R-311 63
.4359	.2916	.3709	.5015	.6263	.6914	.2022	.3424	.2400	.2722	.1408	.3305	44. R-312 63
.3973	.2416	.3380	.4268	.5436	.6247	.2256	.2496	.1749	.2228	.0962	.3187	45. R-333 63
.1714	.1998	.1213	.2576	.3064	.3357	.0674	.4782	.2803	.2879	.1372	.1303	46. F-410 63
.1047	.1277	.0833	.1243	.1211	.1719	.0645	.1176	.1514	.1764	.1396	.1441	47. F-420 63
.1605	.1764	.0901	.1664	.1821	.2207	.0417	.1704	.1562	.2657	.1601	.1766	48. F-430 63
.2274	.2553	.2004	.2144	.1152	.1226	.0361	.1436	.1404	.1731	.2754	.1266	49. F-440 63
.5144	.2930	.3601	.4266	.5845	.5592	.1749	.2949	.1856	.2090	.1235	.4127	50. R-102 60
.3658	.2208	.2885	.3675	.4766	.5128	.1787	.2343	.1520	.2086	.1232	.3814	51. R-103 60
.3639	.2067	.2853	.3407	.4330	.4784	.1523	.2257	.1500	.1861	.1191	.3841	52. R-104 60
.4182	.2247	.3175	.4225	.5656	.5687	.1586	.3135	.1797	.2078	.0973	.3765	53. R-105 60
.4596	.2817	.3913	.4793	.6068	.6807	.2561	.2841	.1492	.2261	.1010	.3733	54. R-106 60
.4901	.2598	.3596	.4215	.5504	.5323	.1711	.2527	.1634	.1851	.0980	.3202	55. R-107 60
.4400	.2020	.2979	.3479	.4652	.4385	.1248	.1978	.1423	.1416	.0969	.2598	56. R-108 60
.3737	.2231	.2717	.3751	.4667	.4129	.1244	.2295	.1536	.1723	.1010	.2883	57. R-109 60
.4911	.2354	.3436	.3616	.4434	.4227	.1541	.1742	.1099	.1372	.0956	.3348	58. R-110 60
.5241	.2613	.3516	.3422	.4575	.3961	.1473	.1711	.0960	.0926	.0640	.2967	59. R-111 60
.5026	.2551	.3176	.3160	.4347	.3726	.1295	.1867	.1166	.1082	.1032	.2838	60. R-112 60
.3723	.2045	.2359	.2877	.3859	.3394	.0896	.2224	.1398	.1241	.0617	.1740	61. R-113 60
.3203	.1929	.2395	.2664	.3437	.3356	.1095	.1848	.1225	.1196	.0808	.2200	62. R-114 60
.2925	.2001	.1902	.3377	.4378	.4633	.1652	.2917	.1745	.2182	.1003	.3236	63. R-115 60
.3848	.2491	.3076	.3387	.4496	.4499	.1438	.2349	.1567	.2015	.1460	.3344	64. R-131 60
.3328	.2061	.2463	.2926	.4298	.4162	.1315	.2363	.1506	.1745	.0953	.2809	65. R-132 60
.3429	.2041	.2317	.3025	.4434	.4565	.1176	.2643	.1802	.2091	.1098	.3312	66. R-133 60
.3856	.1998	.2568	.2976	.3797	.3572	.1067	.2226	.1339	.1336	.0981	.2471	67. R-134 60
.2577	.1755	.1985	.2285	.3045	.2948	.1338	.1469	.0622	.1353	.0622	.2169	68. R-135 60
.2552	.1542	.2012	.2474	.3467	.3482	.1188	.1625	.1067	.1407	.0452	.2590	69. R-138 60
.3377	.2050	.2491	.2975	.4611	.4225	.1350	.2319	.1829	.1575	.0928	.2983	70. R-139 60
.3284	.2134	.2170	.3064	.3836	.3698	.1117	.2880	.2085	.1925	.1519	.2705	71. R-140 60
.2966	.1738	.2235	.2696	.4051	.4068	.1512	.2153	.1262	.1554	.0531	.2189	72. R-142 60
.1948	.1033	.0791	.0658	.0978	.0629	.0316	.0392	.0452	.0157	.0528	-.0045	73. R-145 60
.2197	.0969	.1050	.1115	.1794	.1329	.0717	.0954	.0563	.0868	.0924	.0621	74. R-146 60
.4184	.2458	.2810	.3473	.4335	.4308	.1390	.2554	.1714	.1633	.1336	.3482	75. R-147 60
.3302	.2028	.2397	.3118	.4035	.4309	.1347	.2470	.1603	.1883	.0936	.3371	76. R-150 60
.4254	.2631	.3132	.3875	.5343	.5174	.1397	.2807	.2002	.2188	.1291	.3742	77. R-162 60
.2469	.1591	.2029	.2931	.3561	.3849	.1540	.1981	.0923	.1614	.0953	.1831	78. R-212 60
.4115	.3039	.2825	.3492	.4249	.4415	.1521	.2337	.2029	.3351	.2033	.2729	79. R-220 60
.2191	.1394	.1405	.2652	.4103	.4719	.1477	.3059	.1824	.2967	.0838	.2021	80. R-231 60
.3007	.1886	.1977	.3133	.3818	.3962	.1119	.2933	.1998	.1884	.0980	.1991	81. R-232 60
.4133	.2670	.3322	.4574	.5729	.6087	.1747	.3368	.2300	.2703	.1343	.2715	82. R-233 60
.3758	.2278	.2481	.3436	.4720	.4484	.1179	.2850	.1900	.1931	.0936	.2571	83. R-234 60
.3177	.2074	.2298	.3564	.4234	.3992	.0957	.2866	.1903	.1877	.1176	.2175	84. R-235 60
.3948	.2624	.3348	.4255	.5382	.5800	.1845	.2762	.1789	.2467	.1274	.2928	85. R-240 60
.5247	.3115	.3844	.5035	.6027	.5982	.1544	.3546	.2385	.2788	.1555	.3563	86. R-250 60
.5152	.3223	.4126	.4360	.4964	.4641	.1650	.2244	.1852	.1965	.1808	.3065	87. R-260 60
	.4730	.5708	.5279	.4786	.4484	.1504	.2027	.1667	.1389	.2033	.2666	88. R-270 60
.4730		.4493	.3881	.2927	.2832	.0810	.1922	.2196	.1939	.2917	.1671	89. R-281 60
.5708	.4493		.5040	.4100	.3758	.1268	.1704	.1487	.1330	.2143	.2160	90. R-282 60
.5279	.3881	.5040		.4905	.4878	.1424	.2992	.2190	.2147	.1 97	.2851	91. R-290 60
.4786	.2927	.4100	.4905		.6390	.1887	.3421	.1853	.1846	.1094	.3313	92. R-311 60
.4484	.2832	.3758	.4878	.6390		.2437	.3500	.1835	.2223	.1124	.3292	93. R-312 60
.1504	.0810	.1268	.1424	.1887	.2437		.0472	-.0044	.0267	-.0067	.0823	94. R-333 60
.2027	.1922	.1704	.2992	.3421	.3500	.0472		.3042	.2953	.1354	.1282	95. F-410 60
.1667	.2196	.1487	.2190	.1853	.1835	-.0044	.3042		.3586	.3479	.1150	96. F-420 60
.1389	.1939	.1330	.2147	.1846	.2223	.0267	.2953	.3586		.3252	.1105	97. F-430 60
.2033	.2917	.2143	.1997	.1094	.1124	-.0067	.1354	.3479	.3252		.1115	98. F-440 60
.2666	.1671	.2160	.2851	.3313	.3292	.0823	.1282	.1150	.1105	.1115		99. P*801 60

---

[a] This matrix was obtained by the special procedure described in Chapter 3 for estimating correlations when data are missing, and for insuring that the matrix will be consistent. Retest weight Z was used.

[b] The unweighted numbers of cases on which each correlation coefficient is based may be determined from Table 2-5.

TABLE 6-1b. Consistent[a] matrix of correlation among 99 variables (aptitude information, achievement, socioeconomic index)

Matrix 1B. Based on females (matched cases only)[b]

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
Information Test	1. R-102 63 Vocab. I		.7329	.6710	.7228	.6592	.7153	.6089	.5650	.4998	.4880	.5093	.5783
	2. R-103 63 Literature	.7329		.6527	.7256	.6555	.6627	.5930	.4893	.4467	.4176	.3979	.5047
	3. R-104 63 Music	.6710	.6527		.6317	.5541	.5957	.5151	.4544	.4327	.4123	.4189	.4458
	4. R-105 63 Soc. Stud.	.7228	.7256	.6317		.6282	.6931	.5966	.4931	.4465	.4439	.3988	.5268
	5. R-106 63 Math	.6592	.6555	.5541	.6282		.7194	.5349	.4404	.4481	.4745	.3967	.4351
	6. R-107 63 Phys. Sci.	.7153	.6627	.5957	.6931	.7194		.6346	.4694	.5241	.5931	.4960	.5194
	7. R-108 63 Bio. Sci.	.6089	.5930	.5151	.5966	.5349	.6346		.4313	.4491	.4279	.4474	.5091
	8. R-109 63 Scient.Att	.5650	.4893	.4544	.4931	.4404	.4694	.4313		.3801	.3295	.3861	.4168
	9. R-110 63 Aero-Space	.4998	.4467	.4327	.4465	.4481	.5241	.4491	.3801		.4603	.4446	.3737
	10. R-111 63 Electronic	.4880	.4176	.4173	.4439	.4745	.5931	.4279	.3295	.4603		.4943	.4089
	11. R-112 63 Mechanics	.5093	.3979	.4189	.3988	.3967	.4960	.4474	.3861	.4446	.4943		.5400
	12. R-113 63 Farming	.5783	.5047	.4458	.5268	.4351	.5194	.5091	.4168	.3737	.4089	.5400	
	13. R-114 63 Home Ec.	.4701	.3802	.4083	.4167	.3498	.4085	.4186	.3685	.3161	.3257	.4576	.4684
	14. R-115 63 Sports	.5477	.5127	.5171	.5289	.5029	.5024	.4217	.3964	.4061	.3521	.3927	.4157
	15. R-131 63 Art	.6636	.6266	.5648	.5703	.4487	.5227	.4878	.4513	.4125	.2998	.4488	.4595
	16. R-132 63 Law	.5829	.5693	.5287	.5759	.4272	.4813	.4358	.4337	.4349	.3609	.4445	.4589
	17. R-133 63 Health	.5639	.5312	.5080	.5152	.3988	.4767	.4493	.4143	.3562	.3114	.4192	.4838
	18. R-134 63 Engin.	.4466	.3922	.4073	.3743	.3552	.4326	.3711	.3601	.3189	.3582	.4484	.4401
	19. R-135 63 Arch.	.4208	.4297	.4190	.4193	.3350	.4224	.3957	.2805	.3001	.3501	.3217	.3147
	20. R-138 63 Military	.4433	.4487	.4190	.4765	.3056	.3812	.3043	.2534	.2964	.3149	.2852	.2715
	21. R-139 63 Acct,Busi.	.6013	.5520	.5540	.6165	.4495	.4799	.3794	.4298	.3860	.2818	.3973	.4675
	22. R-140 63 Prac.Knowl	.4401	.4260	.4010	.4183	.2906	.3305	.2963	.3477	.2320	.2504	.3097	.3062
	23. R-142 63 Bible	.5213	.5573	.4782	.5299	.3875	.5039	.4356	.3597	.3157	.3396	.3580	.3948
	24. R-145 63 Hunting	.1160	.0538	.0402	.1212	.0547	.1527	.1687	.0252	.1114	.2095	.2541	.2478
	25. R-146 63 Fishing	.0558	.0474	.0760	.0459	.0225	.0721	.1160	.0594	.0933	.1896	.2198	.0968
	26. R-147 63 Outdoor	.5310	.4997	.4633	.4946	.4704	.4706	.4347	.3769	.3848	.3385	.3850	.3912
	27. R-150 63 Theater	.6726	.6318	.6186	.6014	.5436	.5301	.4655	.4599	.4366	.2889	.3873	.4164
	28. R-162 63 Vocab. II	.6939	.6373	.5925	.6439	.5327	.5657	.5007	.4738	.4297	.3153	.4265	.5099
	29. R-212 63 Mem. Words	.4239	.4022	.3784	.4054	.4301	.3532	.3035	.2576	.2272	.2384	.2035	.2633
English Test	30. R-220 63 Disg. Wds.	.5124	.4857	.4406	.4097	.4675	.4635	.3829	.3532	.2849	.3215	.2763	.2924
	31. R-231 63 Spelling	.4472	.4707	.3502	.4064	.3930	.3291	.2924	.2439	.1175	.2071	.1654	.2818
	32. R-232 63 Capital.	.3084	.3292	.2569	.3022	.2568	.2825	.2286	.1885	.1456	.1600	.1702	.2868
	33. R-233 63 Punct.	.5708	.6223	.4907	.5663	.5752	.5046	.4288	.3843	.2252	.2826	.2860	.4191
	34. R-234 63 Eng. Usage	.5000	.5090	.3766	.4564	.4855	.4249	.3594	.3576	.2643	.2756	.2382	.4026
	35. R-235 63 Eff. Exp.	.4565	.4412	.3861	.4375	.4583	.4066	.3584	.3962	.2031	.2551	.2752	.3826
	36. R-240 63 Word.Funct	.5639	.5618	.4962	.5777	.5965	.5587	.4663	.4445	.3616	.3039	.3441	.4284
	37. R-250 63 Rdg. Compr	.7007	.6948	.6206	.7034	.5830	.6239	.5623	.5739	.4671	.4130	.4635	.5576
	38. R-260 63 Creativity	.5742	.5273	.4342	.4725	.5189	.5117	.4978	.4434	.4308	.4030	.4522	.4360
	39. R-270 63 Mech.Reas	.5161	.4234	.4246	.4280	.5339	.5455	.4791	.3889	.4694	.4157	.4331	.3902
	40. R-281 63 Vis. 2 Dim	.2982	.2413	.2346	.2476	.3309	.3109	.2858	.2162	.2584	.2505	.2428	.2602
	41. R-282 63 Vis. 3 Dim	.4605	.3765	.3597	.3602	.4483	.4536	.4099	.3705	.3845	.3600	.4073	.3494
	42. R-290 63 Abst.Reas	.5047	.4495	.4196	.4584	.4699	.4697	.3871	.4226	.3160	.2878	.3387	.3713
Math Test	43. R-311 63 Arith.Reas	.6249	.5479	.4866	.5838	.6514	.5882	.4625	.4620	.2940	.3810	.3802	.4864
	44. R-312 63 Int.HSMath	.5539	.5754	.5075	.5886	.8310	.6332	.4751	.4039	.3180	.4403	.3247	.3826
	45. R-333 63 Adv.HSMath	.3764	.4116	.3581	.3911	.6756	.5020	.3105	.2491	.2728	.3286	.2121	.2256
	46. F-410 63 Arith.Comp	.3939	.2992	.3289	.3475	.3835	.3218	.2126	.2779	.1348	.2703	.2551	.3225
	47. F-420 63 Table Read	.2816	.1928	.1882	.2145	.2392	.2637	.1632	.2272	.1866	.1862	.1767	.1614
	48. F-430 63 Cler.Check	.2568	.1887	.1292	.2110	.2625	.2350	.1849	.1362	.1635	.1949	.1298	.1339
	49. F-440 63 Obj.Insp.	.3061	.2127	.2240	.2081	.2516	.2796	.2431	.2010	.2395	.2545	.2854	.2152
Information Test	50. R-102 60 Vocab. I	.7569	.6674	.6329	.6516	.6034	.6594	.5779	.4918	.4655	.4616	.4570	.5107
	51. R-103 60 Literature	.6158	.7143	.5726	.5979	.5452	.5655	.4771	.4157	.3831	.3705	.3293	.3799
	52. R-104 60 Music	.6062	.5902	.7367	.5829	.5253	.5515	.4536	.3922	.3863	.3805	.3738	.3951
	53. R-105 60 Soc. Stud.	.6919	.6851	.6118	.7924	.6182	.6645	.5681	.4602	.4086	.4339	.3836	.4737
	54. R-106 60 Math	.5758	.5646	.5004	.5445	.6840	.5917	.4708	.3757	.3638	.3500	.3333	.3777
	55. R-107 60 Phys. Sci.	.5929	.5504	.4793	.5848	.5446	.7066	.5280	.3796	.3930	.4524	.3648	.4044
	56. R-108 60 Bio. Sci.	.5288	.5166	.4514	.5185	.4615	.5490	.6169	.3919	.3587	.3839	.4017	.4706
	57. R-109 60 Scient.Att	.5010	.4463	.4144	.4439	.3963	.4389	.3862	.5155	.3096	.2976	.3289	.3922
	58. R-110 60 Aero-Space	.4036	.3895	.3565	.3721	.3885	.4313	.3414	.2737	.4732	.3212	.2793	.2474
	59. R-111 60 Electronic	.3682	.3242	.2810	.3395	.3435	.4288	.3181	.2328	.2740	.4572	.3019	.2873
	60. R-112 60 Mechanics	.4367	.3568	.3609	.3576	.3475	.4184	.3980	.3085	.3408	.3776	.5746	.4471
	61. R-113 60 Farming	.5487	.4863	.4378	.5022	.4248	.5119	.5083	.3875	.3768	.3848	.5098	.6893
	62. R-114 60 Home Ec.	.4753	.4235	.4254	.4211	.3975	.4208	.4102	.3887	.3037	.3227	.4188	.4334
	63. R-115 60 Sports	.4896	.4664	.4647	.4756	.4667	.4410	.3531	.3344	.3341	.2879	.3469	.3932
	64. R-131 60 Art	.6363	.6128	.5692	.5661	.5034	.5258	.4893	.4331	.3854	.3540	.3920	.4253
	65. R-132 60 Law	.4509	.4391	.3984	.4228	.3794	.4169	.3567	.3398	.3250	.2978	.3135	.3371
	66. R-133 60 Health	.5819	.5388	.4988	.5258	.4408	.5072	.4743	.4023	.3424	.3342	.3600	.4074
	67. R-134 60 Engin.	.4244	.3587	.3845	.3598	.3379	.3719	.3596	.3165	.2752	.3259	.3612	.3400
	68. R-135 60 Arch.	.3570	.3413	.3111	.3433	.3042	.3160	.2682	.2001	.2210	.2275	.2100	.2614
	69. R-138 60 Military	.2970	.2724	.2848	.2960	.2848	.2729	.2197	.1785	.1891	.2036	.2052	.1978
	70. R-139 60 Acct,Busi.	.5415	.5168	.4570	.5128	.4744	.4792	.3974	.3659	.3253	.3267	.3285	.3780
	71. R-140 60 Prac.Knowl	.4313	.3857	.3532	.4017	.3356	.3525	.3166	.3825	.2501	.2290	.2799	.2882
	72. R-142 60 Bible	.4801	.5256	.4322	.5082	.4251	.4598	.4225	.3596	.3104	.3050	.3185	.4056
	73. R-145 60 Hunting	.1073	.0396	.0514	.0936	.0660	.0991	.0858	.0484	.0890	.0959	.1426	.1376
	74. R-146 60 Fishing	.0537	.0566	.0555	.0502	.0611	.0606	.0940	.0431	.0595	.0589	.0762	.0646
	75. R-147 60 Outdoor	.5313	.4687	.4771	.4695	.4394	.4722	.4128	.3925	.3521	.3189	.3440	.3749
	76. R-150 60 Theater	.5804	.5712	.5287	.5153	.4708	.4616	.3884	.3744	.3627	.3031	.3148	.3726
	77. R-162 60 Vocab. II	.6658	.6242	.5813	.6076	.5394	.5691	.5045	.4713	.3808	.3806	.4083	.4604
	78. R-212 60 Mem. Words	.4408	.4434	.3843	.4343	.4216	.4146	.3415	.3017	.2373	.2514	.2418	.2796
English Test	79. R-220 60 Diag. Wds.	.5463	.4923	.4910	.4606	.4541	.4460	.4102	.3671	.2888	.2789	.2958	.3562
	80. R-231 60 Spelling	.4584	.4425	.3841	.4126	.4283	.4019	.3128	.2939	.1956	.2434	.2052	.3037
	81. R-232 60 Capital.	.3508	.3428	.2997	.3373	.2806	.2918	.2452	.2536	.1770	.1847	.2159	.2875
	82. R-233 60 Punct.	.5880	.5653	.5022	.5566	.5623	.5822	.4451	.4349	.3246	.3492	.3341	.4363
	83. R-234 60 Eng. Usage	.4802	.4764	.4002	.4421	.4054	.4072	.3292	.3456	.2558	.2793	.2849	.3504
	84. R-235 60 Eff. Exp.	.4296	.4309	.3690	.3916	.3832	.3831	.3212	.3521	.2371	.2400	.2362	.2863
	85. R-240 60 Word.Funct	.5534	.5541	.4408	.5235	.5983	.5315	.4368	.4118	.3325	.3269	.2871	.3765
	86. R-250 60 Rdg. Compr	.7369	.7039	.6220	.6927	.6161	.6526	.5909	.5366	.4476	.4142	.4434	.5320
	87. R-260 60 Creativity	.5325	.4732	.4544	.4547	.4754	.4937	.4620	.3913	.3707	.3671	.4274	.4063
	88. R-270 60 Mech.Reas	.4869	.3966	.4034	.4080	.4685	.5047	.4169	.3799	.4164	.3817	.4232	.3774
	89. R-281 60 Vis. 2 Dim	.3385	.2916	.2789	.3033	.3558	.3291	.2588	.3213	.2512	.2414	.2893	.3036
	90. R-282 60 Vis. 3 Dim	.3981	.3403	.3240	.3593	.4131	.4136	.3359	.3384	.3058	.3018	.3199	.2962
	91. R-290 60 Abst.Reas	.5066	.4298	.4272	.4497	.4921	.4808	.4003	.4072	.3311	.3123	.3320	.3510
Math Test	92. R-311 60 Arith.Reas	.6009	.5363	.4804	.5616	.5945	.5871	.4572	.4488	.3666	.3752	.3902	.4393
	93. R-312 60 Int.HSMath	.5779	.5624	.4788	.5543	.6666	.5851	.4399	.4122	.3711	.3884	.3520	.3870
	94. R-333 60 Adv.HSMath	.1172	.0853	.1026	.0977	.1597	.1306	.1057	.1159	.0802	.1010	.0861	.0647
	95. F-410 60 Arith.Comp	.3200	.2944	.2914	.3096	.3190	.2850	.2332	.2325	.1691	.1902	.1677	.2333
	96. F-420 60 Table Read	.2048	.2005	.1886	.1715	.1859	.1767	.1168	.1798	.1329	.1384	.1474	.1734
	97. F-430 60 Cler.Check	.1853	.1972	.1622	.1664	.1984	.1637	.1237	.1376	.1089	.0890	.0636	.1438
	98. F-440 60 Obj.Insp.	.2142	.2016	.2041	.1736	.2296	.2022	.1722	.1967	.1504	.1398	.1586	.1656
	99. P*801 60 Socioecon.	.4079	.4200	.4474	.3841	.4059	.3535	.2824	.3001	.2562	.2022	.1872	.2015

TABLE 6-1b (continued)

13	14	15	16	17	18	19	20	21	22	23	24	25	Variable
.4701	.5477	.6636	.5829	.5639	.4466	.4208	.4433	.6013	.4401	.5213	.1160	.0558	1. R-102 63
.3802	.5127	.6266	.5693	.5312	.3922	.4297	.4487	.5520	.4260	.5573	.0538	.0474	2. R-103 63
.4083	.5171	.5648	.5289	.5080	.4073	.4190	.4190	.5540	.4010	.4782	.0402	.0760	3. R-104 63
.4167	.5289	.5763	.5759	.5152	.3743	.4193	.4765	.6165	.4183	.5299	.1212	.0459	4. R-105 63
.3498	.5029	.4487	.4272	.3988	.3552	.3350	.3056	.4495	.2906	.3875	.0547	.0225	5. R-106 63
.4085	.5024	.5227	.4813	.4767	.4326	.4224	.3812	.4799	.3305	.5039	.1527	.0721	6. R-107 63
.4186	.4217	.4878	.4358	.4493	.3711	.3957	.3043	.3794	.2963	.4356	.1687	.1160	7. R-108 63
.3685	.3964	.4513	.4337	.4143	.3601	.2805	.2534	.4298	.3477	.3597	.0252	.0594	8. R-109 63
.3161	.4061	.4125	.4349	.3562	.3189	.3001	.2964	.3860	.2320	.3157	.1114	.0933	9. R-110 63
.3257	.3521	.2998	.3609	.3114	.3582	.3501	.3149	.2818	.2504	.3396	.2035	.1896	10. R-111 63
.4576	.3927	.4488	.4445	.4192	.4484	.3217	.2852	.3973	.3097	.3580	.2541	.2198	11. R-112 63
.4684	.4157	.4595	.4589	.4838	.4401	.3147	.2715	.4675	.3062	.3948	.2478	.0968	12. R-113 63
	.3627	.4182	.3786	.4340	.4053	.2724	.2507	.4578	.2960	.3103	.2014	.0691	13. R-114 63
.3627		.4262	.4669	.3917	.2931	.3445	.3491	.4412	.3432	.2964	.0809	.0646	14. R-115 63
.4182	.4262		.5129	.5099	.3781	.4525	.3986	.4802	.4299	.4532	.0514	.1069	15. R-131 63
.3786	.4669	.5129		.4279	.3496	.3610	.3995	.4890	.3672	.4442	.0869	.0947	16. R-132 63
.4340	.3917	.5099	.4279		.3343	.3276	.3347	.4210	.3943	.4278	.0814	.0759	17. R-133 63
.4053	.2931	.3781	.3496	.3343		.2441	.2478	.3199	.3034	.3176	.1543	.1249	18. R-134 63
.2724	.3445	.4525	.3610	.3276	.2441		.2971	.3144	.2579	.3400	.0639	.1024	19. R-135 63
.2507	.3491	.3986	.3995	.3347	.2478	.2971		.3200	.2591	.3282	.0883	.0897	20. R-138 63
.4578	.4412	.4802	.4890	.4210	.3199	.3144	.3200		.3768	.3546	.0629	.0752	21. R-139 63
.2960	.3432	.4299	.3672	.3943	.3034	.2579	.2591	.3768		.3087	.0444	.0510	22. R-140 63
.3103	.2964	.4532	.4442	.4278	.3176	.3400	.3282	.3546	.3087		.1101	.0719	23. R-142 63
.2014	.0809	.0514	.0869	.0814	.1543	.0639	.0883	.0629	.0444	.1101		.0769	24. R-145 63
.0691	.0646	.1069	.0947	.0759	.1249	.1024	.0897	.0752	.0510	.0719	.0969		25. R-146 63
.3903	.4240	.4700	.4093	.3930	.3569	.3127	.2904	.3891	.3486	.3310	.0818	.1165	26. R-147 63
.3865	.4979	.6300	.5221	.4934	.3678	.4058	.3878	.5189	.4132	.4118	.0555	.0759	27. R-150 63
.4703	.4401	.5960	.5468	.5521	.3541	.3650	.3683	.6174	.3897	.4343	.0699	.0680	28. R-162 63
.1815	.3316	.4142	.4019	.3424	.2006	.3312	.3276	.3179	.2674	.4105	.0680	.0845	29. R-212 63
.1809	.3787	.4210	.2739	.3056	.1289	.2610	.2139	.3102	.2018	.2805	.0263	.0024	30. R-220 63
.1821	.3014	.3935	.3637	.3521	.2075	.3207	.2877	.3228	.2782	.3008	.0413	.1189	31. R-231 63
.1914	.2488	.3041	.3073	.3591	.1588	.2174	.2539	.2527	.2487	.2537	.0462	-.0193	32. R-232 63
.2797	.4227	.4100	.4333	.4017	.2404	.3441	.3327	.4467	.3205	.3682	.0178	.0961	33. R-233 63
.2537	.3481	.3932	.3637	.4423	.2222	.3239	.3020	.3314	.2500	.3902	-.0278	.0928	34. R-234 63
.3228	.3352	.4007	.3489	.3165	.2192	.2892	.3051	.3738	.2386	.3490	.0309	.0182	35. R-235 63
.3063	.4028	.4303	.4786	.4149	.2878	.3538	.3278	.4334	.3463	.4421	.0324	-.0141	36. R-240 63
.4316	.4365	.6593	.5921	.5332	.3727	.4540	.3957	.5477	.4343	.5894	.0852	.0601	37. R-250 63
.3442	.4328	.4514	.4010	.3401	.2397	.2970	.3467	.4087	.2693	.3494	.0618	.1292	38. R-260 63
.3124	.3392	.3617	.3103	.2402	.2375	.1994	.3138	.3252	.2138	.2695	.0759	.0559	39. R-270 63
.1901	.2413	.1824	.1109	.1641	.1959	.0952	.1388	.1851	.1085	.1681	.0184	.0692	40. R-281 63
.3487	.2729	.2994	.2742	.2973	.2557	.2390	.2377	.2872	.2171	.3419	.0313	.0499	41. R-282 63
.3545	.3733	.4419	.4028	.3730	.2972	.2932	.2555	.4217	.3235	.3415	.0600	.0876	42. R-290 63
.3880	.4543	.4597	.4867	.4097	.3063	.3667	.3170	.5506	.2957	.4309	.0398	.0821	43. R-311 63
.3153	.4316	.4262	.4209	.3997	.2493	.3786	.3544	.4330	.2938	.3803	.0268	.0756	44. R-312 63
.1562	.3333	.3747	.3444	.3013	.2374	.3603	.3101	.2922	.2234	.2891	-.0027	.0939	45. R-333 63
.2407	.2923	.2788	.2806	.2709	.1308	.1947	.2223	.3581	.3003	.2836	.0574	.0756	46. F-410 63
.0779	.2070	.2335	.1238	.3287	.1125	.1221	.1001	.2014	.2185	.1848	.0335	.0522	47. F-420 63
.0140	.1715	.0786	.1297	.1517	.0835	.1009	.1103	.1461	.0802	.0419	.0634	.0876	48. F-430 63
.1164	.2103	.1715	.0912	.2200	.1999	.0875	.1085	.1276	.1700	.0702	.0104	.0306	49. F-440 63
.4106	.5099	.6012	.5374	.5158	.3652	.4802	.4426	.5313	.3730	.4883	.0720	.0771	50. R-102 60
.3220	.4263	.5957	.4674	.4509	.2752	.4627	.3933	.4502	.3275	.4707	.0620	.0605	51. R-103 60
.3790	.4966	.5522	.4643	.4326	.3138	.4246	.4163	.4725	.3356	.3980	.0395	.0561	52. R-104 60
.3830	.5205	.5979	.5614	.4904	.3495	.4607	.4497	.5126	.3634	.5124	.0990	.0446	53. R-105 60
.3268	.4140	.4524	.4496	.3945	.3265	.4041	.3683	.4389	.2970	.3815	.0348	.0762	54. R-106 60
.3242	.4186	.4923	.4428	.4359	.3486	.3890	.3324	.4310	.2868	.4042	.1054	.0628	55. R-107 60
.3977	.3735	.4449	.4162	.4111	.3037	.3332	.2982	.3567	.2676	.3829	.1087	.1149	56. R-108 60
.3342	.3195	.4205	.4053	.3812	.2969	.2831	.2986	.3818	.3206	.3748	.0833	.0435	57. R-109 60
.2220	.3009	.3201	.3074	.2847	.2084	.2523	.2699	.2700	.1994	.2651	.0596	.0979	58. R-110 60
.2358	.2465	.2583	.2453	.2220	.2023	.2572	.1936	.2410	.1557	.2249	.0777	.0925	59. R-111 60
.3749	.3149	.3547	.3579	.2950	.2987	.2568	.2658	.3289	.2185	.2609	.1589	.1651	60. R-112 60
.4460	.3799	.4633	.4655	.4286	.4035	.3267	.2844	.4390	.2844	.3875	.1769	.1074	61. R-113 60
.6432	.3890	.3945	.3927	.3684	.3433	.3115	.2510	.3807	.2978	.2805	.1012	.0759	62. R-114 60
.3264	.6066	.4111	.4009	.3556	.2450	.3172	.3122	.3685	.3039	.2647	.0365	.0870	63. R-115 60
.3500	.4393	.6675	.4512	.4605	.3340	.4092	.3588	.4447	.3644	.3910	.0345	.0642	64. R-131 60
.2794	.3586	.4001	.4436	.3329	.2345	.2824	.2821	.3703	.2588	.3308	.0350	.0233	65. R-132 60
.3728	.3997	.4869	.4131	.5462	.3504	.3658	.3110	.4311	.3100	.3668	.0429	.0477	66. R-133 60
.3184	.3016	.3389	.3202	.3142	.4117	.2708	.2078	.3271	.2493	.2433	.0629	.0965	67. R-134 60
.2403	.2781	.3201	.2725	.2556	.1781	.3594	.2340	.2686	.2130	.2554	.0397	.0438	68. R-135 60
.1609	.2486	.2667	.2872	.2228	.1645	.2015	.3388	.2529	.2099	.2500	.0418	.0445	69. R-138 60
.3145	.3581	.4368	.3919	.3338	.2285	.3297	.3071	.5194	.2857	.3370	.0307	.0271	70. R-139 60
.2821	.3140	.4166	.3295	.2952	.2530	.2588	.2504	.3622	.4285	.2677	.0072	-.0096	71. R-140 60
.3216	.2955	.4258	.3709	.3880	.2577	.3236	.3063	.3308	.2939	.7623	.0724	.0242	72. R-142 60
.0822	.0530	.0732	.0602	.0673	.1173	.0215	.0587	.0639	.0314	.0581	.2394	.0722	73. R-145 60
.0551	.0961	.0710	.0443	.0478	.0387	.0196	.0248	.0586	.0462	.0200	.0525	.2377	74. R-146 60
.3555	.4079	.4459	.3920	.3779	.3142	.3457	.2661	.3836	.3363	.3030	.0007	.1024	75. R-147 60
.3085	.4378	.5481	.4333	.4009	.3080	.3984	.3416	.4580	.3294	.3232	.0102	.0503	76. R-150 60
.3983	.4274	.5761	.4717	.4770	.3328	.3924	.3569	.4974	.3700	.4325	.0055	.0457	77. R-162 60
.2205	.3216	.3293	.2839	.3014	.1914	.2635	.2264	.2797	.2076	.2769	.0299	-.0023	78. R-212 60
.2604	.3796	.4386	.3662	.3954	.2726	.3239	.2944	.3722	.3095	.3224	.0342	.0560	79. R-220 60
.1989	.3053	.3466	.3089	.3311	.2079	.2939	.2566	.3260	.2233	.2745	.0483	.0315	80. R-231 60
.2225	.2536	.4075	.3737	.3798	.2536	.2769	.2545	.3936	.2925	.3082	.0067	.0386	81. R-232 60
.3185	.3922	.4573	.4577	.4282	.2937	.3663	.3282	.4484	.3260	.4083	.0631	.0433	82. R-233 60
.2576	.3006	.4255	.3752	.3688	.2450	.3089	.2852	.3586	.2667	.3157	.0328	.0538	83. R-234 60
.2730	.2714	.3602	.3395	.3182	.2104	.2556	.2224	.3304	.2465	.3109	.0218	.0405	84. R-235 60
.2633	.3808	.4266	.4013	.3692	.2564	.3915	.2968	.3968	.2911	.3924	.0208	.0266	85. R-240 60
.4138	.4987	.6220	.5643	.5287	.3778	.4482	.4029	.5155	.3786	.5527	.0581	.0680	86. R-250 60
.3500	.3669	.4477	.3912	.3560	.2979	.3212	.2397	.4036	.2658	.3438	.0522	.0808	87. R-260 60
.3300	.3508	.3941	.3374	.3104	.2914	.2645	.2728	.3283	.2477	.2987	.0803	.1013	88. R-270 60
.2579	.2727	.2798	.2113	.2264	.2181	.1340	.1558	.2501	.2093	.1814	.0134	.0719	89. R-281 60
.2952	.2752	.2977	.2832	.2595	.2357	.2146	.1705	.2758	.2090	.2502	.0248	.0521	90. R-282 60
.3175	.3378	.4082	.3683	.3584	.2669	.2988	.2651	.3617	.2695	.3273	.0425	.0639	91. R-290 60
.3457	.3829	.4111	.4628	.3830	.3004	.3320	.3297	.4916	.3052	.3976	.0629	.0303	92. R-311 60
.3180	.4227	.4512	.4338	.4058	.2972	.3446	.3150	.4421	.3140	.4049	.0185	.0414	93. R-312 60
.0653	.1087	.0814	.0534	.0746	.0787	.0674	.0370	.0746	.0939	.0546	.0323	.0444	94. R-333 60
.1893	.2677	.2424	.2414	.2854	.1591	.1850	.1564	.3140	.2435	.1865	.0279	.0109	95. F-410 60
.1461	.1817	.1665	.1528	.2170	.1325	.0851	.1104	.1635	.1751	.1326	.0391	.0065	96. F-420 60
.0696	.1454	.1432	.1296	.1160	.0812	.1438	.0928	.1032	.1343	.0716	.0198	.0223	97. F-430 60
.1593	.1848	.1570	.1169	.1638	.0972	.0831	.0810	.1037	.1262	.0646	.0263	.0196	98. F-440 60
.1870	.3398	.3930	.3032	.2599	.2069	.3039	.2633	.2811	.2496	.1608	-.0500	-.0102	99. P*801 60

TABLE 6-1b (continued)

	Variable	26	27	28	29	30	31	32	33	34	35	36	37
Information Test	1. R-102 63 Vocab. I	.5310	.6726	.6939	.4239	.5124	.4472	.3084	.5708	.5000	.4565	.5634	.7007
	2. R-103 63 Literature	.4997	.6318	.6373	.4022	.4859	.4707	.3292	.6223	.5090	.4412	.5518	.6948
	3. R-104 63 Music	.4633	.6186	.5925	.3784	.4406	.3502	.2569	.4907	.3766	.3861	.4362	.6206
	4. R-105 63 Soc. Stud.	.4946	.6014	.6439	.4054	.4097	.4064	.3022	.5663	.4564	.4375	.5777	.7034
	5. R-106 63 Math	.4704	.5436	.5327	.4301	.4675	.3930	.2568	.5752	.4855	.4583	.5965	.5830
	6. R-107 63 Phys. Sci.	.4706	.5301	.5657	.3532	.4635	.3291	.2825	.5046	.4249	.4066	.5587	.6239
	7. R-108 63 Bio. Sci.	.4347	.4655	.5007	.3035	.3829	.2924	.2286	.4288	.3594	.3584	.4663	.5623
	8. R-109 63 Scient.Att	.3769	.4599	.4738	.2576	.3532	.2439	.1885	.3843	.3576	.3962	.4445	.5739
	9. R-110 63 Aero-Space	.3848	.4366	.4297	.2272	.2849	.1175	.1456	.2252	.2643	.2031	.3616	.4671
	10. R-111 63 Electronic	.3385	.2889	.3153	.2384	.3215	.2071	.1600	.2826	.2756	.2551	.3033	.4135
	11. R-112 63 Mechanica	.3850	.3873	.4265	.2035	.2763	.1654	.1702	.2860	.2382	.2752	.3441	.4635
	12. R-113 63 Farming	.3912	.4164	.5099	.2633	.2924	.2818	.2868	.4191	.4026	.3826	.4284	.5576
	13. R-114 63 Home Ec.	.3903	.3865	.4703	.1815	.1809	.1821	.1914	.2797	.2537	.3228	.3063	.4316
	14. R-115 63 Sports	.4240	.4979	.4401	.3316	.3787	.3014	.2488	.4227	.3481	.3352	.4028	.4365
	15. R-131 63 Art	.4700	.6300	.5960	.4142	.4210	.3935	.3041	.4100	.3932	.4007	.4303	.6593
	16. R-132 63 Law	.4093	.5221	.5468	.4019	.2739	.3637	.3073	.4333	.3637	.3489	.4786	.5921
	17. R-133 63 Health	.3930	.4934	.5521	.3424	.3056	.3521	.3591	.4017	.4423	.3165	.4149	.5332
	18. R-134 63 Engin.	.3569	.3678	.3541	.2006	.1289	.2075	.1588	.2404	.2222	.2172	.2878	.3727
	19. R-135 63 Arch.	.3127	.4058	.3650	.3312	.2610	.3207	.2174	.3441	.3239	.2892	.3538	.4540
	20. R-138 63 Military	.2904	.3878	.3683	.3276	.2139	.2877	.2539	.3327	.3020	.3051	.3278	.3957
	21. R-139 63 Acct,Busi.	.3891	.5189	.6174	.3179	.3102	.3228	.2527	.4467	.3314	.3738	.4334	.5477
	22. R-140 63 Prac.Knowl	.3486	.4132	.3897	.2674	.2018	.2782	.2487	.3205	.2500	.2386	.3463	.4343
	23. R-142 63 Bible	.3310	.4118	.4343	.4105	.2805	.3008	.2537	.3682	.3902	.3490	.4421	.5894
	24. R-145 63 Hunting	.0818	.0555	.0699	.0680	.0263	.0413	.0462	.0178	-.0279	.0309	.0324	.0852
	25. R-146 63 Fishing	.1165	.0759	.0680	.0845	.0024	.1189	-.0193	.0961	.0928	.0182	-.0141	.0601
	26. R-147 63 Outdoor		.4456	.5215	.3260	.2270	.3215	.2635	.4011	.3237	.3319	.3703	.5262
	27. R-150 63 Theater	.4456		.5830	.4171	.3470	.3722	.2847	.4318	.3711	.4050	.4155	.5625
	28. R-162 63 Vocab. II	.5215	.5830		.3954	.3497	.3747	.2952	.4254	.4476	.3565	.4792	.6241
	29. R-212 63 Mem. Words	.3260	.4171	.3954		.3676	.3914	.2690	.4802	.4230	.3624	.4809	.5187
	30. R-220 63 Disg. Wds.	.2270	.3470	.3497	.3676		.5222	.3565	.5640	.4865	.4399	.4707	.5094
English Test	31. R-231 63 Spelling	.3215	.3722	.3747	.3914	.5222		.4326	.5797	.5176	.4051	.4949	.4870
	32. R-232 63 Capital.	.2635	.2847	.2952	.2690	.3565	.4326		.5039	.4960	.4155	.2495	.3295
	33. R-233 63 Punct.	.4011	.4318	.4254	.4802	.5640	.5797	.5039		.6265	.5567	.6173	.6356
	34. R-234 63 Eng. Usage	.3237	.3711	.4476	.4230	.4865	.5176	.4960	.6265		.5291	.4184	.4976
	35. R-235 63 Eff. Exp.	.3319	.4050	.3565	.3624	.4399	.4051	.4150	.5567	.5291		.4312	.5081
	36. R-240 63 Word.Funct	.3703	.4155	.4792	.4809	.4707	.4949	.2495	.6173	.4184	.4312		.6635
	37. R-250 63 Rdg. Compr	.5262	.5625	.6241	.5187	.5094	.4870	.3295	.6356	.4976	.5081	.6635	
	38. R-260 63 Creativity	.3079	.3529	.4509	.3631	.4658	.3647	.2993	.5212	.4187	.4429	.5154	.5905
	39. R-270 63 Mech.Reas	.3978	.2966	.3224	.3204	.3725	.3064	.2673	.5098	.3988	.3699	.4577	.4832
	40. R-281 63 Vis. 2 Dim	.2338	.1182	.1724	.1853	.3040	.1405	.2099	.3234	.2305	.2754	.2790	.2934
	41. R-282 63 Vis. 3 Dim	.3309	.1783	.3063	.3129	.3192	.2236	.2046	.4094	.3000	.3056	.4442	.4558
	42. R-290 63 Abst.Reas	.4037	.4053	.4565	.4081	.3565	.3425	.3312	.5466	.4014	.4589	.5072	.5233
Math Test	43. R-311 63 Arith.Reas	.3896	.4710	.5302	.4438	.4404	.4265	.3260	.6071	.4695	.4783	.5753	.6193
	44. R-312 63 Int.HSMath	.4373	.4188	.4436	.4232	.4441	.4170	.3084	.5795	.4828	.4242	.6047	.5710
	45. R-333 63 Adv.HSMath	.3795	.3491	.3135	.3217	.3336	.2645	.1971	.4079	.3500	.2723	.4451	.3973
	46. F-410 63 Arith.Comp	.2439	.2642	.2573	.3374	.3354	.3763	.2909	.4487	.3227	.3444	.3378	.3747
	47. F-420 63 Table Read	.1201	.2325	.1976	.2773	.3068	.2448	.1986	.2401	.2098	.2116	.2380	.2306
	48. F-430 63 Cler.Check	.1063	.1163	.1725	.2056	.3907	.3568	.2433	.3411	.2425	.3025	.2496	.2243
	49. F-440 63 Obj.Insp.	.1413	.1506	.1301	.2392	.2905	.1914	.2062	.2259	.1592	.2523	.2660	.2422
Information Test	50. R-102 60 Vocab. I	.4798	.5834	.5983	.4356	.5294	.4523	.2808	.5307	.4572	.4365	.5412	.6514
	51. R-103 60 Literature	.4101	.5487	.5156	.3787	.4466	.3925	.2751	.4609	.4170	.4062	.4520	.5751
	52. R-104 60 Music	.4233	.5410	.5225	.3965	.4580	.3857	.2620	.4636	.4041	.3780	.4617	.5372
	53. R-105 60 Soc. Stud.	.4270	.5507	.5937	.4415	.4413	.4310	.3015	.5497	.4511	.4229	.5475	.6479
	54. R-106 60 Math	.3966	.4605	.4733	.4035	.3846	.3509	.2314	.4777	.3897	.3720	.5247	.4975
	55. R-107 60 Phys. Sci.	.3958	.4741	.4809	.3456	.4371	.3534	.2492	.4400	.3885	.3506	.5265	.5758
	56. R-108 60 Bio. Sci.	.3762	.4033	.4563	.3436	.3543	.3183	.2104	.4030	.3548	.3422	.4447	.5042
	57. R-109 60 Scient.Att	.3376	.3840	.4463	.3013	.3315	.2551	.1901	.3996	.3309	.3583	.3935	.4994
	58. R-110 60 Aero-Space	.2905	.3202	.3117	.2346	.2164	.1692	.1274	.2150	.2167	.1916	.2594	.3291
	59. R-111 60 Electronic	.2482	.2437	.2688	.1924	.2124	.2064	.1283	.2429	.2223	.2021	.2352	.2717
	60. R-112 60 Mechanica	.3207	.3182	.3567	.2467	.2719	.2038	.1476	.2802	.2510	.2438	.3067	.3998
	61. R-113 60 Farming	.3617	.4243	.4841	.3440	.3266	.3211	.2597	.4220	.3781	.3741	.4285	.5388
	62. R-114 60 Home Ec.	.3799	.3640	.4329	.3122	.3094	.2774	.2177	.3788	.3178	.3279	.3985	.4490
	63. R-115 60 Sports	.3400	.4247	.3951	.3162	.2793	.2749	.1926	.3534	.2936	.3021	.3563	.4144
	64. R-131 60 Art	.4212	.5334	.5308	.3602	.4277	.3719	.2283	.4381	.3846	.3692	.4422	.5790
	65. R-132 60 Law	.3103	.3717	.4135	.2966	.2697	.2503	.1870	.3414	.2972	.2559	.3063	.4382
	66. R-133 60 Health	.3661	.4646	.5165	.3431	.3724	.3836	.2626	.4358	.3983	.3738	.4199	.5215
	67. R-134 60 Engin.	.3251	.3088	.3439	.2423	.2620	.2574	.1396	.2909	.2135	.2158	.3327	.3817
	68. R-135 60 Arch.	.2546	.2878	.2885	.2599	.2356	.2537	.1667	.2764	.2379	.2278	.2862	.3147
	69. R-138 60 Military	.2349	.2753	.2739	.1983	.1373	.1466	.0831	.1932	.1674	.1544	.1751	.2545
	70. R-139 60 Acct,Busi.	.3322	.4200	.4579	.2781	.3317	.3091	.2055	.3708	.3117	.2950	.4177	.4831
	71. R-140 60 Prac.Knowl	.3145	.3735	.4146	.2430	.2921	.2443	.2043	.3307	.2449	.2977	.3288	.4256
	72. R-142 60 Bible	.3104	.3752	.3984	.3792	.3052	.2939	.1829	.3925	.3299	.2999	.4122	.5455
	73. R-145 60 Hunting	.0611	.0652	.0929	.0313	.0270	.0232	.0487	.0404	.0401	.0205	.0226	.0578
	74. R-146 60 Fishing	.0409	.0785	.0875	.0365	-.0203	.0384	-.0150	.0155	.0154	.0162	.0403	.0358
	75. R-147 60 Outdoor	.5121	.4089	.4373	.3331	.3554	.2965	.2255	.3859	.3210	.3644	.3860	.4642
	76. R-150 60 Theater	.4038	.6321	.4928	.3730	.4125	.3838	.2348	.4015	.3856	.3607	.4171	.5178
	77. R-162 60 Vocab. II	.4418	.5399	.6198	.4103	.4642	.3995	.2635	.4864	.4215	.3883	.5062	.6160
	78. R-212 60 Mem. Words	.2610	.3166	.3618	.5533	.3455	.3265	.1935	.3836	.3364	.3104	.4141	.4285
	79. R-220 60 Disg. Wds.	.3377	.4468	.4453	.3777	.6099	.4505	.2432	.4664	.4488	.3474	.4754	.4951
English Test	80. R-231 60 Spelling	.2425	.3482	.3823	.3564	.4439	.5852	.2294	.4662	.3597	.3002	.4766	.4200
	81. R-232 60 Capital.	.3556	.4160	.4478	.2720	.2870	.3342	.3087	.4104	.3193	.3236	.3375	.3889
	82. R-233 60 Punct.	.3928	.4550	.5066	.4440	.4606	.4968	.3399	.6927	.5211	.4589	.6244	.5809
	83. R-234 60 Eng. Usage	.3488	.4047	.4295	.3161	.4048	.3831	.2634	.4752	.4924	.3822	.4396	.4939
	84. R-235 60 Eff. Exp.	.2881	.3819	.4153	.3206	.3362	.3394	.2498	.4242	.3868	.4605	.4064	.4820
	85. R-240 60 Word.Funct	.3775	.4194	.4314	.4523	.4531	.4290	.2510	.5670	.4513	.4092	.6606	.5328
	86. R-250 60 Rdg. Compr	.4550	.5734	.5973	.4738	.4978	.4819	.3396	.6018	.5178	.5005	.6087	.7643
	87. R-260 60 Creativity	.3518	.4148	.4095	.3274	.3363	.2800	.2111	.4047	.3389	.3508	.4320	.4889
	88. R-270 60 Mech.Reas	.3728	.3330	.3797	.3012	.3194	.2367	.1935	.4155	.3511	.3306	.3949	.4195
	89. R-281 60 Vis. 2 Dim	.2723	.2465	.2611	.2358	.2886	.1739	.1877	.3210	.2498	.2011	.3132	.3023
	90. R-282 60 Vis. 3 Dim	.2610	.2568	.2938	.2594	.2703	.1820	.1931	.3517	.2465	.2793	.3713	.3732
	91. R-290 60 Abst.Reas	.3320	.3780	.4335	.3781	.3820	.2980	.2412	.4963	.3827	.4073	.4989	.4896
Math Test	92. R-311 60 Arith.Reas	.3709	.4217	.5055	.4083	.4129	.3890	.2563	.5369	.4208	.4208	.5641	.5821
	93. R-312 60 Int.HSMath	.3886	.4657	.4717	.4124	.4080	.4017	.2366	.5385	.4221	.3944	.5947	.5443
	94. R-333 60 Adv.HSMath	.1289	.0898	.0714	.0867	.0637	.0665	.0457	.0841	.0498	.0658	.0754	.0830
	95. F-410 60 Arith.Comp	.2011	.2493	.2844	.2998	.3274	.3787	.2736	.4392	.3442	.3632	.4168	.4114
	96. F-420 60 Table Read	.1516	.1708	.1460	.1274	.1950	.1666	.2267	.2559	.1609	.1610	.1978	.1835
	97. F-430 60 Cler.Check	.1092	.1455	.1223	.2050	.3184	.2840	.2145	.2775	.2278	.1607	.2589	.2205
	98. F-440 60 Obj.Insp.	.1451	.1162	.0974	.1453	.2099	.1363	.1551	.2128	.1415	.1435	.1893	.1838
	99. P*801 60 Socioecon.	.3962	.3709	.3345	.2521	.3068	.1861	.1741	.2637	.2454	.2777	.2894	.3406

TABLE 6-15 (continued)

38	39	40	41	42	43	44	45	46	47	48	49	50	Variable
.5742	.5161	.2982	.4605	.5047	.6249	.5539	.3764	.3939	.2816	.2568	.3061	.7561	1. R-102 63
.5273	.4234	.2413	.3765	.4495	.5479	.5754	.4116	.2992	.1928	.1887	.2127	.6674	2. R-103 63
.4342	.4246	.2346	.3597	.4196	.4866	.5075	.3581	.3269	.1882	.1292	.2240	.6329	3. R-104 63
.4725	.4200	.2476	.3602	.4584	.5838	.5886	.3911	.3475	.2145	.2110	.2081	.6516	4. R-105 63
.5189	.5339	.3309	.4483	.4699	.6514	.8330	.6756	.3835	.2392	.2625	.2516	.6034	5. R-106 63
.5117	.5455	.3109	.4536	.4697	.5882	.6332	.5020	.3218	.2637	.2350	.2776	.6594	6. R-107 63
.4978	.4791	.2858	.4099	.3871	.4625	.4751	.3105	.2126	.1632	.1549	.2431	.5779	7. R-108 63
.4434	.3889	.2162	.3705	.4226	.4620	.4039	.2491	.2779	.2272	.1362	.2010	.4918	8. R-109 63
.4308	.4694	.2584	.3845	.3160	.2940	.3180	.2728	.1348	.1866	.1635	.2395	.4655	9. R-110 63
.4030	.4157	.2505	.3600	.2878	.3810	.4403	.3286	.2703	.1862	.1949	.2545	.4616	10. R-111 63
.4522	.4331	.2428	.4073	.3387	.3802	.3247	.2121	.2551	.1767	.1298	.2854	.4570	11. R-112 63
.4360	.3902	.2602	.3494	.3713	.4864	.3826	.2256	.3225	.1614	.1339	.2152	.5107	12. R-113 63
.3442	.3124	.1901	.3487	.3545	.3880	.3153	.1562	.2407	.0779	.0140	.1164	.4106	13. R-114 63
.4328	.3392	.2413	.2729	.3733	.4543	.4316	.3333	.2923	.2070	.1715	.2103	.5099	14. R-115 63
.4514	.3617	.1824	.2994	.4419	.4597	.4262	.3747	.2788	.2335	.0786	.1715	.6012	15. R-131 63
.4010	.3103	.1109	.2742	.4028	.4867	.4209	.3444	.2806	.1238	.1297	.0912	.5374	16. R-132 63
.3401	.2402	.1641	.2973	.3730	.4097	.3997	.3013	.2709	.3287	.1517	.2200	.5158	17. R-133 63
.2397	.2375	.1959	.2557	.2972	.3063	.2493	.2374	.1308	.1125	.0835	.1999	.3652	18. R-134 63
.2970	.1994	.0952	.2390	.2932	.3667	.3786	.3603	.1947	.1221	.1009	.0875	.4802	19. R-135 63
.3467	.3138	.1388	.2377	.2555	.3170	.3544	.3101	.2223	.1061	.1103	.1085	.4426	20. R-138 63
.4087	.3252	.1851	.2872	.4217	.5506	.4330	.2922	.3581	.2014	.1461	.1276	.5313	21. R-139 63
.2693	.2138	.1085	.2171	.3235	.2957	.2938	.2234	.3003	.2185	.0802	.1700	.3730	22. R-140 63
.3494	.2695	.1681	.3419	.3415	.4309	.3803	.2891	.2836	.1848	.0419	.0702	.4883	23. R-142 63
.0618	.0759	.0184	.0313	.0600	.0398	.0268	-.0027	.0574	.0335	.0634	.0104	.0720	24. R-145 63
.1292	.0559	.0692	.0499	.0876	.0821	.0756	.0939	.0756	.0522	.0876	.0306	.0771	25. R-146 63
.3079	.3978	.2338	.3309	.4037	.3896	.4373	.3795	.2439	.1201	.1063	.1413	.4798	26. R-147 63
.3529	.2966	.1182	.1783	.4053	.4710	.4188	.3491	.2642	.2325	.1163	.1506	.5834	27. R-150 63
.4509	.3224	.1724	.3063	.4565	.5302	.4436	.3135	.2573	.1976	.1725	.1301	.5983	28. R-162 63
.3631	.3204	.1853	.3129	.4081	.4438	.4232	.3217	.3374	.2773	.2056	.2392	.4356	29. R-212 63
.4658	.3725	.3040	.3192	.3565	.4404	.4441	.3336	.3354	.3068	.3907	.2905	.5294	30. R-220 63
.3647	.3064	.1405	.2236	.3425	.4265	.4170	.2645	.3763	.2448	.3568	.1914	.4523	31. R-231 63
.2993	.2673	.2099	.2046	.3312	.3260	.3084	.1971	.2909	.1986	.2433	.2062	.2808	32. R-232 63
.5212	.5098	.3234	.4094	.5466	.6071	.5795	.4079	.4487	.2401	.3411	.2259	.5307	33. R-233 63
.4187	.3988	.2305	.3000	.4014	.4695	.4828	.3500	.3227	.2098	.2425	.1592	.4572	34. R-234 63
.4429	.3699	.2754	.3056	.4589	.4783	.4242	.2723	.3444	.2116	.3025	.2523	.4365	35. R-235 63
.5154	.4577	.2790	.4442	.5072	.5753	.6047	.4451	.3378	.2380	.2496	.2660	.5412	36. R-240 63
.5905	.4892	.2934	.4558	.5233	.6193	.5710	.3973	.3747	.2306	.2243	.2422	.6514	37. R-250 63
	.4939	.3316	.4564	.4671	.5185	.4651	.3562	.2671	.2399	.2400	.2484	.5357	38. R-260 63
.4939		.4617	.5668	.5074	.4795	.4775	.3888	.2258	.2175	.2161	.3065	.4496	39. R-270 63
.3316	.4617		.4593	.3756	.2912	.2464	.2074	.2326	.2534	.2525	.3360	.2597	40. R-281 63
.4564	.5668	.4593		.5060	.4568	.4081	.3414	.2377	.2492	.2171	.3489	.3784	41. R-282 63
.4671	.5074	.3756	.5060		.5766	.5038	.3368	.3940	.2449	.2236	.2932	.4389	42. R-290 63
.5185	.4795	.2912	.4568	.5766		.6466	.4753	.4065	.2319	.2624	.2157	.5778	43. R-311 63
.4651	.4775	.2464	.4081	.5038	.6466		.6583	.4162	.2330	.2767	.1445	.5445	44. R-312 63
.3562	.3888	.2074	.3414	.3368	.4753	.6583		.2323	.1659	.2225	.1079	.4201	45. R-333 63
.2671	.2258	.2326	.2377	.3940	.4065	.4162	.2323		.4152	.4114	.2857	.3115	46. F-410 63
.2399	.2175	.2534	.2492	.2449	.2319	.2330	.1659	.4152		.3768	.4493	.1920	47. F-420 63
.2400	.2161	.2525	.2171	.2236	.2624	.2767	.2225	.4114	.3768		.3708	.2302	48. F-430 63
.2484	.3065	.3360	.3489	.2932	.2157	.1445	.1079	.2857	.4493	.3708		.2191	49. F-440 63
.5357	.4496	.2597	.3784	.4389	.5778	.5445	.4201	.3115	.1920	.2302	.2191	.	50. R-102 60
.4374	.3584	.2214	.3177	.3768	.4674	.4926	.3952	.2526	.1773	.1999	.1745	.6494	51. R-103 60
.4345	.3722	.2251	.3136	.3822	.4791	.4819	.3691	.2896	.1630	.2002	.2056	.6215	52. R-104 60
.4721	.4085	.2211	.3646	.4501	.5693	.5727	.4334	.3066	.1757	.2238	.1595	.6883	53. R-105 60
.4369	.4073	.2607	.3643	.4185	.5521	.6176	.5254	.2838	.2043	.2265	.1799	.5820	54. R-106 60
.4433	.4547	.2693	.3669	.4150	.5083	.4903	.4000	.2266	.1837	.2335	.2063	.6141	55. R-107 60
.4104	.3603	.1970	.3208	.3333	.4411	.4454	.3647	.2117	.0940	.1208	.1309	.5623	56. R-108 60
.3652	.3023	.1986	.3039	.3686	.4540	.3921	.2792	.2150	.0967	.1393	.1110	.4822	57. R-109 60
.2909	.3327	.1717	.2424	.2361	.2829	.2868	.2408	.1059	.1244	.1094	.1283	.4037	58. R-110 60
.2755	.2380	.1631	.1807	.2158	.2936	.2814	.2233	.1511	.1015	.1271	.0661	.3683	59. R-111 60
.3928	.4002	.2275	.3410	.2857	.3715	.3175	.2652	.1781	.1058	.1171	.1629	.4746	60. R-112 60
.4175	.3716	.2275	.3468	.3747	.4905	.4142	.2919	.2637	.1008	.1345	.1583	.5351	61. R-113 60
.4212	.3565	.2441	.3648	.3638	.4347	.3768	.2781	.2803	.1428	.1205	.1695	.4981	62. R-114 60
.3558	.3044	.2139	.2539	.3243	.4030	.4068	.3128	.2662	.2033	.2068	.2181	.4871	63. R-115 60
.4694	.3850	.2389	.3332	.4044	.4394	.4323	.3427	.2631	.1441	.1824	.1602	.6191	64. R-131 60
.3594	.2566	.1451	.2324	.2844	.3915	.3743	.2955	.2065	.1066	.1192	.0847	.4586	65. R-132 60
.3878	.2863	.1931	.2644	.3637	.4309	.3904	.2693	.2991	.1622	.1748	.1694	.5634	66. R-133 60
.3252	.3038	.2017	.2628	.2838	.3066	.2894	.2031	.1976	.1213	.1333	.1484	.4157	67. R-134 60
.2755	.2286	.1540	.2241	.2306	.2823	.2774	.2419	.2111	.1041	.1419	.1487	.3908	68. R-135 60
.1990	.1746	.0962	.1279	.1720	.2143	.2286	.1856	.1169	.0658	.0566	.0616	.3146	69. R-138 60
.4002	.2978	.1912	.2690	.3174	.4329	.3875	.3011	.2427	.1474	.1835	.1294	.5269	70. R-139 60
.3409	.2771	.1971	.2589	.3183	.3138	.3077	.2099	.2500	.2138	.1727	.1782	.4157	71. R-140 60
.3720	.2762	.1703	.2921	.3135	.4177	.4143	.2954	.2438	.0984	.0765	.0891	.4831	72. R-142 60
.0586	.0370	-.0119	.0416	.0506	.0703	.0410	-.0208	.0751	.0334	.0176	.0343	.0823	73. R-145 60
.0712	.0326	.0320	.0161	.0227	.0214	.0164	.0157	.0147	-.0098	-.0034	.0065	.0530	74. R-146 60
.3858	.3402	.2377	.3255	.3658	.4368	.4042	.3208	.2733	.2164	.1716	.2036	.5042	75. R-147 60
.4169	.3124	.1803	.2645	.3475	.4183	.3912	.3100	.2430	.1660	.1806	.1689	.5902	76. R-150 60
.4812	.3598	.2233	.3372	.4085	.5017	.4555	.3474	.2843	.1621	.1827	.1765	.6350	77. R-162 60
.3596	.3138	.2042	.2917	.3242	.3824	.3857	.2899	.2606	.1306	.1781	.1406	.4173	78. R-212 60
.4286	.3555	.2474	.3026	.3822	.4051	.3981	.2928	.2846	.2447	.2870	.2374	.5372	79. R-220 60
.3659	.2456	.1546	.2284	.3028	.3826	.4060	.2766	.3283	.1982	.2572	.1290	.4637	80. R-231 60
.2838	.2493	.1803	.2087	.3543	.3683	.3510	.2091	.2938	.1679	.1531	.1573	.3473	81. R-232 60
.4480	.4250	.2650	.3933	.4817	.5888	.5940	.4262	.3974	.1950	.2182	.1959	.5572	82. R-233 60
.3526	.3125	.2005	.2830	.3517	.4195	.3847	.2666	.2967	.1457	.1630	.1729	.4686	83. R-234 60
.3335	.3047	.1814	.2395	.3629	.4121	.3655	.2551	.2777	.0970	.1178	.1188	.4117	84. R-235 60
.4535	.4005	.2486	.3489	.4336	.5693	.5853	.4699	.3369	.1600	.2360	.2039	.5445	85. R-240 60
.5346	.4430	.2725	.4008	.5033	.6236	.5751	.4245	.3555	.2021	.2414	.2010	.7135	86. R-250 60
.5391	.3840	.2461	.3629	.4064	.4678	.4150	.3377	.2466	.1347	.1743	.1776	.5201	87. R-260 60
.4186	.6350	.3802	.4895	.4599	.4918	.4476	.3699	.2278	.1749	.1674	.2327	.4639	88. R-270 60
.2952	.4080	.5653	.4143	.4008	.3469	.3207	.2261	.2554	.2005	.2002	.2723	.3050	89. R-281 60
.3829	.4912	.4213	.5855	.4644	.4046	.3934	.3188	.2104	.1592	.1599	.2437	.3489	90. R-282 60
.4455	.4782	.3666	.4751	.6004	.5243	.4677	.3471	.3126	.2224	.2396	.3051	.4637	91. R-290 60
.4776	.4602	.2938	.4422	.4941	.6837	.5769	.4435	.3588	.1841	.2145	.1935	.5647	92. R-311 60
.4611	.4608	.2861	.4280	.4816	.6031	.6751	.5242	.3680	.2381	.2229	.2277	.5528	93. R-312 60
.1042	.1052	.0423	.0707	.0796	.0958	.1272	.1496	.0646	.0486	.0445	.0310	.1107	94. R-333 60
.3096	.2621	.2325	.2719	.3395	.3858	.3626	.2329	.4828	.2453	.2311	.2148	.3393	95. F-410 60
.1627	.1615	.1429	.1445	.2221	.1869	.1749	.0805	.2335	.2295	.1612	.1894	.1810	96. F-420 60
.1919	.1406	.1559	.1708	.1945	.2272	.2637	.1620	.2746	.2066	.2830	.2002	.2226	97. F-430 60
.1886	.2287	.2280	.2699	.2691	.1923	.1881	.1134	.2211	.2465	.2350	.4068	.1806	98. F-440 60
.2910	.2901	.1456	.2164	.3105	.3300	.3691	.2867	.1450	.1085	.2050	.1571	.4125	99. P*801 60

TABLE 6-1b (continued)

	Variable	51	52	53	54	55	56	57	58	59	60	61	62
Information Test	1. R-102 63 Vocab. I	.6158	.6062	.6919	.5758	.5929	.5288	.5010	.4036	.3682	.4367	.5487	.4753
	2. R-103 63 Literature	.7143	.5902	.6851	.5646	.5504	.5166	.4463	.3895	.3242	.3568	.4863	.4235
	3. R-104 63 Music	.5726	.7367	.6118	.5004	.4793	.4514	.4144	.3565	.2810	.3609	.4378	.4254
	4. R-105 63 Soc. Stud.	.5979	.5829	.7924	.5445	.5848	.5185	.4439	.3721	.3395	.3576	.5022	.4211
	5. R-106 63 Math	.5452	.5253	.6182	.6840	.5446	.4615	.3963	.3885	.3435	.3475	.4248	.3975
	6. R-107 63 Phys. Sci.	.5655	.5515	.6645	.5917	.7066	.5490	.4389	.4313	.4288	.4184	.5119	.4208
	7. R-108 63 Bio. Sci.	.4771	.4536	.5681	.4708	.5280	.6169	.3862	.3414	.3181	.3980	.5083	.4102
	8. R-109 63 Scient.Att	.4157	.3922	.4602	.3757	.3796	.3919	.5155	.2737	.2328	.3085	.3875	.3887
	9. R-110 63 Aero-Space	.3831	.3863	.4086	.3638	.3930	.3587	.3096	.4732	.2740	.3408	.3768	.3037
	10. R-111 63 Electronic	.3705	.3805	.4339	.3500	.4524	.3839	.2976	.3212	.4572	.3776	.3848	.3227
	11. R-112 63 Mechanics	.3293	.3738	.3836	.3333	.3648	.4017	.3289	.2793	.3019	.5746	.5098	.4188
	12. R-113 63 Farming	.3799	.3951	.4737	.3777	.4044	.4706	.3922	.2474	.2873	.4471	.6893	.4334
	13. R-114 63 Home Ec.	.3220	.3790	.3830	.3268	.3242	.3977	.3342	.2220	.2358	.3749	.4460	.6432
	14. R-115 63 Sports	.4263	.4966	.5205	.4140	.4186	.3735	.3195	.3009	.2465	.3149	.3799	.3890
	15. R-131 63 Art	.5957	.5522	.5979	.4524	.4923	.4449	.4205	.3201	.2583	.3547	.4633	.3945
	16. R-132 63 Law	.4674	.4643	.5614	.4496	.4428	.4162	.4053	.3074	.2453	.3579	.4655	.3927
	17. R-133 63 Health	.4509	.4326	.4904	.3945	.4359	.4111	.3812	.2847	.2220	.2950	.4286	.3684
	18. R-134 63 Engin.	.2752	.3138	.3495	.3265	.3486	.3037	.2969	.2084	.2023	.2987	.4035	.3433
	19. R-135 63 Arch.	.4627	.4246	.4607	.4041	.3890	.3332	.2831	.2523	.2572	.2568	.3267	.3115
	20. R-138 63 Military	.3933	.4163	.4497	.3683	.3324	.2982	.2986	.2699	.1936	.2658	.2844	.2510
	21. R-139 63 Acct,Busi.	.4502	.4725	.5126	.4389	.4310	.3567	.3818	.2700	.2410	.3289	.4390	.3807
	22. R-140 63 Prac.Knowl	.3275	.3356	.3634	.2970	.2868	.2676	.3206	.1994	.1557	.2185	.2844	.2978
	23. R-142 63 Bible	.4707	.3980	.5124	.3815	.4042	.3829	.3748	.2651	.2249	.2609	.3875	.2805
	24. R-145 63 Hunting	.0620	.0395	.0990	.0348	.1054	.1087	.0833	.0596	.0777	.1589	.1769	.1012
	25. R-146 63 Fishing	.0605	.0561	.0446	.0762	.0628	.1149	.0435	.0979	.0925	.1651	.1074	.0759
	26. R-147 63 Outdoor	.4101	.4233	.4270	.3966	.3958	.3762	.3376	.2905	.2482	.3207	.3617	.3799
	27. R-150 63 Theater	.5487	.5410	.5507	.4605	.4741	.4033	.3840	.3202	.2437	.3182	.4243	.3640
	28. R-162 63 Vocab. II	.5156	.5225	.5937	.4733	.4809	.4563	.4463	.3117	.2688	.3567	.4841	.4329
	29. R-212 63 Mem. Words	.3787	.3965	.4415	.4035	.3456	.3436	.3013	.2346	.1924	.2467	.3440	.3122
	30. R-220 63 Disg. Wds.	.4466	.4580	.4413	.3846	.4371	.3543	.3315	.2164	.2124	.2719	.3266	.3094
English Test	31. R-231 63 Spelling	.3925	.3857	.4310	.3509	.3534	.3183	.2551	.1692	.2064	.2038	.3211	.2774
	32. R-232 63 Capital.	.2751	.2620	.3015	.2314	.2492	.2104	.1901	.1274	.1283	.1476	.2597	.2177
	33. R-233 63 Punct.	.4609	.4636	.5497	.4777	.4400	.4030	.3996	.2150	.2429	.2802	.4220	.3788
	34. R-234 63 Eng. Usage	.4170	.4041	.4511	.3897	.3885	.3548	.3309	.2167	.2223	.2510	.3781	.3178
	35. R-235 63 Eff. Exp.	.4062	.3780	.4229	.3720	.3506	.3422	.3583	.1916	.2021	.2438	.3741	.3279
	36. R-240 63 Word.Funct	.4520	.4617	.5475	.5247	.5265	.4447	.3935	.2594	.2352	.3067	.4285	.3985
	37. R-250 63 Rdg. Compr	.5751	.5372	.6479	.4975	.5758	.5042	.4994	.3291	.2717	.3998	.5388	.4490
	38. R-260 63 Creativity	.4374	.4345	.4721	.4369	.4433	.4104	.3652	.2909	.2755	.3928	.4175	.4212
	39. R-270 63 Mech.Reas	.3584	.3722	.4085	.4073	.4547	.3603	.3023	.3327	.2380	.4002	.3716	.3565
	40. R-281 63 Vis. 2 Dim	.2214	.2251	.2211	.2607	.2693	.1970	.1986	.1717	.1631	.2275	.2275	.2441
	41. R-282 63 Vis. 3 Dim	.3177	.3136	.3646	.3643	.3669	.3208	.3039	.2424	.1807	.3410	.3468	.3648
	42. R-290 63 Abst.Reas	.3768	.3822	.4501	.4185	.4150	.3333	.3686	.2361	.2158	.2857	.3747	.3638
Math Test	43. R-311 63 Arith.Reas	.4674	.4791	.5693	.5521	.5083	.4411	.4540	.2829	.2936	.3715	.4905	.4347
	44. R-312 63 Int.HSMath	.4926	.4819	.5727	.6176	.4903	.4454	.3921	.2868	.2814	.3175	.4142	.3768
	45. R-333 63 Adv.HSMath	.3952	.3691	.4334	.5254	.4000	.3647	.2792	.2408	.2233	.2652	.2919	.2781
	46. F-410 63 Arith.Comp	.2526	.2896	.3066	.2838	.2266	.2117	.2150	.1059	.1511	.1781	.2637	.2803
	47. F-420 63 Table Read	.1773	.1630	.1757	.2043	.1837	.0940	.0967	.1244	.1015	.1058	.1008	.1428
	48. F-430 63 Cler.Check	.1999	.2002	.2238	.2265	.2335	.1208	.1393	.1094	.1271	.1171	.1345	.1205
	49. F-440 63 Obj.Insp.	.1745	.2056	.1595	.1799	.2063	.1309	.1110	.1283	.0661	.1629	.1583	.1695
Information Test	50. R-102 60 Vocab. I	.6494	.6215	.6883	.5820	.6141	.5623	.4822	.4037	.3683	.4746	.5351	.4981
	51. R-103 60 Literature		.5902	.6527	.5244	.5357	.4900	.4004	.3683	.3134	.3589	.4333	.4008
	52. R-104 60 Music	.5902		.6179	.5266	.4910	.4448	.4050	.3460	.3058	.3564	.4342	.4429
	53. R-105 60 Soc. Stud.	.6527	.6179		.5915	.6219	.5377	.4593	.3766	.3439	.4029	.5245	.4688
	54. R-106 60 Math	.5244	.5266	.5915		.5391	.4363	.3741	.3403	.3307	.3647	.4182	.4171
	55. R-107 60 Phys. Sci.	.5357	.4910	.6219	.5391		.5176	.3911	.3806	.4660	.3857	.4697	.4180
	56. R-108 60 Bio. Sci.	.4900	.4448	.5377	.4363	.5176		.3939	.3211	.3046	.3869	.4919	.4189
	57. R-109 60 Scient.Att	.4004	.4050	.4593	.3741	.3911	.3939		.2501	.2267	.3100	.3826	.3782
	58. R-110 60 Aero-Space	.3683	.3460	.3766	.3403	.3806	.3211	.2501		.2678	.2933	.2711	.2721
	59. R-111 60 Electronic	.3134	.3058	.3439	.3307	.4660	.3046	.2267	.2678		.3294	.3064	.2954
	60. R-112 60 Mechanics	.3589	.3564	.4029	.3647	.3857	.3869	.3100	.2933	.3294		.4667	.4001
	61. R-113 60 Farming	.4333	.4342	.5245	.4182	.4697	.4919	.3826	.2711	.3064	.4667		.4809
	62. R-114 60 Home Ec.	.4008	.4429	.4688	.4171	.4180	.4189	.3782	.2721	.2954	.4001	.4809	
	63. R-115 60 Sports	.4311	.4543	.4692	.4255	.3936	.3659	.3071	.3112	.2581	.3343	.3942	.3621
	64. R-131 60 Art	.5852	.5772	.5906	.4888	.4905	.4501	.4199	.3580	.3212	.3983	.4388	.4165
	65. R-132 60 Law	.4148	.3874	.4495	.3605	.3382	.3428	.3103	.2922	.2454	.3005	.3429	.3160
	66. R-133 60 Health	.4729	.4865	.5357	.4133	.4662	.4549	.3991	.3046	.2819	.3607	.4429	.4358
	67. R-134 60 Engin.	.3361	.3532	.3730	.3417	.3441	.3369	.2769	.2367	.2657	.3578	.3376	.3566
	68. R-135 60 Arch.	.3923	.3616	.3953	.3366	.3296	.2976	.2374	.2214	.2335	.2580	.2750	.2651
	69. R-138 60 Military	.2988	.2767	.3278	.2781	.2506	.2219	.1906	.2228	.1856	.2188	.2044	.1833
	70. R-139 60 Acct,Busi.	.4541	.4574	.5121	.4328	.4218	.3735	.3643	.2806	.2795	.3495	.3904	.3598
	71. R-140 60 Prac.Knowl	.3642	.3824	.4194	.3273	.3122	.2894	.3242	.2070	.2225	.2739	.3107	.3365
	72. R-142 60 Bible	.4935	.4119	.5106	.3994	.4059	.4133	.3664	.2644	.2517	.2975	.4139	.3202
	73. R-145 60 Hunting	.0578	.0543	.0676	.0493	.0763	.0802	.0424	.0382	.0944	.1470	.1316	.0888
	74. R-146 60 Fishing	.0652	.0631	.0620	.0601	.0461	.0702	.0342	.0577	.0392	.0914	.0799	.0498
	75. R-147 60 Outdoor	.4465	.4551	.4764	.4169	.4082	.3824	.3554	.2843	.2516	.3420	.3813	.3911
	76. R-150 60 Theater	.5598	.5339	.5471	.4505	.4319	.3982	.3627	.3108	.2687	.3246	.4030	.3807
	77. R-162 60 Vocab. II	.5397	.5399	.6074	.4964	.5119	.4603	.4353	.3150	.3056	.3909	.4794	.4568
	78. R-212 60 Mem. Words	.3904	.3914	.4374	.3972	.3550	.3452	.2996	.2125	.2166	.2103	.3102	.2841
	79. R-220 60 Disg. Wds.	.4776	.4655	.4683	.4351	.4187	.3804	.3595	.2682	.2177	.2893	.3625	.3473
English Test	80. R-231 60 Spelling	.3970	.3883	.4453	.4143	.3638	.3109	.2950	.1701	.2086	.2131	.3288	.2785
	81. R-232 60 Capital.	.3140	.3123	.3591	.2688	.3012	.2497	.2589	.1590	.1732	.1922	.2952	.2763
	82. R-233 60 Punct.	.4763	.4846	.5531	.5195	.4698	.4102	.4230	.2625	.2527	.3104	.4394	.3827
	83. R-234 60 Eng. Usage	.4181	.3994	.4426	.3686	.3793	.3204	.3503	.2173	.1854	.2619	.3599	.3101
	84. R-235 60 Eff. Exp.	.3623	.3571	.3078	.3406	.3466	.3040	.3517	.2126	.1834	.2048	.3100	.3022
	85. R-240 60 Word.Funct	.4756	.4524	.5284	.5489	.4801	.4241	.3898	.2832	.2540	.2843	.3789	.3368
	86. R-250 60 Rdg. Compr	.6342	.5934	.6969	.5483	.5774	.5435	.5302	.3704	.3328	.4235	.5477	.4680
	87. R-260 60 Creativity	.4584	.4339	.4723	.4429	.4233	.3996	.3754	.3098	.2900	.3996	.4239	.3849
	88. R-270 60 Mech.Reas	.3605	.3816	.3880	.4204	.4323	.3596	.3464	.3297	.2764	.3980	.3865	.3668
	89. R-281 60 Vis. 2 Dim	.2592	.2470	.2532	.2821	.2543	.2176	.2224	.1726	.1532	.2304	.2766	.2425
	90. R-282 60 Vis. 3 Dim	.3223	.3010	.3468	.3663	.3423	.2756	.2827	.2213	.2018	.2904	.3309	.2920
	91. R-290 60 Abst.Reas	.3856	.4143	.4481	.4252	.4238	.3321	.3842	.2478	.2200	.2684	.3797	.3349
Math Test	92. R-311 60 Arith.Reas	.4614	.4614	.5605	.5343	.5176	.4185	.4556	.2872	.3038	.3607	.4489	.4236
	93. R-312 60 Int.HSMath	.5038	.4905	.5680	.6351	.5062	.4076	.3945	.3032	.2965	.3219	.4173	.4015
	94. R-333 60 Adv.HSMath	.1216	.1226	.1253	.1744	.1086	.1035	.0865	.1296	.0832	.0961	.0742	.0867
	95. F-410 60 Arith.Comp	.2586	.2935	.3531	.3150	.2757	.2300	.2388	.1308	.1806	.1970	.2820	.2647
	96. F-420 60 Table Read	.1317	.1303	.1272	.1199	.1475	.1016	.1279	.0688	.0929	.1259	.1372	.1266
	97. F-430 60 Cler.Check	.2035	.1784	.1955	.1783	.1588	.1207	.1428	.0869	.0817	.0859	.1410	.1158
	98. F-440 60 Obj.Insp.	.1618	.1403	.1360	.1487	.1321	.1318	.1268	.1060	.0704	.1222	.1468	.1506
	99. P*801 60 Socioecon.	.3870	.4521	.3920	.3502	.3091	.2337	.2773	.2301	.1463	.1764	.2118	.2433

TABLE 6-1b (continued)

63	64	65	66	67	68	69	70	71	72	73	74	75	Variable
.4896	.6363	.4509	.5819	.4244	.3570	.2970	.5415	.4313	.4801	.1073	.0537	.5313	1. R-102 63
.4664	.6128	.4391	.5388	.3587	.3413	.2724	.5168	.3857	.5256	.0396	.0566	.4687	2. R-103 63
.4647	.5692	.3984	.4988	.3845	.3111	.2848	.4570	.3532	.4322	.0514	.0555	.4771	3. R-104 63
.4756	.5661	.4228	.5258	.3598	.3433	.2960	.5128	.4017	.5082	.0936	.0502	.4695	4. R-105 63
.4667	.5034	.3794	.4408	.3379	.3042	.2848	.4744	.3356	.4251	.0660	.0611	.4394	5. R-106 63
.4410	.5258	.4169	.5072	.3719	.3160	.2729	.4792	.3525	.4598	.0991	.0606	.4722	6. R-107 63
.3531	.4893	.3567	.4743	.3596	.2682	.2197	.3974	.3166	.4225	.0858	.0940	.4128	7. R-108 63
.3344	.4331	.3398	.4023	.3165	.2001	.1785	.3659	.3825	.3596	.0484	.0431	.3925	8. R-109 63
.3341	.3854	.3250	.3424	.2752	.2210	.1891	.3253	.2501	.3104	.0890	.0595	.3521	9. R-110 63
.2879	.3540	.2978	.3342	.3259	.2275	.2036	.3267	.2290	.3050	.0959	.0589	.3189	10. R-111 63
.3469	.3920	.3135	.3600	.3612	.2100	.2052	.3285	.2799	.3185	.1426	.0762	.3440	11. R-112 63
.3932	.4253	.3371	.4074	.3400	.2614	.1978	.3780	.2882	.4056	.1376	.0646	.3749	12. R-113 63
.3264	.3500	.2794	.3728	.3184	.2403	.1609	.3145	.2821	.3216	.0822	.0551	.3555	13. R-114 63
.6066	.4393	.3586	.3997	.3016	.2781	.2486	.3581	.3140	.2955	.0530	.0961	.4079	14. R-115 63
.4111	.6675	.4001	.4869	.3389	.3201	.2667	.4368	.4166	.4258	.0732	.0710	.4459	15. R-131 63
.4009	.4512	.4436	.4131	.3202	.2725	.2872	.3919	.3295	.3709	.0602	.0443	.3920	16. R-132 63
.3556	.4605	.3329	.5462	.3142	.2556	.2228	.3338	.2952	.3880	.0673	.0478	.3779	17. R-133 63
.2450	.3340	.2345	.3504	.4117	.1781	.1645	.2285	.2530	.2577	.1173	.0387	.3142	18. R-134 63
.3172	.4092	.2824	.3658	.2708	.3594	.2015	.3297	.2588	.3236	.0215	.0196	.3457	19. R-135 63
.3122	.3588	.2821	.3110	.2078	.2340	.3388	.3071	.2504	.3063	.0587	.0248	.2661	20. R-138 63
.3685	.4447	.3703	.4311	.3271	.2686	.2529	.5194	.3622	.3308	.0639	.0586	.3836	21. R-139 63
.3039	.3644	.2588	.3100	.2493	.2130	.2099	.2857	.4285	.2939	.0314	.0462	.3363	22. R-140 63
.2647	.3910	.3308	.3668	.2433	.2554	.2500	.3370	.2677	.7623	.0581	.0200	.3030	23. R-142 63
.0365	.0345	.0350	.0429	.0629	.0397	.0418	.0307	.0072	.0724	.2394	.0925	.0007	24. R-145 63
.0870	.0642	.0233	.0477	.0965	.0438	.0445	.0271	-.0096	.0242	.0722	.2377	.1024	25. R-146 63
.3400	.4212	.3103	.3661	.3251	.2546	.2349	.3322	.3145	.3104	.0611	.0409	.5121	26. R-147 63
.4247	.5334	.3717	.4646	.3088	.2878	.2753	.4200	.3735	.3752	.0652	.0785	.4089	27. R-150 63
.3951	.5308	.4135	.5165	.3439	.2885	.2739	.4579	.4146	.3984	.0929	.0875	.4373	28. R-162 63
.3162	.3602	.2966	.3431	.2423	.2599	.1983	.2781	.2430	.3792	.0313	.0365	.3331	29. R-212 63
.2793	.4277	.2697	.3724	.2620	.2356	.1373	.3317	.2921	.3052	.0270	-.0203	.3554	30. R-220 63
.2749	.3719	.2503	.3836	.2574	.2537	.1466	.3091	.2443	.2939	.0232	.0384	.2965	31. R-231 63
.1926	.2283	.1870	.2626	.1396	.1667	.0831	.2055	.2043	.1829	.0487	-.0150	.2255	32. R-232 63
.3534	.4381	.3414	.4358	.2909	.2764	.1932	.3708	.3307	.3925	.0404	.0155	.3859	33. R-233 63
.2936	.3846	.2972	.3983	.2135	.2379	.1674	.3117	.2449	.3299	.0401	.0154	.3210	34. R-234 63
.3021	.3692	.2559	.3738	.2158	.2278	.1544	.2950	.2977	.2999	.0205	.0162	.3644	35. R-235 63
.3563	.4422	.3063	.4199	.3327	.2862	.1751	.4177	.3288	.4122	.0226	.0403	.3860	36. R-240 63
.4144	.5790	.4382	.5215	.3817	.3147	.2545	.4831	.4256	.5455	.0578	.0358	.4642	37. R-250 63
.3558	.4694	.3594	.3878	.3252	.2755	.1990	.4002	.3409	.3720	.0586	.0712	.3858	38. R-260 63
.3044	.3850	.2566	.2863	.3038	.2286	.1746	.2978	.2771	.2762	.0370	.0326	.3402	39. R-270 63
.2139	.2389	.1451	.1931	.2017	.1540	.0962	.1912	.1971	.1703	-.0119	.0320	.2377	40. R-281 63
.2539	.3332	.2324	.2644	.2628	.2241	.1279	.2690	.2589	.2921	.0416	.0161	.3255	41. R-282 63
.3243	.4044	.2844	.3637	.2838	.2306	.1720	.3174	.3183	.3135	.0506	.0227	.3658	42. R-290 63
.4030	.4394	.3915	.4309	.3066	.2823	.2143	.4329	.3138	.4177	.0703	.0214	.4368	43. R-311 63
.4068	.4323	.3743	.3904	.2894	.2774	.2286	.3875	.3077	.4143	.0410	.0164	.4042	44. R-312 63
.3128	.3427	.2955	.2693	.2031	.2419	.1856	.3011	.2099	.2954	-.0208	.0157	.3208	45. R-333 63
.2662	.2631	.2065	.2991	.1976	.2111	.1169	.2427	.2500	.2438	.0751	.0147	.2733	46. F-410 63
.2033	.1441	.1066	.1622	.1213	.1041	.0658	.1474	.2138	.0984	.0334	-.0098	.2164	47. F-420 63
.2068	.1824	.1192	.1748	.1333	.1419	.0566	.1835	.1727	.0765	.0176	-.0034	.1716	48. F-430 63
.2181	.1602	.0847	.1694	.1484	.1487	.0616	.1294	.1782	.0891	.0343	.0065	.2036	49. F-440 63
.4871	.6191	.4586	.5634	.4157	.3908	.3146	.5269	.4157	.4831	.0823	.0530	.5042	50. R-102 60
.4311	.5852	.4148	.4729	.3361	.3923	.2988	.4541	.3642	.4935	.0578	.0652	.4465	51. R-103 60
.4543	.5772	.3874	.4865	.3532	.3616	.2767	.4574	.3824	.4119	.0543	.0631	.4551	52. R-104 60
.4692	.5906	.4495	.5357	.3730	.3953	.3278	.5121	.4194	.5106	.0676	.0620	.4764	53. R-105 60
.4255	.4888	.3605	.4133	.3417	.3366	.2781	.4328	.3273	.3994	.0493	.0601	.4169	54. R-106 60
.3936	.4905	.3382	.4662	.3441	.3296	.2506	.4218	.3122	.4059	.0763	.0461	.4082	55. R-107 60
.3658	.4501	.3428	.4549	.3369	.2976	.2219	.3735	.2894	.4133	.0802	.0702	.3824	56. R-108 60
.3071	.4199	.3103	.3991	.2769	.2374	.1906	.3643	.3242	.3664	.0424	.0342	.3554	57. R-109 60
.3112	.3580	.2922	.3046	.2367	.2214	.2228	.2806	.2070	.2644	.0382	.0577	.2843	58. R-110 60
.2581	.3212	.2454	.2819	.2657	.2335	.1856	.2795	.2225	.2517	.0944	.0392	.2516	59. R-111 60
.3343	.3983	.3005	.3607	.3578	.2580	.2188	.3495	.2739	.2975	.1470	.0914	.3420	60. R-112 60
.3942	.4388	.3429	.4429	.3376	.2750	.2044	.3904	.3107	.4139	.1316	.0799	.3813	61. R-113 60
.3621	.4165	.3160	.4358	.3566	.2651	.1833	.3598	.3365	.3202	.0888	.0498	.3911	62. R-114 60
	.4208	.3553	.3706	.2827	.2724	.2453	.3545	.3171	.3085	.0508	.0802	.3808	63. R-115 60
.4208		.4091	.5308	.3958	.3583	.2902	.4773	.4172	.4488	.0692	.0751	.4825	64. R-131 60
.3553	.4091		.3729	.2710	.2725	.2694	.3978	.3127	.3797	.0704	.0403	.3347	65. R-132 60
.3706	.5308	.3729		.3776	.3086	.2285	.4338	.4044	.4007	.0803	.0605	.4247	66. R-133 60
.2827	.3958	.2710	.3776		.2311	.1762	.3134	.2870	.2776	.0897	.0769	.3448	67. R-134 60
.2724	.3583	.2725	.3086	.2311		.2176	.3140	.2425	.3086	.0910	.0677	.2664	68. R-135 60
.2453	.2902	.2694	.2285	.1762	.2176		.2653	.1717	.2515	.0526	.0555	.2210	69. R-138 60
.3545	.4773	.3978	.4338	.3134	.3140	.2653		.3448	.3833	.0651	.0636	.3971	70. R-139 60
.3171	.4172	.3127	.4044	.2870	.2425	.1717	.3448		.3107	.0692	.0376	.3740	71. R-140 60
.3085	.4488	.3797	.4007	.2776	.3086	.2515	.3833	.3107		.0755	.0613	.3445	72. R-142 60
.0508	.0692	.0704	.0803	.0897	.0910	.0526	.0651	.0692	.0755		.0516	.0847	73. R-145 60
.0802	.0751	.0403	.0605	.0769	.0677	.0555	.0636	.0376	.0613	.0516		.0858	74. R-146 60
.3808	.4825	.3347	.4247	.3448	.2664	.2210	.3971	.3740	.3445	.0847	.0858		75. R-147 60
.4198	.5795	.3920	.4694	.3490	.3243	.2682	.4711	.3921	.3848	.0495	.0339	.4303	76. R-150 60
.4062	.6305	.4908	.5959	.3759	.3293	.2661	.6090	.4300	.4554	.0751	.0749	.5327	77. R-162 60
.2860	.3806	.2543	.3191	.2214	.2342	.1662	.3210	.2625	.3163	.0286	.0369	.2889	78. R-212 60
.3346	.4518	.2884	.4483	.2926	.2727	.2128	.3626	.3154	.3435	.0383	.0613	.3841	79. R-220 60
.3043	.3813	.2507	.3780	.2467	.2508	.1828	.3151	.2576	.3032	.0435	.0443	.2941	80. R-231 60
.2617	.3129	.2216	.3277	.2163	.1729	.1371	.2583	.2959	.2530	.0337	.0295	.2728	81. R-232 60
.3700	.4635	.3413	.4389	.3026	.2823	.2060	.4067	.3420	.4099	.0504	.0293	.3830	82. R-233 60
.2885	.3937	.2854	.3926	.2524	.2527	.1676	.3269	.2903	.3331	.0418	.0147	.3214	83. R-234 60
.2500	.3514	.2692	.3497	.2285	.1881	.1283	.3117	.2822	.2887	.0205	.0026	.2873	84. R-235 60
.3438	.4341	.3227	.3932	.2928	.3018	.2137	.4109	.2987	.4045	.0304	.0292	.3720	85. R-240 60
.4422	.6180	.4573	.5741	.3872	.3754	.2796	.5269	.4330	.5613	.0578	.0556	.5016	86. R-250 60
.3549	.4571	.3433	.4072	.3415	.3191	.2298	.4004	.3212	.3491	.0897	.0655	.3821	87. R-260 60
.3114	.3841	.2994	.3311	.3181	.2392	.2123	.3118	.2756	.2916	.0826	.0517	.3865	88. R-270 60
.2201	.2658	.1968	.2405	.2112	.1645	.1266	.1983	.2308	.1946	.0407	.0142	.2671	89. R-281 60
.2355	.3082	.2109	.2492	.2454	.2164	.1561	.2689	.2154	.2227	.0363	.0238	.2805	90. R-282 60
.3116	.4124	.2928	.3567	.2598	.2435	.1827	.3304	.3134	.3192	.0401	.0352	.3615	91. R-290 60
.3693	.4509	.3885	.4209	.3185	.2897	.2188	.4602	.3425	.4102	.0756	.0295	.4181	92. R-311 60
.4004	.4582	.3487	.4169	.3201	.3038	.2266	.4142	.3342	.4130	.0446	.0453	.4210	93. R-312 60
.1261	.1042	.0844	.0782	.0875	.0765	.0955	.1003	.0799	.0907	.0290	.0273	.0817	94. R-333 60
.2564	.2833	.1985	.3207	.2034	.1869	.1250	.2656	.2871	.2219	.0106	.0485	.2692	95. F-410 60
.1443	.1544	.0824	.1891	.1172	.0853	.0204	.1207	.1797	.1249	.0517	.0099	.1708	96. F-420 60
.1508	.1587	.1389	.1789	.0986	.1253	.0706	.1552	.1638	.1317	.0294	.0469	.1635	97. F-430 60
.1440	.1628	.0798	.1561	.1303	.0984	.0609	.1377	.1471	.0822	.0205	.0241	.1771	98. F-440 60
.3298	.3895	.2510	.3013	.1988	.2289	.1821	.3114	.2710	.1776	-.0005	-.0004	.3766	99. P*801 60

TABLE 6-1b (continued)

	Variable	76	77	78	79	80	81	82	83	84	85	86	87
Information Test	1. R-102 63 Vocab. I	.5804	.6658	.4408	.5463	.4584	.3508	.5880	.4802	.4296	.5534	.7369	.5325
	2. R-103 63 Literature	.5712	.6242	.4434	.4923	.4425	.3428	.5653	.4764	.4309	.5541	.7039	.4732
	3. R-104 63 Music	.5287	.5813	.3843	.4910	.3841	.2997	.5022	.4002	.3690	.4408	.6220	.4544
	4. R-105 63 Soc. Stud.	.5153	.6076	.4343	.4606	.4126	.3373	.5566	.4421	.3916	.5235	.6927	.4547
	5. R-106 63 Math	.4708	.5394	.4216	.4541	.4283	.2806	.5623	.4054	.3832	.5983	.6161	.4754
	6. R-107 63 Phys. Sci.	.4616	.5691	.4146	.4460	.4019	.2918	.5422	.4071	.3831	.5315	.6526	.4937
	7. R-108 63 Bio. Sci.	.3884	.5045	.3415	.4102	.3128	.2452	.4451	.3292	.3212	.4368	.5909	.4620
	8. R-109 63 Scient.Att	.3744	.4713	.3017	.3671	.2939	.2536	.4349	.3456	.3521	.4118	.5366	.3913
	9. R-110 63 Aero-Space	.3627	.3808	.2373	.2888	.1956	.1770	.3246	.2558	.2371	.3325	.4476	.3707
	10. R-111 63 Electronic	.3031	.3806	.2514	.2789	.2434	.1847	.3492	.2793	.2400	.3269	.4142	.3671
	11. R-112 63 Mechanics	.3148	.4083	.2418	.2958	.2052	.2159	.3341	.2849	.2362	.2871	.4434	.4274
	12. R-113 63 Farming	.3726	.4604	.2796	.3562	.3037	.2875	.4363	.3504	.2863	.3765	.5320	.4063
	13. R-114 63 Home Ec.	.3085	.3983	.2205	.2604	.1989	.2225	.3185	.2576	.2730	.2633	.4138	.3500
	14. R-115 63 Sports	.4378	.4274	.3216	.3796	.3053	.2536	.3922	.3006	.2714	.3808	.4987	.3669
	15. R-131 63 Art	.5481	.5761	.3293	.4386	.3466	.4075	.4573	.4255	.3602	.4266	.6220	.4477
	16. R-132 63 Law	.4333	.4717	.2839	.3662	.3089	.3737	.4577	.3752	.3395	.4013	.5643	.3912
	17. R-133 63 Health	.4009	.4770	.3014	.3954	.3311	.3798	.4282	.3688	.3182	.3692	.5287	.3560
	18. R-134 63 Engin.	.3080	.3128	.1914	.2726	.2079	.2536	.2937	.2450	.2104	.2564	.3778	.2979
	19. R-135 63 Arch.	.3984	.3924	.2635	.3239	.2939	.2769	.3663	.3089	.2556	.3915	.4482	.3212
	20. R-130 63 Military	.3416	.3569	.2264	.2944	.2566	.2545	.3282	.2852	.2224	.2968	.4029	.2397
	21. R-139 63 Acct,Busi.	.4580	.4974	.2797	.3722	.3260	.3936	.4484	.3586	.3304	.3968	.5155	.4036
	22. R-140 63 Prac.Knowl	.3294	.3700	.2076	.3095	.2233	.2925	.3260	.2667	.2465	.2911	.3786	.2658
	23. R-142 63 Bible	.3232	.4325	.2769	.3224	.2745	.3082	.4083	.3157	.3109	.3924	.5527	.3438
	24. R-145 63 Hunting	.0102	.0055	.0299	.0342	.0483	.0067	.0631	.0328	.0218	.0208	.0581	.0522
	25. R-146 63 Fishing	.0503	.0457	-.0023	.0560	.0315	.0386	.0433	.0538	.0405	.0266	.0680	.0808
	26. R-147 63 Outdoor	.4038	.4418	.2610	.3377	.2425	.3556	.3928	.3488	.2881	.3775	.4550	.3518
	27. R-150 63 Theater	.6321	.5399	.3166	.4468	.3482	.4160	.4550	.4047	.3819	.4194	.5734	.4148
	28. R-162 63 Vocab. II	.4928	.6198	.3618	.4453	.3823	.4478	.5066	.4295	.4153	.4314	.5973	.4095
	29. R-212 63 Mem. Words	.3730	.4103	.5533	.3777	.3564	.2720	.4440	.3161	.3206	.4523	.4738	.3274
	30. R-220 63 Disg. Wds.	.4125	.4642	.3455	.6099	.4439	.2870	.4606	.4048	.3362	.4531	.4978	.3363
English Test	31. R-231 63 Spelling	.3838	.3995	.3265	.4505	.5852	.3342	.4968	.3831	.3394	.4290	.4819	.2800
	32. R-232 63 Capital.	.2348	.2635	.1935	.2432	.2294	.3087	.3399	.2634	.2498	.2510	.3396	.2111
	33. R-233 63 Punct.	.4015	.4864	.3836	.4664	.4662	.4104	.6927	.4752	.4242	.5670	.6018	.4047
	34. R-234 63 Eng. Usage	.3856	.4215	.3364	.4488	.3597	.3193	.5211	.4924	.3868	.4513	.5178	.3389
	35. R-235 63 Eff. Exp.	.3607	.3883	.3104	.3474	.3002	.3236	.4589	.3822	.4805	.4092	.5005	.3508
	36. R-240 63 Word.Funct	.4171	.5062	.4141	.4754	.4766	.3375	.6244	.4396	.4064	.6606	.6087	.4320
	37. R-250 63 Rdg. Compr	.5178	.6160	.4285	.4951	.4200	.3889	.5809	.4939	.4820	.5328	.7643	.4889
	38. R-260 63 Creativity	.4169	.4812	.3596	.4286	.3659	.2838	.4480	.3526	.3335	.4535	.5346	.5391
	39. R-270 63 Mech.Reas	.3124	.3598	.3138	.3555	.2456	.2493	.4250	.3125	.3047	.4005	.4430	.3840
	40. R-281 63 Vis. 2 Dim	.1803	.2233	.2042	.2474	.1546	.1803	.2650	.2005	.1814	.2486	.2725	.2461
	41. R-282 63 Vis. 3 Dim	.2645	.3372	.2917	.3026	.2284	.2087	.3933	.2830	.2395	.3489	.4008	.3629
	42. R-290 63 Abst.Reas	.3475	.4085	.3242	.3822	.3028	.3543	.4817	.3517	.3629	.4336	.5033	.4064
Math Test	43. R-311 63 Arith.Re	.4183	.5017	.3824	.4051	.3826	.3683	.5888	.4195	.4121	.5693	.6236	.4678
	44. R-312 63 Int.HSMath	.3912	.4555	.3857	.3981	.4060	.3510	.5940	.3847	.3655	.5853	.5751	.4150
	45. R-333 63 Adv.HSMath	.3100	.3474	.2899	.2928	.2766	.2091	.4262	.2666	.2551	.4699	.4245	.3377
	46. F-410 63 Arith.Comp	.2430	.2843	.2606	.2846	.3283	.2938	.3974	.2967	.2777	.3369	.3555	.2466
	47. F-420 63 Table Read	.1660	.1621	.1306	.2447	.1982	.1679	.1950	.1457	.0970	.1600	.2021	.1347
	48. F-430 63 Cler.Check	.1806	.1827	.1781	.2870	.2572	.1531	.2182	.1630	.1178	.2360	.2414	.1743
	49. F-440 63 Obj.Insp.	.1689	.1765	.1406	.2374	.1290	.1573	.1959	.1729	.1188	.2039	.2010	.1776
Information Test	50. R-102 60 Vocab. I	.5902	.6350	.4173	.5372	.4637	.3473	.5572	.4686	.4117	.5445	.7135	.5201
	51. R-103 60 Literature	.5598	.5397	.3904	.4776	.3970	.3140	.4763	.4181	.3623	.4756	.6342	.4584
	52. R-104 60 Music	.5339	.5399	.3914	.4655	.3883	.3123	.4846	.3994	.3571	.4524	.5934	.4339
	53. R-105 60 Soc. Stud.	.5471	.6074	.4374	.4683	.4453	.3591	.5531	.4426	.3878	.5284	.6969	.4723
	54. R-106 60 Math	.4505	.4964	.3972	.4351	.4143	.2688	.5195	.3686	.3406	.5489	.5483	.4429
	55. R-107 60 Phys. Sci.	.4319	.5119	.3558	.4187	.3638	.3012	.4698	.3793	.3466	.4801	.5774	.4233
	56. R-108 60 Bio. Sci.	.3982	.4603	.3452	.3804	.3109	.2497	.4102	.3204	.3040	.4241	.5435	.3996
	57. R-109 60 Scient.Att	.3627	.4353	.2996	.3595	.2950	.2589	.4230	.3503	.3517	.3898	.5302	.3754
	58. R-110 60 Aero-Space	.3108	.3150	.2125	.2682	.1701	.1590	.2625	.2173	.2126	.2832	.3704	.3098
	59. R-111 60 Electronic	.2687	.3056	.2166	.2177	.2086	.1732	.2527	.1854	.1834	.2540	.3328	.2900
	60. R-112 60 Mechanics	.3246	.3909	.2103	.2893	.2131	.1922	.3104	.2619	.2048	.2843	.4235	.3996
	61. R-113 60 Farming	.4030	.4794	.3102	.3625	.3288	.2952	.4394	.3599	.3100	.3789	.5477	.4239
	62. R-114 60 Home Ec.	.3807	.4568	.2841	.3473	.2785	.2763	.3827	.3101	.3022	.3368	.4680	.3849
	63. R-115 60 Sports	.4198	.4062	.2860	.3346	.3043	.2617	.3700	.2885	.2500	.3438	.4422	.3549
	64. R-131 60 Art	.5795	.6305	.3806	.4518	.3813	.3129	.4635	.3937	.3514	.4341	.6180	.4571
	65. R-132 60 Law	.3920	.4908	.2543	.2884	.2507	.2216	.3413	.2854	.2692	.3227	.6573	.3433
	66. R-133 60 Health	.4694	.5959	.3191	.4483	.3780	.3277	.4389	.3926	.3497	.3932	.5741	.4072
	67. R-134 60 Engin.	.3490	.3759	.2214	.2926	.2467	.2163	.3026	.2524	.2285	.2928	.3872	.3415
	68. R-135 60 Arch.	.3243	.3293	.2342	.2727	.2508	.1729	.2823	.2527	.1881	.3018	.3754	.3191
	69. R-138 60 Military	.2682	.2661	.1662	.2128	.1828	.1371	.2060	.1676	.1283	.2137	.2796	.2298
	70. R-139 60 Acct,Busi.	.4711	.6090	.3210	.3626	.3151	.2583	.4067	.3269	.3117	.4109	.5269	.4004
	71. R-140 60 Prac.Knowl	.3921	.4300	.2625	.3154	.2576	.2959	.3420	.2903	.2822	.2987	.4330	.3212
	72. R-142 60 Bible	.3848	.4554	.3163	.3435	.3032	.2530	.4099	.3331	.2887	.4045	.5613	.3491
	73. R-145 60 Hunting	.0495	.0751	.0286	.0383	.0435	.0337	.0504	.0418	.0205	.0304	.0578	.0897
	74. R-146 60 Fishing	.0339	.0749	.0369	.0613	.0443	.0295	.0293	.0147	.0026	.0292	.0556	.0655
	75. R-147 60 Outdoor	.4303	.5327	.2889	.3841	.2941	.2728	.3830	.3214	.2873	.3720	.5016	.3821
	76. R-150 60 Theater		.5876	.3471	.4511	.3756	.3125	.4260	.3912	.3491	.4020	.5635	.3981
	77. R-162 60 Vocab. II	.5876		.3948	.4949	.4130	.3374	.5135	.4452	.4092	.4693	.6496	.4608
	78. R-212 60 Mem. Words	.3471	.3948		.3639	.3704	.2977	.4470	.3361	.2905	.4198	.4536	.3373
	79. R-220 60 Disg. Wds.	.4511	.4949	.3639		.4981	.3460	.5121	.4420	.3709	.4697	.5750	.4464
English Test	80. R-231 60 Spelling	.3756	.4130	.3704	.4981		.4026	.5544	.4293	.3704	.4636	.4995	.3396
	81. R-232 60 Capital.	.3125	.3374	.2977	.3460	.4026		.4933	.4259	.3578	.3372	.4309	.2905
	82. R-233 60 Punct.	.4260	.5135	.4470	.5121	.5544	.4933		.5445	.4670	.6112	.6243	.4400
	83. R-234 60 Eng. Usage	.3912	.4452	.3361	.4420	.4293	.4259	.5445		.4534	.4111	.5152	.3472
	84. R-235 60 Eff. Exp.	.3491	.4092	.2905	.3709	.3704	.3578	.4670	.4534		.3826	.4986	.3314
	85. R-240 60 Word.Funct	.4020	.4693	.4198	.4697	.4636	.3372	.6112	.4111	.3826		.6187	.4726
	86. R-250 60 Rdg. Compr	.5635	.6496	.4536	.5750	.4995	.4309	.6243	.5152	.4986	.6187		.5876
	87. R-260 60 Creativity	.3981	.4608	.3373	.4464	.3396	.2905	.4400	.3472	.3314	.4726	.5876	
	88. R-270 60 Mech.Reas	.3273	.3950	.2936	.3726	.2152	.2395	.4123	.3188	.3197	.4135	.4831	.4419
	89. R-281 60 Vis. 2 Dim	.2299	.2543	.2106	.3174	.1922	.2136	.3134	.2356	.2255	.2936	.3438	.3097
	90. R-282 60 Vis. 3 Dim	.2342	.3108	.2626	.2797	.2014	.2233	.3606	.2299	.2511	.3717	.4095	.3703
	91. R-290 60 Abst.Reas	.3498	.4125	.3366	.4261	.3200	.3438	.5065	.3665	.3690	.4849	.5565	.4473
Math Test	92. R-311 60 Arith.Reas	.4264	.5262	.4023	.4355	.4438	.3814	.5852	.4364	.4493	.5716	.6323	.4741
	93. R-312 60 Int.HSMath	.4412	.4859	.4130	.4415	.4843	.3874	.6170	.4342	.4016	.5795	.5906	.4613
	94. R-333 60 Adv.HSMath	.0992	.0887	.0920	.0959	.1077	.0735	.1211	.0713	.0748	.0863	.0919	.1100
	95. F-410 60 Arith.Comp	.2778	.3226	.2776	.3328	.3537	.3128	.4029	.3344	.2744	.3390	.3871	.2816
	96. F-420 60 Table Read	.1541	.1656	.1213	.2308	.1611	.1981	.2037	.1835	.1304	.1978	.2172	.1568
	97. F-430 60 Cler.Check	.1868	.1726	.1962	.3497	.2669	.1875	.2557	.2006	.1398	.2416	.2525	.1832
	98. F-440 60 Obj.Insp.	.1537	.1572	.1593	.2407	.1066	.1773	.1850	.1347	.1214	.2081	.2158	.1950
	99. P*801 60 Socioecon.	.3712	.3464	.2376	.3071	.2205	.2193	.2925	.2472	.2402	.2886	.3680	.2941

TABLE 6-1b (continued)

88	89	90	91	92	93	94	95	96	97	98	99	Variable
.4869	.3385	.3981	.5066	.6009	.5779	.1172	.3200	.2048	.1853	.2142	.4079	1. R-102 63
.3966	.2916	.3403	.4298	.5363	.5624	.0853	.2944	.2005	.1972	.2016	.4200	2. R-103 63
.4034	.2789	.3240	.4272	.4804	.4788	.1026	.2914	.1886	.1622	.2041	.4474	3. R-104 63
.4080	.3037	.3593	.4497	.5616	.5543	.0977	.3096	.1715	.1664	.1736	.3841	4. R-105 63
.4685	.3558	.4131	.4921	.5945	.6666	.1597	.3190	.1859	.1984	.2296	.4059	5. R-106 63
.5047	.3291	.4136	.4808	.5871	.5851	.1306	.2850	.1767	.1637	.2022	.3535	6. R-107 63
.4169	.2588	.3359	.4003	.4572	.4399	.1057	.2332	.1168	.1237	.1722	.2824	7. R-108 63
.3799	.3213	.3384	.4072	.4488	.4122	.1159	.2325	.1798	.1376	.1967	.3001	8. R-109 63
.4164	.2512	.3058	.3311	.3666	.3711	.0802	.1691	.1329	.1089	.1504	.2562	9. R-110 63
.3817	.2414	.3018	.3123	.3752	.3884	.1010	.1902	.1384	.0890	.1398	.2022	10. R-111 63
.4232	.2893	.3199	.3320	.3902	.3520	.0861	.1677	.1474	.0636	.1586	.1872	11. R-112 63
.3774	.3036	.2962	.3510	.4393	.3870	.0647	.2333	.1734	.1438	.1656	.2015	12. R-113 63
.3300	.2579	.2952	.3175	.3457	.3180	.0653	.1893	.1461	.0696	.1593	.1870	13. R-114 63
.3508	.2727	.2752	.3378	.3829	.4227	.1087	.2677	.1817	.1454	.1848	.3398	14. R-115 63
.3941	.2798	.2977	.4082	.4111	.4512	.0814	.2424	.1665	.1432	.1570	.3930	15. R-131 63
.3374	.2113	.2832	.3683	.4628	.4338	.0534	.2414	.1528	.1296	.1169	.3032	16. R-132 63
.3104	.2264	.2595	.3584	.3830	.4058	.0746	.2854	.2170	.1160	.1638	.2599	17. R-133 63
.2914	.2181	.2357	.2669	.3004	.2972	.0787	.1591	.1325	.0612	.0972	.2069	18. R-134 63
.2645	.1340	.2146	.2988	.3320	.3446	.0674	.1850	.0851	.1438	.0831	.3039	19. R-135 63
.2728	.1558	.1705	.2651	.3297	.3150	.0370	.1564	.1104	.0928	.0810	.2633	20. R-138 63
.3283	.2501	.2758	.3617	.4916	.4421	.0746	.3140	.1635	.1032	.1037	.2811	21. R-139 63
.2477	.2093	.2090	.2695	.3052	.3140	.0939	.2435	.1751	.1343	.1262	.2496	22. R-140 63
.2987	.1814	.2502	.3273	.3976	.4049	.0546	.1865	.1326	.0716	.0646	.1608	23. R-142 63
.0803	.0134	.0248	.0425	.0629	.0185	.0323	.0279	.0391	.0198	.0263	-.0500	24. R-145 63
.1013	.0719	.0521	.0639	.0303	.0414	.0444	.0109	.0065	.0223	.0196	-.0102	25. R-146 63
.3728	.2723	.2610	.3320	.3709	.3886	.1289	.2011	.1516	.1092	.1451	.3962	26. R-147 63
.3330	.2465	.2568	.3780	.4217	.4657	.0898	.2493	.1708	.1455	.1162	.3709	27. R-150 63
.3797	.2611	.2938	.4335	.5055	.4717	.0714	.2844	.1460	.1223	.0974	.3345	28. R-162 63
.3012	.2358	.2594	.3781	.4083	.4124	.0867	.2998	.1274	.2050	.1453	.2521	29. R-212 63
.3194	.2886	.2703	.3820	.4129	.4080	.0637	.3274	.1950	.3184	.2099	.3068	30. R-220 63
.2367	.1739	.1820	.2980	.3890	.4017	.0665	.3787	.1666	.2840	.1363	.1861	31. R-231 63
.1935	.1877	.1931	.2412	.2563	.2366	.0457	.2736	.2267	.2145	.1551	.1741	32. R-232 63
.4155	.3210	.3517	.4963	.5369	.5385	.0841	.4392	.2559	.2775	.2128	.2637	33. R-233 63
.3511	.2498	.2465	.3827	.4208	.4221	.0498	.3442	.1609	.2278	.1415	.2454	34. R-234 63
.3306	.2811	.2793	.4073	.4208	.3944	.0658	.3632	.1610	.1607	.1435	.2777	35. R-235 63
.3949	.3132	.3713	.4989	.5641	.5947	.0754	.4168	.1978	.2589	.1893	.2894	36. R-240 63
.4195	.3023	.3732	.4896	.5821	.5443	.0830	.4114	.1835	.2205	.1838	.3406	37. R-250 63
.4186	.2952	.3829	.4455	.4776	.4611	.1042	.3096	.1627	.1919	.1886	.2910	38. R-260 63
.6350	.4080	.4912	.4782	.4602	.4608	.1052	.2621	.1615	.1406	.2287	.2901	39. R-270 63
.3802	.5653	.4213	.3666	.2938	.2861	.0423	.2325	.1429	.1559	.2280	.1456	40. R-281 63
.4895	.4143	.5855	.4751	.4422	.4280	.0707	.2719	.1445	.1708	.2699	.2164	41. R-282 63
.4599	.4008	.4644	.6004	.4941	.4816	.0796	.3395	.2221	.1945	.2691	.3105	42. R-290 63
.4918	.3469	.4046	.5243	.6837	.6031	.0958	.3858	.1869	.2272	.1923	.3300	43. R-311 63
.4476	.3207	.3934	.4677	.5769	.6751	.1272	.3626	.1749	.2637	.1881	.3691	44. R-312 63
.3699	.2261	.3188	.3471	.4435	.5242	.1496	.2329	.0805	.1620	.1134	.2867	45. R-333 63
.2278	.2554	.2104	.3126	.3588	.3680	.0646	.4828	.2335	.2746	.2211	.1450	46. F-410 63
.1749	.2005	.1592	.2224	.1841	.2381	.0486	.2453	.2295	.2066	.2465	.1085	47. F-420 63
.1674	.2002	.1599	.2396	.2145	.2229	.0445	.2311	.1612	.2830	.2350	.2050	48. F-430 63
.2327	.2723	.2437	.3051	.1935	.2277	.0310	.2148	.1894	.2002	.4068	.1571	49. F-440 63
.4639	.3050	.3489	.4637	.5647	.5528	.1107	.3393	.1810	.2226	.1806	.4125	50. R-102 60
.3605	.2592	.3223	.3856	.4614	.5038	.1216	.2586	.1317	.2035	.1618	.3870	51. R-103 60
.3816	.2470	.3010	.4143	.4614	.4905	.1226	.2935	.1303	.1784	.1403	.4521	52. R-104 60
.3880	.2532	.3468	.4481	.5605	.5680	.1253	.3531	.1272	.1955	.1360	.3920	53. R-105 60
.4204	.2821	.3663	.4282	.5343	.6351	.1744	.3150	.1199	.1783	.1487	.3502	54. R-106 60
.4323	.2543	.3423	.4238	.5176	.5062	.1086	.2757	.1475	.1588	.1321	.3091	55. R-107 60
.3596	.2176	.2756	.3321	.4185	.4076	.1035	.2300	.1016	.1207	.1318	.2337	56. R-108 60
.3464	.2224	.2827	.3842	.4556	.3945	.0865	.2388	.1279	.1428	.1268	.2773	57. R-109 60
.3297	.1726	.2213	.2478	.2872	.3032	.1296	.1308	.0688	.0869	.1060	.2301	58. R-110 60
.2764	.1532	.2018	.2200	.3038	.2965	.0832	.1806	.0929	.0817	.0704	.1463	59. R-111 60
.3980	.2304	.2904	.2684	.3607	.3219	.0961	.1970	.1259	.0859	.1222	.1764	60. R-112 60
.3865	.2766	.3309	.3797	.4489	.4173	.0742	.2820	.1372	.1410	.1468	.2118	61. R-113 60
.3668	.2425	.2920	.3349	.4236	.4015	.0867	.2647	.1266	.1158	.1506	.2433	62. R-114 60
.3114	.2201	.2355	.3116	.3693	.4004	.1261	.2564	.1443	.1508	.1440	.3298	63. R-115 60
.3841	.2658	.3082	.4124	.4509	.4582	.1042	.2833	.1544	.1587	.1628	.3895	64. R-131 60
.2994	.1968	.2109	.2928	.3885	.3487	.0844	.1985	.0824	.1389	.0798	.2510	65. R-132 60
.3311	.2405	.2492	.3567	.4209	.4169	.0782	.3207	.1891	.1789	.1561	.3013	66. R-133 60
.3181	.2112	.2454	.2598	.3185	.3201	.0875	.2034	.1172	.0986	.1303	.1988	67. R-134 60
.2392	.1645	.2164	.2435	.2897	.3038	.0765	.1869	.0853	.1253	.0984	.2289	68. R-135 60
.2123	.1266	.1561	.1827	.2188	.2266	.0955	.1250	.0204	.0706	.0609	.1821	69. R-138 60
.3118	.1983	.2689	.3304	.4602	.4142	.1003	.2656	.1207	.1552	.1377	.3114	70. R-139 60
.2756	.2308	.2154	.3134	.3425	.3342	.0799	.2871	.1797	.1638	.1471	.2710	71. R-140 60
.2916	.1946	.2227	.3192	.4102	.4130	.0907	.2219	.1299	.1317	.0822	.1776	72. R-142 60
.0826	.0407	.0363	.0401	.0756	.0446	.0290	.0106	.0517	.0294	.0205	-.0005	73. R-145 60
.0517	.0142	.0238	.0352	.0295	.0453	.0273	.0485	.0099	.0469	.0241	-.0004	74. R-146 60
.3865	.2871	.2885	.3615	.4181	.4210	.0817	.2692	.1708	.1635	.1771	.3766	75. R-147 60
.3273	.2299	.2342	.3498	.4264	.4412	.0992	.2778	.1541	.1868	.1537	.3712	76. R-150 60
.3950	.2543	.3108	.4125	.5262	.4859	.0887	.3226	.1656	.1726	.1572	.3464	77. R-162 60
.2936	.2106	.2626	.3366	.4023	.4130	.0920	.2776	.1213	.1962	.1593	.2376	78. R-212 60
.3726	.3174	.2797	.4261	.4355	.4415	.0959	.3328	.2308	.3497	.2407	.3071	79. R-220 60
.2152	.1922	.2014	.3200	.4438	.4843	.1077	.3537	.1611	.2669	.1066	.2205	80. R-231 60
.2395	.2136	.2233	.3438	.3814	.3874	.0735	.3128	.1981	.1875	.1773	.2193	81. R-232 60
.4123	.3124	.3606	.5065	.5852	.6170	.1211	.4029	.2037	.2557	.1850	.2925	82. R-233 60
.3188	.2356	.2299	.3665	.4364	.4342	.0713	.3344	.1835	.2006	.1347	.2472	83. R-234 60
.3197	.2255	.2511	.3690	.4493	.4016	.0748	.2744	.1304	.1398	.1214	.2402	84. R-235 60
.4135	.2936	.3717	.4849	.5716	.5795	.0863	.3390	.1978	.2416	.2081	.2886	85. R-240 60
.4831	.3438	.4095	.5565	.6323	.5906	.0919	.3871	.2172	.2525	.2158	.3680	86. R-250 60
.4419	.3097	.3703	.4473	.4741	.4613	.1100	.2816	.1568	.1832	.1950	.2941	87. R-260 60
	.4238	.5246	.5058	.4698	.4445	.1071	.2053	.1654	.1507	.2587	.2741	88. R-270 60
.4238		.4233	.3932	.3219	.3422	.0612	.2078	.2273	.2147	.2808	.1823	89. R-281 60
.5246	.4233		.4983	.4111	.4039	.1011	.1990	.1843	.1430	.2539	.2245	90. R-282 60
.5058	.3932	.4983		.5139	.4972	.0949	.3275	.2139	.2077	.2925	.3280	91. R-290 60
.4698	.3219	.4111	.5139		.6175	.1156	.3669	.1688	.1856	.1469	.2890	92. R-311 60
.4445	.3422	.4039	.4972	.6175		.1803	.3947	.1930	.2142	.1721	.3407	93. R-312 60
.1071	.0612	.1011	.0949	.1156	.1803		.0428	.0129	.0328	.0221	.0710	94. R-333 60
.2053	.2078	.1990	.3275	.3669	.3947	.0428		.2529	.2179	.1944	.1679	95. F-410 60
.1654	.2273	.1843	.2139	.1688	.1930	.0129	.2529		.3142	.3347	.1024	96. F-420 60
.1507	.2147	.1430	.2077	.1856	.2142	.0328	.2179	.3142		.3325	.1416	97. F-430 60
.2587	.2808	.2539	.2925	.1469	.1721	.0221	.1944	.3347	.3325		.1459	98. F-440 60
.2741	.1823	.2245	.3280	.2890	.3407	.0710	.1679	.1024	.1416	.1459		99. P*801 60

---

[a] This matrix was obtained by the special procedure described in Chapter 3 for estimating correlations when data are missing, and for insuring that the matrix will be consistent. Retest weight Z was used.

[b] The unweighted numbers of cases on which each correlation coefficient is based may be determined from Table 2-5.

TABLE 6-2. Basic data concerning the development of consistent correlation Matrices 1A and 1B

Matrix	Sex	Total no. of cases[a]	No. of variables	Matrices with 1's in diagonal	Matrix shown in	No. of eigenvalues			Values of negative eigenvalues
						$\lambda<0$	$\lambda=0$	$\lambda>0$	
1A	M	3441	99	Initial matrix (pseudo-matrix)	Table I-1	1	0	98	-.31
				Intermediate matrix	--	2	0	97	-.01, -.29
				Final (consistent) matrix	Table 6-1a	0	2	97	--
1B	F	3676	99	Initial matrix (pseudo-matrix)	Table I-2	1	0	98	-.10
				Intermediate matrix	--	1	0	98	-.13
				Final (consistent) matrix	Table 6-1b	0	1	98	--

[a] Maximum unweighted number of cases. The numbers of cases for most of the correlation coefficients are considerably smaller. (See Table 2-5)

CANONICAL CORRELATION ANALYSIS

As a preliminary to the factor analysis that is discussed later in this chapter, a canonical correlation analysis was undertaken. The purpose of the factor analysis was to provide some explanatory constructs to account for as many as possible of the interrelations among the cognitive variables (both within-grade and between-grade relationships). The canonical correlation analysis, in contrast, was intended to focus on the organization of the relationships between the set of grade 9 variables and the set of grade 12 variables. This analysis was based on the matrices in Table 6-1, and it was done separately for males (Consistent Matrix 1A) and females (Consistent Matrix 1B). For each matrix the set of 49 grade 12 variables was correlated with the corresponding set of grade 9 variables.

Since all four of the 49-variable within-grade matrices (two for males and two for females) were of full rank (rank 49), 49 canonical correlations were obtained for males and 49 for females. No exact test of significance is available for these correlations since there is no single number of cases for the consistent correlation matrices. If N is assumed to equal 600 (a gross understatement of the average number of cases involved in the statistics of these matrices, as can be seen in Table 2-5), 17 of the canonical correlations for males would be statistically significant (at the .05 level) and 17 for females. Thus 17 may safely be regarded as a lower-bound estimate of the number of significant canonical correlations for each sex.

This means that there are at least 17 distinct dimensions which the grade 9 and grade 12 variables share. Each of the composite variables represented by those dimensions has a correlation significantly greater than 0 with at least one grade 9 variable and one grade 12 variable. It will be noted that the expression used above is "<u>at least</u>" 17 dimensions. Because of the very conservative basis used in estimating this lower bound, it seems almost certain that there really are more than 17 such dimensions in the population of students from which our sample was drawn, and that a different approach might uncover some additional non-chance dimensions. As a matter of fact, as we shall see later in this chapter, when the factor analysis results are discussed, that is exactly what we think <u>has</u> happened; there <u>are</u> more than 17 factors linking the grade 9 and grade 12 measures, and we are hypothesizing that many of the additional factors represent non-chance relationships.

Table 6-3 shows the canonical correlations. The reader is urged to avoid attaching undue significance to the fact that the first canonicals are remarkably high (1.000 for males and .999 for females). The explanation of this phenomenon is clearly that when there are as many as 49 variables in each set, and particularly when there are strong built-in linkages between the sets there is considerable room for capitalization on chance (i.e., on sampling errors), in the early canonicals.

No effort will be made in this present discussion to describe or interpret the canonical variates since the meaning of unrotated factors[1] of this sort is obscure. A discussion of the intrinsic nature of specific factors linking the grade 9 and grade 12 variables is therefore postponed to a later section of this chapter, where the rotated factors resulting from the factor analysis are discussed.

At this point, let us restrict ourselves to a consideration of the concept of joint factors linking two grades, rather than concerning ourselves about the nature of individual factors of this type. To the extent that there are significant canonical linkages between grade 9 scores and grade 12 scores--in other words linkages that exist not just in the sample we happen to be using but in the population it represents--there are underlying factors basic to performance in grade 9 and likewise basic to grade 12 performance. These factors may be in essence aptitudes as of grade 9. They may be personality factors or motives that have affected achievement up to grade 9 and continue to affect it through grade 12, and that themselves remain essentially unchanged

---

[1] The author is indebted to two colleagues, Bary G. Wingersky and Charles E. Hall, for pointing out that rotation of canonical factors (and similarly rotation of discriminant functions) would facilitate interpretation, in much the same way that factor rotation facilitates interpretation of an ordinary factor analysis.

TABLE 6-3. Canonical correlations between grade 9 and grade 12 cognitive variables (separately by sex)

Based on consistent matrices 1A (males) and 1B (females)

k	Canonical r*		Percent of reliable within-grade variance accounted for by first k canonical r's**	
	M	F	M	F
1	1.000	.999	3.0	3.4
2	.981	.954	6.0	6.6
3	.932	.861	8.9	9.6
4	.793	.785	11.3	12.2
5	.733	.724	13.5	14.7
6	.719	.690	15.7	17.1
7	.680	.641	17.7	19.2
8	.627	.588	19.6	21.2
9	.614	.584	21.5	23.2
10	.570	.529	23.2	25.0
11	.533	.508	24.9	26.8
12	.517	.496	26.4	28.4
13	.508	.478	28.0	30.1
14	.471	.469	29.4	31.7
15	.461	.452	30.8	33.2
16	.452	.444	32.2	34.7
17	.431	.426	33.5	36.2
18-49	.414-.009	.395-.007	53.6	59.0

---

[*] These canonical correlations are based on 98 variables (49 for grade 9 and the corresponding 49 for grade 12) in the Table 6-1 matrices. The only Table 6-1 variable not included in these canonicals is P*801.

[**] The formula used for estimating these percentages is given in Appendix H-3 (Formula 5). It will be observed that the average of the reliability coefficients for the individual variables in a set enters into this formula. The averages used for this purpose are based on 42 reliability coefficients each (from Table 4-8, cols. 1-4), since coefficients are not available for R-212, R-220, R-281, F-410, F-420, F-430, or F-440. The averages used are as follows:

Grade	$\bar{r}_{xx}$		Number of coefficients
	M	F	
9	.6567	.5765	42
12	.6870	.6240	42

during this entire time span. Or they may be home or community factors--socioeconomic and other environmental factors. At this point we cannot do more than surmise what they are. But we can say with certainty that they (whatever they may be) are elements that are present in grade 9 and are still present, unchanged, in grade 12. Let's consider a hypothetical example. Suppose one of the canonical factors (after rotation) were to turn out to be an aspect of spatial ability. This canonical factor would have high correlations with the "spatial" tests in the TALENT battery--Visualization in Two Dimensions and Visualization in Three Dimensions--at both grade levels. The meaning to be attached to this canonical factor would be that there is some element or component of spatial ability that is an attribute of the grade 9 student and that he still possesses at the same relative level (i.e., at the same level relative to other members of the group of individuals under consideration) in grade 12. It would most emphatically <u>not</u> mean that the entire complex of abilities that affects performance on a "spatial" task such as these called for by the "Visualization in Two Dimensions" and "Visualization in Three Dimensions" tests is invariant between grades 9 and 12. There would still, presumably, be ample room for change since the "spatial" canonical factor would almost certainly not account for all the reliable variance in the two visualization tests. Some of the other components--the "noncanonical" ones--affecting grade 12 scores might very well be improved by certain kinds of training. For instance some students' relative scores on the "Visualization in Three Dimensions" test might rise as a consequence of course work in solid geometry.[1]

Now let's drop this discussion of hypothetical examples and get back to real findings. The fact that at least 17 of the 49 canonical correlations are significant means that there are at least 17 <u>independent</u> ways in which students

---

[1] This particular supposition, though presented as a hypothetical example, was not pulled out of the air. French (1965) found that a variable representing the individual's general approach to items measuring spatial visualization operates as a rather potent "moderating variable," substantially affecting the factorial composition of many tests that involve higher mental processes. This moderating variable indicates the degree to which the individual tends to approach spatial visualization items analytically and to try to reason out the answer, perhaps using geometric concepts in the process, as opposed to attempting to perceive the figures globally.

differ when they enter high school and continue to differ, at least for the next three or four years.

Are these 17 ways abilities, or are they something else--interests or other motivational factors, perhaps? At this stage we can't answer with certainty--but since all 49 variables of the battery in question are cognitive measures derived from objective tests rather than noncognitive measures such as personality or interest variables, it seems reasonable to surmise that most (and perhaps, but not necessarily, all) of the 17 canonical factors represent dimensions of <u>ability</u>, unaltered by the students' experiences in grades 10, 11, and 12.

Because it is an important point and one on which misunderstanding may occur, let us reiterate: we are not denying that grade 12 scores on tests in which any of these 17 stable factors are involved are affected significantly by whatever has happened in grades 10, 11, and 12. They <u>can</u> be and <u>are</u> affected by these experiences--but that is only because the 17 abilities we are talking about are not the sole determiners of the grade 12 test scores. Other ability factors too can enter into them and affect them in an important way--and these other abilities are presumably the direct outcome of changes that occur in grades 10, 11, and 12. These may be changes for the better or changes for the worse; they may be due to deliberate efforts on the part of the school, individual teachers, family, friends, counselors, or the student himself to effect changes of a particular kind--or they may be wholly accidental by-products of efforts to bring about other changes. To give a hypothetical example, if a school were to decide to require all students to take four years of high school mathematics and were to make room (in the students' schedules and in the school's budget) for this change by eliminating all foreign language courses, the average level of mathematics achievement in the school would almost certainly rise substantially--and this would be a deliberately sought effect--but foreign language mastery would almost certainly be affected in an undesirable direction--and this would be an incidental and unsought effect of the decision to concentrate a large share of the school's resources on its mathematics program.

A logical next question is: Just how much of the variance do these canonical factors account for? There appears to be some disagreement among statisticians as to how to determine the "percentage of variance accounted for" by a set of canonical correlations. The view taken here is that the question should be asked separately for sets of variables correlated rather than for the overall battery combining the two sets.

At this point a little clarification of terminology is in order, to differentiate between the terms "canonical variate" and "canonical factor," as used in this chapter. By "canonical variates" are meant the linear combination of grade 9 scores and the linear combination of grade 12 scores which when correlated with each other yield a canonical correlation coefficient. By "canonical factor" is meant the hypothetical factor assumed to underlie the two corresponding canonical variates and to account for the canonical correlation between them. Having established these definitions, let us reword the question asked in the preceding paragraph. How much of the variance of each canonical variate is accounted for by the canonical factor underlying it?

The answer to that question depends on how the factor loadings for the two corresponding canonical variates are determined. The only restrictions they are subject to is that neither can exceed 1 and their product must equal the canonical r. Any values assigned them, within these restrictions, are legitimate, and merely serve to define the canonical factor--in other words to fix its location in "factor space." The square of the loading then represents the proportion of the canonical variate's variance accounted for by the canonical factor.

In the special case where we choose to assign equal loadings to the two canonical variates, each of the loadings must equal the square root of canonical r. Let us note that under these circumstances the canonical correlation would represent the proportion of the canonical variate's variance explained by the canonical factor. Let us emphasize: the proportion would equal the correlation itself, not its square.[1]

---

[1] The situation here is entirely analogous to the situation in ordinary factor analysis, where there is good reason to prefer the multiple correlation to its square as an estimate of a variable's communality. This preference is discussed at considerable length in the section on "Factor Analysis Methodology," later in this chapter. Let it suffice at this point to say that not only are all the arguments for multiple R that are presented in that section entirely applicable to the use of canonical r in the present context, but they are, if anything, even stronger here since in the two-variable context the correlation coefficient may be regarded more as an exact value of the communality than as a mere estimate. (The two variables of the present context are the grade 9 canonical variate and the corresponding grade 12 canonical variate.)

In the present case, instead of assigning equal loadings to the two canonical variates so that the proportions of this total variance accounted for by the canonical factor are equal, it seems advantageous to define the loadings in such a way that it is the proportions of the reliable variance that are approximately equal. When the loadings are determined in accordance with this principle, and when, furthermore, the number of variables in the two within-grade matrices are equal, as they are in this case (49 variables in each matrix), and when both the matrices are of full rank, the percentage of the total reliable variance of a within-grade matrix that is accounted for by the first k canonical factors is given by the following formula[1]:

$$\% = \frac{100 \sum_{i=1}^{k} r_{A_i B_i}}{n\sqrt{\bar{r}_{aa}}\,\sqrt{\bar{r}_{bb}}} \tag{1}$$

where $r_{A_i B_i}$ = $i^{\underline{th}}$ canonical r between grade 9 and grade 12

$\bar{r}_{aa}$ = average reliability coefficient for the grade 9 variables

$\bar{r}_{bb}$ = average reliability coefficient for the grade 12 variables

n = number of variables for grade 9
= number of variables for grade 12

Having disposed of some of the methodological problems involved, let us look at Table 6-3 again. The two columns at the right show the cumulative percentage of the grade 9 reliable variance (or the grade 12 reliable variance) accounted for by the canonical factors. These percentages were computed by means of the formula above.

---

[1] This formula is derived in Appendix H-3.

It is seen from this table that the complete set of 49 canonical relationships accounts for about 54 percent of the within-grade reliable variance among males and about 59 percent among females. What we are trying to establish in this discussion is some notion of the relative extent to which achievement as of grade 12 is a direct outcome of the student's potential when entering high school and the extent to which it is the result of departures from what would have been predicted on the basis of the grade 9 record. Although this may appear to be a resurrection of the old nature-versus-nurture argument,it isn't. Full recognition is given to the fact that the student's ability pattern at grade 9 is a result not only of his heredity but also, and to a very important extent, of the environment he has been in and the experiences he has had up to that time. However we can get an estimate of the proportion that is normally subject to modification during the high school years, if we accept the assumption that the variance accounted for by the canonical correlations represents that component of the student's performance that is invariant (relative to other students) during the high school years. Furthermore the statement that it is invariant is not intended to imply that it is unmodifiable under any conceivable circumstances. All that is meant is that it is not normally subject to modification under present circumstances in schools of the type now in existence, with school practices of the type now followed. In any event, if we subtract from 100 some reasonable approximation of the percentage of reliable variance due to invariant factors, what we have left is an estimate of the percentage of variance modified (or modifiable under present circumstances) during the high school years. In connection with this use of canonical correlation data a question may arise as to whether we are overestimating the proportion of variance in the "invariant" category when we base this estimate in part on the early canonical correlations, in view of the fact that they are undoubtedly somewhat inflated as a result of the capitalization-on-chance phenomenon mentioned earlier in this section. However this poses no insuperable difficulties, particularly when the entire set of canonical correlations is used in the estimate; we can probably then assume that about the same amount of capitalization on chance is likely to have occurred in the portion representing modifiable variance since the same number of factors (principal components) is probably involved (49 within grade 9 and 49 within grade 12), to account for the same set of variables (the 49 variables for grade 9 or the 49 for grade 12). Following the proposed procedure, we obtain as our final estimate something in the vicinity of 56 percent for the invariant components and 44 percent for the modifiable components. Somewhat surprisingly this latter percentage is considerably greater than the percentage of variance attributed to environment in most of the studies that compare identical and fraternal twins (Nichols, 1965). This percentage usually turns out to be around 30 percent. The discrepancy between the results of twin studies and our results here is not entirely inexplicable, however. In the first place, because of the many assumptions and approximations that are necessarily involved our results can only be regarded as rough estimates, not as precise values. But even more important, the battery on which our results are based is broader in scope than a conventional intelligence test, which is what many of the twin studies use.

INVARIANT COMPONENTS MEASURED BY INDIVIDUAL TESTS

In the previous section we drew some conclusions from the canonical correlation analysis. These conclusions can be refined and sharpened by a consideration of analogous data for individual tests. For this purpose zero-order correlations may be regarded as a special case of canonical correlations. Since all the same logic therefore applies that was used in the Appendix H-3 derivation, we can determine the percentage of the reliable variance that is accounted for by what we are terming the "invariant factor" underlying the correlation between the grade 9 and grade 12 scores on a test. Let us reemphasize at this point that by the word "invariant" we mean to imply merely that this is a factor that typically doesn't vary between grades 9 and 12--and not that it couldn't vary. Conceivably it could, under greatly modified circumstances.

This percentage of the reliable variance that is "invariant" in the sense explained above is given by formula 1 of the previous section. In the case of a zero-order correlation between grade 9 and grade 12 scores on a test, the formula reduces to correction for attenuation. The correlation coefficient corrected for attenuation equals the proportion of reliable variance in either grade that is accounted for by the common factor affecting score in both grades.

For this purpose Table 5-4 provides the basic data. We see from columns 3-4 in that table that about 80 percent of the Abstract Reasoning (R-290) variance (78 percent for girls, 82 percent for boys) is invariant in the grade-9-to-12 interval, about 80 percent of the Reading Comprehension (R-250) variance, about 90 percent of Arithmetic Reasoning (R-311) and close to 100 percent of Vocabulary I (R-102) (although this latter percentage is probably at least a slight overestimate, resulting, perhaps, from an underestimate of the reliability). In any event these four (R-102, R-250, R-290, and R-311) are the tests most akin to those in typical intelligence tests. It appears, thus, that perhaps only about 20 percent of the Reading Comprehension variance and 20 percent of Abstract Reasoning variance are typically subject to modification during the high school years, and even smaller percentages of Arithmetic Reasoning variance and Vocabulary I variance. These percentages are somewhat lower than the 30 percent attributed to environment in most of the studies that compare identical and fraternal twins. But this is not surprising. Even though these percentages represent variance components that have become fixed by the time a student enters high school and are therefore invariant during the high school years, there is no reason to think that this is explainable solely in terms of heredity. Presumably by grade 9 the effects of heredity have become augmented by effects of home, community, schooling up to grade 9, and other environmental factors. Thus, taking the methodological differences into account our results seem quite compatible, on the whole, with those obtained in twin studies; the broad similarities in the findings are perhaps more noteworthy than the small differences. Moreover the present results may be regarded as supplementing the results of twin studies, by providing some rough idea of the proportion of the potential for modification that is "used up" before a boy or girl reaches grade 9.

FACTOR ANALYSIS OF CONSISTENT CORRELATION MATRICES

Factor Analysis Methodology: Some Issues, Opinions, Evidence, and Decisions[1]

Several technical decisions on methodology are involved in any factor analysis. Sometimes the decisions are not made explicitly; in these cases they are implicit in the procedure chosen, or, more likely, in the computer program available and therefore used. It is this writer's conviction, based in part on empirical evidence and in part on theoretical considerations, that contrary to a widely prevalent belief, many of the decisions made do sometimes make a substantial difference in the results and in the way they should be interpreted, and that therefore the decisions that are made should be made knowingly and with due thought, not accidentally or by default. In the research under consideration now, a main purpose of the factor analysis is to compare the factorial composition of two sets of data obtained three years apart and determine whether the number and nature of the common factors has changed in those three years. For such a purpose it is especially important that careful thought be given to methodological issues. A poor decision could easily lead not merely to loss of factors or to inconclusive results but to downright misleading conclusions of a substantive nature. Therefore special attention has been paid to methodological problems in the present research, in an effort to give the substantive conclusions as sound a basis as possible. The procedural decisions that were made in connection with the factor analysis described in this chapter and the reasons for them are presented below.

ISSUES AND DECISIONS

Issue 1. What kind of matrix is to be factor analyzed? The choices are a covariance matrix, a correlation matrix, or some sort of matrix involving

---

[1] Readers interested only in the substantive results of the research are advised to skip this section, which deals solely with methodological matters.

modification of the data-based correlations (such as alpha factor analysis, or image covariance, for instance). The choice is easy. The present problem is to gain an understanding of the way abilities underlying the TALENT test battery are organized rather than to interpret the TALENT battery as a random sample of some inconceivable hypothetical infinite population of tests. The alpha factor analysis procedure approaches the population-of-tests concept as a goal (Kaiser and Caffrey, 1962), and is therefore out of the question. Its underlying assumption that the battery to be factor analyzed is a random sample of an infinite population of tests would be in direct contradiction to the way the TALENT battery was constructed, which was <u>anything but</u> a random procedure. It might be mentioned in this connection that Loevinger (1965) has most effectively demolished the concept of a test as a random sample of a hypothetical infinite population of items, and also, more generally, of a battery as a random sample of tests.

Having eliminated alpha factor analysis from the list of possibilities, we must decide what to do about image covariance analysis, which, though it doesn't postulate a hypothetical infinite population of tests, does replace the original data-based correlations with "image covariances" before factor analysis. This, too, is unacceptable for present purposes since our purpose is to explain the <u>correlations</u> among the variables. In thus rejecting the image covariance procedure as not meeting the needs of the present study, are we also giving up important advantages not available in other methods we might use? The answer appears to be negative. It is true that image covariance, along with the principal components method and unlike most other factor-analytic procedures, permits exact computation, as opposed to mere estimation, of factor scores for individuals (Kaiser, 1958). But this is a matter of no moment for our purposes. In the first place this property of direct computability of factor scores, however valuable it is in situations where factor scores for individuals are needed, is of no utility whatever in studies in which determination of individual factor scores is neither an immediate nor intermediate nor ultimate purpose of the research. And in the present research it is none of these. Moreover even if individuals' factor scores <u>were</u> needed, "exact" factor scores based on image covariance would not necessarily have any advantage over "estimated" factor scores obtained from some other factor-analytic procedure employing communality estimates in the diagonal and retaining the original correlations as the off-diagonal terms. Though the "exact" factor scores obtained from image covariance would necessarily be completely uncorrelated for the sample of individuals on which the image covariance analysis was based, they would almost certainly lose this property of orthogonality in a "cross-validation sample."

As for the computed-correlation-*vs.*-computed-covariance issue (quite apart from the issue of modification of the raw computed values as in the image covariance procedure), again the purpose of the research guides us to our decision. In the present study we are concerned with understanding the organization of abilities underlying the existent test battery and independent of the metric of the tests; we do not regard the specific metric of the tests as they stand as having some inherently important meaning; therefore the matrix to be factor analyzed should contain correlations not raw covariances.

Issue 2. What values should go into the diagonal of the correlation matrix--1's or communality estimates? The answer in this case, since the primary goal is to gain an understanding of the factors accounting for the intercorrelations and explaining the underlying variables, rather than to obtain estimates of factor scores, is that the diagonal should contain reasonable estimates of the communality. This keeps the unique factors (test specificity and unreliability) from getting mixed into the so-called common factors in which a unique factor cannot logically have any place.

Issue 3. What value should be used for the communality estimates? Inherent in the answer is the principle that any estimation procedure that necessarily produces an inconsistent matrix (a non-Gramian matrix) is a bad procedure. The term "inconsistent matrix" as used here means a matrix that no possible factor structure could be compatible with unless one were willing to represent loadings and scores on some of the factors by using the algebraic construct of imaginary numbers. Since such factors are worthless as explanatory constructs they are unacceptable. The squared multiple correlation (SMC), which is widely favored as an estimate of communality, is known to have this defect, which is too often ignored by advocates of the method. Use of any systematic underestimates of communality in the diagonal, such as SMC's for instance, automatically produces a non-Gramian matrix (except in the trivial cases when all the multiple correlations equal 0 or unity, in which situation, though use of SMC's would produce a Gramian matrix, doing a factor analysis would of course be wholly pointless).

However the use of the multiple correlation coefficient itself (unsquared) does not have this defect. The author has investigated the matter sufficiently, both empirically and by developing some supportive evidence of a theoretical nature, to be convinced that multiple correlation coefficients give much more reasonable results when used as communality estimates than do SMC's.

Any time the writer has used multiple correlation in the diagonal it has given eminently satisfactory results. It has invariably resulted in either a Gramian matrix or one so close to Gramian (i.e., one with only a very small number of negative eigenvalues, and those few quite close to zero and corresponding to factors that have only negligible loadings) that departures from the mathematical properties of a Gramian matrix might reasonably be ascribed to sampling errors. However the mere fact that use of the multiple correlation coefficient in the diagonal produces a matrix that is for all practical purposes Gramian would hardly be impressive. One can achieve a Gramian matrix, with no trouble at all, by merely putting 1's in the diagonal. But 1's are not communality estimates. The fact that multiple correlation coefficients <u>are</u> excellent communality estimates is evidenced by the substantial reduction they produce in the number of common factors, as shown by the large number of eigenvalues that are approximately zero. (This doesn't normally happen when 1's are put in the diagonal.)

Thus as suggested above, a wealth of empirical evidence is available that multiple correlation coefficients are useful estimates of communality. But in addition to the empirical evidence that they work well and the practical consideration that they are very easy to obtain, there is substantial theoretical evidence supporting the view that they provide good estimates of communality. DuBois (1962), for instance, makes the following point in their favor as first approximations:

> "Since with zero-order r the proportion of common variance (as contrasted with the proportion of predicted variance) is close to r itself, the multiple correlation between a given variable and all the other variables in the matrix is taken as a good working approximation of the communality."

Probably one source of confusion has been, as DuBois implies, confusion between the variance on one variable that is predictable from the rest of them (which is unquestionably R^2) and proportion of the variable's variance attributable to common factors, a proportion that is generally higher than R^2 and never lower. Although it can be demonstrated algebraically that multiple correlations are not necessarily precisely equal to communalities, they are neither systematic underestimates (as their squares are) nor systematic overestimates (as 1's are). A multiple correlation may be either larger than the theoretical communality or slightly lower (in which case a slightly non-Gramian matrix results), but it is never as much of an underestimate as the SMC is. This suggests that multiple R is likely to be much closer to an unbiased estimate of the communality than SMC is.

As may be inferred without too much difficulty from the foregoing discussion, the multiple correlation coefficient was the statistic chosen to estimate communality in the present research.

Issue 4. What initial computation method is to be used to extract the factors? This presents no great problem, since any method that yields an orthogonal factor structure that reproduces the original correlation matrix reasonably well is satisfactory. From this viewpoint the principal components method (or to be more precise the principal factor method[1], since the diagonal of the matrix factored does not consist of 1's) is as good as any and better than most.

Issue 5. How many common factors should be obtained (or retained, if a full solution is carried out)? Kaiser (1960) has suggested, in effect, that the number of eigenvalues greater than 1 (the size of the average eigenvalue) for the original correlation matrix with 1's in the diagonal usually coincides with the number of common factors worth retaining. This assertion has been widely misinterpreted to mean these are the only components

---

[1] Although the nomenclature is not entirely standardized, we are following the practice, in this report, of using the term "principal factors" rather than "principal components" when the diagonal of the original correlation matrix contains communality estimates rather than 1's.

that represent something more than sampling error--a notion which, as Kaiser indicates (Kaiser, 1960, 1964; Kaiser and Caffrey, 1962), is patently false. Several logical considerations make its falsity apparent; for instance the fact that this criterion is independent of number of cases, unlike any reasonable test of statistical significance, and the fact that absurd conclusions may result from it (such as that about half the principal components are useful when in fact the original correlation matrix to be factored does not differ significantly from a matrix of 0 correlations, i.e., an identity matrix). But quite apart from these logical considerations, Humphreys (1964) has shown empirically that particularly when N is large the eigenvalue rule of thumb may give far too few factors, and thus discard useful information.

For these reasons both the Kaiser criterion itself, which is based on principal components analysis, and its principal factor analogue, which could be considered to consist in discarding factors with eigenvalues smaller than the average one in the set, i.e., smaller than the average communality estimate, are rejected for the present research. This leaves us dependent on subjective judgment, unfortunately, but the hazards seem less of a risk than the known inaccuracies that the eigenvalue rule of thumb would present in the present case. A major basis for the subjective decisions is of course the utility of the results, which in turn depends in large part on their interpretability.

Issue 6. Should the factors be rotated? The answer to this question is an unequivocal yes. When the purpose of the factor analysis is to aid understanding of the organization of the abilities underlying the variables factor analyzed, the factor solution should be one which will facilitate achievement of this purpose. This requires interpretable factors, and there is no reason to believe that principal factors will be particularly interpretable. A suitable rotation can be expected to bring a substantial improvement in this respect.

Issue 7. Should the rotated factors be oblique or orthogonal? This is largely a matter of personal preference on the part of the researcher, when the purpose of the factor analysis is to aid understanding of the underlying abilities. The present writer prefers orthogonal factors because they result in a solution that is simpler to interpret. This facilitation of interpretation derives from the concept of orthogonality, which has at least one major inherent advantage: it clarifies the apportionment of variance.

Issue 8. What criterion should be used in rotating the factors? What analytic procedure is chosen for rotating factors to a new orthogonal solution--and, for that matter, whether any analytic solution is to be used in preference to subjective rotation--depends solely on what is the shortest, fastest route to an interpretable and reasonable solution with the desired statistical characteristics. One of the most important of such characteristics, in the writer's view, is "positive manifold." In other words, if the original correlation matrix is essentially positive throughout, the final matrix of factor loadings should be essentially positive; there should be no significantly bipolar factors. Of no importance whatever, at least for the purposes of the present study, is the quartimax criterion of maximizing the variance among squares of loadings or the varimax criterion of maximizing the sum of these variances within factors--except insofar as these criteria help achieve the subjective goals of reasonableness and interpretability and the closely related objective goal of positive manifold.

As to whether the quartimax tendency under certain circumstances to produce a sizable general factor or the opposing varimax tendency to minimize or eliminate such a factor is to be preferred, again the answer lies in the extent to which a general factor is reasonable and interpretable and contributes to the purpose of the study. The varimax solution is more likely to meet the criterion of "simple structure" than is quartimax, but in the writer's opinion that is not in itself an important advantage. The criterion of simple structure, one characteristic of which is the absence of a general factor, may represent a statistical convenience but it certainly does not, in the usual situation, represent any logical necessity. Elimination of a general factor doesn't even necessarily produce a simpler neater explanation of the results since it doesn't cut down the number of common factors, which is determined by the rank of the matrix, not by the presence or absence of a general factor.

In the present research it seemed desirable to avoid any preconceived notion that there would be no general factor, or at most, one of minimal importance. It was felt, in other words, that if there turned out to be a general factor that appeared to be substantial and important and if the solution was otherwise satisfactory, the general factor should not be artificially suppressed or reduced in influence.

The above paragraphs are a defense of eclecticism in choice of rotational procedure. In other words use of any such procedure that works is espoused. Thus if an analytic rotation procedure is tried and proves not to give useful results on a given set of factors, there is no objection to trying another--and still another if there is another available that seems promising.

Furthermore--and most important--there is no objection (except on the grounds of inconvenience) to deciding subjectively about the factors to rotate and the positions to which to rotate them, if subjectively determined rotations of this sort give more satisfactory results (i.e., a solution with a clearer, more reasonable interpretation) than can be obtained by purely analytic methods. The sole purpose of factor rotation is usually to make interpretation easier and better. (Any analytic or subjectively determined rotations after quartimax would presumably still be subject to the restriction of factor orthogonality.)

Taking all the above considerations into account, the strategy settled upon was to try quartimax first. If quartimax were to prove unsatisfactory varimax would be the next choice, and if this too failed the final tactic would be to resort to subjective rotation. As we shall see, this series of eventualities was exactly what occurred.

SUMMARY

The factor analysis methodology considered for use in the present research is discussed above at some length. The methodological decisions themselves, without the reasons for them, may be summarized very briefly as follows: factor analysis of correlation matrices, using the principal factor procedure for the original solution, with multiple R's as the communality estimates in the diagonal of the correlation matrix; subjective decision (based in large part on interpretability) as to number of principal factors to be retained; rotation of the initial factor solution to another orthogonal solution, using the quartimax criterion as the first effort in this direction; retaining the option of substituting varimax--and even following that by additional orthogonal rotations if quartimax failed to yield a satisfactory solution; and using positive manifold (where appropriate), simplicity (which is regarded as not necessarily synonymous with the formal criteria for "simple structure"), and--most important of all--ready interpretability, as the primary criteria of whether a solution is satisfactory.

SPECIAL PROBLEMS

The preceding discussion is concerned only with problems that are relevant to the usual factor analysis for which a correlation matrix based entirely on cases with no missing data is available. This happy situation does not apply in the present instance. However the special problems in obtaining a suitable correlation matrix when a very large proportion of the data is missing have been discussed at considerable length in Chapter 3, and the trio of techniques presented there and utilized in developing the 99-variable matrices presented in Tables 6-1a and 6-1b seems to work well. The use of the resulting consistent matrices in the factor analyses is therefore proposed. The trio of techniques referred to above consists of:

1. Weighting the cases[1] to make the groups taking the six batteries A, B, C, D, E, and F as nearly equivalent as possible, by capitalizing on the presence of the Abstract Reasoning test in all six batteries.
2. Use of a newly developed special procedure for estimating correlation coefficients when some of the data are missing.
3. Testing the resulting correlation matrix for consistency (i.e., Gramianness) and if it turns out to be slightly non-Gramian using another newly developed procedure to make it Gramian with only minimal alterations of the correlation coefficients composing it.

Purpose and Plan of the Factor Analysis

The basic purpose of the factor analysis on the retest data was to explore the question of whether the factor pattern was consistent from grade 9 to grade 12 or whether there were systematic changes in it. In view of this purpose it was essential to include exactly the same test variables for the two grades. Socioeconomic index (P*801) was also included in order to determine the extent to which it was related to the various

---

[1] Retest Weight Z is used for this purpose.

TABLE 6-4. Some basic empirical data on use of multiple R in correlation matrix diagonal, for factor analysis

Consistent matrix	Sex	No. of variables used for factor analysis	No. of eigenvalues (for matrix with R in diagonal)			Values of negative eigenvalues	Total trace[a]
			$\lambda<0$	$\lambda=0$	$\lambda>0$		
1A	M	95	4	0	91	-.005+ to -.06	80.631
1B	F	95	4	0	91	-.02 to -.09	75.633

[a] Total trace equals sum of multiple R's.

factors and to determine whether socioeconomic factors play a major role in any shifts in pattern that occur between grades 9 and 12.

An auxiliary purpose was to determine whether any shifts in factor pattern between grades 9 and 12 that might be uncovered by this research would prove to apply equally to boys and girls. For this reason, and for others as well, including the fact that the correlation matrix for males and the one for females differed significantly in some respects, it was decided to carry out a factor analysis separately for each sex, and in order to maintain comparability of results, to include exactly the same variables in both analyses.

Procedure

Initial Steps. Since the 99-variable consistent matrix for males had two 0 eigenvalues, two variables had to be eliminated from it before factor analysis, in order to make the matrix non-singular. Accordingly variables R-135 and R-138 were eliminated. To maintain parallel data for grades 9 and 12, those variables were eliminated for both grades, thus cutting the 99 variables to 95. The same four variables were eliminated from the matrix for females (although non-singularity in this case could have been achieved by eliminating a single variable) in order to have the analysis for females parallel the one for males. Thus both of the 99-variable consistent matrices (1A and 1B) were reduced to 95-variable non-singular consistent matrices.

Multiple correlations were then obtained for use in the diagonal. For this purpose each of the 95 variables was used as the dependent variable, with the remaining 94 as independent variables. The resulting multiple correlation coefficients are shown in columns 1-2 of Tables 6-6a and 6-6b. (These tables also contain other data which will be explained later in the chapter.) The correlation matrices maintained their internal consistency almost fully even after multiple R's were substituted for 1's in the diagonal. There were a very few negative eigenvalues for each matrix (only four each out of a total of 95 eigenvalues each) and they were so close to 0 that departures could reasonably be attributed to sampling errors. (The details about the eigenvalues are presented in Table 6-4.)

A principal factor analysis was then applied to the matrix, extracting all 95 principal factors. The last four for each matrix were imaginary, of course,(as can be seen from Table 6-4) but utterly trivial, the largest loading for any of the eight imaginary factors (four for each of two matrices) being only .086*i* and the largest off-diagonal residual correlation in either matrix without use of these imaginary factors being only about .006.

Number of Principal Factors Retained. In the absence of a satisfactory arbitrary criterion as to how many factors to retain (it will be recalled that the widely used procedure of retaining only factors with eigenvalues greater than 1 was duly considered and rejected for the present study) there is a considerable element of subjective judgment in the decision. In the case of the factor analyses under consideration the decision was based primarily on inspection of the distributions (after extraction of various numbers of common factors) of correlation residuals, which were divided into three kinds--(1) diagonal terms, (2) off-diagonal terms representing the residual of the correlation between a grade 9 variable and the corresponding grade 12 variable, and (3) all other off-diagonal residual terms. The greatest attention was paid to the last of these three categories. The first category (diagonal residuals) was considered of hardly any importance since these residuals were not measured from "true" communalities but from fallible estimates of communality. In other words, they were residuals from estimates and approximations, not from hard empirical data. The second category of off-diagonal residuals (between corresponding grade 9 and grade 12 variables) was considered of major importance, but for reasons to be discussed later, did not play much of a role in the decision as to number of common factors to rotate. Thus the primary basis was the distribution of the off-diagonal residuals in the third category. Visual inspection of these data, together with some trial quartimax and varimax rotations of different numbers of factors, suggested that from the viewpoint of contributing to interpretable and useful rotated factors, principal factors beyond the first 17 were best ignored. This held for both boys and girls. The distributions of all three categories of residuals after extraction of the first 17 principal factors are shown in Table 6-5. It will be noted that the category 3 residuals (off-diagonal residuals other than those between corresponding grade 9 and grade 12 variables) have their mean very close to zero and that their standard deviation is also very small. This constituted the primary evidence for not using principal factors beyond the 17th.

Supplementary information used in the decision was provided by the canonical correlations between grade 9 variables and grade 12 variables. (In determining these canonicals there were 49 variables, not 47, in the set for each grade, since the two information scales eliminated from the matrix for the factor analysis--Architecture (R-135) and Military (R-138)--were included in the canonicals.) It will be recalled that in the case of both canonical analyses--the one based on males and the one for females--17 of the 49 canonical correlations turned out to be definitely significant. This suggested that as an absolute minimum 17 factors should be rotated since the canonical analyses indicated there were at least 17 completely independent dimensions linking the grade 12 measures with those for grade 9.

The possibility of additional dimensions providing linkage among variables within one grade and independent of variables in the other grade also must be recognized. This dictates the desirability of allowing for at least a few more common factors than the minimum number indicated above, 17. As we shall see, a substantial number of additional common factors was allowed for by a technique wholly independent of the rotation of principal factors. This is discussed later in this chapter, under the heading "Extraction of Test-Specific Doublet Factors."

A combination of all these considerations and others as well (i.e., hunch) led to the decision to rotate exactly 17 principal factors for males and the same number for females.

Consequences of Use of Multiple R in Diagonal. It is interesting to note, in passing, that the proportion of the total variance that is explained by the common factors that are extracted by the principal factor method and retained turns out, for most variables, to be much closer to multiple R^2 than to multiple R. (It even remains true when we add the test-specific factors since they do not change the picture much, as far as percentage of variance extracted is concerned.) But this is by no means to be regarded as an argument for starting with multiple R^2 in the matrix diagonal instead of

TABLE 6-5. Distribution of correlation residuals after extraction of 17 principal factors

Resid. (Lower bound of interval)	Off-diag. residuals						Diag.resids.	
	non-corresp.		corresp.		all			
	M	F	M	F	M	F	M	F
.20+							49	56
.19							12	7
.18							8	5
.17							5	10
.16							3	5
.15							9	3
.14							2	2
.13							3	2
.12							4	3
.11								
.10				1		1		
.09			1	2	1	2		1
.08	1		1	2	2	2		1
.07		1	1	5	1	6		
.06	10	8	6	3	16	11		
.05	15	12	5	6	20	18		
.04	25	60	9	4	34	64		
.03	97	139	6	10	103	149		
.02	291	284	6	4	297	288		
.01	619	539	2	3	621	542		
.00	929	923	2	3	931	926		
-.01	965	980	3	1	968	981		
-.02	780	741	2	1	782	742		
-.03	404	397	1	1	405	398		
-.04	159	196			159	196		
-.05	70	88			70	88		
-.06	27	32			27	32		
-.07	15	10	1		16	10		
-.08	8	4	1	1	9	5		
-.09		2				2		
-.10	2	2			2	2		
-.11								
-.12								
-.13	1				1			
No.	4418	4418	47	47	4465	4465	95	95
Mean	-.003	-.003	.032	.041	-.002	-.002	.214	.208
S.D.	.019	.020	.034	.034	.019	.020	.221	.212

with multiple R. As has already been pointed out, the chief argument for the use of multiple R instead of multiple R^2 is that the former produces a matrix that is in effect internally consistent[1], while the matrix resulting from the use of multiple R^2 would necessarily be internally inconsistent (unless values other than the observed correlations were used in it). And that argument still holds. The fact that the off-diagonal residuals are so very small even when only 17 principal factors were used as the basis (see Table 6-5) shows that the solution fits the empirical data very well. It seems probable that if multiple R^2 had been used with the same number of principal factors retained, the off-diagonal residuals from the empirical correlation data would have been larger, indicating a poorer fit, and also (although this is not in itself a criticism) that the proportion of total variance extracted would have been still lower, since most of the diagonal terms reproduced by the extracted factors would, as usual, have been substantially lower than the original diagonal terms (multiple R^2 in this case).

Extraction of Test-Specific Doublet Factors. Now let us focus our attention on what we have more or less brushed aside thus far--the off-diagonal residuals corresponding to the diagonal elements of the intergrade matrix. Examination of the distribution of these residuals, shown in Table 6-5 in the columns headed "Corresp.," reveals a striking phenomenon. Not only are almost all of them positive but they tend to be systematically higher than the other off-diagonal residuals. And this phenomenon is not unique to the 17-factor residuals. As a matter of fact, after extraction of just about any reasonable number of common factors the residual correlations between corresponding grade 9 and grade 12 variables tend to be substantially larger than the residual correlations between other pairs of variables. For most of the variables, as a matter of fact, these residual correlations between corresponding grade 9 and grade 12 variables turn out to be the largest off-diagonal residuals in their row, and also in their

---

[1] In other words, Gramian or only trivially departing from gramianness.

TABLE 6-6a. Determination of test-specific loadings, and miscellaneous related statistics

For factor analysis of consistent Matrix 1A: MALES

		No.of Items	Mult.R		$\sum_{j=1}^{17} a_{ij}^2$		Diag. Resid. (for 17 factors)		$r_{9,12}$	Resid. $r_{9,12}$ $= b_i^2$	$\sqrt{\text{Resid.}}$ $= b_i$ (>.2)	$\sum_{j=1}^{40} b_{ij}^2$	
			Gr. 9 (1)	Gr. 12 (2)	Gr. 9 (3)	Gr. 12 (4)	Gr. 9 (5)	Gr. 12 (6)	(7)	(8)	(9)	Gr. 9 (10)	Gr. 12 (11)
	Information I												
R-102	Vocabulary I	21	.882	.962	.761	.811	.120	.151	.738	.026		.761	.811
R-103	Literature	24	.863	.950	.684	.794	.180	.156	.705	.045	.212	.729	.839
R-104	Music	13	.808	.929	.605	.696	.203	.234	.710	.097	.311	.702	.793
R-105	Social Studies	24	.905	.962	.741	.788	.164	.174	.738	.062	.249	.803	.850
R-106	Mathematics	23	.837	.977	.689	.853	.148	.124	.711	-.009		.689	.853
R-107	Physical Science	18	.872	.954	.721	.826	.151	.128	.742	.035		.721	.826
R-108	Biological Science	11	.890	.912	.621	.675	.269	.237	.635	.053	.230	.674	.728
R-109	Scientific Attitude	10	.710	.915	.476	.644	.234	.270	.544	.064	.253	.540	.708
R-110	Aero.-Space	10	.813	.968	.604	.717	.208	.252	.662	.059	.243	.663	.776
R-111	Electricity and Electronics	20	.884	.926	.703	.767	.181	.159	.701	.019		.703	.767
R-112	Mechanics	19	.843	.939	.661	.726	.182	.214	.643	.044	.210	.705	.770
R-113	Farming	12	.908	.957	.657	.731	.251	.226	.620	.026		.657	.731
R-114	Home Economics	21	.802	.941	.612	.807	.190	.134	.557	-.075		.612	.807
R-115	Sports	14	.873	.933	.702	.777	.170	.157	.699	.022		.702	.777
	Information II												
R-131	Art	12	.842	.856	.638	.653	.204	.203	.635	.065	.255	.703	.718
R-132	Law	9	.732	.950	.495	.647	.237	.303	.526	.057	.239	.552	.704
R-133	Health	9	.786	.931	.557	.619	.229	.312	.513	.063	.251	.620	.682
R-134	Engineering	6	.717	.964	.431	.571	.286	.393	.408	.041	.202	.472	.612
R-139	Acct., Bus., Sales	10	.802	.956	.569	.694	.234	.262	.465	-.022		.569	.694
R-140	Practical Knowledge	4	.709	.910	.489	.658	.220	.251	.478	.035		.489	.658
R-142	Bible	15	.850	.961	.691	.802	.160	.159	.731	.038		.691	.802
R-145	Hunting	5	.679	.774	.456	.595	.223	.180	.520	.026		.456	.595
R-146	Fishing	5	.702	.728	.482	.561	.220	.167	.531	.046	.214	.528	.607
R-147	Outdoor Activities (other)	9	.744	.934	.520	.631	.224	.303	.534	.074	.272	.594	.705
R-150	Theater; Ballet	8	.743	.942	.550	.661	.193	.281	.581	.044	.210	.594	.705
R-162	Vocabulary II	9	.888	.899	.736	.730	.152	.169	.641	.029		.736	.730
R-212	Memory for Words	24	.730	.866	.539	.744	.190	.122	.513	-.070		.539	.744
R-220	Disguised Words	30	.783	.921	.586	.731	.197	.190	.585	.047	.217	.633	.778
	English												
R-231	Spelling	16	.756	.896	.565	.696	.190	.200	.638	.081	.285	.646	.777
R-232	Capitalization	33	.940	.945	.679	.702	.261	.243	.381	-.011		.679	.702
R-233	Punctuation	27	.858	.919	.636	.728	.222	.191	.657	.058	.241	.694	.786
R-234	English Usage	25	.705	.780	.517	.584	.187	.196	.522	.047	.217	.564	.631
R-235	Effective Expression	12	.651	.764	.439	.538	.212	.226	.454	.034		.439	.538
R-240	Word Functions	24	.794	.945	.574	.707	.220	.238	.611	.046	.214	.620	.753
R-250	Reading Comprehension	48	.890	.983	.758	.798	.132	.185	.699	.048	.219	.806	.846
R-260	Creativity	20	.881	.970	.544	.646	.337	.324	.541	.067	.259	.611	.713
R-270	Mechanical Reasoning	20	.837	.947	.686	.710	.151	.237	.655	.036		.686	.710
R-281	Vis. in 2 Dimensions	24	.816	.980	.545	.669	.271	.310	.479	.002		.545	.669
R-282	Vis. in 3 Dimensions	16	.794	.815	.602	.630	.192	.184	.599	.055	.235	.657	.685
R-290	Abstract Reasoning	15	.752	.787	.534	.567	.217	.220	.567	.067	.259	.601	.634
	Mathematics												
R-311	I. Arithmetic Reasoning	16	.796	.894	.648	.711	.148	.183	.651	.030		.648	.711
R-312	II. Intro. h.s. Math.	24	.858	.961	.687	.825	.171	.136	.691	-.001		.687	.825
R-333	III. Adv. h.s. Math.	14	.460	.930	.134	.741	.326	.189	.226	-.005		.134	.741
F-410	Arithmetic Computation	72	.729	.905	.463	.631	.266	.274	.478	.011		.463	.631
F-420	Table Reading	72	.632	.897	.431	.698	.201	.199	.151	.024		.431	.698
F-430	Clerical Checking	74	.632	.922	.442	.630	.190	.292	.266	.006		.442	.630
F-440	Object Inspection	40	.675	.764	.482	.496	.194	.267	.275	-.012		.482	.496
P*801	Socioeconomic Index	9	.757		.379		.377					.379	

TABLE 6-6b. Determination of test-specific loadings, and miscellaneous related statistics

For factor analysis of consistent Matrix 1B: FEMALES

		No. of Items	Mult.R		$\sum_{j=1}^{17} a_{ij}^2$		Diag. Resid. (for 17 factors)		$r_{9,12}$	Resid. $r_{9,12} = b_i^2$	$\sqrt{\text{Resid.}} = b_i$ (>.2)	$\sum_{j=1}^{40} b_{ij}^2$	
			Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12				Gr. 9	Gr. 12
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Information I												
R-102	Vocabulary I	21	.853	.967	.716	.802	.138	.164	.757	.034		.716	.802
R-103	Literature	24	.808	.937	.628	.768	.180	.169	.714	.050	.224	.678	.818
R-104	Music	13	.819	.937	.620	.692	.199	.246	.737	.109	.330	.729	.801
R-105	Social Studies	24	.894	.927	.722	.769	.173	.158	.792	.073	.270	.795	.842
R-106	Mathematics	23	.786	.955	.609	.832	.177	.122	.684	.005		.609	.832
R-107	Physical Science	18	.872	.887	.641	.790	.232	.098	.707	.028		.641	.790
R-108	Biological Science	11	.777	.851	.529	.604	.248	.246	.617	.082	.286	.611	.686
R-109	Scientific Attitude	10	.683	.832	.450	.591	.233	.241	.515	.027		.450	.591
R-110	Aero.-Space	10	.649	.883	.382	.655	.267	.228	.473	.017		.382	.655
R-111	Electricity and Electronics	20	.766	.765	.533	.572	.233	.193	.457	.001		.533	.572
R-112	Mechanics	19	.708	.933	.500	.692	.207	.242	.575	.046	.214	.546	.738
R-113	Farming	12	.789	.851	.584	.653	.205	.198	.689	.094	.307	.678	.747
R-114	Home Economics	21	.778	.890	.591	.667	.187	.222	.643	.070	.265	.661	.737
R-115	Sports	14	.760	.763	.506	.552	.254	.211	.607	.093	.305	.599	.645
	Information II												
R-131	Art	12	.805	.904	.623	.668	.182	.236	.667	.070	.265	.693	.738
R-132	Law	9	.626	.892	.375	.598	.251	.295	.444	.033		.375	.598
R-133	Health	9	.750	.876	.535	.659	.215	.217	.546	.048	.219	.583	.707
R-134	Engineering	6	.587	.876	.353	.616	.235	.261	.412	.038		.353	.616
R-139	Acct., Bus., Sales	10	.725	.884	.491	.683	.233	.201	.519	.035		.491	.683
R-140	Practical Knowledge	4	.698	.684	.438	.406	.260	.278	.429	.067	.259	.505	.473
R-142	Bible	15	.843	.922	.722	.835	.120	.087	.762	.021		.722	.835
R-145	Hunting	5	.369	.689	.124	.477	.246	.212	.239	.017		.124	.477
R-146	Fishing	5	.350	.560	.106	.363	.244	.197	.238	.070	.265	.176	.433
R-147	Outdoor Activities (other)	9	.702	.856	.467	.572	.235	.284	.512	.068	.261	.535	.640
R-150	Theater; Ballet	8	.826	.963	.572	.703	.254	.260	.632	.072	.268	.644	.775
R-162	Vocabulary II	9	.831	.929	.656	.679	.175	.250	.620	.039		.656	.679
R-212	Memory for Words	24	.850	.935	.607	.814	.243	.122	.553	-.075		.607	.814
R-220	Disguised Words	30	.811	.905	.606	.682	.205	.223	.610	.051	.226	.657	.733
	English												
R-231	Spelling	16	.810	.907	.621	.682	.189	.225	.585	.035		.621	.682
R-232	Capitalization	33	.936	.791	.701	.599	.235	.192	.309	-.029		.701	.599
R-233	Punctuation	27	.844	.913	.681	.755	.162	.157	.693	.059	.243	.740	.814
R-234	English Usage	25	.695	.811	.461	.639	.234	.172	.492	.055	.235	.516	.694
R-235	Effective Expression	12	.662	.778	.423	.576	.240	.202	.481	.068	.261	.491	.644
R-240	Word Functions	24	.785	.845	.604	.671	.181	.174	.661	.048	.219	.652	.719
R-250	Reading Comprehension	48	.931	.916	.773	.770	.159	.146	.764	.031		.773	.770
R-260	Creativity	20	.708	.864	.475	.612	.233	.252	.539	.056	.237	.531	.668
R-270	Mechanical Reasoning	20	.786	.928	.579	.693	.207	.235	.635	.039		.579	.693
R-281	Vis. in 2 Dimensions	24	.688	.725	.484	.563	.204	.162	.565	.085	.292	.569	.648
R-282	Vis. in 3 Dimensions	16	.727	.864	.524	.648	.202	.217	.586	.038		.524	.648
R-290	Abstract Reasoning	15	.746	.843	.552	.602	.195	.241	.600	.053	.230	.605	.655
	Mathematics												
R-311	I. Arithmetic Reasoning	16	.820	.853	.647	.683	.173	.170	.684	.049	.221	.696	.732
R-312	II. Intro. h.s. Math.	24	.810	.954	.664	.821	.147	.133	.675	-.001		.664	.821
R-333	III. Adv. h.s. Math.	14	.346	.917	.063	.717	.283	.200	.150	-.018		.063	.717
F-410	Arithmetic Computation	72	.745	.835	.441	.638	.305	.197	.483	.022		.441	.638
F-420	Table Reading	72	.534	.783	.357	.604	.177	.179	.230	.013		.357	.604
F-430	Clerical Checking	74	.612	.754	.439	.509	.173	.245	.283	.004		.439	.509
F-440	Object Inspection	40	.677	.872	.494	.635	.183	.237	.407	.036		.494	.635
P*801	Socioeconomic Index	9	.650		.443		.207					.443	

column, of the residual matrix, and if they are large enough to be non-trivial they are usually the <u>only</u> non-trivial residuals in that row or column.

These considerations, together with *a priori* expectations that linkages explaining variance unique to a particular test but common to the grade 9 and grade 12 scores obtained with this test would manifest themselves, suggested that each of these non-trivial residuals between corresponding grade 9 and grade 12 variables can legitimately be considered the basis of a doublet factor--a factor entering into only the two variables involved.

In other words what we seem to have is a situation in which subjective judgment should be allowed to modify the principal factor pattern through the addition of some of the "test-specific[1]" factors revealed by the inspection of residuals. This means the addition of new factors, orthogonal to the first 17 principal factors and to each other, but not themselves principal factors (and in most cases probably not even obtainable from the full set of principal factors by rotation).

Loadings for each of these new factors were defined as being 0 for all variables other than the two (grade 9 score and grade 12 score) for the test they referred to. For these two variables the loadings were indeterminate[2], the only restriction imposed being that their product had to equal the residual of their correlation. In the absence of any specific hypothesis to the contrary, equal loadings were assigned to the ninth-grade score and the twelfth-grade score (these loadings being equal, of course, to the square root of the residual).

Table 6-6a shows some data relevant to the test-specific factors for males and Table 6-6b shows comparable data for the females. Column 7 in each of these tables shows the original correlation between corresponding grade 9 and grade 12 scores. (These correlations are extracted from Tables 6-1a and 6-1b.) Column 8 shows the corresponding residuals after

---

[1] The term "test-specific" is used here to signify that these new factors represent reliable variance that is specific to the particular test and that they thus would be true specific factors if the matrix factor-analyzed involved only a single administration of the battery. Technically they are "common factors" but they have this status only because the tests were administered twice.

[2] This indeterminacy is a general characteristic of loadings on doublets (common factors entering into only two variables).

TABLE 6-7. Final distribution of correlation residuals, after extraction of 17 principal factors and 23 test-specific factors

Resid. (Lower bound of interval)	Off-diag. residuals						Diag. resids.	
	non-corresp.		corresp.		all			
	M	F	M	F	M	F	M	F
.20+							49	56
.19							12	7
.18							8	5
.17							5	10
.16							3	5
.15							9	3
.14							2	2
.13							3	2
.12							4	3
.11								
.10								
.09								1
.08	1				1			1
.07		1				1		
.06	10	8			10	8		
.05	15	12			15	12		
.04	25	60			25	60		
.03	97	139	6	10	103	149		
.02	291	284	6	4	297	288		
.01	619	539	2	3	621	542		
.00	929	923	14	15	943	938		
-.01	965	980	14	12	979	992		
-.02	780	741	2	1	782	742		
-.03	404	397	1	1	405	398		
-.04	159	196			159	196		
-.05	70	88			70	88		
-.06	27	32			27	32		
-.07	15	10	1		16	10		
-.08	8	4	1	1	9	5		
-.09		2				2		
-.10	2	2			2	2		
-.11								
-.12								
-.13	1				1			
No.	4418	4418	47	47	4465	4465	95	95
Mean	-.003	-.003	.004	.008	-.003	-.002	.214	.208
S.D.	.019	.020	.022	.020	.019	.020	.221	.212

extraction of 17 principal factors. Columns 3-4 show the computed communality reproduced by these same 17 principal factors.

It was decided to extract inter-grade doublet factors only for those tests for which the inter-grade residual correlation was at least +.04, so that its square root, used as the loading, would be at least .20. On this basis, 23 test-specific doublet factors were added for the males, and (strictly by coincidence) exactly the same number for the females. The loadings on these test-specific factors are shown in Tables 6-6a and 6-6b, in column 9. The diagonal residuals based on the 17 principal factors are shown in columns 5-6. These residuals are diminished by the amounts shown in column 8, when the test-specific factors are taken into account.

The inter-grade residuals corresponding to the added doublet factors drop automatically to 0, of course, and the corresponding reproduced communalities are raised substantially. Columns 10-11 show these new communalities after inclusion of the test-specific factors. These are the final computed communalities. The revised distribution of residuals is shown in Table 6-7.

It is quite apparent from a comparison of this table with Table 6-5 that extraction of the test-specific factors improves the factor solution materially. The mean of the off-diagonal correlation residuals for corresponding grade 9 and grade 12 variables is no longer markedly further from 0 than the mean for residuals of non-corresponding variables, nor is the standard deviation of the residuals any longer nearly twice as large for corresponding variables as for non-corresponding ones. Extraction of the test-specific factors reduces the former standard deviation to about the same size as the latter.

It is important to recognize that the doublet factors, because of the way they were generated, are <u>necessarily</u> orthogonal to all the other factors--in other words uncorrelated with them--and that they are in every sense just as "legitimate" as any of the other factors even though not derived from a rotation of principal factors.

In addition to the 23 doublets, it will be seen when the results of the rotation of the first 17 principal factors are presented that some of these rotated factors also turn out to be very much like doublets--in other words to have substantial loadings on only two variables--the grade 9 and grade 12 scores for the same test (in every case, of course, a test that is not one of the 23 having a doublet factor).

The existence of all these doublet and near-doublet factors has important psychometric implications--but more about that later.

Rotation of Principal Factors. Neither quartimax nor normal varimax gave completely clear-cut factor patterns for which direct interpretation was immediately apparent. The quartimax solution failed to meet the criterion of positive manifold; it produced several substantial bipolar factors. The varimax procedure eliminated this difficulty but did not produce a solution that had a clear interpretation. This was a situation in which it seemed desirable to resort to subjective rotations, which accordingly were undertaken, using the normal varimax pattern as a starting point. Orthogonality was maintained in the rotations.

Four pairs of varimax factors for males were rotated, and four pairs for females (a pair at a time).

An example of one such orthogonal rotation--the rotation of varimax factors V_{10} and V_5 for males to produce final factors F_4 and F_6--is shown in Figure 6-1. In the graph used operationally all variables were plotted for which the loading on at least one of the two varimax factors was .14 or more. In the interests of visual clarity, however, Figure 6-1 has been simplified, to show only those tests with sizable loadings on at least one of the two varimax factors V_{10} and V_5. The ten pairs of points shown in it represent the grade 9 and grade 12 test variables for the following: R-220, R-231, R-232, R-233, R-234, R-235, R-240, R-250, R-260, R-311. All except the last two of these are direct measures of language skills. These ten variables are all the ones for which one or both of the two points (grade 9 and grade 12) are at a distance of at least .30 from the origin. Socioeconomic index (P*801) is also plotted. It will be noted that the high V_5 loadings are on variables measuring language skills (reading, English, etc.) in grade 12 while variables measuring the same skills in grade 9 have low loadings. On factor V_{10} on the other hand, the grade 9 measures of language skills have substantially higher loadings than the same measures for grade 12. A factor which plays a major role in language skills in grade 9, only to shrink in importance by the time grade 12 is reached and be largely replaced by a brand new factor, is not a helpful explanatory concept. A 27°-rotation

FIGURE 6-1. Subjective Rotation of Two Varimax Factors (V_{10} and V_5)
(Based on factor analysis of Matrix 1A: Males)

KEY

- ⊙ Grade 9 variables
- X Grade 12 variables
- • Socioec. Index

Tests are identified by the three-digit variable code number.

EXPLANATORY NOTES:

The only test-score variables not plotted are those for which both the grade 9 point and the grade 12 point are at a distance less than .30 from the origin.

For the loadings of all 95 variables on the two varimax and two final factors, see Table 6-8.

The two final factors (F_4 and F_6) are numbered as in the final factor pattern table (TABLE 6-10).

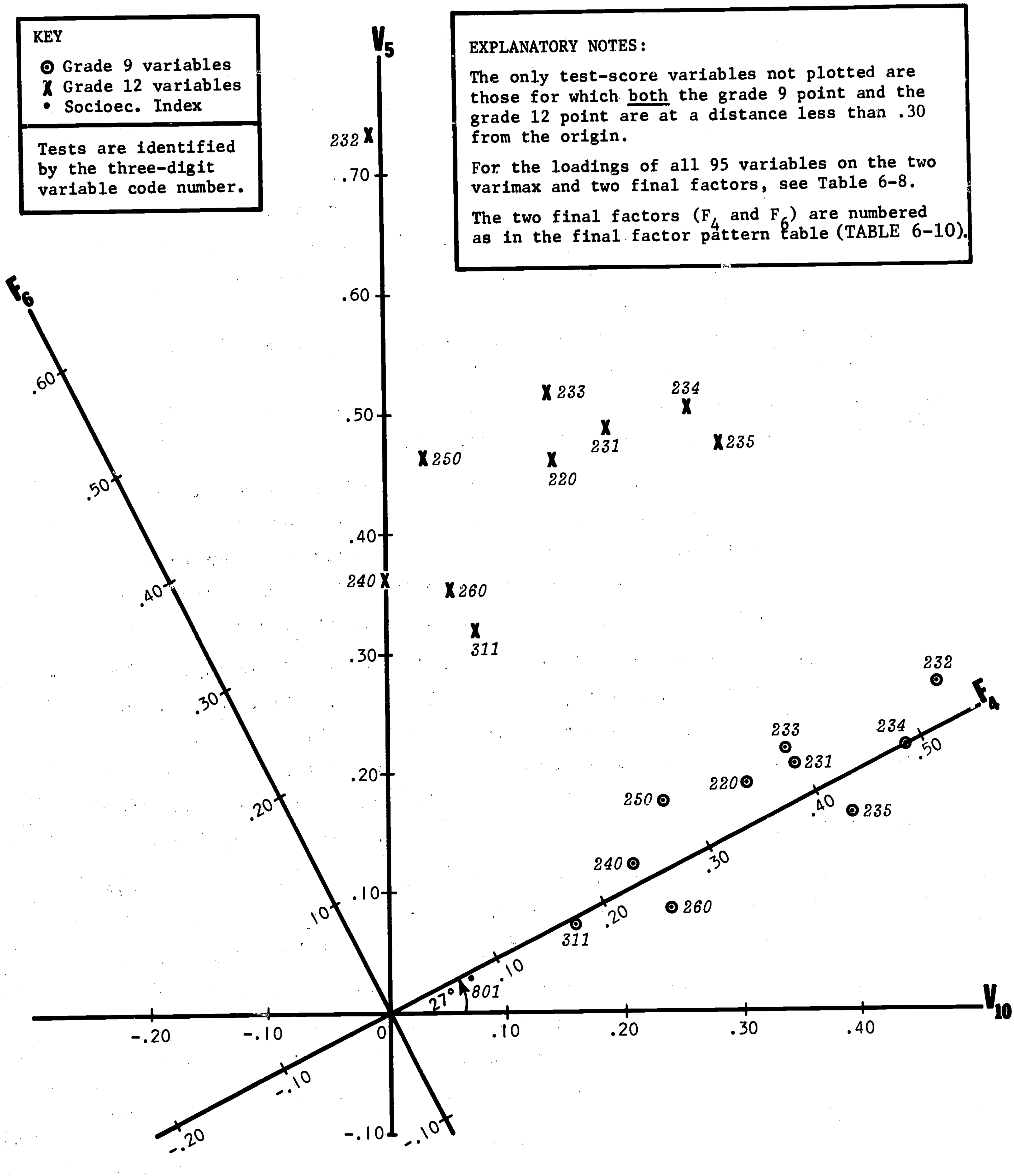


TABLE 6-8. Factor loadings on a pair of varimax factors, and on the same pair after subjective rotation[a]

(In factor analysis of Matrix 1A: Males)

		FACTOR LOADINGS							
		Varimax factors				Subjectively rotated factors			
		V_{10}		V_5		F_4		F_6	
		Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12
	Information I								
R-102	Vocabulary I	.136	.068	.136	.148	.183	.128	.060	.101
R-103	Literature	.085	-.007	.135	.203	.137	.086	.081	.184
R-104	Music	.119	.102	.078	.117	.142	.144	.015	.058
R-105	Social Studies	.019	-.042	.120	.168	.072	.039	.098	.169
R-106	Mathematics	.087	-.045	.014	.100	.084	.005	-.027	.109
R-107	Physical Science	.014	-.025	.111	.102	.063	.024	.092	.102
R-108	Biological Science	.027	-.058	.143	.172	.089	.026	.115	.180
R-109	Scientific Attitude	.147	.079	.164	.143	.206	.135	.079	.092
R-110	Aeronautics and Space	.088	.021	.038	.044	.095	.039	-.006	.029
R-111	Electricity and Electronics	.065	.037	-.015	-.010	.051	.028	-.042	-.026
R-112	Mechanics	.146	.093	.083	.061	.168	.110	.008	.012
R-113	Farming	.089	.062	.112	.156	.130	.126	.059	.111
R-114	Home Economics	.036	.012	.048	.080	.054	.047	.027	.066
R-115	Sports	.076	.028	.057	.063	.094	.053	.016	.044
	Information II								
R-131	Art	.067	.094	.159	.175	.132	.163	.112	.113
R-132	Law	-.006	-.004	.068	.100	.025	.042	.063	.091
R-133	Health	.051	.096	.134	.143	.106	.150	.096	.084
R-134	Engineering	.054	.134	.083	-.026	.085	.108	.049	-.084
R-139	Acct., Bus., Sales	-.062	.024	.045	.029	-.035	.035	.068	.015
R-140	Practical Knowledge	-.008	.009	.161	.130	.066	.067	.147	.111
R-142	Bible	.051	.139	.109	.116	.094	.177	.074	.040
R-145	Hunting	-.000	.027	.035	-.039	.015	.006	.031	-.047
R-146	Fishing	-.009	.060	.049	-.002	.014	.052	.048	-.029
R-147	Outdoor Activities (other)	.053	.196	.087	.052	.087	.199	.054	-.043
R-150	Theater; Ballet	.114	.182	.114	.139	.153	.225	.050	.041
R-162	Vocabulary II	.042	.108	.128	.170	.096	.173	.095	.102
R-212	Memory for Words	.136	.029	.045	.235	.142	.132	-.022	.196
R-220	Disguised Words	.302	.142	.191	.463	.356	.336	.033	.348
	English								
R-231	Spelling	.343	.190	.209	.488	.400	.390	.030	.349
R-232	Capitalization	.465	-.009	.275	.737	.539	.327	.034	.661
R-233	Punctuation	.334	.138	.217	.520	.396	.359	.042	.401
R-234	English Usage	.437	.253	.220	.505	.490	.455	-.003	.335
R-235	Effective Expression	.392	.281	.166	.475	.424	.466	-.030	.296
R-240	Word Functions	.207	-.000	.124	.363	.240	.164	.016	.324
R-250	Reading Comprehension	.232	.035	.176	.464	.286	.242	.052	.398
R-260	Creativity	.239	.054	.088	.352	.253	.208	-.030	.290
R-270	Mechanical Reasoning	.184	.010	.021	.258	.173	.126	-.064	.226
R-281	Visualization in 2 Dimensions	.043	-.060	-.011	.079	.034	-.017	-.030	.098
R-282	Visualization in 3 Dimensions	.064	-.046	-.050	.159	.035	.032	-.074	.162
R-290	Abstract Reasoning	.169	.047	.053	.236	.175	.149	-.030	.189
	Mathematics								
R-311	I. Arithmetic Reasoning	.156	.075	.075	.320	.173	.212	-.004	.251
R-312	II. Intro. h.s. Math.	.150	-.009	.073	.277	.167	.118	-.003	.250
R-333	III. Adv. h.s. Math.	.037	-.033	-.058	.173	.006	.049	-.069	.169
F-410	Arithmetic Computation	.133	.044	.047	.258	.140	.156	-.019	.209
F-420	Table Reading	.028	.059	.098	-.021	.069	.043	.074	-.045
F-430	Clerical Checking	.088	-.054	.117	.254	.131	.067	.064	.251
F-440	Object Inspection	-.002	.022	-.029	.079	-.014	.056	-.025	.060
P*801	Socioeconomic Index	.066		.028		.072		-.006	
	Sum of squares	1.79		3.80		3.37		2.21	
	Sum of squares for factor pair	5.59				5.58			

---

[a] See Figure 6-1.

TABLE 6-9. Summary of common factors

		M A L E S						F E M A L E S					
					Proportion of						Proportion of		
	Nature of factor	Factor #	Kind of factor*	Σb^2	Common variance	Total variance	Mnemonic	Factor #	Kind of factor*	Σb^2	Common variance	Total variance	Mnemonic
1	General verbal	F-1	S	18.17	.288	.191	VERBL	F-1	S	20.65	.350	.217	VERBL
2	Mathematical	F-2	S	10.27	.163	.108	MATH	F-2	S	2.04	.035	.021	MATH
3	Spatial	F-3	S	3.48	.055	.037	SPACE	F-3	S	4.51	.077	.048	SPACE
4	English	F-4	S	3.37	.054	.035	ENGL	F-4a	V	4.19	.071	.044	ENG-A
								F-4b	S	2.41	.041	.026	ENG-B
5	Technical information	F-5	V	2.80	.045	.029	TECH	F-5	S	3.12	.053	.033	TECH
6	Gain in English skills	F-6	S	2.21	.035	.023	Δ-ENG	F-6	S	2.06	.035	.022	Δ-ENG
7	Gain in general info.	F-7	S	2.86	.045	.030	Δ-INF						
8a	Speed and timing: Grade 9	F-8a	V	1.95	.031	.021	SP-1	F-8a	V	1.74	.029	.018	SP-1
8b	Speed and timing: Grade 12	F-8b	V	2.06	.033	.022	SP-2	F-8b	V	2.36	.040	.025	SP-2
9	Rural	F-9	S	2.15	.034	.023	RURAL	F-9	S	3.52	.060	.037	RURAL
10	Fishing and Hunting	F-10	S	2.06	.033	.022	F & H	F-10a	V	1.16	.020	.012	FISH
								F-10b	S	1.02	.017	.011	HUNT
11	Bible information	F-11	V	1.76	.028	.019	BIBLE	F-11	V	2.01	.034	.021	BIBLE
12	Memorization	F-12	V	1.49	.024	.016	MEM	F-12	V	1.40	.024	.015	MEM
13	Common sense	F-13	V	1.26	.020	.013	SENSE	F-13	V	1.41	.024	.015	SENSE
14	Arithmetic computation	F-14	V	1.62	.026	.017	COMP						
15	Sports information	F-15	V	1.47	.023	.015	SPORT	T-115	T	.19	.003	.002	SPORT
16	Home economics info.	F-16	V	1.35	.021	.014	HOMEC	T-114	T	.14	.002	.001	HOMEC
17	Aero-space information	T-110	T	.12	.002	.001	AERO	F-17	V	1.35	.023	.014	AERO
18	Engineering information	T-134	T	.08	.001	.001	ENGIN	F-18	V	.96	.016	.010	ENGIN
19-44	Other test-specific common factors												
	16 factors:both sexes		T	1.84	.029	.019			T	2.02	.034	.021	
	5 factors:males only		T	.62	.010	.007			-	-	-	-	
	5 factors:females only		-	-	-	-			T	.73	.012	.008	
"Total common variance"			$\sum_{i=1}^{95} h_i^2 =$	62.99	1.000	.663			$\sum_{i=1}^{95} h_i^2 =$	58.99	1.000	.621	
Unique variance				32.01		.337				36.01		.379	
"TOTAL VARIANCE"				95.00		1.000				95.00		1.000	

*See Appendix K for an explanation of this notation.

of the axes, as shown in Figure 6-1, greatly improves the picture. One of the two new factors produced, F_4, has about equal loadings on corresponding grade 9 and grade 12 variables. And the other new factor, F_6, has high loadings for grade 12 on the language skills variables and essentially zero loadings for grade 9 on the same variables; it also has essentially zero loadings for both grades on other tests. The complete set of pre-rotation and post-rotation loadings for the factors involved in this particular rotation is shown in Table 6-8. (After the angle of rotation was decided upon on the basis of inspection of the graph, the computer was used to determine the new loadings.)

The eight rotations performed (four for males, four for females) were all by significant amounts that resulted in important changes in the pattern of factor loadings. The possible range of angle of rotation, in terms of absolute amount, is from 0° to 45°, with 45° representing maximum change in factor pattern, and 0° (or 90°) no change. Bearing this in mind, it is clear that the eight actual rotations, which ranged in magnitude from 16° to 32°, had sizable effects on the final factor pattern.

One major effect, by no means accidental, was to make the factor solutions for the two sexes more alike. The varimax solutions differed substantially, and it was quite clear that much of the difference was unnecessary and misleading, since it could be easily eliminated by a few simple rotations.

Final Set of Factors

The final sets of factors, for both males and females, are summarized in Table 6-9 and the detailed factor patterns are presented in Table 6-10. Table 6-9 indicates the nature of each factor, its source (i.e., varimax, test-specific, or subjectively determined rotation), and the proportion of variance it accounts for, and shows the general similarity between the factors for males and the ones for females. (Table 6-11 concentrates on this latter point, showing exactly how many factors of each kind correspond for the two sexes.) For each factor, Table 6-9 also shows a factor number and a mnemonic label (of not more than five characters), for convenience in presentation and discussion of the results.

TABLE 6-10. Final factor pattern: Loadings of 95 variables on common factors

M A L E S

Variable #	F-1 VERBL		F-2 MATH		F-3 SPACE		F-4 ENGL		F-5 TECH		F-6 Δ-ENG		F-7 Δ-INF		F-8a SP-1		F-8b SP-2		F-9 RURAL	
	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12
R-102	.689	.596	.328	.328	.088	.169	.183	.128	.268	.240	.060	.101	.010	.267	.048	.059	.033	.196	.117	.192
R-103	.682	.613	.275	.312	-.004	.066	.137	.086	.119	.120	.081	.184	-.078	.214	.074	.092	.042	.161	.041	.120
R-104	.644	.625	.252	.273	.050	.114	.142	.144	.076	.070	.015	.058	-.110	.083	.041	.056	.072	.167	.047	.064
R-105	.669	.523	.351	.323	-.034	.080	.072	.039	.224	.222	.098	.169	.055	.341	.052	.073	-.003	.135	.066	.140
R-106	.508	.450	.614	.707	-.020	.023	.084	.005	.138	.198	-.027	.109	.014	.165	.033	.094	.021	.173	.045	.089
R-107	.516	.478	.410	.484	.046	.134	.063	.024	.464	.409	.092	.102	-.016	.228	.047	.074	.039	.188	.062	.127
R-108	.470	.386	.276	.262	.027	.132	.089	.026	.382	.364	.115	.180	.042	.226	.093	.045	-.127	.035	.168	.240
R-109	.438	.387	.252	.265	.076	.178	.206	.135	.133	.160	.079	.092	-.020	.149	.072	.114	-.058	.142	.059	.092
R-110	.583	.537	.250	.250	.160	.289	.095	.039	.364	.375	-.006	.029	-.031	.197	-.001	.047	.005	.134	.025	.091
R-111	.481	.439	.283	.340	.169	.314	.051	.028	.564	.490	-.042	-.026	-.024	.152	-.047	-.044	.036	.187	.072	.131
R-112	.527	.338	.147	.102	.213	.393	.168	.110	.336	.344	.008	.012	.006	.270	-.047	-.084	.005	.141	.231	.262
R-113	.380	.176	.133	.078	.092	.218	.130	.126	.232	.152	.059	.111	.035	.310	-.000	-.008	-.109	.040	.516	.603
R-114	.427	.349	.179	.159	.038	.182	.054	.047	.122	.082	.027	.066	-.004	.229	.037	.021	-.009	.113	.106	.087
R-115	.510	.424	.313	.263	-.084	-.035	.094	.053	-.030	-.021	.016	.044	.013	.266	.054	.060	.049	.154	.025	.088
R-131	.728	.653	.166	.204	.109	.085	.132	.163	.046	.083	.112	.113	-.047	.282	.076	.047	.040	.037	.016	.041
R-132	.625	.571	.207	.214	.018	-.008	.025	.042	.057	.097	.063	.091	.002	.412	.060	.016	-.005	-.040	.057	.140
R-133	.650	.489	.191	.208	-.031	.043	.106	.150	.128	.159	.096	.084	.013	.468	.106	.066	.040	.040	.092	.097
R-134	.502	.401	.152	.122	.122	.091	.085	.108	.226	.212	.049	-.084	.006	.439	.026	.007	-.015	.066	.034	.076
R-139	.645	.548	.241	.200	.008	-.012	-.035	.035	-.030	.023	.068	.015	-.012	.451	.040	.070	.038	.121	.075	.112
R-140	.587	.485	.136	.091	.078	.063	.066	.067	.021	-.076	.147	.111	.083	.555	.131	.111	.061	.057	-.065	-.054
R-142	.521	.486	.203	.203	.020	-.002	.094	.177	-.009	.087	.074	.040	-.044	.206	-.012	-.023	.014	.051	.067	.083
R-145	.087	.039	.006	.008	.068	.105	.015	.006	.007	.002	.031	-.047	.037	.088	-.000	-.088	-.006	.066	.412	.544
R-146	.180	.190	.070	.109	-.015	-.016	.014	.052	.078	.084	.048	-.029	-.067	.151	.111	.058	-.044	.022	.190	.266
R-147	.586	.443	.219	.187	.093	.121	.087	.199	.116	.167	.054	-.043	.043	.430	.073	-.008	.008	.030	.031	.053
R-150	.682	.650	.169	.147	.042	.062	.153	.225	-.006	-.013	.050	.041	-.044	.270	.058	.073	.047	.081	.063	.172
R-162	.774	.620	.260	.226	.045	.066	.096	.173	.030	.083	.095	.102	.018	.442	.081	.044	.031	.045	.105	.164
R-212	.275	.217	.292	.271	-.012	.072	.142	.132	.061	.019	-.022	.196	-.053	.063	.025	.075	.073	.036	.084	-.014
R-220	.472	.397	.312	.329	.054	.106	.356	.336	.007	.059	.033	.348	.016	-.182	.224	.081	.117	.310	.175	.179
R-231	.325	.311	.344	.312	-.214	-.237	.400	.390	.041	.066	.030	.349	.015	.160	.180	.237	.122	.030	.168	.146
R-232	.284	.170	.212	.139	-.001	.118	.539	.327	.039	-.036	.034	.661	.154	.014	.039	.056	-.031	.125	-.203	-.045
R-233	.354	.337	.521	.507	-.028	-.020	.396	.359	.091	.023	.042	.401	.037	.146	.134	.091	.028	.019	.066	.009
R-234	.347	.362	.307	.253	.012	-.031	.490	.455	.061	.084	-.003	.335	.081	.165	.077	.059	.026	.006	.136	.118
R-235	.304	.275	.255	.229	.057	.058	.424	.466	.012	.067	-.030	.296	.022	.096	.122	.097	-.014	.087	.046	.006
R-240	.311	.276	.593	.607	-.047	.008	.240	.164	.046	.038	.016	.324	-.072	-.040	.127	.129	.061	.112	.064	.009
R-250	.624	.424	.379	.352	.069	.164	.286	.242	.126	.186	.052	.398	-.029	.094	.148	.047	.022	.093	.107	.116
R-260	.501	.359	.325	.309	.244	.342	.253	.208	.093	.252	-.030	.290	-.035	-.044	.106	.025	.006	.104	.055	.102
R-270	.328	.214	.432	.389	.509	.566	.173	.126	.223	.251	-.064	.226	.060	.114	.044	-.034	-.026	.068	.100	.108
R-281	.185	.085	.320	.309	.540	.630	.034	-.017	-.086	.082	-.030	.098	.004	-.076	.250	.063	.010	.180	.133	.134
R-282	.204	.160	.478	.419	.536	.559	.035	.032	.030	.079	-.074	.162	.018	.118	.095	.081	-.064	.135	-.012	-.070
R-290	.243	.211	.514	.488	.344	.376	.175	.149	.031	.056	-.030	.189	.005	.087	.138	.065	-.030	.143	-.030	-.009
R-311	.398	.376	.592	.526	.050	.092	.173	.212	.100	.074	-.004	.251	.010	.169	.036	.032	-.008	-.040	.077	.033
R-312	.376	.331	.682	.738	-.019	-.041	.167	.118	.025	.144	-.003	.250	.039	.135	.039	.101	.051	.031	.036	-.011
R-333	.114	.264	.280	.759	-.003	-.101	.006	.049	-.006	.123	-.069	.169	-.066	.104	-.108	.074	.047	-.017	-.030	-.030
F-410	.164	.137	.226	.221	.011	.001	.140	.156	.028	.023	-.019	.209	.009	.108	.319	.232	.060	.251	.049	.083
F-420	.111	.058	.098	.095	.074	.063	.069	.043	.013	-.005	.074	-.045	.058	.141	.581	.074	.022	.778	-.014	-.070
F-430	.132	.151	.148	.141	-.027	.030	.131	.067	.004	.077	.064	.251	-.055	-.066	.582	.144	.133	.674	.026	.139
F-440	.077	.047	.072	.074	.223	.357	-.014	.056	-.011	.047	-.025	.060	.035	.192	.630	.226	.087	.442	.005	-.094
P*801	.450		.260		.061		.072		.024		-.006		-.018		.007		.126		-.139	
Σb^2	18.17		10.27		3.48		3.37		2.80		2.21		2.86		1.95		2.06		2.15	

TABLE 6-10 (continued)

F E M A L E S

Variable #	F-1 VERBL		F-2 MATH		F-3 SPACE		F-4a ENG-A		F-4b ENG-B		F-5 TECH		F-6 Δ-ENG		F-8a SP-1		F-8b SP-2		F-9 RURAL	
	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12
R-102	.699	.732	-.009	-.041	.110	.225	.270	.229	.024	.093	.234	.139	.112	.082	.076	.020	.054	.180	.177	.200
R-103	.686	.752	-.029	.014	.083	.158	.187	.218	.014	.092	.196	.060	.135	.177	.098	.075	.003	.043	.010	.086
R-104	.710	.756	-.042	-.061	.130	.224	.167	.124	.015	.047	.146	.021	.093	.036	.037	.052	.056	.088	.089	.116
R-105	.722	.739	.062	.048	.083	.167	.212	.153	.072	.132	.193	.089	.105	.086	.014	.006	.040	.102	.162	.172
R-106	.590	.651	.332	.488	.147	.235	.208	.171	.033	.010	.206	.176	.012	.118	.021	.067	.067	.123	.125	.094
R-107	.533	.626	.112	.215	.072	.185	.228	.163	.074	.033	.422	.330	.079	.070	-.021	.013	.072	.143	.158	.195
R-108	.469	.508	.075	.028	.056	.200	.185	.182	-.046	-.068	.202	.195	.159	.138	.035	.009	-.046	.046	.346	.314
R-109	.444	.484	.015	-.014	.129	.224	.151	.095	.054	.042	.107	.050	.067	.034	.070	.090	-.028	.110	.185	.184
R-110	.409	.458	.018	-.027	.047	.208	-.024	-.034	.026	.038	.301	.226	.007	-.051	.035	.035	.026	.127	.011	.081
R-111	.289	.350	.072	.154	-.135	.076	.050	.056	.080	-.006	.604	.431	.031	.044	-.012	-.011	.033	.183	.151	.203
R-112	.328	.337	-.017	-.047	.133	.240	.083	.032	-.029	.034	.322	.180	.045	-.015	.016	-.015	.006	.155	.361	.457
R-113	.415	.401	-.013	-.042	.162	.211	.184	.143	.095	.122	.151	.058	.125	.142	.047	.066	-.028	.052	.494	.542
R-114	.407	.382	.005	-.060	.133	.207	.084	-.053	.050	.120	.223	.078	.086	.033	.034	.040	.025	-.036	.533	.660
R-115	.568	.610	.056	.047	.076	.147	-.012	-.011	.052	.070	.092	.027	.047	.111	.121	.126	.141	.135	.200	.205
R-131	.671	.675	-.135	-.157	.108	.137	.180	.094	.010	.189	.226	.055	.069	.098	.065	.051	.019	.042	.077	.074
R-132	.498	.584	-.003	.026	.017	.081	.029	.040	.055	.272	.163	-.032	.064	.085	.055	.038	-.001	.000	.105	.196
R-133	.534	.468	-.105	-.041	-.008	.020	.230	.107	.111	.305	.209	.026	.082	.092	.116	.116	.079	.206	.258	.322
R-134	.366	.355	-.029	.031	.097	.144	.148	.081	.005	.104	.227	.060	-.036	-.095	.010	-.015	.077	.085	.255	.374
R-139	.578	.618	-.040	-.044	.059	.188	.178	.115	.010	.302	.204	-.012	-.018	-.060	.032	-.081	.054	.137	.118	.224
R-140	.446	.442	-.116	-.037	.044	.052	.040	-.038	.119	.236	.218	-.011	-.019	-.019	.134	.116	.156	.190	.097	.127
R-142	.446	.422	.006	-.000	.074	.129	.115	.065	.004	.138	.148	.069	.059	.094	.069	-.028	-.028	.040	.113	.078
R-145	.039	-.011	-.034	-.010	-.031	-.011	.000	.008	.013	-.017	.077	.012	-.013	.023	.052	.027	.002	.009	.152	.302
R-146	.068	.018	-.015	.052	.007	.037	.024	.008	-.017	.038	.001	.041	-.051	.052	.031	-.054	-.024	.051	.048	.038
R-147	.542	.543	.000	.097	.135	.177	.036	-.077	.044	.244	.202	.123	.085	.135	.104	.028	.100	-.007	.136	.135
R-150	.674	.744	-.142	-.082	.048	.070	.188	.078	.062	.272	.132	-.065	.062	.026	.084	.049	.048	.069	.029	.036
R-162	.662	.660	-.107	-.087	.076	.130	.255	.167	.051	.318	.204	.017	.054	.004	.043	-.059	.051	.061	.161	.224
R-212	.351	.347	.057	.087	.119	.134	.267	.151	.052	.136	.145	.028	.008	.150	.067	.020	.035	.185	.100	.038
R-220	.448	.385	-.063	-.032	.162	.156	.490	.494	.030	-.086	.091	.162	.088	.373	.282	.164	.086	.236	.032	-.047
R-231	.348	.318	.093	.051	.017	.010	.642	.536	.175	.221	.059	.012	-.018	.377	.090	.053	.107	.202	.069	.036
R-232	.266	.190	-.031	-.021	.090	.080	.277	.057	.688	.389	.151	.083	-.086	.575	.152	.169	.022	.133	.034	.093
R-233	.444	.408	.208	.177	.223	.286	.458	.371	.310	.262	.100	.075	.087	.440	.104	.101	.025	.111	.124	.092
R-234	.369	.340	-.010	.086	.118	.127	.393	.287	.298	.272	.116	.102	.107	.529	.088	.066	.003	.057	.061	.076
R-235	.348	.350	.008	.015	.143	.221	.292	.176	.270	.203	.121	.117	.128	.451	.014	.005	-.038	.128	.043	.111
R-240	.463	.453	.297	.249	.207	.275	.381	.413	.087	.090	.094	.023	.062	.057	.147	.066	.022	.143	.070	.166
R-250	.644	.605	.010	-.006	.186	.241	.331	.248	.124	.148	.169	.055	.118	.188	.150	.007	.001	.128	.149	.178
R-260	.446	.408	.038	.027	.223	.300	.211	.247	.025	-.027	.228	.196	.011	.217	.139	.022	-.028	.132	.168	.168
R-270	.334	.299	.115	.136	.484	.575	.054	.099	.077	.050	.352	.354	.065	.211	.104	-.025	-.032	.073	.104	.078
R-281	.197	.104	.008	-.020	.553	.587	.057	.078	.092	.020	.223	.352	.020	.088	.226	.072	.088	.196	.057	.044
R-282	.236	.199	.120	.116	.580	.616	.056	.091	.068	-.006	.273	.276	-.019	.042	.113	.029	.008	.170	.094	.188
R-290	.360	.361	.102	.105	.469	.494	.185	.077	.162	.268	.187	.132	.029	.136	.162	.089	.069	.130	.058	.109
R-311	.476	.506	.233	.289	.264	.305	.313	.210	.178	.188	.216	.123	-.011	.147	.001	.029	.048	.092	.168	.206
R-312	.519	.551	.369	.588	.231	.190	.293	.168	.175	.113	.189	.129	-.046	.178	.069	.110	.100	.081	.097	.095
R-333	.130	.458	.129	.629	.000	.120	.013	.062	.013	.029	.112	.137	-.044	.125	.008	.039	.011	.036	.007	-.032
F-410	.211	.232	.096	.154	.074	.096	.273	.129	.255	.245	.154	.058	.073	.111	.168	.178	.269	.494	.152	.142
F-420	.100	.125	.001	.035	.095	.098	.040	.032	.173	.112	.055	.054	.033	.033	.521	.148	.130	.720	.076	-.013
F-430	.114	.125	.068	.098	.055	.069	.234	.232	.012	-.042	.035	.163	.105	.238	.570	.170	.110	.514	-.028	-.070
F-440	.086	.078	.001	-.065	.261	.315	.009	.076	-.012	-.052	.076	.108	.011	.035	.600	.208	.184	.624	.069	.083
P*801	.562		.030		.139		-.018		-.007		.064		.093		.098		.029		-.105	
Σb^2	20.65		2.04		4.51		4.19		2.41		3.12		2.06		1.74		2.36		3.52	

TABLE 6-10 (continued)

M A L E S

Variable #	F-10 F&H		F-11 BIBLE		F-12 MEM		F-13 SENSE		F-14 COMP		F-15 SPORT		F-16 HOMEC		F-17 AERO		F-18 ENGIN		Test-specific factors			Communality h²	
	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Factor #	Loading Gr. 9	Loading Gr. 12	Gr. 9	Gr. 12
R-102	.100	.048	.054	.105	.111	.108	.058	.178	.057	-.024	.096	.154	.063	.074								.761	.811
R-103	.033	-.039	.217	.299	.136	.119	-.027	.043	-.064	-.117	.120	.204	.058	.062					T-103	.212	.212	.729	.839
R-104	-.063	-.061	.128	.180	.072	.081	-.036	.029	-.050	-.132	.153	.233	.154	.173					T-104	.311	.311	.702	.793
R-105	.025	-.033	.188	.275	.109	.105	.042	.097	.147	.080	.149	.244	.011	.033					T-105	.249	.249	.803	.850
R-106	.023	-.021	.061	.072	.085	.060	-.003	.046	.047	.014	.054	.106	.082	.052								.689	.853
R-107	.088	.024	.135	.204	.107	.054	-.034	.037	.083	-.003	.032	.075	.051	.077								.721	.826
R-108	.214	.163	.161	.302	.123	.057	.046	.100	-.007	-.085	.079	.090	.085	.128					T-108	.230	.230	.674	.728
R-109	.128	.004	.046	.104	.056	.012	.317	.472	.072	-.032	.088	.172	.033	.107					T-109	.253	.253	.540	.708
R-110	.122	.090	.074	.116	-.022	-.032	.030	.112	-.044	-.104	.098	.158	.020	.040	.243	.243			T-110	See F-17		.663	.776
R-111	.037	.117	-.053	.022	.020	.021	.041	.075	.059	.041	-.119	-.083	.085	.112								.703	.767
R-112	.211	.249	-.177	-.112	.019	.004	.098	.226	.121	.075	-.034	-.003	.135	.123					T-112	.210	.210	.705	.770
R-113	.073	.102	.093	.202	.136	.104	.068	.097	.263	.183	.034	.096	.159	.141								.657	.731
R-114	.096	.072	-.040	.067	.051	-.028	.011	.061	.084	-.030	-.012	.042	.587	.724								.612	.807
R-115	.083	.048	-.038	.038	.085	.042	.045	.076	.213	.128	.508	.622	-.004	.025								.702	.777
R-131	.064	-.001	.104	.125	.068	.003	-.037	-.058	.033	-.066	.008	.114	.071	.099					T-131	.255	.255	.703	.718
R-132	.071	.004	.142	.130	.030	.042	.117	.198	.084	.022	.008	.071	.003	.031					T-132	.239	.239	.552	.704
R-133	.085	.113	.054	.100	.087	.008	.004	-.062	.116	.009	.008	.085	.086	.112					T-133	.251	.251	.620	.682
R-134	.157	.220	-.055	.076	.058	-.053	-.013	-.026	.193	.197	-.027	.009	.090	.153			.202	.202	T-134	See F-18		.472	.612
R-139	.086	-.009	-.002	-.018	.058	.069	.152	.292	.163	.041	-.128	-.136	.052	.074								.569	.694
R-140	.144	.167	-.005	.043	.065	.069	.020	-.071	.183	.141	.008	.019	.050	.044								.489	.658
R-142	.103	.015	.564	.650	.112	.084	.053	.032	.109	.036	-.030	.019	-.004	.019								.691	.802
R-145	.511	.501	.009	.039	-.008	-.057	.029	-.016	.059	-.041	-.071	-.065	-.009	.053								.456	.595
R-146	.603	.621	.021	.021	.052	.038	.010	-.001	-.022	-.004	.105	.128	.048	.028					T-146	.214	.214	.528	.607
R-147	.225	.255	-.040	.005	.066	.118	.081	.064	.130	.044	.080	.193	.035	.076					T-147	.272	.272	.594	.705
R-150	-.029	-.081	.027	.083	.033	-.004	-.002	-.035	.022	-.057	.071	.138	.093	.095					T-150	.210	.210	.594	.705
R-162	.070	-.004	-.002	.001	.098	.037	.082	.092	.079	.021	-.035	.063	.020	.045								.736	.730
R-212	-.014	.016	.054	.085	.575	.736	.013	.025	.016	.044	.061	.009	.015	.003								.539	.744
R-220	.017	-.113	.009	-.084	.096	.052	-.143	-.096	-.070	-.114	.075	.051	-.013	-.014					T-220	.217	.217	.633	.778
R-231	-.043	-.090	.031	.002	.158	.188	-.141	-.138	.042	-.008	.076	.020	.039	.021					T-231	.285	.285	.646	.777
R-232	.150	.066	.029	.046	.170	.058	-.121	-.010	.350	.220	.034	.055	.052	.112								.679	.702
R-233	-.009	.011	.093	.090	.115	.130	.040	.050	.148	.065	-.016	-.065	.038	-.028					T-233	.241	.241	.694	.786
R-234	.060	-.035	.051	.048	.062	.064	.113	.073	.066	.001	-.003	-.037	.012	-.053					T-234	.217	.217	.564	.631
R-235	.026	.029	.084	.101	.045	.071	.237	.228	.092	.052	.067	.009	.025	-.006								.439	.538
R-240	-.016	.028	.157	.146	.082	.198	.040	.137	.009	-.027	-.002	.082	.032	.101					T-240	.214	.214	.620	.751
R-250	.101	.052	.190	.204	.123	.129	.106	.235	.067	.054	.076	.232	.034	.101					T-250	.219	.219	.806	.846
R-260	.132	.059	.022	.092	.055	.087	.071	.162	-.014	-.016	-.072	.122	.085	.172					T-260	.259	.259	.611	.713
R-270	.167	.108	.002	.013	-.023	.068	-.016	.094	.024	.038	-.049	.037	.007	.066								.686	.710
R-281	-.010	-.133	-.053	-.001	.026	.075	-.120	.048	.090	.034	.004	.225	-.031	.124								.545	.669
R-282	.076	.088	.078	.088	-.002	.080	-.023	.088	-.014	-.014	-.096	-.022	.043	.093					T-282	.235	.235	.657	.685
R-290	.024	.032	.071	.111	.068	.083	.088	.124	.143	.102	.033	.049	.009	-.004					T-290	.259	.259	.601	.634
R-311	.042	.060	.054	-.013	.048	.062	.224	.254	.172	.245	-.020	-.071	.043	.022								.648	.711
R-312	.014	-.005	.087	-.035	.077	.091	.045	.046	.148	.156	.044	.081	.072	-.014								.687	.825
R-333	.086	.043	.009	-.011	.047	.050	-.045	.013	.016	.005	.061	.127	.056	.031								.134	.741
F-410	-.031	-.014	.074	.015	.021	.012	.080	-.031	.469	.593	.133	.062	.071	-.049								.463	.631
F-420	-.005	.037	.010	.091	-.008	-.017	.083	.091	.206	.124	.010	.031	.044	.086								.431	.698
F-430	-.023	-.050	.006	-.017	.068	.047	-.035	-.073	.115	.052	.017	.036	-.011	-.022								.442	.630
F-440	.078	.090	-.012	-.084	.015	.191	.008	.032	-.085	-.037	.007	.083	.000	.009								.482	.496
P*801	-.010		-.153		-.078		.124		-.074		.115		-.016									.379	
Σb^2	2.06		1.76		1.49		1.26		1.62		1.47		1.35		.12		.08			2.46		62.99	

TABLE 6-10 (continued)

FEMALES

Variable #	F-10a FISH		F-10b HUNT		F-11 BIBLE		F-12 MEM		F-13 SENSE		F-15 SPORT		F-16 HOMEC		F-17 AERO		F-18 ENGIN		Test-specific factors			Communality h^2	
	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Gr. 9	Gr. 12	Factor #	Loading Gr. 9	Loading Gr. 12	Gr. 9	Gr. 12
R-102	.057	-.017	.014	.105	.105	.111	.073	.016	.070	.105					.099	.134	-.002	.033				.716	.802
R-103	.040	-.036	.016	.041	.188	.226	.088	.012	-.040	-.020					.036	.122	.028	.041	T-103	.224	.224	.678	.818
R-104	.046	.029	.015	.057	.012	.085	.130	.047	-.062	-.055					-.048	.014	.029	.076	T-104	.330	.330	.729	.801
R-105	-.059	-.123	.077	.170	.187	.204	.115	.030	-.028	-.026					.028	.070	-.057	-.063	T-105	.270	.270	.795	.842
R-106	.041	-.037	-.047	.040	.064	.042	.112	.033	-.018	.010					.012	.085	.005	.009				.609	.832
R-107	-.100	-.086	.090	.176	.110	.155	.057	-.013	-.035	.001					.169	.225	.056	.064				.641	.790
R-108	.038	-.013	-.012	.087	.163	.168	.114	.026	.019	.013					.169	.246	.066	.111	T-108	.286	.286	.611	.686
R-109	-.055	-.063	.036	-.009	.115	.087	.061	-.023	.362	.457					.032	.118	.039	.065				.450	.591
R-110	.094	.102	.017	.092	.033	.025	.082	-.002	-.005	.083					.318	.542	-.015	-.033				.382	.655
R-111	.026	.117	.140	.276	.045	.101	.014	-.044	.002	.072					.048	.201	-.034	.077				.533	.572
R-112	.317	.337	.044	.180	.030	.070	.015	-.051	.115	.188					.110	.241	-.049	.057	T-112	.214	.214	.546	.738
R-113	.122	.085	.092	.176	.138	.154	.049	-.063	.036	.042					.094	.130	-.050	-.037	T-113	.307	.307	.678	.747
R-114	.045	-.009	-.146	-.037	-.027	.022	.129	.008	.093	.060			.265	.265	-.075	-.049	.025	.064	T-114	See	F-16	.661	.737
R-115	.151	.108	-.051	.026	-.074	-.094	.128	.094	-.110	-.089	.305	.305			.040	.091	-.158	-.122	T-115	See	F-15	.599	.645
R-131	.111	.155	-.062	-.036	.096	.150	.077	.087	.089	.119					-.018	.081	.068	.161	T-131	.265	.265	.693	.738
R-132	.099	.131	-.039	.092	.132	.119	.048	.090	.140	.162					.056	.200	-.154	-.107				.375	.598
R-133	.004	.006	-.114	-.172	.111	.226	.032	.032	.078	-.023					.018	.232	.069	.170	T-133	.219	.219	.583	.707
R-134	.161	.094	-.015	.167	.026	.065	.009	-.073	.087	.081					-.045	.002	.162	.487				.353	.616
R-139	.020	.028	-.027	.054	.081	.022	-.030	-.099	.114	.078					-.037	-.028	-.194	-.245				.491	.683
R-140	-.009	.069	-.092	-.040	.050	.128	.040	.028	.276	.191					-.140	-.066	.027	.140	T-140	.259	.259	.505	.473
R-142	.050	.032	.018	.102	.664	.753	.107	.090	.062	.061					-.032	.051	-.027	.044				.722	.835
R-145	.100	.080	.276	.607	.014	.036	.002	.058	.033	-.029					-.019	.042	.001	.041				.124	.477
R-146	.300	.566	.032	.131	.008	.017	.015	-.018	-.041	.025					.003	.025	-.030	.077	T-146	.265	.265	.176	.433
R-147	.118	.124	-.080	.039	.005	-.023	.064	.060	.143	.081					-.075	.004	.114	.300	T-147	.261	.261	.535	.640
R-150	.101	.074	-.048	.089	-.011	.015	.099	.076	.046	.032					-.020	.119	.017	.097	T-150	.268	.268	.644	.775
R-162	.038	.005	-.106	-.005	.120	.071	.049	.027	.164	.091					-.008	.135	-.021	-.002				.656	.679
R-212	-.085	.112	.042	.022	.046	.174	.585	.720	-.006	.069					.026	.003	-.026	-.005				.607	.814
R-220	.096	-.004	-.018	-.002	.019	-.003	.078	.034	.052	.063					.057	.042	.088	-.010	T-220	.226	.226	.657	.733
R-231	.070	.167	.012	-.012	.033	.066	.100	.093	-.037	-.038					-.041	-.103	-.002	.044				.621	.682
R-232	.043	-.052	-.033	-.015	.030	.054	.080	.013	.017	-.053					.013	.019	.072	.004				.701	.599
R-233	-.016	.009	.032	.006	.103	.104	.127	.090	.106	.078					.029	-.072	-.020	-.090	T-233	.243	.243	.740	.814
R-234	.005	.027	.010	-.081	.058	.114	.058	.081	.135	.066					.051	.094	.053	.008	T-234	.235	.235	.516	.694
R-235	-.085	-.106	.037	.044	.032	.018	.098	.104	.263	.234					.006	-.084	.025	-.018	T-235	.261	.261	.491	.644
R-240	-.036	-.069	-.003	-.054	.128	.167	.156	.164	.133	.142					.078	.094	-.036	-.042	T-240	.219	.219	.652	.719
R-250	.006	-.002	.026	.035	.238	.287	.099	.119	.188	.255					.088	.113	-.025	.000				.773	.770
R-260	.136	.166	-.000	-.063	.053	.058	.079	.074	.192	.233					.108	.196	-.060	-.169	T-260	.237	.237	.531	.668
R-270	.120	.051	.042	.043	.004	-.034	.067	.067	.139	.068					.140	.213	.037	.018				.579	.693
R-281	.068	.033	.002	-.040	.032	.037	-.028	-.024	-.022	-.118					-.081	-.073	.034	.012	T-281	.292	.292	.569	.648
R-282	.008	.015	-.028	-.114	.066	.157	.054	.089	.050	.081					.052	.106	-.004	.028				.524	.648
R-290	-.041	-.008	.035	.042	.045	.048	.141	.148	.187	.190					.034	-.047	-.004	-.008	T-290	.230	.230	.605	.655
R-311	-.053	-.014	.045	.041	.098	.102	.079	.069	.217	.182					.019	-.026	-.145	-.178	T-311	.221	.221	.696	.732
R-312	.006	.001	-.042	.001	.100	.107	.099	.040	.063	.063					.020	-.006	-.032	-.040				.664	.821
R-333	.085	.137	.005	-.124	-.029	.070	.058	.043	.016	.032					-.011	.060	.053	.088				.063	.717
F-410	-.014	.064	-.083	.124	.033	.109	.105	.059	.095	.113					-.173	-.284	-.176	-.184				.441	.638
F-420	-.013	.035	.042	-.050	.050	.081	-.044	.047	.041	.017					.004	.078	-.003	.024				.357	.604
F-430	.060	.036	.045	.132	.004	-.121	.057	.003	.019	.024					-.045	-.062	-.042	-.071				.439	.509
F-440	-.048	-.073	.018	-.001	-.032	-.065	.053	.092	.007	-.022					.065	.158	.041	.148				.494	.635
P*801	-.062		-.012		-.190		.084		.078						-.041		.130					.443	
Σb^2	1.16		1.02		2.01		1.40		1.41		.19		.14		1.35		.96			2.75		58.99	

TABLE 6-11. Sources of common factors, and the relationship between factors for males and those for females

	No. of common factors							
	V-factor (Retained from varimax solution)		S-factor (Rotated subjectively after varimax		T-factor (Test-specific factor)		Total no. of factors	
	M	F	M	F	M	F	M	F
Matches V-factor in other sex	5	5	1*	1	2	2	8*	8
Matches S-factor in other sex	1	1**	6*	6***	-	-	7*	7
Matches T-factor in other sex	2	2	-	-	16	16	18	18
Unmatched	1	1**	1	1***	5	5	7	7
Total by sex	9	9	8	8	23	23	40	40
Total[a]	13		10		30		47	

* Two factors (F_4 and F_{10}) were given half-weight in this count.
** Two factors (F_{4a} and F_{10a}) were given half-weight in this count.
*** Two factors (F_{4b} and F_{10b}) were given half-weight in this count.

[a] The numbers in this row are not the sums of the numbers above them, since matched factors in the designated category (V,S, or T), if any, are counted only once.

The sum of squares of factor loadings is shown in Table 6-9 for each factor (under the heading Σb^2), and also in Table 6-10. In Table 6-12 these sums of squares are summarized in terms of category of common factor. It is apparent from this table that most of the more important factors are concentrated in the S-factor category (subjectively rotated factors). The extracted common factors account for about 78 percent of trace, of which, as shown in Table 6-12, almost all is from the V-factor and S-factor categories. The common factors also account for roughly 65 percent of the total variance, as shown in the same table, and a considerably larger proportion, of course, of the total reliable variance.

COMPARISON OF FACTOR PATTERNS FOR MALES AND FEMALES

In general, and particularly as far as the more important factors are concerned, there is an overall similarity between the patterns for males and females. One major difference is that factor F_4 (English) for the males is split into two independent factors for females--both of them in the area of English. Other conspicuous differences are (1) that the Δ-INF factor, representing change in amount of general information relative to the group during the three-year interval, shows up for boys but not for girls, (2) that the MATH factor accounts for far more variance for the boys than for the girls, and (3) that a small factor, COMP, representing an aspect of arithmetic computation ability, also shows up for the boys but not for the girls. There are a few other differences but most of them either are very trivial or else have obvious explanations based on known sex differences in interests and behavior patterns.

The general similarity between the factor patterns for the two sexes can perhaps be regarded as a sort of "validity generalization," providing evidence that the factor solution is a defensible one.

A GENERAL FACTOR

Verbal Factor (VERBL). The common factor whose mnemonic is VERBL accounts for about one-fifth of the total battery variance and about one-third of the common variance (as may be seen from the bottom row of Table 6-13). Of all the common factors yielded by the factor analysis, this one is the

TABLE 6-12. Apportionment of common variance among three kinds of factors

Kind of common factor	$\sum_{i=1}^{95} b_{ij}^2$ (Sum of squares of loadings)		% of $\sum_{i=1}^{95} h_i^2$ % of computed communality		% of $\sum R_i$ (% of trace)[a]		% of n* (% of "total variance")		No. of common factors	
	M	F	M	F	M	F	M	F	M	F
V-factor	15.76	16.58	25.0	28.1	19.55	21.92	16.59	17.45	9	9
S-factor	44.57	39.33	70.8	66.7	55.27	52.00	46.92	41.40	8	8
T-factor	2.66	3.08	4.2	5.2	3.30	4.07	2.80	3.24	23	23
Total	62.99	58.99	100.0	100.0	78.12	77.99	66.31**	62.09**	40	40

[a] Trace = sum of multiple R's

[*] n = number of variables (n = 95)

[**] Average communality

closest to a general factor, and the closest to what is commonly called "general verbal intelligence" or "scholastic aptitude" or "academic aptitude."

This factor is closely related to measures of general information. Most of the tests which have high loadings in it are scales of the Information Test. Among the higher loadings are those with the vocabulary measures. Reading ability (R-250) also has very substantial loadings although not quite as high as vocabulary. Information in the humanities (literature, music, art, etc.) has higher loadings on this factor than does information in the technical and scientific areas (physical science, biological science, mathematics, electronics, etc.).

Interestingly enough, it is the only one of the factors that has a high correlation with socioeconomic index (P*801). This is true for both sexes, although for the boys the second common factor, MATH, also has a sizable correlation with socioeconomic index. As may be seen from the P*801 row in Table 6-13, of the variance in socioeconomic index accounted for by common factors, about half is attributable to VERBL in the case of the males, and nearly three-fourths in the case of the females. Probably not much significance should be attached to this difference in proportions for the two sexes since there is no way of being certain that the general factors are exactly the same for the two groups. (In other words instead of the difference between the sexes in proportion of common socioeconomic variance due to VERBL representing a real difference between groups it may merely represent a difference in the factors describing them.) There is probably no definitive way of resolving this ambiguity.

Again going back to the P*801 row in Table 6-13, we see that variance in socioeconomic index "explains" about one-fifth of the variance in VERBL for the males and one-third for the females. Conversely, it is possible to regard variance in VERBL as "explaining" about one-fifth of the socioeconomic variance for males, and one-third for females. Which comes first in the explanation depends largely on the explainer's point of view. The present explainer happens to favor a middle-of-the-road viewpoint. The cause-and-effect relationships explaining the correlation between VERBL and socioeconomic index are undoubtedly complex and almost certainly operate reciprocally. In other words each has an effect on the other and each is at the same time affected by the other. This would help explain the high loadings that most

TABLE 6-13. Comparison of grade 9 and grade 12 test variables and socioeconomic index, in regard to variance accounted for by general factor

	k		$\sum_{i=1}^{k} b_{i1}^2$		$\sum_{i=1}^{k} h_i^2$		$\frac{100\sum b_{i1}^2}{\sum h_i^2}$	
	(No. of variables)		(General factor variance)		(Total common variance)		(Percentage)	
	M	F	M	F	M	F	M	F
Test score variables: Grade 9	47	47	10.43	9.82	28.67	26.20	36.4	37.5
Test score variables: Grade 12	47	47	7.54	10.51	33.94	32.35	22.2	32.5
Socioeconomic index (P*801)	1	1	.20	.32	.38	.44	52.6	72.7
TOTAL	95	95	18.17	20.65	62.99	58.99	28.8	35.0

Notation

k = no. of variables

$\sum_{i-1}^{k} b_{i1}^2$ = total variance accounted for by general factor (F_1)

$\sum_{i=1}^{k} h_i^2$ = sum of communalities = total common variance

$100\ \Sigma b_{i1}^2 / \Sigma h_i^2$ = percentage of total common variance accounted for by general factor of the information scales have on VERBL. Boys and girls in the moderate-to-high socioeconomic bracket not only tend to have better verbal ability than those from a deprived background by the time they reach high school, but they are also somewhat more likely to be in the kind of environment that makes information available to them (via reading matter, conversation, parental encouragement, social contacts, and general milieu) that they can acquire and retain if they have the ability to do so and sufficient interest to motivate them.

SOME IMPORTANT GROUP FACTORS

Mathematics Factor (MATH). This factor shows substantially higher loadings throughout for males than for females. But otherwise the patterns of loadings are fairly similar. For both sexes the factor has its highest loadings on Mathematics Information (R-106), Math I (R-311), Math II (R-312), and at least in grade 12, Math III (R-333). Math III was designed for grades above the ninth, and therefore is almost nonfunctioning for most ninth-grade students, because of the fact that it tests mastery of skills and concepts they have never encountered.

Other variables with sizable loadings on MATH are Physical Science Information (R-107), Word Functions in Sentences (R-240), which for both boys and girls has the highest loading on MATH of any nonmathematical test, Punctuation (R-233), Mechanical Reasoning (R-270), and Abstract Reasoning (R-290). In regard to the loading of Physical Science Information on MATH, the relation between mathematical ability and ability in the science area is generally recognized. As for Mechanical Reasoning and Abstract Reasoning, both of these tests have a substantial element of reasoning, as their names imply. This is apparently their link with the MATH factor. Somewhat less obviously, Word Functions in Sentences and Punctuation, both of which measure skills in the language area, also involve substantial elements of reasoning. This is not a mere artifact arising out of the nature of the tests. It would appear that the kind of special ability that is needed in mathematics is also helpful in the kind of comprehension of grammar principles that is required for the Word Functions in Sentences test. Perhaps this should not surprise us. In a certain sense, formal grammar is, after all, an exercise in logic. The ability to reason, which is obviously of major importance in mastery of mathematical skills, is also involved in the ability to punctuate properly.

Spatial Factor (SPACE). This factor, representing the ability to manipulate figures mentally in two- or three-dimensional space, has its highest loadings in Visualization in Three Dimensions (R-282), Visualization in Two Dimensions (R-281), Mechanical Reasoning (R-270), and Abstract Reasoning (R-290). It also has sizable loadings on Creativity (R-260) and on Object Inspection (F-440); and for males but not for females on the technical information tests: Mechanical Information (R-112), Electrical and Electronic Information (R-111), and Aerospace Information (R-110)--in grade 12 especially. It is not surprising that the SPACE factor does not load on these technical information tests in the case of the girls, whose information in these areas is typically so scanty that the tests are extremely difficult for them. However the SPACE factor does load on Math I (R-311) and Math II (R-312) for the girls but not for the boys.

English Factor (ENGL, or ENG-A and ENG-B). Factor F_4 (English ability) for the boys splits, rather surprisingly, into two distinct and independent English factors, F_{4a} (ENG-A) and F_{4b} (ENG-B), for the girls. All these factors have high loadings on some or all of the English subtests (R-131 through R-135), which measure mastery of various formal aspects of English communication (i.e., punctuation, capitalization, spelling, English usage, etc.), in other words the use of English to express oneself in writing or speaking. The loadings on measures of comprehension of the English language as used by others (e.g., the Reading Comprehension Test, R-250) are somewhat lower, though still substantial. Other variables with sizable loadings are Word Functions (R-240), which is closely related to knowledge of grammatical concepts or ability to learn them, and Disguised Words (R-220). Arithmetic Reasoning (Math I, R-311), which seems to have a sizable verbal component, particularly for the girls, is another test that shows a loading on an English factor. The grade 12 loadings for most variables are very similar to the grade 9 loadings, suggesting that this factor represents the level of mastery reached as of grade 9, and that it is independent of anything that happens during the high school years. This doesn't mean, of course, that scores on the English tests are unaffected during the period in high school. Quite the contrary! But to see what these effects are and how they operate we have to look to factors other than F_4 (ENGL); for instance to factor F_6 (Δ-ENG).

Technical Information Factor (TECH). This factor has its highest loadings on the measures of information in electricity and electronics, mechanics, aeronautics and space, and physical science (R-111, R-112, R-110, R-107). It also has sizable loadings on Mechanical Reasoning (R-270), particularly for the girls.

FACTORS MEASURING CHANGE

Factors F_6 and F_7 are "change components" of the test variables. These factors are particularly interesting because they probably would not have shown up in any kind of factor-analytic study that didn't involve testing at at least two periods several years apart. And if by some strange quirk these factors had shown up in a factor analysis based on a single testing (e.g., during grade 12) what they represented would almost certainly have gone unrecognized since adequate data for interpreting them would have been lacking.

Gain in English Skills (Δ-ENG). Factor F_6 is probably a measure of gain in English skills. The factor is clearly related to change between grades 9 and 12 in the student's relative standing within the group in regard to mastery of English. But the important thing to note is that it represents a component completely unrelated to the factors representing English ability in general--i.e., factors F_4, F_{4a}, and F_{4b} (ENGL, ENG-A, and ENG-B). The feature of Δ-ENG (F_6) that distinguishes it from ENGL (F_4) is that on the ENGL factor corresponding grade 9 and grade 12 variables have about equal loadings, but on Δ-ENG the relevant grade 12 variables have substantial loadings while all grade 9 variables have negligible loadings. Further exploration will be necessary to pin down the exact nature of this Δ-ENG factor. It may depend on the kind of formal classwork that is offered in English or it may be a function of interest or lack of it--or perhaps it is a combination of these. Or perhaps it is something entirely different from any of these things. But whatever it is, it is apparent that a new factor of some sort is entering the picture, too late to affect any grade 9 scores much but in plenty of time to have a major effect on grade 12 scores in the verbal domain--and particularly those scores related to mastery of the English language. If the factor represents a part of the effects of the school's program in English, students in high schools and curricula which place a heavy emphasis on English and provide a strong instructional program in it should tend to have higher hypothetical scores on the Δ-ENG factor than students who don't fit this description.

The factor appears to be independent of the socioeconomic index (P*801).

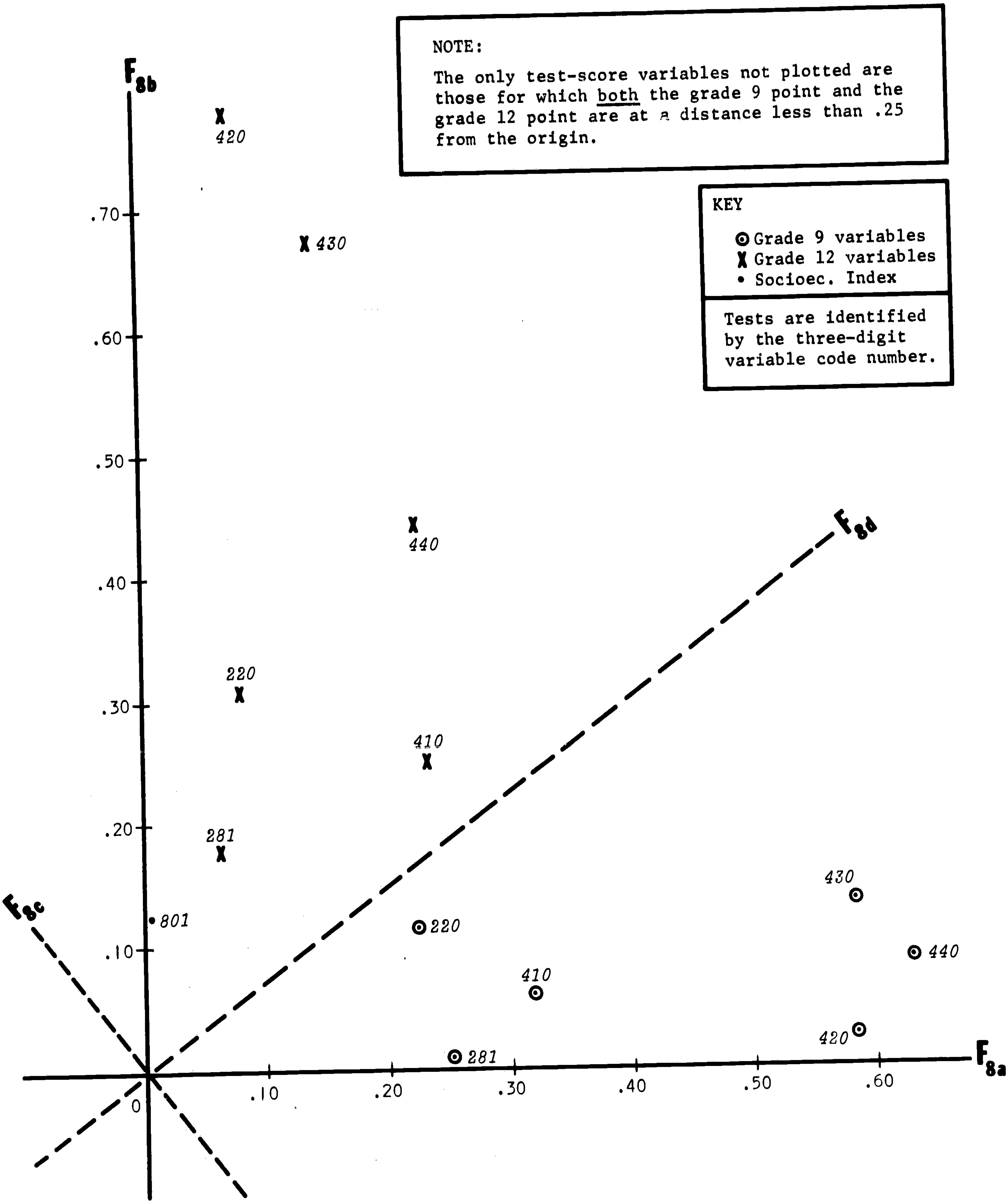
Gain in General Information (Δ-INF). This factor, which showed up for boys but not for girls, bears about the same relation to factor F_1 (VERBL) that F_6 (Δ-ENG) bears to F_4 (ENGL). It represents that component of change in relative breadth of general information during the high school years that is independent of the student's status in this respect as a high school freshman. Variables with high loadings in this factor are those in which twelfth-grade score is least likely to be almost wholly a function of the level of achievement reached by grade 9 and of the time elapsed.

SPEED versus ACCURACY: SET AND TIMING.

Factors SP-1 and SP-2. Factors 8a and 8b are rather remarkable; they show up in exactly the same tests, and with rather high loadings, but for different grades. Factor 8a has all its major loadings on the grade 9 scores and factor 8b on the grade 12 scores. The tests that these factors show up in are the ones that are highly speeded, especially those that measure some sort of perceptual task (specifically the Object Inspection, Clerical Checking, and Table Reading tests). The loadings are somewhat lower for Arithmetic Computation, which is another sharply speeded task, but one that clearly calls for something quite different from and considerably more complex than simple perception. Moderately speeded tests, such as Visualization in Two Dimensions and Disguised Words, both of which can be finished by a small percentage of the students but only by those who work at top speed on the tests, also have loadings that are substantial, but they are somewhat lower than the ones for the simple perceptual tasks. Except for factors 8a and 8b there is no factor that links together the speeded tests and only those tests. Thus it appears from this factor analysis that there is no single factor that clearly represents a relatively stable student characteristic corresponding to perceptual speed or accuracy or an amalgam of the two. What we have instead is two separate factors, one for grade 9 and one for grade 12; and because they are separate and totally uncorrelated it seems extremely doubtful that either of them represents any characteristic with a great deal of stability. Whatever factor 8a (the ninth-grade factor) is, most of it has vanished by grade 12. On the other hand it does not represent a characteristic so evanescent that it affects only one test in the course of a day's testing and is no longer operative when the next highly speeded test is administered an hour or two later. This leaves us with a problem as to what kind of a factor could have temporal characteristics such as those described--shorter than a period of several years, but longer than a half hour. This is not really as wide a range as it may seem, in terms of the number of possible explanations it permits. However at least two possibilities suggest themselves. One is that the factor represents the student's temporary (short-term but longer than momentary) set on the speed-versus-accuracy problem, and his approach to it. In any highly speeded test calling for performance on a task which the student can perform perfectly provided he devotes sufficient care to it, he may either devote an extravagant amount of time to each question in turn, sacrificing speed to accuracy, or he may zip through the test as fast as he can, sacrificing accuracy to speed, or he may operate on some basis that is a compromise between these two extremes. Which of these principles he operates on, in other words what his set is, may depend in large part on his interpretation of what is more important in the test or group of tests, and this speed-versus-accuracy set under which he happens to be operating on a particular occasion may last long enough to affect the several tests given during the course of the day.

Another possibility is that in the few classrooms where bad timing errors may have occurred more or less consistently on the speeded tests and have remained undetected, this would create a systematic error carrying from one speeded test to another and having little or no effect on the unspeeded tests. It should be observed that some of the highly speeded tests, Clerical Checking for instance, had time limits as short as three minutes, so that an error of as little as one minute extra would lengthen the time about 33 percent and presumably result in a roughly proportional increase in the school mean. Larger errors in timing would of course be even more serious. So far as we know, timing errors of this sort did not occur frequently, and

FIGURE 6-2. Relationship between factors F_{8a} and F_{8b}
(Based on factor analysis of Matrix 1A: Males)



NOTE:

The only test-score variables not plotted are those for which both the grade 9 point and the grade 12 point are at a distance less than .25 from the origin.

Tests are identified by the three-digit variable code number.

where they were known to have occurred the scores affected were eliminated from the data. But they did occur occasionally. In a few cases for instance kindhearted teachers felt it was "unfair" to stop a test before the students had time to finish, so they deliberately extended the time allowance from about three minutes to as much as ten minutes! Some of them explained to us that they had done this but others may have done it without explaining. And a teacher who would deliberately allow extra time on Clerical Checking would be just as likely to do so on the Table Reading test or any of the other highly speeded tests. It would take only a few undetected instances of this to have a major effect on the correlations, and thus perhaps to produce factors where none belong and to obscure factors that really exist. The hypothesis that timing errors and other administrative irregularities might account for the two factors under consideration is of course completely compatible with the occurrence of separate independent factors for grade 9 and grade 12, since there is no reason to think that administrative errors of this sort would carry over three years later to affect exactly the same students.

Because we have no reason to favor either of the two explanatory constructs proposed above--short-term set and errors in test administration--we are not eliminating either in favor of the other. As a matter of fact the reader will find later in this chapter, under the heading "Factors that Didn't Show Up," that we are also proposing for consideration an entirely different hypothesis that allows the existence of a genuine speed-and-accuracy factor common to the grade 9 and grade 12 variables.

As a matter of fact, there may be a trace of such a factor buried in factor F_{8a} (SP-1) which is the one that may be primarily short-term set during the grade 9 testing. While the really high loadings on this factor are all for grade 9 variables, the grade 12 speeded tests also have loadings on it which are greater than zero by a small but visible amount. Figure 6-2 makes this apparent.

Some readers may wonder why factors 8a and 8b weren't rotated in such a way as to produce a sizable speed-and-accuracy-of-perception factor having sizable loadings on both the grade 9 and grade 12 speeded tests, since such a factor would clearly be in line with expectation. The answer is that efforts were made along these lines but these efforts led inexorably to the conclusion that if such a factor were forced into the pattern it would automatically bring with it as a partner an uninterpretably bipolar and therefore unacceptable factor. Figure 6-2 provides graphic evidence on this. In that figure, loadings of the speeded tests (and socioeconomic index) on factors 8a and 8b have been plotted. The two dotted lines (F_{8d} and F_{8c}) show one rotation of axes that was considered carefully and rejected. F_{8d} would have had the advantage of resembling a factor in which all the speeded tests had loadings that not only were fairly large but also were about equal for the grade 9 and grade 12 measures, while the unspeeded tests would have had loadings very close to zero. This would have been convenient but the other part of the package, factor F_{8c}, would have had substantial positive loadings for the grade 12 speeded tests and substantial negative loadings for their grade 9 counterparts, (or vice versa). In an earlier section of this chapter the general uninterpretability of bipolar factors was emphasized, and factor F_{8c} is a case in point. At least no simple and reasonable interpretation for a factor of this sort occurs to the author. It could not be anything of the sort hypothesized for factor 8b which isn't bipolar, since an explanation such as timing errors or short-term set in grade 12 would have to work retroactively. For instance if a group of students were allowed too much time on a speeded test in 1963 this would have to cause them to have been in a situation in 1960 which tended to reduce their grade 9 score below average. Any factor that cannot be explained without resorting to some logical absurdity like retroactive causation has to be eliminated from the solution even though this necessitates the elimination of a plausible factor like 8d. Since it appeared impossible to rotate a factor like 8d into existence without also introducing a logically absurd factor 8c, efforts to rotate these factors were abandoned and the two varimax factors, 8a and 8b, were retained.

Perhaps the search for a large factor linking the speeded tests is a search for something that just doesn't exist. After all, the type of perceptual speed called for by the Object Inspection Test (F-440) is quite different from the type called for by Clerical Checking (R-430) or Table

Reading (F-420). And of course the Arithmetic Computation Test (F-410), although highly speeded just as the other three tests mentioned above are, is entirely different from any of them in what it measures directly.

OTHER FACTORS

Rural Factor (RURAL). This is a factor on which students living in rural areas probably have an advantage over city boys and girls. The highest loadings are on Farming Information (R-113). Other comparatively high loadings for the boys are on Hunting Information (R-145). The loadings on Fishing Information (R-146) and Mechanical Information (R-112) are moderate. As a matter of fact, Mechanical Information has far higher loadings for girls than for boys. The loadings for girls are also high on Home Economics Information (R-114), Biological Science Information (R-108), and(for grade 12 only) Hunting Information (R-145). All this seems quite reasonable in factors which differentiate country boys and girls from their city cousins.

Fishing and Hunting Factors (F&H, FISH, HUNT). For the boys the Fishing and Hunting factor (F_{10}) has its highest loadings on Fishing and Hunting Information (R-146 and R-145), of course; it also has significant though low loadings on measures of knowledge about other aspects of outdoor life, such as the information scales in Outdoor Activities (R-147) and Biological Science (R-108). Mechanical Information (R-112) also has a sizable loading on the factor.

For girls, fishing and hunting split into two separate factors (F_{10a} and F_{10b}).

Bible Information (BIBLE). The only high loading on this factor is, as the factor name implies, for the Bible Information scale (R-142). However there are also significant loadings on Reading Comprehension. What this factor apparently measures is that component of information about the Bible that is left after the general information component (VERBL) has been extracted. In this connection it should be noted that the loading of the Bible Information scale on BIBLE is at least slightly higher than the loading on VERBL.

Memorization Factor (MEM).[1] This factor represents a kind of associative learning ability--the ability to memorize partly meaningless verbal material by rote, and retain it in memory for a few minutes. It is important to recognize the distinction between this factor and VERBL, a factor which involves the tendency to acquire and remember for an indefinite time a wide variety of meaningful material. The Memory for Words test (R-212), which is the only test that loads on MEM, has its highest loadings on that factor but it also has very substantial loadings on VERBL.

Common Sense (SENSE). This factor has its loadings on the Scientific Attitude scale (R-109). A somewhat more accurate name than "scientific attitude" for what the R-109 scale measures might be "rational approach," or "practical judgment," or "common sense." "SENSE" (from "common sense") is therefore the mnemonic that was chosen.

The tests which have the highest loadings on SENSE besides Scientific Attitude (R-109) are Arithmetic Reasoning (R-311); Reading Comprehension (R-250); Accounting, Business, and Sales Information (R-139), for boys; Practical Knowledge (R-140), for girls; and, somewhat puzzlingly, Effective Expression (R-235), for both sexes.

Some Other Minor Factors. In addition to the common factors discussed above there are 20 others, of relatively minor importance, that show up for both the males and the females, six additional ones for males only, and five

---

[1] This factor is probably a little bit larger than it should be, for both sexes, and Factor F_{16} (HOMEC), consisting primarily of Home Economics Information (R-114), is likewise probably a bit too large, since the corresponding three off-diagonal residuals (R-212 male, R-212 female, and R-114 male) for correlations between corresponding grade 9 and grade 12 variables are not only negative but are by far the largest numerically of the residuals between corresponding variables. (Minor computational anomalies of this sort are probably attributable to the occasional use of too high communality estimates in the corresponding diagonal cells. It will be recalled that multiple correlations are not systematic underestimates and that therefore they may occasionally be overestimates. In such cases, if we may hazard a momentary lapse into anthropomorphism, the principal factor procedure "works too hard" to reduce this excessively high diagonal term to zero, and in so doing happens also to reduce the correlation between the grade 9 and grade 12 scores on the variable excessively.) See Tables 6-6 and 6-7.

for females. All these minor factors are either varimax factors with heavy loadings on only a single test (both grade 9 and grade 12) or test-specific common factors, which by definition have their only loadings on a single test. These factors will not be discussed separately here, since their nature should be readily inferable from Tables 6-9 and 6-10. Loadings on the test-specific factors are shown in the next-to-last pair of columns in Table 6-10.

Shifts in Factorial Pattern between Grades 9 and 12

Examination of Table 6-10 makes it apparent that there are substantial differences between the factor patterns of the grade 9 variables and their grade 12 counterparts. But how are we to interpret these shifts? Are they changes in what the tests measure or what the students' tools are with which to attack the tasks the tests present? In other words is it the factorial composition of the tests that changes or is it the factorial organization of the students' abilities?

This is one of the major questions raised by Thorndike in his paper on "Intellectual Status and Intellectual Growth" (1966), and discussed in Chapter 3. The other major difficulty he mentions, the problems of determining whether unit size is constant at different levels of the score scale, is highly relevant to the dilemma under consideration here.

For instance there are some tests in the battery that show large systematic shifts in factor loadings between grades 9 and 12 for virtually all factors that are relevant in either grade. The tests for which this occurs are primarily measures of subject matter achievement or information. Math III (R-333) is a notable case in point. Its grade 9 loadings are almost all very low, but its grade 12 loadings are high on MATH and moderate on VERBL. This is almost certainly a result of the fact that Math III was designed to measure achievement in grades above the ninth, and that because it functions in the way that was intended, its grade 9 reliability is low. The low reliability probably affects the unit size in terms of the underlying variable. Moreover, performance on a test measuring mastery of an area in which one has received no formal instruction is almost certainly based on different sorts of components from those that affect performance after three years of formal instruction.

Furthermore, even for those tests where the loadings remain almost unchanged, this doesn't necessarily mean that the elements contributing to test performance are unchanged. The factorial components of test performance are not necessarily identical with the "absolute components" that determine "absolute level" of a person's performance on a test. All that factorial components represent is the person's relative standing within the group on which the factor analysis is based. There is no evidence on factors that may differentiate members of that group (in our case high school students who reach grade 12) from others. But although uniformity of factorial loadings from grade to grade would therefore not necessarily indicate stability of the "absolute components," changes in factorial loadings do strongly suggest changes in absolute as well as relative components.

But even more important, when the factors themselves (and not merely the magnitude of the loadings) are different ones, it can be regarded as fairly conclusive proof that a real change, independent of the effects of variation in unit size on the variable, has occurred. It is in this connection that the existence of "change factors" such as Δ-ENG and Δ-INF is especially significant. Thus it would appear that at least some of the shifts in loadings between grade 9 and 12 represent real changes and not mere artifacts. And if, as seems likely, these real changes are changes in the factorial organization of abilities rather than merely in test scales, it is reasonable to follow up with an attempt to find some clues on a basic question about the developmental pattern of mental abilities.

Various researchers have proposed the theory that intellectual aptitudes are undifferentiated in infancy and that specialized abilities are gradually differentiated out of the one general ability factor, as the child matures. If this theory is correct, one would expect that in the present study the greater maturity of the students by the time they reach grade 12 would result in a smaller percentage of the common variance in this grade being attributable to the general factor and a larger percentage to group factors than in grade 9. The actual results appear to lend some credence to this theory. Equally plausibly, however, the results can be explained in terms of the effects of different courses of study. (Prior to high school, the curriculum is far more uniform, thus producing a somewhat more potent general factor whose relative importance diminishes as a result of differing curricula and extracurricular activities in high school.) As seen in Table 6-13 (last two columns, top two rows) the proportion of the common variance of the males that is due to the general factor drops from 36 percent to 22 percent between grades 9 and 12, while for females it drops from 37 per cent to 32 percent. The smaller drop for females may be due in part to their earlier maturation--and perhaps in part to the fact that the factors involved are probably not identical for the two sexes.

Factors That Didn't Show Up

The factors that were turned up in the final factor pattern proved, on the whole, to be quite interpretable and reasonable. None of them was really puzzling. The few puzzles in the outcomes lay in factors that didn't turn up rather than in the ones that did.

It will be recalled that at least two "change factors"--factors with substantial loadings on a subset of the grade 12 variables but with essentially zero loadings on the corresponding grade 9 variables (and on all the other variables as well)--showed up. But no such change factor showed up in the mathematics area, where it might very well have been expected. To anticipate the results to be presented in Chapter 8, it is shown in that chapter that there is a definite relationship between the changes in scores on most of the mathematics tests (more specifically, on R-106, R-312, and R-333, but not on Arithmetic Reasoning, R-311) and the number of college-preparatory mathematics courses taken in high school. But no factor of this sort, linking the grade 12 scores on R-312, R-333, and R-106 came out of the factor analysis--nor could such a factor be forced into existence by subjective rotations. Knowing (from the evidence of Chapter 8 and from our own knowledge of the content of the tests in question) that such a factor must exist, we are obliged to seek an explanation for its failure to manifest itself in the factor analysis. It is the author's opinion that this non-appearance of a mathematics change factor is due to one of the limitations of factor analysis, arising from the essentially indeterminate character of the solutions it yields. The hypothesis offered here is that the compression in number of common factors that arises from the effort to do the factor analysis in such a way that this number will be the minimum possible may sometimes result in the forced reduction to fewer common factors than really are operating. An automatic reduction of dimensions occurs in factor analysis when the procedure chosen involves (as it almost always does) an effort to account for the intercorrelations in terms of the smallest number of common factors mathematically possible. For instance, to take a hypothetical case, suppose there are three tests and that each of the three correlation coefficients is accounted for by a different common factor. That would mean there really are three common factors (at least insofar as "real" existence can ever be ascribed to statistical factors). But it is well known that in such a case it is always possible, through choice of an "optimum" set of communality estimates--i.e., a set that reduces the number of common factors to a minimum--to reduce to just one the number of factors required to explain the common variance. Furthermore this single factor would be quite different from any of three "real" factors. And likewise if there were three "real" common factors underlying four tests and explaining the intercorrelations among them, the "optimum" set of communality estimates would indicate only two such factors. This artificial compression of factors would probably be the result of unduly low communality estimates--in other words estimates that permit a mathematically reasonable solution but one which happens not to fit the facts very well. And under the usual circumstances there would be no way of knowing that this artificial shrinkage in number of common factors had occurred.

It is hypothesized here that an accident resulting from just this sort of dimension reduction, but on a somewhat larger scale (i.e., a 95-variable matrix instead of just three or four variables), has caused the mathematics change factor to be compressed out of existence.

The one other glaring gap in the factor analysis results was the already mentioned lack of a general speed-and-accuracy-of-perception factor. Whatever general speed-and-accuracy-of-perception factor may exist apparently loses its identity in the factor-analytic process (or at least is muddied up enough to make identification difficult). This factor, if it exists, may therefore show up chiefly as bits and pieces incorporated into a "general factor" or some approximation of one (e.g., factor F_1), and in other common factors. The most plausible hypothesis as to why this should have happened seems to be that the same sort of mechanism is operating here to suppress a real factor such as that to which the lack of a mathematics change factor is attributed.

Furthermore the same phenomenon may explain why two English factors (other than F_6, Δ-ENG) showed up for the girls (i.e. factors F_{4a} and F_{4b}) and only one for the boys (F_4). The two factors may have collapsed into a single one for the boys through the same kind of factor compression effect we have been hypothesizing to explain the nonappearance of certain other factors. (The same explanation might also apply to the absence of a Δ-INF factor for the girls.)

None of the foregoing is to be regarded as an effort to depreciate the very real value of factor analysis as a tool of research. Like all other tools of research it has limitations, and in this section we have been merely focusing on one of them with the purpose of better understanding the results. Doubtless with slight modifications of technique, the details of which remain to be worked out, it would be possible to reanalyze the data in such a way that these two factors that we feel exist would appear. One possibility that seems quite plausible is that the missing factors would be given room to reappear if the initial communality estimates for the variables involved were raised a little. (This would also result in some modifications of the factors that now appear.) The procedure, under these circumstances, could continue to be principal factor analysis followed by rotation. But it is not within the scope of the present study to attempt to develop and try out the techniques that would be required for such a reanalysis of the data.

Rather, for present purposes it is wholly sufficient to recognize that the missing factors almost certainly exist, since there is evidence elsewhere of their existence (in Chapter 8, for example, for the mathematics change factor). As long as the whole picture is borne in mind and these two factors are realized to exist and are taken into account in any decision-making based on the outcomes it isn't really important whether their direct source is the factor analysis itself or some other data analysis.

Psychometric Implications of the Test-Specific Doublet Factors

It will be recalled that for each sex as many as 23 test-specific doublet factors were extracted, of which 16 for each sex matched test-specific factors for the other sex and two for each sex were for tests having near-doublet varimax factors in the other sex. (Thus, considering the two sexes jointly, as many as 30 different tests yielded test specific factors.)

The fact that each of these factors accounts for only a very small percentage of total variance does not mean it is unimportant. All it means is that with so many variables in the factor analysis the total variance is very large; a factor with loadings in only two of 95 variables necessarily accounts for a much smaller percentage of the total variance than it would if there were fewer variables and therefore a smaller total variance. The specific variance associated with Music Information (R-104) for instance, though small, is not necessarily unimportant. As a matter of fact this specific variance is no less important in a factor-analyzed battery of 95 variables than it would be in a battery of only six variables. If anything, it is much <u>more</u> important because variance that is specific to one test among 47 is much more clearly specific than variance specific to one test among a half-dozen would be since most of such variance would probably have turned out not to be specific if more tests had been included.

The existence of as many as 25 doublet and near-doublet factors, for each sex, with each such factor corresponding to the ninth-grade and twelfth-grade scores on just a single test has important psychometric implications, as has already been suggested. These doublets would have been true specific factors having a loading on only a single variable and therefore not showing up at all among the common factors, in a factor analysis of the usual sort based on only a single set of measures rather than a replicated set. This points up that it is not sound practice to automatically eliminate tests from a battery merely because they lack substantial loadings on common factors. All too often it is assumed by factor analysts that all unique variance is unreliable variance. That conclusion might very well be true in some batteries but it clearly is <u>not</u> true in the TALENT battery, since by means of a factor analysis of a battery that was administered twice, variance that would normally appear as unique variance has been shown to be reliable.

Effects of Basing Factor Analysis on Retest Data

Number of Common Factors Extracted. In the present factor analyses 40 common factors, all of them interpretable, were extracted for males and 40 for females. This is probably a much larger number than is usual, even for a large battery. Perhaps we can attribute the increase in part to methodological innovations such as the use of multiple R instead of multiple R^2 in the matrix diagonal, and the extraction of additional factors (the doublets) to supplement the principal factors. But most of the increase in number of common factors is almost certainly due to the fact that the same tests were administered twice. That is what caused the doublet factors to exist. If the tests had been administered in grade 12 only, only about 11 or 12 common factors would have turned up--and even fewer if the single administration occurred in grade 9 since the "change factors" (Δ-ENG and Δ-INF) would not have appeared under those circumstances. Obviously if the testing had been confined to a single grade none of test-specific factors would have been extractable as common factors. Nor would any of the other factors (i.e., the varimax and subjectively rotated factors) that function as virtually test-specific factors (e.g., factors F_{11} through F_{18}) have shown up. The 11 common factors that probably would have shown up in a grade 12 factor analysis would be VERBL, MATH, SPACE, ENGL (or ENG-A and ENG-B for females), TECH, Δ-ENG, and for males only, Δ-INF (but neither of these change factors would have been properly identifiable), SP-2 (which also would almost certainly have been misinterpreted), RURAL, SENSE, and F&H (for males) or FISH (for females). (Factor 10b, HUNT, from the females' factor analysis would almost certainly have been lost since it loads on only one variable, Hunting Information.) The BIBLE factor might have shown up on a single-grade factor analysis since in addition to its large loading on Bible Information (R-142) it has a small but significant loading on another test, Reading Comprehension (R-250). BIBLE would thus be the twelfth within-grade common factor.

Comparison with a Within-Grade Factor Analysis. It is interesting to note, in passing, that the number of common factors we are surmising would be extracted from a within-grade factor analysis of the data (i.e., 11 to 12 factors) is just about the same as the number extracted by a colleague, Paul Lohnes, from an entirely different set of TALENT data. Using a group representative of the entire TALENT sample rather than just the retested students, he found 11 common factors among 60 TALENT variables in the cognitive domain, after eliminating the effects of grade and sex (Lohnes, 1966). There appears to be considerable overlap between the conclusions he draws and the conclusions presented in this report after the differences in the nature of the basic data are taken into account. What differences do exist are probably largely due to number of test variables included in the matrix (60 versus 47), the specific set of variables included, methodological differences in initial solution, and differences in rotation. Further rotation of one or both of the solutions could almost certainly bring the two factor patterns even closer together, at least with respect to that part of the retest factor solution that involves within-grade factors. The fact that even though the purposes of the two analyses are entirely different their results are essentially quite similar (within the limits imposed by the difference between a within-grade analysis and an across-grades retest analysis) is to be regarded as evidence supporting both solutions, and suggesting that each is valid for its own purposes.

Effect of Retest Data on Factor Interpretation. It will be recalled that we asserted, a few paragraphs ago, that some of the factors extracted would have been misinterpreted if they had been derived from a within-grade factor analysis instead of from retest data. Among these factors would be the ones now called Δ-ENG, Δ-INF, and SP-2 (or its partner, SP-1, if the within-grade factor analysis had been for grade 9 instead of grade 12). The Δ-ENG factor would almost certainly have been regarded as another factor of the same type as factor F_4 (ENGL), if, indeed, it hadn't been swallowed up in it and disappeared entirely. Similarly Δ-INF would either have been swallowed up in F_1 (VERBL), or would be regarded as merely a variant of it. The essential character of Δ-ENG and Δ-INF, as measures of change independent of initial status, would have gone unrecognized. Likewise SP-2, instead of being regarded as a rather puzzling and ambiguous phenomenon, that might chiefly represent either short-term set or test administration irregularities or even some complex combination of both, would confidently, but erroneously, be interpreted as representing a large and stable speed-and-accuracy-of-perception factor that would carry across several grades. Thus it requires a retest situation to demonstrate that these factors lack grade-to-grade stability--just as a retest situation helps to demonstrate that factors representing <u>specific</u> variance within grade may <u>possess</u> considerable stability across grades, in the form of test-specific doublet factors.

Chapter 7. EFFECTIVE AND INEFFECTIVE HIGH SCHOOLS: FACT OR MIRAGE?

What determines how much a student learns during his four years in high school? It is well known, of course, that the more able a student is, the faster he is likely to learn. The mental endowment he brings with him when he enters high school is a major factor. But isn't there more to it than this? Even though bright students usually learn faster, better, and with less effort than their not-so-bright classmates, aren't there some kinds of school milieus in which bright students might make even larger gains than in typical schools? In other words aren't there superior schools as well as superior students? And aren't there also some substandard schools--schools whose students do not receive as good an education as they might if they went to some other school? It was in search of clues to the answers to these questions that the analysis discussed in this chapter was undertaken.

The basic idea was to carry out a two-stage study, each stage being designed to yield the answer to an important question. The purpose of the first stage was to answer, if possible, the question as to whether some schools are more effective than others. Contingent on demonstrating the existence of such inter-school differences, the second stage was intended to seek ways in which the more effective schools differed from the less effective ones, with a view to finding out what school practices were most likely to have demonstrably successful results.

PROCEDURE

The statistical procedure used was a combination of univariate and multivariate analysis of variance, together with discriminant function analysis.[1] The variables whose variance was analyzed, in other words the "dependent variables," were grade 12 scores. The grade 9 scores were used as covariates.

---

[1] The computer program used, the MANOVA program, developed by Charles E. Hall and Elliot M. Cramer (1962), yields these several kinds of statistics as part of a single "package." The acronym MANOVA stands for Multivariate ANalysis Of VAriance.

Thus initial ability, as represented by grade 9 scores, was controlled statistically.

The basic idea was to analyze the gain in score between grade 9 and grade 12 to see whether there was any significant difference among schools in this respect, above and beyond those attributable to differences in initial ability level of the students. In addition, grade 9 and grade 12 scores were analyzed without covariates.

The groups of students compared were those in different schools. School, in other words, was the single "design factor" in a one-way analysis of variance. For this purpose the schools were grouped in four overlapping sets, each set consisting of schools taking any one of three retest batteries (or for one set four) having in common a large number of test variables suitable for inclusion in a study of this sort. The retest batteries and numbers of students, schools, and variables that were involved in this mode of data organization are summarized in Table 7-1.

The test variables included were mostly the ones included in the correlation matrices in Tables 6-1a and 6-1b. The most important change was the omission of the highly speeded tests from the present analysis. This was done as a direct result of the two test administration factors $\left(F_{8a} \text{ and } F_{8b}\right)$ that showed up in the factor analysis and suggested that there had been systematic timing errors in the highly speeded tests in at least a few of the classes in some of the schools. Inclusion of the affected tests in the present analysis would have produced misleading evidence about basic school differences.

RESULTS

Differences between Grades 9 and 12

Tables 7-2a through 7-2d summarize the univariate data that resulted. These four tables contain the results of the analyses of variance carried out for each test individually. Also shown in these tables are the mean scores for grades 9 and 12, the difference between them (i.e., the mean gain), the within-grade standard deviation (for grade 9), and the ratio of the mean gain to this within-grade standard deviation.

TABLE 7-1. Summary of the constituents of the four sets of data discussed in Chapter 7

	For analysis of males' data		For analysis of females' data		No. of dependent variables		Retest Batteries
	No. of schools	No. of male students[a]	No. of schools	No. of female students[a]	Gr. 9	Gr. 12	
a.	65	1682	59	1867	15	15	ABCV
b.	44	1242	44	1422	15	15	ADE
c.	51	1482	51	1655	10	10	BDF
d.	50	1610	50	1671	6	6	CEF

---

[a] Cases included were students in retest classification 0 (see Appendix C-5) who were in the same school or school system when they were retested in grade 12 as when they were originally tested in grade 9.

TABLE 7-2a. Analysis of differences among schools on grade 9 and grade 12 test scores, and on gains with covariate control on grade 9 scores[a]

Based on selected tests in retest batteries A, B, C, and V

		No. of items	Boys								Girls							
			Mean			σ_{9w}	Gain / σ_{9w}	F_9	F_{12}	$F_{12.9}$	Mean			σ_{9w}	Gain / σ_{9w}	F_9	F_{12}	$F_{12.9}$
			Gr. 9	Gr. 12	Gain						Gr. 9	Gr. 12	Gain					
	Info. I																	
R-102	Vocab.I	21	11.06	13.81	2.75	3.34	.82	7.73	7.51	2.36	9.90	12.60	2.70	3.50	.77	8.35	8.73	2.91
R-103	Lit.	24	9.85	14.10	4.25	3.66	1.16	7.64	7.28	4.91	9.63	14.23	4.60	3.45	1.33	8.16	9.10	8.05
R-104	Music	13	4.96	5.90	.94	2.58	.36	7.04	5.47	2.62	5.55	6.54	.99	2.56	.39	8.42	7.43	2.61
R-105	Soc.Stud.	24	13.47	17.06	3.59	4.60	.78	8.31	5.26	2.82	11.81	15.02	3.21	4.40	.73	9.02	7.14	3.07
R-106	Math	23	7.08	10.88	3.80	3.61	1.05	7.93	7.07	3.25	6.33	8.31	1.98	3.35	.59	6.89	6.58	3.30
R-107	Phys.Sci.	18	9.09	10.62	1.53	3.30	.46	8.04	6.16	2.30	7.54	7.95	.41	3.11	.13	10.12	6.53	2.88
R-108	Biol.Sci.	11	5.67	6.79	1.12	2.12	.53	4.70	4.70	2.17	4.80	5.87	1.07	2.02	.53	5.96	3.40	1.55
R-109	Scient.Att.	10	5.20	6.52	1.32	1.89	.70	3.71	3.93	1.47	5.30	6.54	1.24	1.75	.71	5.39	5.67	1.68
R-110	Aero-Space	10	4.14	5.52	1.38	2.20	.63	4.93	5.46	1.71	2.51	3.39	.88	1.57	.56	3.89	4.64	1.70
R-111	Electr.	20	8.31	11.18	2.87	3.57	.80	5.42	6.65	4.23	5.42	6.16	.74	2.37	.31	5.60	5.80	3.56
R-112	Mechanics	19	10.63	13.10	2.47	2.97	.83	5.67	6.13	2.94	6.99	8.73	1.74	2.60	.67	4.16	5.75	2.41
R-113	Farming	12	7.48	8.43	.95	2.04	.46	8.46	8.67	3.97	6.97	7.98	1.01	2.28	.44	9.73	12.30	4.89
R-114	Home Ec.	21	7.38	8.96	1.58	2.62	.60	3.20	2.93	1.84	11.35	13.49	2.14	2.95	.73	9.32	8.22	3.00
R-115	Sports	14	6.93	8.57	1.64	2.68	.61	5.48	3.97	1.65	4.86	6.04	1.18	2.08	.57	8.22	8.15	2.97
R-290	Abst.Reas.	15	8.35	9.86	1.51	2.82	.53	4.33	4.26	2.15	8.13	9.28	1.15	2.77	.42	6.06	7.16	2.06
	No. of schools			65								59						
	No. of students			1682								1867						
	df (1)							64	64	64						58	58	58
	df (2)							1617	1617	1602						1808	1808	1793

[a] For each grade 12 variable the covariates in the variance analysis of gains are grade 9 scores on <u>all</u> variables in the selected set of tests.

NOTE: All F ratios in this table are large enough to indicate significance at the .01 level.

NOTATION:

F_9 = Univariate F ratio testing whether schools differ significantly in grade 9 means.

F_{12} = Univariate F ratio testing whether schools differ significantly in grade 12 means.

$F_{12.9}$ = Univariate F ratio testing whether schools differ significantly in gains, with covariate control on all 15 of the grade 9 variables.

σ_{9w} = estimate of within-school standard deviation for grade 9 population.

TABLE 7-2b. Analysis of differences among schools on grade 9 and grade 12 test scores, and on gains with covariate control on grade 9 scores[a]

Based on selected tests in retest batteries A, D, E

			Boys								Girls							
		No. of items	Mean Gr. 9	Mean Gr. 12	Mean Gain	σ_{9w}	Gain / σ_{9w}	F_9	F_{12}	$F_{12.9}$	Mean Gr. 9	Mean Gr. 12	Mean Gain	σ_{9w}	Gain / σ_{9w}	F_9	F_{12}	$F_{12.9}$
	Info. II																	
R-131	Art	12	5.31	6.66	1.35	2.27	.59	4.02	3.97	2.43	5.54	7.02	1.48	2.27	.65	5.66	6.33	2.81
R-132	Law	9	4.23	5.71	1.48	1.70	.87	3.67	4.93	4.95	3.85	5.18	1.33	1.54	.86	3.60	7.09	6.93
R-133	Health	9	5.00	6.22	1.22	1.93	.63	3.42	5.83	2.68	5.56	6.79	1.23	1.61	.68	4.44	5.61	3.51
R-134	Engin.	6	2.94	3.57	.63	1.17	.54	2.73	5.35	5.24	2.44	3.02	.58	1.21	.48	3.09	4.26	3.17
R-135	Arch.	6	2.20	2.80	.60	1.20	.50	3.18	2.71	1.74	2.25	2.77	.52	1.16	.45	2.66	2.38	.95**
R-138	Military	7	1.99	2.90	.91	1.34	.68	2.93	2.39	2.05	1.53	2.20	.67	1.14	.59	2.03	3.03	2.38
R-139	Acct.Bus.	10	4.02	5.40	1.38	1.72	.80	2.75	4.13	2.63	3.91	5.56	1.65	1.68	.98	3.87	6.29	2.56
R-142	Bible	15	6.45	7.69	1.24	3.10	.40	2.94	2.93	2.01	6.73	7.86	1.13	3.02	.37	3.40	3.96	2.31
R-145	Hunting	5	2.27	2.72	.45	1.16	.39	3.04	5.59	3.47	1.14	1.28	.14	.89	.16	1.51*	2.45	2.27
R-146	Fishing	5	1.69	2.12	.43	1.20	.36	2.47	4.16	2.23	1.08	1.14	.06	.90	.07	1.41*	1.98	1.72
R-147	Outdoor Act.	9	4.55	5.33	.78	1.74	.45	3.39	5.36	3.51	3.97	4.74	.77	1.71	.45	4.09	5.26	2.85
R-149	Games	5	2.21	2.50	.29	1.10	.26	4.06	2.75	1.56*	1.96	2.20	.24	.97	.25	2.82	2.33	1.39*
R-150	Theatre	8	3.38	4.33	.95	1.55	.61	2.19	3.45	2.78	3.82	4.79	.97	1.52	.64	5.17	6.97	3.73
R-151	Foods	4	.87	1.20	.33	.88	.38	3.15	7.14	3.73	1.14	1.72	.58	.90	.64	6.67	9.79	4.36
R-290	Abst.Reas.	15	8.39	9.72	1.33	2.80	.48	2.52	3.91	2.25	8.27	9.52	1.25	2.77	.45	4.29	6.51	2.62
	No. of schools			44								44						
	No. of students			1242								1422						
	df (1)							43	43	43						43	43	43
	df (2)							1198	1198	1183						1378	1378	1363

[a] For each grade 12 variable the covariates in the variance analysis of gains are grade 9 scores on all variables in the selected set of tests.

*Significant at .05 level.

**Not significant.

NOTE: All other F ratios in this table are significant at the .01 level.

NOTATION:

F_9 = Univariate F ratio testing whether schools differ significantly in grade 9 means.

F_{12} = Univariate F ratio testing whether schools differ significantly in grade 12 means.

$F_{12.9}$ = Univariate F ratio testing whether schools differ significantly in gains, with covariate control on all 15 of the grade 9 variables.

σ_{9w} = estimate of within-school standard deviation for grade 9 population.

TABLE 7-2c. Analysis of differences among schools on grade 9 and grade 12 test scores, and on gains with covariate control on grade 9 scores[a]

Based on selected tests in retest batteries B, D, F

		No.of items	Boys								Girls							
			Mean			σ_{9w}	$\frac{\text{Gain}}{\sigma_{9w}}$	F_9	F_{12}	$F_{12.9}$	Mean			σ_{9w}	$\frac{\text{Gain}}{\sigma_{9w}}$	F_9	F_{12}	$F_{12.9}$
			Gr. 9	Gr. 12	Gain						Gr. 9	Gr. 12	Gain					
R-212	Memory for Wds.	24	9.96	12.28	2.32	4.74	.49	1.91	3.31	3.53	11.30	14.46	3.16	5.03	.63	2.99	5.13	5.07
	English																	
R-231	Spelling	16	7.76	9.44	1.68	2.74	.61	3.21	3.38	2.38	9.31	11.19	1.88	2.63	.71	2.80	3.31	2.00
R-232	Cap.	33	28.16	29.56	1.40	3.46	.40	3.94	2.78	2.18	29.60	30.47	.87	3.05	.29	4.49	4.27	2.51
R-233	Punct.	27	15.71	18.02	2.31	4.04	.57	3.63	4.13	2.81	18.00	20.27	2.27	3.79	.60	5.44	5.08	2.23
R-234	Eng.Usage	25	15.26	16.92	1.66	3.05	.54	3.36	3.78	2.37	16.30	17.74	1.44	2.87	.50	3.98	3.00	1.80
R-235	Effect.Exp.	12	7.60	8.83	1.23	2.37	.52	2.38	3.53	1.86	8.28	9.39	1.11	2.06	.54	2.61	4.26	2.72
R-290	Abst.Reas.	15	8.21	9.75	1.54	2.73	.56	5.00	4.75	2.45	8.24	9.53	1.29	2.78	.46	4.32	6.46	2.74
	Math																	
R-311	I.Arith.Reas.	16	7.41	9.61	2.20	3.14	.70	5.04	5.85	2.20	7.41	9.03	1.62	3.03	.53	4.51	6.29	2.54
R-312	II.Int.h.s.math	24	9.31	12.14	2.83	3.77	.75	5.75	4.05	2.03	9.97	10.78	.81	3.61	.22	5.73	5.46	3.68
R-333	III.Adv.h.s.math	14	2.40	4.22	1.82	1.59	1.14	2.29	3.94	1.83	2.29	3.32	1.03	1.48	.70	2.28	3.60	2.84
	No. of schools			51								51						
	No. of students			1482								1655						
	df (1)							50	50	50						50	50	50
	df (2)							1431	1431	1421						1604	1604	1594

[a] For each grade 12 variable the covariates in the variance analysis of gains are grade 9 scores on all variables in the selected set of tests.

NOTE: All F ratios in this table are large enough to indicate significance at the .01 level.

NOTATION:

F_9 = Univariate F ratio testing whether schools differ significantly in grade 9 means.

F_{12} = Univariate F ratio testing whether schools differ significantly in grade 12 means.

$F_{12.9}$ = Univariate F ratio testing whether schools differ significantly in gains, with covariate control on all 10 of the grade 9 variables.

σ_{9w} = estimate of within-school standard deviation for grade 9 population.

TABLE 7-2d. Analysis of differences among schools on grade 9 and grade 12 test scores, and on gains with covariate control on grade 9 scores[a]

Based on selected tests in retest batteries C, E, F

	No. of items	Boys								Girls							
		Mean			σ_{9w}	Gain / σ_{9w}	F_9	F_{12}	$F_{12.9}$	Mean			σ_{9w}	Gain / σ_{9w}	F_9	F_{12}	$F_{12.9}$
		Gr. 9	Gr. 12	Gain						Gr. 9	Gr. 12	Gain					
R-240 Word Functions	24	8.20	10.78	2.58	4.67	.55	3.98	5.00	2.91	9.91	12.85	2.94	5.14	.57	3.89	3.67	2.20
R-250 Reading Comp.	48	24.92	31.21	6.29	9.57	.66	9.25	7.24	3.76	27.16	33.27	6.11	9.51	.64	3.97	5.10	2.97
R-260 Creativity	20	7.80	10.80	3.00	3.55	.84	5.47	6.37	3.37	7.70	10.04	2.34	3.40	.69	3.16	3.74	1.96
R-270 Mech. Reason.	20	11.48	13.86	2.38	3.69	.64	4.51	5.78	2.71	8.10	9.51	1.41	3.30	.43	3.28	3.79	1.96
R-282 Vis. in 3 Dim.	16	8.09	9.83	1.74	3.09	.56	3.46	4.99	3.03	7.68	8.87	1.19	2.86	.42	1.86	2.96	2.02
R-290 Abstract Reas.	15	8.10	9.61	1.51	2.82	.54	6.07	4.85	2.08	8.27	9.57	1.30	2.81	.46	3.70	3.66	1.80
No. of schools			50								50						
No. of students			1610								1671						
df (1)							49	49	49						49	49	49
df (2)							1560	1560	1554						1621	1621	1615

[a] For each grade 12 variable the covariates in the variance analysis of gains are grade 9 scores on all variables in the selected set of tests.

NOTE: All F ratios in this table are large enough to indicate significance at the .01 level.

NOTATION:

F_9 = Univariate F ratio testing whether schools differ significantly in grade 9 means.

F_{12} = Univariate F ratio testing whether schools differ significantly in grade 12 means.

$F_{12.9}$ = Univariate F ratio testing whether schools differ significantly in gains, with covariate control on all six of the grade 9 variables.

σ_{9w} = estimate of within-school standard deviation for grade 9 population.

This ratio, which amounts in effect to mean gain expressed in a kind of standard score unit, thus making these gains more directly meaningful and providing them with a kind of comparability, helps us answer the critical first question that must be asked in any study of whether there is anything the schools do or <u>can</u> do that affects the amount of learning or the improvement in skill mastery that occurs during the high school years. That first question is: "Does any such gain occur, and if so is it large enough to be of practical significance?" After all, unless worthwhile gains are occurring somewhere, there is little merit to a study to determine whether and how schools differ in the degree to which they are able to produce those gains.

Let us look, therefore, at the columns in Tables 7-2a through 7-2d that show the gains expressed in comparable units. These are the columns that are headed $\frac{\text{Gain}}{\sigma_{9w}}$ and the numbers in them are by no means insignificant or trivial. It has become a commonplace to remark that the differences within a grade are greater than the differences among grades. This observation is still a true one and still important and there is nothing in the data presented here to contradict it. But in the $\frac{\text{Gain}}{\sigma_{9w}}$ columns of the four tables we are seeing the opposite side of this coin. Differences among grades do exist, in all areas, and they are uniformly in the right direction (the direction of progress rather than retrogression, of increase rather than decrease). Furthermore the gains in important areas are certainly large enough, in most cases, to escape the label "trivial," and in the more important areas they are generally quite substantial in magnitude. Except in a very few areas the average gain between grades 9 and 12 is at least half a standard-deviation unit and in some cases, notably Literature Information (R-102) and, for boys, Mathematics Information (R-106) and Advanced High School Mathematics (R-333), the average gain is over one full unit. Thus when we speak of the gains that occur between grades 9 and 12 and speculate on what school policies, principles, and procedures, if any, are effective in producing these gains, we are talking about gains that are large enough to be <u>worth</u> talking about.

It is encouraging to note that the larger gains generally tend to be associated with school-taught subjects--or areas such as vocabulary that if not taught directly are at least fields in which most schools would like to increase their students' mastery and promote growth. Thus, other areas in which growth in knowledge or ability is fairly large between grades 9 and 12 are information about law (R-132), information about accounting and business (R-139), electrical and electronic information (R-111), and mechanical information (R-112). All of these areas of substantial growth are curriculum-related (though not all are related to the academic curriculum). The test scale on Law Information necessarily has considerable overlap with the social studies curriculum, since it involves, among other things, such matters as legal safeguards on constitutional rights. Information about accounting and business is imparted in commercial courses, and mechanical and electrical-electronic information are of course staples of vocational curricula. Electrical and electronic information is also an important component of academic courses in physics or general science.

Differences among Schools

Having established that growth in mastery does occur in all areas and that particularly in curriculum-related areas it is often substantial in magnitude, the next question that arises concerns whether there is any evidence that schools differ in these respects. (If it were to develop that schools do not differ in regard to their effectiveness it would be rather hopeless to seek clues concerning what general or specific behaviors on the part of schools are likely to be effective.)

In studying school effects it is not sufficient merely to consider the grade 12 results and to claim they represent what the high school has done. They don't, unless one can assume that the high schools all started out with equivalent student bodies having identical distributions of test scores at entrance (or grade 9 scores) and identical distributions of environmental characteristics (both home and community). We know, of course, that this isn't true. If a high school in a prosperous suburban community has higher grade 12 scores, on the average, than its counterpart in a slum neighborhood in a large city it certainly does not mean that the suburban school is necessarily doing a better job. Rather, it is quite possible that the better showing made by the suburban school is the result of a combination of two potent factors: (1) that the students entered the high school with higher aptitude and achievement levels than their disadvantaged contemporaries from the depressed urban area, and (2) that the better environmental factors provided by home, family, and community in the prosperous suburb tend to promote more out-of-school learning than is typical in less favored situations.

What all this means for the present research is that if we wish to find out whether schools differ in their effects it is not at all adequate merely to examine the grade 12 data; the grade 12 results must be corrected by taking into account the initial situation (as represented in the case of Project TALENT by the grade 9 scores). This is accomplished by treating the grade 9 scores as covariates, and analyzing the resultant residuals.

Therefore for each variable in Tables 7-2a, 7-2b, 7-2c, and 7-2d three analyses of variance were carried out for boys and three for girls--one on the grade 9 results, one on the grade 12 results, and one on "residual gains"--in other words on grade 12 scores with covariate control on the grade 9 data. In all cases the groups compared were schools. The results are shown in the columns headed F_9, F_{12}, and $F_{12.9}$ in the four tables.

<u>All</u> of the F ratios not only for grade 9 and 12 individually but for gains as well, in Tables 7-2a, 7-2c, and 7-2d, are significant at the .01 level, and most of them even at the .001 level. In Table 7-2b too, a great many of the F ratios are significant at the .001 level and almost all of them at the .01 level. There are only five F's in the entire table that do not meet this latter standard of significance, and four of them (three for girls and one for boys, two for grade 9 and two for gains), are significant at the .05 level. These four all concern recreational activities of a sort in which direct instruction is not normally offered in high schools (hunting, fishing, and indoor games, such as chess, checkers, and cards). The single F ratio in the entire set that turned out not to be significant at any level was the girls' F ratio on gains in the Architecture Information score (R-135).

The conclusion to be drawn from all of this, and particularly, of course, from the high $F_{12.9}$ values corresponding to the covariance analyses, is that in any area of knowledge or ability represented by the TALENT tests under consideration students in some schools learn more, or improve their ability more, than in other schools. But this does not imply that the schools themselves are necessarily responsible for this outcome. The most that we can conclude is that entities represented by school-plus-community-plus-the-people-in-it do differ in the degree to which growth of knowledge or increase in ability occurs during the high school years, so that whether it is the school or other aspects of the neighborhood or community that bear the major part of the responsibility is a moot question.

It will be noted that the conclusion stated above says nothing about schools *per se* differing in effectiveness. It refers, rather, to the differing effectiveness of a complex entity described as school-plus-community-plus-the-people-in-it (which we shall start referring to merely as "school-plus," in the interests of brevity). This caution is necessary in the present context. In interpreting the results of an analysis such as the one under consideration, there is no way of distinguishing clearly and definitely between effects of what the school does and effects of other environmental influences, such as family and community. Fortunately, however, the necessity of omitting environmental factors from the set of variables considered in this analysis[1] is of relatively little importance, since it was possible to include socioeconomic index systematically as a variable in the Chapter 8 analyses, where its inclusion is much more useful, because the individual rather than the school is the unit of study in that chapter. And even from the analyses in the present chapter it is possible to draw some tentative inferences about the amount of effect that the "school-plus" entities have.

---

[1] In view of capacity restrictions on the computer program and other practical considerations, it was not feasible to incorporate in this data analysis any socioeconomic variables or other direct measures of community and family characteristics.

More specifically, we can tentatively infer, from the relative size of the F's for a group of schools, which F's primarily represent differential school effectiveness and which ones primarily represent differential community effects. These inferences are based not on the statistics but rather on knowledge of what each test measures and what part of it is likely to be covered in the school curriculum either directly or indirectly and either partially or wholly. Looked at from this point of view, the data of Table 7-2a, which contains the results for the Information Part I scores, suggest that the schools themselves are playing a rather important role in determining the effectiveness (or ineffectiveness) of the "school-plus"[1] units of which they are parts. There seems to be some tendency for the larger F's to be associated with curriculum-related subjects. (This is in line with the finding, mentioned earlier, that the variables for which the ratio of mean gain to within-grade standard deviation is relatively large are likely to be curriculum-related.) The largest $F_{12.9}$ value, both for boys and for girls, is for Literature Information (R-103). Other relatively high ones are for information in mathematics (R-106), social studies (R-105), and electricity-electronics (R-111), an area closely related to the physical science taught in the academic curriculum.

Farming Information (R-113) seems to be one exception to this generalization about the curriculum-relatedness of the tests with high $F_{12.9}$ values. Community effects (rural *vs.* urban) may be operating here to raise the F, rather than school effects.

Most of the large F values that show up in Table 7-2b, which contains the results for the Information Part II scores, appear to be primarily a function of community differences rather than school practices. Again, as in the case of the earlier consideration of raw gains scores, information about law (R-132), which is curriculum-related via its close association with social studies, may be an exception. But many of the scales of Information Part II cover recreational activities and hobbies--hunting, fishing, theater and ballet, etc.,--and the prevalence of some of these

---

[1] For an explanation of this term, see page 7-11.

activities among students in a particular type of school may be largely a matter of type of community. Boys in a rural area, for instance, are undoubtedly much more likely to have hunting as a hobby and consequently to know a lot about it than are city boys. Likewise knowledge about legitimate theater and ballet is in part a matter of living in a community where there is enough live theater for one to have the opportunity to acquire information in this area, and partly a matter of being in a socioeconomic stratum where theater-going is regarded as desirable behavior. Tables 6-1a and 6-1b, in conjunction with Table 4-8, provide evidence supporting this hypothesis. If one allows for the fact that the Theater-and-Ballet Information Scale (R-150) has a reliability of only about .60, which, although excellent for a test having only eight items, is rather low in absolute terms, it has a higher correlation with the socioeconomic index (P*801) than almost any other scale in the battery. Information about foods (R-151) is another area that is probably dependent in large part on community characteristics (and probably has a substantial correlation with socioeconomic level).

By far the largest $F_{12.9}$ value in Table 7-2c, both for boys and for girls, is for Memory for Words (R-212). But the cause of these school differences is not clear. If we may anticipate some of the Chapter 8 findings for a moment, it is apparent from them that even though the Memory for Words test is known to be an effective <u>predictor</u> of success in studying foreign languages (Carroll, 1962), large gains on it are not a direct consequence of such study. Thus there is no reason to hypothesize a close relationship between a school's foreign language program and the kind of gains its students make on the Memory for Words test. Furthermore comparison of the school's report of its course offerings in foreign language with the performance of its students on the test suggests that no relationship of any significant magnitude exists.

The largest F ratios in Table 7-2d, both for boys and for girls, are for the Reading Comprehension Test (R-250). It seems quite likely that this represents school effects at least to a certain extent although home and community factors also undoubtedly play a part.

Further Comments on "Aptitude" *vs.* "Achievement"

Table 7-2d points up the aptitude-*vs.*-achievement dilemma discussed in Chapter 5. Tests in areas such as visualization in three dimensions, abstract reasoning, mechanical reasoning, and creativity are customarily considered "aptitude tests" rather than "achievement tests" because they are in areas in which formal instruction is not usually explicitly offered in high schools. But the relatively high F's for all those areas suggest that the "school-plus"[1] complex is affecting performance and also lend some credence to the notion that the schools themselves are playing a significant role in this. (It is hard to conceive of an entire neighborhood or community exclusive of the school, that has characteristics fostering or hindering the development of spatial visualization after due allowance has been made (statistically) for the level reached by grade 9. The school itself is much more likely to be responsible for at least part of the effect. A strong program in geometry is one hypothesis. Further research, directed toward this hypothesis, would of course be necessary before the hypothesis could be established as fact.)

Perhaps most striking of all is the significant difference among schools in regard to changes in Creativity score (R-260) between grades 9 and 12. If these changes are indeed school effects, a supposition which would need independent confirmation before it could be accepted, it would be most interesting to know what specific or general aspects of the school program, policies, or facilities brought it about.

In any event the data of Tables 7-2a through 7-2d may have given the *coup de grâce* to any lingering notions among researchers that it is possible in studying performance at high school age to draw a <u>sharp</u> distinction between measures of a category of abilities called "aptitudes" which are allegedly impervious to external effects (training, education, etc.) and another category called "achievement" which admittedly are very much subject to the effects of education (as well as to the effects of the "aptitudes").

---

[1] For an explanation of this term see p. 7-11.

"Aptitude measures" and "achievement measures" are still handy labels for identifying certain categories of tests, and the terms are therefore not likely to be abandoned in a hurry. And there is still a very strong likelihood that what have commonly been called "aptitudes" are relatively resistant to the effects of specific training and education. Nothing in the findings of this research indicates anything to the contrary. All that has really been suggested is that "aptitudes" are not wholly resistant to environmental effects (specific training, education, or some other more general environmental factors). It is a matter of degree not of kind. Only the notion of a sharp clear wholly unambiguous line that can be drawn separating aptitude and achievement need be relinquished--and this is likely to be relatively painless since many researchers relinquished that idea years ago!

A Word of Caution on Comparison of F Ratios

It should be noted that comparison of F ratios is only done within a table; the F's are not directly comparable from table to table, since each table is based on a different set of schools and students. F ratios are group-specific. Thus unless groups are identical, as they are for all variables within a single table (Tables 7-2a, 7-2b, 7-2c, and 7-2d) instead of merely having partial overlap such as exists between the groups represented by any two of the four tables mentioned above, no comparison of F's for different variables is valid.

The fact that the Abstract Reasoning test was administered in all the retest schools and that scores on it (R-290) are therefore included in all four sets of variables analyzed provides us with a convincing demonstration of the hazards involved in comparing F's based on different groups. All the data of Tables 7-2a, 7-2b, 7-2c, and 7-2d relevant for this purpose are summarized in Table 7-4. A look at this table makes it apparent that corresponding F ratios differ markedly among the four groups of schools. We might look at the boys' F values for grade 9, testing whether schools differ significantly in grade 9 mean scores. The F is 2.52 for the set of schools to which the Table 7-2b data apply, and 6.07 for the Table 7-2d set of schools. If the Table 7-2b and 7-2d data applied to different tests, careless interpretation of the results might very well result in the conclusion

TABLE 7-3a: Summary of overall results of univariate and multivariate analyses of variance corresponding to the Table 7-2a data

	MALE			FEMALE		
No. of schools	65			59		
No. of students	1682			1867		
	X_9	X_{12}	$X_{12.9}$	X_9	X_{12}	$X_{12.9}$
No. of variables	15	15	15	15	15	15
No. of univariate F's significant at:						
.01 level	15	15	15	15	15	15
.05 level	15	15	15	15	15	15
Maximum no. of discriminant functions	30		15	30		15
No. of discrim. functions significant[c] at:						
.01 level	16		9	17		10
.05 level	17		10	18		10
Footnotes applying to column	a		b	a		b

[a] The X_9 and X_{12} columns contain the grade 9 and grade 12 data respectively, uncorrected for covariates.

[b] The $X_{12.9}$ columns contain data for residuals --in other words for grade 12 scores adjusted for grade 9 covariates. For each grade 12 variable, the covariates are all of the grade 9 variables of Table 7-2a.

[c] See footnote on page 7-21.

TABLE 7-3b: Summary of overall results of univariate and multivariate analyses of variance corresponding to the Table 7-2b data

	MALE			FEMALE		
No. of schools	44			44		
No. of students	1242			1422		
	X_9	X_{12}	$X_{12.9}$	X_9	X_{12}	$X_{12.9}$
No. of variables	15	15	15	15	15	15
No. of univariate F's significant at:						
.01 level	15	15	14	13	15	13
.05 level	15	15	15	15	15	14
Maximum no. of discriminant functions	30		15	30		15
No. of discrim. functions significant[c] at:						
.01 level	11		7	12		9
.05 level	11		8	13		10
Footnotes applying to column	a		b	a		b

[a] The X_9 and X_{12} columns contain the grade 9 and grade 12 data respectively, uncorrected for covariates.

[b] The $X_{12.9}$ columns contain data for residuals--in other words for grade 12 scores adjusted for grade 9 covariates. For each grade 12 variable, the covariates are all of the grade 9 variables of Table 7-2b.

[c] See footnote on page 7-21.

TABLE 7-3c: Summary of overall results of univariate and multivariate analyses of variance corresponding to the Table 7-2c data

	MALE			FEMALE		
No. of schools	51			51		
No. of students	1482			1655		
	X_9	X_{12}	$X_{12.9}$	X_9	X_{12}	$X_{12.9}$
No. of variables	10	10	10	10	10	10
No. of univariate F's significant at:						
.01 level	10	10	10	10	10	10
.05 level	10	10	10	10	10	10
Maximum no. of discriminant functions	20		10	20		10
No. of discrim. functions significant[c] at:						
.01 level	9		5	11		7
.05 level	10		6	12		7
Footnotes applying to column	a		b	a		b

[a] The X_9 and X_{12} columns contain the grade 9 and grade 12 data respectively, uncorrected for covariates.

[b] The $X_{12.9}$ columns contain data for residuals--in other words for grade 12 scores adjusted for grade 9 covariates. For each grade 12 variable, the covariates are all of the grade 9 variables of Table 7-2c.

[c] See footnote on page 7-21.

TABLE 7-3d: Summary of overall results of univariate and multivariate analyses of variance corresponding to the Table 7-2d data

	MALE			FEMALE		
No. of schools No. of students	50 1610			50 1671		
	X_9	X_{12}	$X_{12.9}$	X_9	X_{12}	$X_{12.9}$
No. of variables	6	6	6	6	6	6
No. of univariate F's significant at:						
.01 level	6	6	6	6	6	6
.05 level	6	6	6	6	6	6
Maximum no. of discriminant functions	12		6	12		6
No. of discrim. functions significant[c] at:						
.01 level	8		5	6		4
.05 level	9		5	6		4
Footnotes applying to column	a		b	a		b

[a] The X_9 and X_{12} columns contain the grade 9 and grade 12 data respectively, uncorrected for covariates.

[b] The $X_{12.9}$ columns contain data for residuals--in other words for grade 12 scores adjusted for grade 9 covariates. For each grade 12 variable, the covariates are all of the grade 9 variables of Table 7-2d.

[c] See footnote on page 7-21.

TABLE 7-4. Comparison of analyses of variance for four separate sets of schools on the Abstract Reasoning scores (R-290), testing whether schools differ significantly

Sex	Data from	Retest batteries	No. of schools	No. of students	Mean			σ_{9w}	$\frac{\text{Gain}}{\sigma_{9w}}$	F_9	F_{12}	$F_{12.9}$
					Gr. 9	Gr. 12	Gain					
M	Table 7-2a	ABCV	65	1682	8.35	9.86	1.51	2.82	.53	4.33	4.26	2.15
	Table 7-2b	ADE	44	1242	8.39	9.72	1.33	2.80	.48	2.52	3.91	2.25
	Table 7-2c	BDF	51	1482	8.21	9.75	1.54	2.73	.56	5.00	4.75	2.45
	Table 7-2d	CEF	50	1610	8.10	9.61	1.51	2.82	.54	6.07	4.85	2.08
F	Table 7-2a	ABCV	59	1867	8.13	9.28	1.15	2.77	.42	6.06	7.16	2.06
	Table 7-2b	ADE	44	1422	8.27	9.52	1.25	2.77	.45	4.29	6.51	2.62
	Table 7-2c	BDF	51	1655	8.24	9.53	1.29	2.78	.46	4.32	6.46	2.74
	Table 7-2d	CEF	50	1671	8.27	9.57	1.30	2.81	.46	3.70	3.66	1.80

NOTE: These data have been extracted from Tables 7-2a, 7-2b, 7-2c, and 7-2d.

that the Table 7-2d Abstract Reasoning test, with its F of 6.07, differentiated among high schools far better than the Table 7-2b test, with its F of only 2.52. Such a conclusion would clearly be totally wrong. There is only one Abstract Reasoning test involved.

It is worth noting, in this connection, that though the F's vary greatly among the four sets of schools, Table 7-4 shows that there isn't much difference among the four means for grade 9 (or for grade 12).

The Discriminant Functions

As has already been indicated, the univariate phase of the analysis, discussed above, was supplemented by a multivariate approach in which sets of multiple discriminant functions were obtained. Since several types of functions exist that have this name and have little else in common except that they are linear functions of the original scores, it seems desirable to specify the sort that was used here. These multiple discriminant functions are mutually uncorrelated, and they are of the type that constitutes an ordered set, in which the first discriminant function is the single linear function that provides maximum differentiation of the groups (schools, in this case), the first and second combined are the pair that provides maximum differentiation, and so forth. Those discriminant functions thus obtained that are inferred to provide real differentiation of the groups instead of merely providing numerical values that represent sampling errors are the ones that are regarded as statistically significant.[1]

It is a useful and convenient convention to refer to the number of significant discriminant functions as the number of "dimensions" necessary in order to describe real differences among groups. This being the case, let us look at the numbers of such dimensions that are needed in the present instances. Tables 7-3a, 7-3b, 7-3c, and 7-3d (corresponding respectively to Tables 7-2a through 7-2d) show the numbers of significant discriminant functions for each set of data, as well as recapitulating, in order to

---

[1] The procedure used for testing significance of the discriminant functions was to convert the appropriate Wilks lambda value to an approximation of chi-square, in accordance with the approximation formula developed by

facilitate comparison, the numbers of significant univariate F ratios, which have already been discussed at some length. Tables 7-3a through 7-3d also indicate the maximum number of discriminant functions mathematically possible for each analysis.[2]

The most striking thing about the discriminant functions to be gleaned from these four tables is the large numbers of them that are significant.

---

1 (continued)

Bartlett. The formula is:

$$\chi_i^2 = - \left[(N-1) - \frac{p+q+1}{2}\right] \log \Lambda_i$$

where N = number of cases
g = number of groups
p = number of variates (not including covariates)
c = number of covariates
$t = p + c$
$q = g - 1$
Λ_i = Wilks lambda for testing the discriminating power of the t-test-battery when c of the t tests are used as covariates, after extraction of i-1 of the discriminant functions.
$\chi_i^2 = \chi^2$ approximation of Λ_i

The number of degrees of freedom corresponding to χ_i^2 is given by:

$$df_i = (p-i+1) \quad (q-i+1)$$

These formulas (with slightly different notation) are presented, and the procedures discussed, by Cooley and Lohnes (1962).

[2] In the present analyses the upper limit on the number of discriminant functions always equals the number of raw variables in the analysis since there are more groups to be differentiated than variables to differentiate them.

Each significant discriminant function may be regarded as representing a separate independent way in which schools together with the other environmental factors acting on the set of students considered as a whole differ in their effects during the last three high school years. For instance in Table 7-3a, which refers to the Information Part I analyses, it is seen that for the males nine out of a possible 15 discriminant functions with covariate control on the grade 9 data are significant at the .01 level and ten at the .05 level. This means that the "school-plus"[1] entities differ in a great many dimensions rather than just one or two. In other words one cannot really speak meaningfully of "good schools" *vs.* "bad schools" or even of good "school-plus-community" entities *vs.* poor ones. This would be a gross oversimplification, apparently, since some of these geographical entities are good (or bad) in one way and some in another, and these various ways all function independently of each other.

Of course it is still true here, as it was in the case of the univariate analyses, that we cannot differentiate clearly between the dimensions that are due to school effects and the dimensions that are due to aspects of the community that have nothing to do with the school. (We <u>can</u> say, however, as we couldn't in the case of the univariate analysis, that there is no overlap between these two numbers of dimensions--those due to school effects and those due to other community effects--since the dimensions provide <u>independent</u> measures.)

It should be recognized, of course, that the number of statistically significant multiple discriminant functions is not necessarily the number of such functions that measure magnitudes large enough to be of practical importance. It is merely the <u>upper bound</u> on the number of "important" discriminant functions. Moreover the fact that a discriminant function measures differences that are not only "significant" but also large enough to be "of practical importance" does not necessarily mean that a value judgment can be attached. High scores on a particular discriminant function are not necessarily either "good" or "bad," "desirable" or "undesirable." This lack

---

[1] For an explanation of this term see page 7-11.

of value-oriented polarity in some of the functions makes direct interpretation of their practical significance difficult if not impossible.[1]

Because of these considerations the conclusions to be drawn as a result of the discriminant function analysis are somewhat vaguer than one could have hoped. We can state quite definitely that the "school-plus"[2] geographic entities differ in a great many psychometric dimensions and we can surmise, although we cannot prove, that a substantial number of these dimensions are school-related.

Why Do Schools Differ in Effectiveness?

Having established that the "school-plus"[2] entities differ in their effectiveness and having surmised that at least part of this is due to the school rather than the alternative hypothesis which would be that all the differences among schools are due to community factors exclusive of school, the next problem is to try to determine what there is about certain schools that makes their students learn more effectively (or less effectively) than the students in other schools. The only feasible approach to this problem, with the present data, was to examine school characteristics as described on the questionnaires answered by the schools that participated in Project TALENT, and determine how they are related to the school differences in performance that manifested themselves. The results, however, were inconclusive. For instance there was no clear relation to be seen between test performance and such school characteristics as course offerings.[3] Schools that reported a strong program in mathematics or in physical science (many courses offered,

---

[1] Rotated discriminant functions were not available. (See footnote 1 on page 6-22.)

[2] For an explanation of this term see page 7-11.

[3] No correlational analysis of these data was undertaken since the records of course offerings of the school were not suitable for the quantified form needed for such analysis.

and strong requirements for graduation) were not especially likely to be among those that scored higher than average in those areas.

No specific data are presented here on this area of inquiry because the investigation was strictly an informal and exploratory one aimed at deciding whether an extensive formal analysis of the relation of residual test score gains to course offerings and associated school characteristics would be worth while. The decision was that it wouldn't be, and that other approaches would be more likely to lead to productive results.

It seems likely that the lack of any readily apparent relation of the school characteristics under consideration to the very substantial inter-school differences in performance which had been demonstrated to exist might be due in large part to the fact that courses offered by a school are not necessarily taken by a large proportion of that school's students--or, for that matter, by the right students, those who would profit most. The results of the analyses described in the next chapter (Chapter 8) provide strong support for this hypothesis.

In the meantime the research reported in the present chapter suggests that schools vary in effectiveness in a great many dimensions, even though the specific school characteristics that produce these differential results are somewhat elusive. One reason they are so resistant to identification may be that they are elusive inherently, not just in the present context. In other words one of the crucial differences between an effective school and an ineffective one may be something as tenuous and resistant to identification on the basis of a questionnaire as the school's atmosphere--the ambience it provides--or some other concept equally hard to nail down. Vague though this concept is, it at least has the advantage of fitting the facts and providing an explanation for them. For instance it would explain why number of courses offered in an area might be irrelevant. It doesn't matter much how many advanced courses a school reports it offers if few or none of the students take them. And this may be largely a matter of the students' motivation and interest. There are enormous differences among students, of course, with respect to their motivation to take elective courses in specified areas, and their interest in adding to their mastery in those areas. But superimposed on these normal differences among students are the differences produced by the school itself, considered as a motivation-generating environment.

The school may provide an atmosphere where the motivation to learn is stimulated or it may provide an atmosphere that reduces this motivation and produces students whose goal is to barely "get by." The quality of the faculty would probably play an important part in such differences. Perhaps this can be condensed into the suggestion that it isn't so much what the school does as how it does it that matters. (Offering advanced courses but failing to interest suitable students in taking them is a case in point.)

Some of the foregoing discussion is based on speculation, quite obviously, and not on hard facts--but it does fit what facts we know and that consideration lends it plausibility.

In summary, then, to answer the question suggested in the title of this chapter, effective high schools and ineffective ones are a fact, not a mirage. And since we have found that there are important differences among schools in their effectiveness, it would appear that education is susceptible of improvement. But since the sources of these differences among schools resist ready identification, there would appear to be no easy panacea for the problems of education.

Chapter 8. CORRELATES OF CHANGE: A CONSIDERATION OF CONCOMITANCE AND CAUSATION

Some students learn more in high school than other students. Individual differences in aptitude of course play a major role. But what role do other factors play?

It was shown in the last chapter that there are significant differences among schools in regard to kind and magnitude of changes in level of test performance occurring between grades 9 and 12, and that these differences still exist even after initial ability levels have been controlled statistically (by using the grade 9 test scores as covariates).

But what the Chapter 7 analysis couldn't establish is the nature of some of the explanatory agencies immediately underlying the differential gains. It will be recalled that significant differences among schools in regard to the changes produced in their students were found to exist in virtually all the cognitive areas tested. But though these differences were particularly large in areas such as mathematics, in other words in areas where specific course work might be expected to be especially potent in effecting changes, no clear relationship between these differences and the school's course offerings could be established. It was therefore hypothesized that the differences were not so much a matter of what courses the school indicated that it offered or was prepared to offer as of the extent to which the students took advantage of the available courses by taking them as electives.

Other moderating variables which it was felt might be having a substantial, though perhaps indirect, effect on the extent to which the student's mastery of various specific areas changed during the high school years included such things as his socioeconomic status, his plans (more specifically, whether he planned to go to college), and the extent to which the school had had or had made an opportunity to try formally to help him plan.

In our search for leads as to what factors are responsible for the changes in relative performance level that have been shown to exist, it is assumed that whatever factors are having an effect are probably operating on, or through, the individual student in one way or another, rather than necessarily affecting all the students in a school in a unitary way. Suppose, for instance, that we are interested in the extent to which the study of foreign languages improves mastery of English. Whether the school offers foreign language courses certainly has some relevance since without such a program the effect cannot occur. But merely offering the opportunity to take foreign languages is not likely to improve a student's mastery of English if he doesn't avail himself of the opportunity. And if a school offers an extensive language program, it is extremely unlikely that all students will take advantage of it to the same extent. For these reasons, among others, it was decided that the student, rather than the school, should be the unit of study for the research reported in this chapter.

Considerable attention is devoted in this chapter to the role of socioeconomic status. It is well known, from the findings of numerous educational researchers, that socioeconomic status is correlated substantially with scores on many kinds of tests. Project TALENT results are quite in line with these usual findings, as can be seen from Matrices 1A and 1B (in Tables 6-1a and 6-1b). P*801 is a variable in these matrices. It was shown in the factor analyses presented in Chapter 6 that the common factor with which socioeconomic status has its highest correlation is general verbal ability ("VERBL") and that the only other common factor with which it has a sizable correlation is MATH (for the males only). Many of the correlations of socioeconomic index with individual variables are substantial, of course, and almost all of them are significantly greater than 0. But it is not at all clear from these data what is cause and what is effect. Are the correlations due chiefly to the effect of environment on achievement or are they due more to the relation between the student's aptitudes when he reaches grade 9 and the environment in which he has been growing up? Can the complex of cause-and-effect relationships and coincidental concomitant relationships be sorted out sufficiently to begin to get answers to these questions? Efforts to do just that, and the results of these efforts, are discussed in this chapter. We shall try to find out, for instance, whether students whose socioeconomic status is low are less likely than other students of the same initial ability level to take college-preparatory courses (mathematics, foreign languages, etc.).

Among the questions on other issues to which we shall seek answers are the following:

1. Do students who plan to go to college learn more in high school than students who don't?
2. If so, does this still hold even if initial differences in aptitude are taken into account? And even if differences in socioeconomic level are taken into account?
3. What is the role played by choice of courses in determining grade 12 achievement level in various areas? Is number of courses taken in various areas to some extent a function of initial ability and thus "self-adjusting" or are some able students who could benefit from academic courses failing to take them (either through choice or because they attend a high school which doesn't offer these courses)?

BASIC DATA AND GENERAL PROCEDURES

The Basic Correlation Matrices

The results presented in this chapter are based almost entirely on six initial correlation matrices, and on further statistics derived from these six matrices. The six matrices are:

Matrix AM: Based on Retest Battery A, males
Matrix AF: Based on Retest Battery A, females
Matrix DM: Based on Retest Battery D, males
Matrix DF: Based on Retest Battery D, females
Matrix EM: Based on Retest Battery E, males
Matrix EF: Based on Retest Battery E, females

The basic facts concerning these matrices (the cases going into them, the variables included, etc.) are summarized in Table 8-1. The matrices themselves are shown in Appendix J. The three batteries used (A, D, and E) are the ones that include the Student Information Blank (SIB). The variables included in each of the six matrices include most of the grade 12 test scores from the retest battery, the corresponding grade 9 scores, and seven other variables, based on responses to the SIB items. These seven variables are:

TABLE 8-1. Description of the six basic correlation matrices[a]

Basic Correlation Matrix	Retest Battery	Sex	N	Test variables for Grade 9 (1960) and Grade 12 (1963)	No. of variables: No.of test variables Gr. 9	No.of test variables Gr. 12	No.of other var.*	Total no.of var.
Matrix AM	A	M	419	R290,R131-135,R139,R142,R102-115	22	22	7	51
Matrix AF	A	F	493	" " " " "	22	22	7	51
Matrix DM	D	M	411	" " " " ,R212,R231-235,R311,R312,R333	17	17	7	41
Matrix DF	D	F	493	" " " " " " " " "	17	17	7	41
Matrix EM	E	M	333	" " " " ,R220,R240,R250,R260,R270,R281-282	15	15	7	37
Matrix EF	E	F	374	" " " " " " " " " "	15	15	7	37

---

*The seven non-test variables in each matrix are:

P*801	Socioeconomic index (in grade 9)
SIB-59	College plans (when in grade 12)
SIB-156	Amount of counseling in high school
X-891'	Number of mathematics courses taken in high school
X-892'	Number of physical science courses taken in high school
X-893'	Number of science courses taken in high school
X-894'	Number of foreign language courses taken in high school

[a] The cases included are those "matched cases" having retest classification code 0 and having valid P*801 values and valid responses on 1963 SIB items 59 and 156, and also valid responses on the 1963 SIB items involved in X-891', X-892', X-893', and X-894'. The cases are not weighted.

a. Four variables representing number of high school courses[1] in selected subject-matter areas.

1) X-891'.	No. of mathematics courses (in a college-preparatory sequence) taken in grades 9-12
2) X-892'.	No. of physical science courses taken in grades 9-12
3) X-893'.	No. of science courses taken in grades 9-12
4) X-894'.	No. of foreign language courses taken in grades 9-12

b. One variable (from the 1960 SIB) related to home background.

5) P*801.	Socioeconomic index:[2] based on responses (in grade 9) to nine SIB items

c. Two additional 1963 SIB items relating to post-high-school plans

6) SIB-59.	Item on college plans
7) SIB-156.	Item on amount of counseling received from high school counselor

SIB items 59 and 156 are as follows:

Item 59. Do you expect to go to college?

(4) A. I definitely will go to college.
(3) B. I am almost sure to go.
(2) C. I am likely to go.
(1) D. I am not likely to go.
(0) E. I will not go to college.

Item 156. How many times have you discussed your plans for after high school with...[the] school counselor?

(0) A. None
(1) B. One
(2) C. Two
(3) D. Three
(4) E. Four
(5) F. Five or more

The numbers in parentheses to the left of the options indicate the "score" assigned for each response.

---

[1] The four "number-of-courses" variables (which are derived from responses to 18 items in the 1963 SIB) are described in detail in Appendix D-2.

[2] The socioeconomic index is described in Appendix E.

Subsequent Data Analysis

Analysis of the six correlation matrices fell into three phases. The first consisted primarily of partial canonical correlation analysis between a predictor set of variables--the four "number-of-courses" variables (X-891' to X-894'), college plans (SIB-59), and amount of counseling (SIB-156)--and a criterion set of variables, the grade 12 test scores, with a third set of variables, the grade 9 test scores, partialed out. (The same analysis was repeated, with socioeconomic index added to the set of partialed-out variables.)

The second phase, which was a by-product of the first, consisted in obtaining part (and partial) correlations of the individual predictor-variables with the individual criterion-variables. This was supplemented by a study of the intercorrelations among the seven variables derived from the SIB, with the grade 9 test scores partialed out. In this analysis particular emphasis was placed on the relation of socioeconomic index to the other six variables based on the SIB (with grade 9 scores partialed out).

The third phase was multiple correlation analysis, with selected grade 12 test scores used as criterion variables and with the independent variables added one at a time in a predetermined order. The independent variables (predictor variables) in this phase were the grade 9 scores, the number-of-courses variables, college plans, and socioeconomic index.

The results obtained from these four phases of data analysis will be discussed in subsequent sections of this chapter.

SOME BASIC RESULTS

The Raw Correlations

Inspection of the correlation matrices, shown in Appendix J, reveals substantial correlations both within and between the three sets of variables included--the grade 9 test scores, the grade 12 test scores, and the other variables used for statistical control or for prediction (i.e., socioeconomic index, courses taken, college plans, etc.). But this doesn't tell us much about cause and effect, since, as all readers of this report surely know, concomitance does not necessarily mean causation. And what we are really interested in is causation. We want some leads as to what factors help produce greater increases in some students' scores than might be expected, other things being equal, and what factors work in the opposite direction, to hinder growth.

Does taking college-preparatory mathematics courses in high school, for instance, improve a student's mastery of elementary school arithmetic? Or is it the motivational effect of expecting to go to college that produces these gains? Or is it neither of these things but rather the effect of greater mathematical aptitude to begin with, which is related both to likelihood of going to college and to likelihood of taking college-preparatory mathematics courses? The raw correlations don't give us the answers. As a matter of fact they present a very complex picture, because of the interrelations among all three kinds of values (grade 9 scores, grade 12 scores, and SIB data).

The rest of this chapter, therefore, is devoted to various statistical analyses that take the raw correlation matrices as their starting point, but go several steps beyond them. The purpose of these further analyses is to see whether it is possible to untangle some of the complex interrelationships among variables in order to get a clearer understanding of what may be happening.

The Partial Canonical Correlation Analyses

The set-up of the 12 partial canonical analyses, which were described briefly in the preceding section, is summarized in Table 8-2. It will be recalled that the grade 12 scores are the criterion set and the grade 9 scores have been partialed out. Table 8-2 shows exactly what variables are in each of the three sets (predictor set, criterion set, and partialed-out set) in each analysis. As seen from this table, the only difference between the six odd-numbered analyses and the six even-numbered ones is that in the latter, socioeconomic index has been added to the set of partialed-out variables.

TABLE 8-2. Set-up of the 12 partial canonical analyses

Basic Correlation Matrix	Retest Battery	Sex	N	Test variables in canonical analysis R290, R131-R135, R139, R142, and:	Partial Canonical Analysis #	Number of variables				
						Predictor set*	Criterion set (1963 scores)	Partialed-out set		
								1960 scores	F*801	Total no. of var.
						n_1	n_2			n_0
Matrix AM	A	M	419	R102-R115	1	6	22	22	-	22
					2	6	22	22	1	23
Matrix AF	A	F	493	Same	3	6	22	22	-	22
					4	6	22	22	1	23
Matrix DM	D	M	411	R212, R231-R235, R311, R312, R333	5	6	17	17	-	17
					6	6	17	17	1	18
Matrix DF	D	F	493	Same	7	6	17	17	-	17
					8	6	17	17	1	18
Matrix EM	E	M	333	R220, R240, R250, R260, R270, R281, R282	9	6	15	15	-	15
					10	6	15	15	1	16
Matrix EF	E	F	374	Same	11	6	15	15	-	15
					12	6	15	15	1	16

*Variables in the "predictor set" are X-891', X-892', X-893', X-894' (i.e., no. of courses in four areas), SIB-59 (college plans), and SIB-156 (amount of counseling).

The six predictor variables are sometimes referred to in this chapter as "student action" variables. This is in recognition of the fact that at least to a certain extent these six variables represent voluntary actions on the part of the student. Whether he plans to go to college is at least partly under his control. Whether he takes college-preparatory math, physical science, and foreign languages would be largely up to him to decide, in many high schools. Even in high schools where taking such courses is mandatory for students in the college-preparatory curriculum, being in that curriculum at all is likely to be at least partly a matter of choice. As for number of contacts with the high school counselor, while some limited number of such meetings may be mandatory, seeking additional assistance beyond the required minimum number of contacts is voluntary.

The resulting partial canonical correlations are shown in Table 8-3. (The number of canonical correlations resulting from each analysis is equal to the number of predictor variables--six in each case--since there are fewer variables in the predictor set than in the criterion set.)[1] Table 8-3 also shows how many of the canonical correlations are significant.

As in the case of the canonical analyses in Chapter 6, and for essentially the same reasons, no attempt will be made to interpret the canonical variates derived in the present analysis. Again the number of <u>significant</u> canonical correlations in each analysis will be regarded as the chief issue.

The number of significant canonical correlations may be regarded as indicating the number of variables (among the set of six predictor variables) that can be considered to have a component which is independent of any of the other five and at the same time is significantly correlated with a linear composite of the criterion variables (grade 12 scores with grade 9 scores partialed out). (In geometrical terms this is perhaps somewhat analogous to rotating the significant canonical factors obliquely so that each axis goes through one of the "significant" predictor variables.)

Now suppose that n' is the number of significant canonical correlations when just the grade 9 scores are partialed out (i.e., partial canonical

---

[1] Since the original correlation matrices (AM, AF, DM, DF, EM, and EF) are all of full rank, the number of canonical correlations extracted never falls below six, in any of the 12 analyses.

TABLE 8-3. Partial canonical correlations[a] between set of grade 12 scores and 6 predictor variables

Matrix →	AM		AF		DM		DF		EM		EF	
Canon. Analysis No. →	1	2	3	4	5	6	7	8	9	10	11	12
Canon. r	PARTIAL CANONICAL CORRELATIONS											
1st	.666**	.662**	.696**	.679**	.587**	.581**	.617**	.600**	.470**	.445**	.415**	.408**
2nd	.407**	.392**	.508**	.487**	.337**	.338**	.267*	.251	.313*	.313*	.325**	.327**
3rd	.338**	.346**	.303*	.301*	.279	.281	.250	.244	.299	.301	.272*	.269
4th	.274	.276	.239	.238	.204	.218	.220	.200	.236	.238	.243	.230
5th	.253	.250	.191	.188	.191	.189	.159	.159	.181	.180	.200	.198
6th	.181	.180	.184	.184	.169	.160	.116	.115	.120	.121	.156	.163
No. of signif. canons. r's[b]	n'	n''	n'	n''	n'	n''	n'	n''	n'	n''	n'	n''
at .01 level	3	3	2	2	2	2	1	1	1	1	2	2
at .05 level	3	3	3	3	2	2	2	1	2	2	3	2

---

[a] The specific variables in the predictor set, criterion set, and partialed-out set are indicated in Table 8-2.

[b] The symbols n' and n'' represent the numbers of significant canonical correlations, in the odd- and even-numbered canonical analyses respectively.

*Significant at .05 level

**Significant at .01 level

analysis numbers 1, 3, 5, 7, 9, and 11) and that n'' is the corresponding number when in addition to the grade 9 scores, socioeconomic index is also partialed out (i.e., partial canonical analysis numbers 2, 4, 6, 8, 10, and 12). We can expect that n'' will usually be either equal to n' or 1 less than n'.

If n'' is equal to n' it may be regarded as meaning that if the grade 9 scores are partialed out there is no significant correlation between socioeconomic index and the criterion variables (grade 12 scores) after all the criterion variance accounted for by the six original predictor variables has been removed.

On the other hand if n'' = n' - 1 it means that one of the n predictor variables that is independent of the other five and significantly correlated with the set of criterion scores may owe this correlation solely to the socioeconomic component.

It can be seen from Table 8-3 that corresponding values of n' and n'' are equal in about every case. This is quite consistent with the easily observed fact that the differences between corresponding canonical correlations in the even-numbered and odd-numbered canonical analyses (i.e., with and without socioeconomic index partialed out) are negligible suggesting that these differences are in all probability not significant (and that whether they are significant or not, they are certainly not sizable enough to be important).

Thus it would appear that the primary way in which socioeconomic factors operate, at least during the high school period, in affecting test scores is by affecting certain behaviors--e.g., choice of an academic or a non-academic program in high school, choice of specific courses, planning for college--which, in turn, have a more <u>direct</u> effect on test scores.

Further aspects of this problem, the effects of socioeconomic status on scholastic performance, are discussed later in the chapter.

There are two or three significant canonicals in the Battery A analyses, one or two in Battery D, and about two in Battery E. These numbers may be regarded as indicators of the number of predictor variables (among the six) that are needed in order to account for <u>all</u> of the effective prediction provided by <u>any</u> of the six. In subsequent sections of this chapter we shall see how the part and partial correlations between individual variables help us to gain insight into the nature of the prediction of grade 12 scores and the character of the predictors producing it.

The Part Correlations[1]

Table 8-4 shows part correlations between the variables of the criterion set (grade 12 scores) on the one hand and the six variables of the predictor set (SIB-based functions) on the other hand, with socioeconomic index and the set of grade 9 scores partialed out of the predictor variables. (The variables involved in this part-correlation analysis are identical with the ones in the even-numbered canonical analyses, described in the previous section.)

The partial correlations corresponding to the part correlations shown in Table 8-4 were also obtained. They were used in determining the significance levels of the part correlations. The principle used was that if a partial correlation coefficient is significantly different from zero, the corresponding part correlation may also be inferred to differ significantly from zero.[2] (The significance level of the partial correlation was determined by means of Fisher's z transformation.)[3] The resulting significance levels of the part correlations are shown in Table 8-4. It will be noted that every one of the six predictor variables has significant part correlations with some of the criterion variables. But many of these significant correlations are obviously due to some sort of indirect linkage rather than to a direct effect. For instance number of courses in foreign languages has a significant part correlation with Mathematics Information (R-106), but it hardly seems likely that the student would augment his stock of information about mathematics in a language course. Almost certainly the correlation of number of language courses with Mathematics Information is due to the fact that students in a college-preparatory program are likely to take both mathematics and language courses while students in a vocational program are

---

[1] Part correlations are discussed in *Multivariate Correlation Analysis* (DuBois, 1957)

[2] The reason for this is that part r has the same numerator as partial r, but a larger denominator, so that if partial r has a non-zero numerator (in the population parameter), part r also does.

[3] The formula used for standard error of z was:

$$\sigma_z = \frac{1}{\sqrt{N - n - 3}}$$

where N = number of cases.

n = number of variables partialed out.

TABLE 8-4. Part correlations[a] between grade 12 test scores (criterion variables) and six predictor variables[b]

Retest Battery	Grade 12 Variable	MALES						FEMALES					
		X-891′	X-892′	X-893′	X-894′	SIB-59	SIB-156	X-891′	X-892′	X-893′	X-894′	SIB-59	SIB-156
A	R-102	.022	.032	-.033	-.018	.046	.020	.018	.013	-.001	.065**	.056*	.012
	R-103	.085**	.068*	.044	.030	.134**	.024	.059*	.061*	.028	.121**	120**	-.007
	R-104	.018	.046	.035	.105**	.071*	.034	.047	.022	-.024	.048	.071**	.032
	R-105	.045	.057	-.033	.013	.018	.015	.020	.049	.034	.015	.020	-.007
	R-106	.286**	.253**	.119**	.114**	.205**	.095**	.300**	.271**	.137**	.179**	.247**	.104**
	R-107	.080**	.179**	.072**	.035	.092**	.038	.098**	.259**	.202**	.021	.119**	.049
	R-108	.068*	.149**	.104**	.034	.056	-.054	.032	.117**	.108**	.041	.053	-.006
	R-109	-.003	-.034	-.033	-.006	.032	.012	-.008	.011	-.018	-.022	-.006	-.025
	R-110	.028	-.022	.006	-.035	-.028	.043	-.003	-.021	-.033	-.104**	-.032	-.032
	R-111	.033	.096**	-.002	-.001	-.003	-.015	.022	.224**	.189**	-.101**	.061	.004
	R-112	-.055	-.033	-.026	-.128**	-.126**	-.050	.015	.105**	.065*	-.040	-.019	.009
	R-113	-.073*	.026	.022	-.015	-.039	-.017	.005	.058	.033	-.010	-.032	-.024
	R-114	.017	-.019	-.024	.007	-.034	.079*	-.003	.032	-.002	-.068*	-.050	-.014
	R-115	.044	.049	.047	.039	.073*	.016	.018	.065*	.007	-.046	.055	.037
	R-131	.025	.052	.055	.030	.049	.041	-.024	-.025	-.046	.057	.006	.014
	R-132	.014	-.042	-.056	-.019	-.072	-.009	-.050	-.013	-.041	.001	-.011	-.061
	R-133	.000	.083*	.024	-.047	-.003	-.033	-.042	.011	-.007	.019	-.078*	-.012
	R-134	.037	.033	-.014	-.067	-.024	-.048	.010	.021	.020	-.009	-.055	-.062
	R-135	.030	.057	.018	.007	.066	.048	.009	.073	.075	.022	-.030	-.015
	R-139	-.043	-.093*	-.048	-.056	-.008	-.016	-.092**	-.118**	-.124**	-.040	-.042	-.013
	R-142	.028	.045	.045	-.024	.104**	-.026	.011	.064*	.045	.045	.051	-.077**
	R-290	.078*	.039	-.032	.030	.030	.050	.006	.060	-.046	-.020	.019	.035
D	R-131	.078*	-.026	.038	.029	.061	.049	.008	-.016	-.013	.039	.009	.010
	R-132	.048	-.014	-.044	-.052	.023	.109**	-.000	.054	.012	.081*	.040	.088*
	R-133	-.006	-.018	.064	.039	-.008	.030	.032	-.019	.083*	.016	.005	-.072*
	R-134	-.018	.016	.021	-.034	-.087*	.004	.016	.066	.013	-.025	.065	.059
	R-135	.114**	.047	-.014	.140**	.067	.052	-.014	.012	.002	.037	.059	.028
	R-139	-.074	-.011	-.056	-.082*	-.003	.073	-.026	-.018	.002	-.048	-.039	.019
	R-142	.042	-.013	.003	.034	.059*	.045	-.002	.023	-.003	-.006	.043	.000
	R-212	.086*	.008	-.003	.060	.043	-.027	-.023	.017	.001	.043	-.013	.029
	R-231	.076*	.042	.039	.020	.079*	.017	-.075*	-.070*	-.068*	.017	.022	-.031
	R-232	.021	.020	.039	.016	.021	-.019	.001	-.009	.035	.032	.016	-.002
	R-233	.069*	.040	-.018	-.002	.084*	-.059	.076*	-.019	-.011	.053	.074*	.016
	R-234	.098*	.071	.042	.018	.122**	.027	.050	.021	-.020	.054	.038	.008
	R-235	.077	.100*	.062	-.013	.079	-.029	.029	-.008	-.033	.006	115**	-.012
	R-290	.106**	-.003	.005	-.058	-.010	.004	-.005	-.020	-.021	-.039	-.051	.009
	R-311	.014	.046	-.053	-.040	.062	-.002	.000	-.002	.002	.003	-.039	-.003
	R-312	.262**	.216**	.088**	.098**	.199**	.069*	.318**	.224**	.132**	.100**	.205**	.118**
	R-333	.260**	.257**	.111**	.118**	.199**	.032	.277**	.238**	.142**	.121**	.190**	.066
E	R-131	-.007	-.036	.025	.043	-.027	.008	-.010	.015	.021	.082*	.089*	.093*
	R-132	-.003	-.061	-.024	.069	.087	-.047	.001	.007	-.025	.099*	.033	.008
	R-133	.091	.038	.069	.025	.085	.057	.061	.096*	.075	.082	.149**	.022
	R-134	.105*	.126*	.007	.106*	.047	.014	.013	.041	.016	.012	.013	.072
	R-135	.018	.064	-.013	.068	.014	-.049	.113**	.040	.023	.108*	.013	-.018
	R-139	-.012	-.061	-.059	.063	.083	-.051	-.061	-.139**	-.100*	-.081	-.005	-.066
	R-142	.057	.005	-.024	.069	.047	-.018	.024	.069*	.052	.066	.045	.088*
	R-220	-.096*	-.002	.068	.058	.021	-.058	-.043	-.056	-.049	.085	-.104*	-.094*
	R-240	.066	.123**	.094*	.174**	.251**	.077*	.143**	.105**	.076*	.150**	.121**	-.001
	R-250	.075*	.035	.065	.072	.159**	.007	.058	.080*	.123**	.114**	.076*	.022
	R-260	-.009	.035	-.011	.006	.043	.007	.044	-.015	.000	.023	.013	.084*
	R-270	-.022	.061	.030	-.017	.076	.046	.101*	.067	.068	.068	.089*	-.002
	R-281	-.047	-.036	-.006	.009	.042	.005	-.034	-.063	-.024	-.043	-.017	-.023
	R-282	.083	.031	.078	.017	.056	.086*	.107**	.023	.025	.068	.047	-.007
	R-290	.067	.035	.003	.028	.091*	.034	.091*	.033	.083*	.045	.097*	.036

---

[a] Based on the same data as the even-numbered partial canonical analyses. See Table 8-2 for details.

[b] Grade 9 scores and socioeconomic index have been partialed out of the predictor variables (the column variables). The row variables (grade 12 scores) have nothing partialed out.

*Significant at .05 level

**Significant at .01 level

TABLE 8-5. Part correlations[a] between "student action" variables and the residuals on those variables after partialing out grade 9 scores and socioeconomic index[b]

Variable	Retest Battery	MALES						FEMALES					
		X-891´	X-892´	X-893´	X-894´	SIB-59	SIB-156	X-891´	X-892´	X-893´	X-894´	SIB-59	SIB-156
X-891´	A	.802	.310**	.224**	.137**	.244**	.071	.850	.263**	.206**	.223**	.306**	.064
	D	.845	.283**	.164**	.073	.244**	.096*	.817	.360**	.250**	.214**	.260**	.124**
	E	.814	.409**	.287**	.302**	.163**	.163**	.874	.547**	.375**	.435**	.322**	.198**
X-892´	A	.287**	.742	.401**	.193**	.287**	.075*	.258**	.833	.480**	.073	.263**	.158**
	D	.276**	.823	.447**	.202**	.184**	.137**	.382**	.867	.525**	.265**	.279**	.247**
	E	.405**	.807	.412**	.300**	.266**	.118**	.544**	.869	.549**	.503**	.339**	.326**
X-893´	A	.254**	.491**	.908	.163**	.284**	.026	.226**	.539**	.935	.067	.158**	.052
	D	.183**	.513**	.944	.076	.162**	.091	.297**	.590**	.974	.140**	.193**	.158**
	E	.330**	.478**	.936	.144**	.158**	.152**	.415**	.611**	.968	.356**	.205**	.228**
X-894´	A	.141**	.215**	.148**	.825	.204**	.108**	.197**	.066	.054	.752	.184**	.071*
	D	.068	.195**	.063	.792	.163**	.161**	.194**	.226**	.106**	.740	.199**	.116**
	E	.265**	.266**	.110**	.714	.234**	.104**	.370**	.430**	.273**	.744	.253**	.180**
SIB-59	A	.248**	.315**	.255**	.202**	.815	.097*	.305**	.268**	.143**	.207**	.848	.206**
	D	.234**	.181**	.139**	.167**	.810	.136**	.257**	.260**	.161**	.218**	.810	.171**
	E	.161**	.264**	.135**	.262**	.802	.200**	.301**	.319**	.173**	.278**	.817	.267**
SIB-156	A	.079	.090*	.026	.117**	.106*	.892	.068	.173**	.051	.086*	.221**	.910
	D	.107*	.157**	.091	.192**	.159**	.942	.137**	.257**	.147**	.142**	.191**	.904
	E	.184**	.135**	.150**	.134**	.230**	.922	.207**	.343**	.216**	.222**	.299**	.916

---

* Significant at .05 level

** Significant at .01 level

[a] Based on the same data as Table 8-4.

[b] Grade 9 scores and P*801 have been partialed out of the column variables. The row variables have nothing partialed out.

more likely to take neither. Table 8-5, which shows the part correlations among the six predictor variables, with the grade 9 score variables and socioeconomic index partialed out of one side, helps support this supposition. The table shows that the correlation between number of math courses taken and number of foreign language courses is significant at the .01 level for three groups of girls (those taking Battery A, the Battery D group, and the Battery E group) and for two groups of boys (the Battery A and Battery E groups).

It will be recalled that Table 8-3 indicates the number of significant partial canonical correlations but doesn't tell which of the six or seven predictor variables account for them. And although we still don't have any definite answers on this matter, careful study of Table 8-5 gives us enough clues to permit surmises. For instance in Matrix DF, Table 8-4 shows that the part correlations of five of the six predictor variables (all except SIB-156) with the criterion variable Math III (R-333) are significant at the .01 level. But we know (from the values shown for n'' in Table 8-3) that only one of the six can possibly have any causative relationship. And it certainly seems more likely that number of math courses taken in grades 9-12 (X-891') has an effect on Math III (Advanced High School Mathematics), which samples the math taught in grades 10-12, than that X-892', X-893', or X-894' (which represent numbers of courses in other areas) has a direct effect on Math III score. And X-891' also seems to be a more likely <u>direct</u> explanation than does SIB-59 (college plans). As for the fact that n' (in Table 8-3) is 1 greater than n'' for the Matrix DF canonical correlations significant at the .05 level, we know that the additional causative variable (at least as far as the seven under consideration are concerned) has to be socioeconomic index (P*801). Thus we tentatively conclude that in Matrix DF variable X-891' accounts for the single significant canonical correlation in canonical analysis #8 and that P*801 accounts for the single additional significant canonical correlation that turned up in canonical analysis #7. This leaves us with a question as to the source of the significant part correlations of R-333 with X-892', X-893', X-894', and SIB-59. Table 8-5 provides the answer. All four of these other variables correlated with R-333 also have sizable part correlations (significant at the .01 level) with X-891'. It seems likely, although the actual computation that would be required for the purpose has not been completed,[1] that if X-891' were partialed out the correlations of X-892', X-893', X-894', and SIB-59 with R-333 would no longer be significant.

Similar reasoning can be applied to the other five correlation matrices (AM, AF, DM, EM, and EF), and surmises can be made in a similar way concerning the predictor variables accounting for the significant canonical relationships. Although for some of these other matrices the situation is not so clear-cut and the surmises on not quite so solid a basis as for Matrix DF, they represent our best hunches compatible with the data. These hunches are summarized in Table 8-6. (The number of significant predictor variables has been determined precisely. It is only their specific identity that is based on surmise.)

Stepwise Multiple Correlation Analysis

In an attempt to determine the extent to which various factors account for performance in grade 12 on individual tests, stepwise multiple regression analysis was undertaken.

Procedure. The procedure used involved adding predictor variables (grade 9 test scores, amounts of course work taken in various subject-matter areas, college plans, and socioeconomic index) either in groups or individually, but always in a predetermined order. (This is important because it means that the disadvantages of the more usual type of stepwise analysis are avoided. In the usual stepwise analysis the order in which predictor variables are added is determined by the data in such a way as to maximize the initial correlation and the increments to the multiple R at each step--a procedure which, unlike the procedure reported on here, capitalizes on random variance.)

---

[1] Further analyses of this sort have been planned and preliminary work on them is in progress. Their purpose is to attempt to determine a little more definitely the causative relationships accounting for canonical and other correlations involved in the six matrices of Appendix J. The results will be presented in a future report.

TABLE 8-6. Predictor variables that probably[1] account for the significant partial canonical correlations shown in Table 8-3

Predictor variable			AM	AF	DM	DF	EM	EF
		Matrix→	AM	AF	DM	DF	EM	EF
X-891'	No. of coll.-prep. math courses		**	**	**	**	-	-
X-892'	No. of physical science courses		**	**	-	-	-	-
X-893'	No. of science courses		-	-	-	-	-	-
X-894'	No. of foreign language courses		-	-	-	-	**	**
SIB-59	Plans for college		**	*	**	-	*	**
SIB-156	Amount of counseling in h.s.		-	-	-	-	-	-
P*801	Socioeconomic index		-	-	-	*	-	*
Number of significant canonical r's (Transferred from Table 8-3)[2]		n'	3	2-3	2	1-2	1-2	2-3
		n''	3	2-3	2	1	1-2	2

[1] The word "probably" is underlined in the title to stress that definite identification of predictor variables bearing a causative relationship to the criterion variables (grade 12 scores) is not entirely possible at this stage.

[2] Where two values are shown for n' or n'' for a matrix, the lower number represents the number of partial canonical correlations significant at the .01 level and the higher number represents those significant at the .05 level.

** The indicated predictor variable can be regarded as probably accounting for one of the Table 8-3 partial canonical correlations significant at the .01 level.

* The indicated predictor variable can be regarded as probably accounting for a Table 8-3 partial canonical correlation that is significant at the .05 level but not at the .01 level.

Fourteen criterion variables (grade 12 test score variables) were selected for inclusion in this analysis. The order in which the predictor variables were introduced into the multiple regression was as follows. The first predictor introduced was grade 9 Abstract Reasoning (R-290) (except for the analysis in which grade 12 Abstract Reasoning was the criterion). The reason for this was to eliminate at the start as much of the effects of those aspects of general ability that are at least relatively independent of what happens in high school as seemed possible with a single test. (It will be recalled that Abstract Reasoning was the only test available for this purpose for all the stepwise analyses, since it was the only test included in all six retest batteries.) After Abstract Reasoning, the remaining grade 9 variables were introduced, the last one to be introduced being, in each case, the ninth-grade variable corresponding to the grade 12 criterion variable. Then whichever one of the four number-of-courses variables (X-891', X-892', X-893', or X-894') seemed most relevant was added; then the college-plans variable (SIB-59); and finally socioeconomic index (P*801).

Results. The results are summarized in Table 8-7. The 14 criterion variables are listed in the column at the left. The table shows the multiple correlation at each stage and also the part r between the last predictor variable (or set of them) added and the criterion variable, with preceding predictor variables partialed out of the last one. (The sum of the squares of the part correlations equals the square of the multiple correlation.)

Looking at the right-hand column of Table 8-7, we see from the part correlations that socioeconomic index makes hardly any contribution to the prediction of the criterion score after the effects of all the other predictors have been removed. Only one of the 28 part r's (the one with the R-107 criterion, for males) is substantial (and that one, somewhat surprisingly, is negative: -.26).

Likewise, planning to go to college does not appear to have any spectacular effect on twelfth-grade score--aside from whatever effects it may have as a motivating factor in causing the student to take more college-preparatory courses (math, etc.), or perhaps merely to enroll in a college-preparatory curriculum in which such courses are mandatory. Even those

TABLE 8-7. Multiple R's and part r's for prediction of selected 1963 (Grade 12) scores from 1960 (Grade 9) scores, number of courses taken in a related area, college plans, and amount of counseling received

Table 8-7, Section 1. Based on cases in retest matrices AM (Males, N=419) and AF (Females, N=493)

In this section the criterion variables are selected information scores

Criterion variable 1963 (Grade 12) test score		Sex	Predictor variables, listed in order of inclusion (from left to right) in multiple R										
			1960 (Grade 9) test scores								No.of courses in relevant area	College plans (1963) SIB59	Socio-economic (1960)
			Abst. Reas.	Scores on miscellaneous tests***						1960 score corresp. to criterion			
R-102 Vocab. I	Predictors →		R290	Scr. R101	*** R104-108	Sc.At R109	*** R110-115	Info.II R192	Lit. R103	Voc.I R102	For.Lang X894'	SIB59	P*801
	Mult. R*	M	.4871	.5350	.8038	.8072	.8251	.8311	.8332	.8443	.8444	.8469	.8475
		F	.5398	.5468	.7956	.8042	.3085	.8390	.8407	.8548	.8584	.8599	.8603
	Part r**	M	.4871	.2213	.5999	.0740	.1709	.0997	.0591	.1365	-.0130	.0650	.0319
		F	.5398	.0872	.5779	.1173	.0833	.2242	.0534	.1546	.0785	.0508	.0262

R-106 Math Info.	Predictors →	Sex	R290	Scr. R101	Voc.I R102	*** R103-105,108-115	Inf.II R192	Phy.Sc R107	Math R106	Math X891'	SIB59	P*801
	Mult. R*	M	.5457	.5759	.7179	.7677	.7716	.7784	.8016	.8557	.8669	.8669
		F	.5101	.5165	.6664	.7326	.7348	.7369	.7783	.8405	.8560	.8566
	Part r**	M	.5457	.1840	.4286	.2720	.0775	.1027	.1915	.2994	.1389	.0000
		F	.5101	.0811	.4211	.3043	.0568	.0556	.2505	.3173	.1622	.0321

R-107 Physical Science Info.	Predictors →	Sex	R290	Scr. R101	Voc. I R102	*** R103-105 113-115 192	Aero R110	Sci. Att. R109	Mech R112	Bio. R108	Math R106	Elec R111	Engn R134	Phys Sci. R107	Phys Sci. X892'	SIB59	P*801
	Mult. R*	M	.5125	.5448	.7422	.7914	.7988	.7991	.7994	.8033	.8125	.8160	.8163	.8398	.8592	.8596	.8969
		F	.4849	.4872	.6964	.7418	.7430	.7450	.7469	.7548	.7590	.7639	.7639	.7890	.8307	.8319	.8320
	Part r**	M	.5125	.1848	.5040	.2747	.1085	-.0219	-.0219	.0791	.1219	.0755	-.0221	.1973	.1816	.0262	-.2560
		F	.4849	.0473	.4976	.2555	.0422	.0546	.0532	.1089	.0797	.0864	.0000	.1974	.2599	.0447	.0129

R-108 Biological Science Info.	Predictors →	Sex	R290	Scr. R101	Voc.I R102	*** R103-106	Sci.At R109	*** R110-115	Inf.II R192	Phy.Sc. R107	Biol. R108	Sci. X893'	SIB59	P*801
	Mult. R*	M	.4059	.4222	.6225	.6659	.6670	.7056	.7152	.7269	.7606	.7678	.7680	.7729
		F	.3941	.3970	.5943	.6436	.6463	.6639	.6663	.6681	.7122	.7200	.7224	.7235
	Part r**	M	.4059	.1162	.4574	.2365	.0383	.2302	.1168	.1299	.2239	.1049	.0175	-.0869
		F	.3941	.0479	.4422	.2470	.0590	.1519	.0565	.0490	.2467	.1057	.0588	.0399

R-109 Scientific Attitude	Predictors →	Sex	R290	Scr. R101	Voc.I R102	*** R103-106, 113-115	*** R110-112	Inf.II R192	Biol. R108	Phy.Sc. R107	Sci.At R109	Phy.Sc. X892'	SIB59	P*801
	Mult. R*	M	.3761	.4177	.5439	.5774	.5827	.5869	.5901	.5930	.6703	.6711	.6745	.6760
		F	.3911	.4005	.5098	.5442	.5455	.5578	.5602	.5602	.6071	.6077	.6078	.6113
	Part r**	M	.3761	.1817	.3484	.1938	.0784	.0701	.0614	.0586	.3125	-.0328	.0676	.0450
		F	.3911	.0863	.3154	.1904	-.0376	.1165	.0518	.0000	.2340	.0270	.0110	.0653

R-111 Electricity and Electronics Info.	Predictors →	Sex	R290	Scr. R101	Voc. I R102	*** R103-105 113-115	Inf. II R192	Bio. R108	Sci. Att. R109	Math R106	Aero R110	Mech R112	Phys. Sci. R107	Elec R111	Phy.Sc. X892'	SIB59	P*801
	Mult. R*	M	.4410	.4534	.6238	.6718	.6838	.6849	.6849	.6887	.7212	.7548	.7779	.7955	.8017	.8025	.8029
		F	.2740	.2759	.4474	.5132	.5133	.5249	.5251	.5253	.5257	.5357	.5496	.5897	.6308	.6311	.6321
	Part r**	M	.4410	.1053	.4284	.2494	.1275	.0388	.0000	.0722	.2141	.2227	.1882	.1664	.0995	-.0358	-.0253
		F	.2740	.0323	.3522	.2514	.0101	.1097	.0145	-.0145	.0205	.1030	.1228	.2137	.2240	-.0195	-.0355

TABLE 8-7. Section 2. Based on cases in retest matrices DM (Males, N=411) and DF (Females, N=493)

In this section the criterion variables are selected "aptitude" and "achievement" scores

Criterion variable 1963 (Grade 12) test score		Sex	Predictor variables, listed in order of inclusion (from left to right) in multiple R													
			1960 (Grade 9) test scores											No.of courses in rel. area	Coll. plans (1963) SIB59	Socio-ec. (1960)
			Abst. Reas.	Scores on miscellaneous tests***									1960 score corresp to crit.			
R-212 Memory for Words	Predictors →		R290	Math I R311	Math II R312	Math III R333	Info II R192	Spell R231	Cap R232	Punc R233	Usage R234	Expr R235	R212	For.Lang X894'	SIB59	P*801
	Mult. R*	M	.2696	.3425	.3467	.3473	.3958	.4044	.4180	.4208	.4242	4308	.5724	.5752	.5761	.5790
		F	.3118	.4016	.4490	.4512	.5416	.5481	.5502	.5580	.5631	.5631	.6367	.6375	.6377	.6377
	Part r**	M	.2696	.2112	.0538	-.0204	.1898	.0830	.1058	.0485	-.0536	.0751	3769	.0567	.0322	-.0579
		F	.3118	.2531	.2008	.0445	.2996	.0842	.0480	.0930	.0756	.0000	2972	.0319	-.0160	.0000
R-230 English Total	Predictors →		R290	Math I R311	*** R312, R333	Info II R192	Mem. Wds. R212	Spell R231	Cap R232	Punc R233	Usage R234	Expr R235		For.Lang X894'	SIB59	P*801
	Mult. R*	M	.3553	.5033	.5825	.6343	.6368	.6940	.7051	.7374	.7394	.7422		.7433	.7537	.7542
		F	.4542	.5910	.6668	.7382	.7438	.7728	.7820	.8196	.8254	.8310		.8318	.8339	.8343
	Part r**	M	.3553	.3565	.2932	.2511	.0564	.2759	.1246	.2159	.0543	.0644		.0404	.1248	.0275
		F	.4542	.3781	.3088	.3167	.0911	.2082	.1222	.2454	.0977	.0963		.0365	.0591	-.0258
R-233 Punctuation	Predictors →		R290	Math I R311	Math II R312	Math III R333	Info II R192	Mem. Wds. R212	Spell R231	Cap R232	Usage R234	Expr R235	Punct. R233	For.Lang X894'	SIB59	P*801
	Mult. R*	M	.4072	.5710	.6065	.6086	.6388	.6389	.6649	.6757	.6803	.6849	.7286	.7292	.7372	.7376
		F	.4720	.5811	.6298	.6300	.6671	.6686	.6817	.6901	.6966	.7010	.7544	.7553	.7569	.7577
	Part r**	M	.4072	.4003	.2045	-.0505	.1941	.0113	.1841	.1203	.0790	.0792	.2485	.0296	.1083	.0243
		F	.4720	.3390	.2428	-.0159	.2194	.0448	.1330	.1073	.0949	.0784	.2788	.0369	.0492	-.0348
R-234 English Usage	Predictors →		R290	Math I R311	Math II R312	Math III R333	Info II R192	Mem. Wds. R212	Spell R231	Cap R232	Punct R233	Expr R235	Usage R234	For.Lang X894'	SIB59	P*801
	Mult. R*	M	.2447	.3758	.4203	.4253	.5024	.5027	.5224	.5225	.5543	.5582	.5760	.5775	.5921	.5929
		F	.3715	.4764	.5369	.5408	.5852	.5982	.6062	.6138	.6338	.6373	.6667	.6669	.6672	.6726
	Part r**	M	.2447	.2852	.1882	-.0650	.2674	.0174	.1421	.0102	.1850	.0659	.1421	.0416	.1307	-.0308
		F	.3715	.2982	.2476	-.0648	.2236	.1240	.0982	.0963	.1580	.0667	.1958	.0163	.0200	-.0851

TABLE 8-7, Section 2 (continued)

Criterion variable 1963 (Grade 12) test score			Sex	Predictor variables, listed in order of inclusion (from left to right) in multiple R										
				1960 (Grade 9) test scores								No.of courses in rel. area	Coll. plans (1963) SIB59	Socio-ec. (1960)
				Abst. Reas.	Scores on miscellaneous tests						1960 score corresp. to crit.			
R-311	Math I Arithmetic Reasoning	Predictors →		R290	InfoII R192	Mem.Wds. R212	Eng.*** R231-235	MathI R311	MathII R312	MathIII R333		Math X891'	SIB59	P*801
		Mult R*	M	.3866	.5665	.5750	.6331	.7165	.7178	.7184		.7186	.7231	.7241
			F	.4714	.6248	.6292	.6765	.7269	.7335	.7335		.7339	.7339	.7400
		Part r**	M	.3866	.4141	.0985	.2649	.3355	.0432	-.0294		.0170	.0805	.0380
			F	.4714	.4101	.0743	.2485	.2660	.0982	.0000		.0242	.0000	.0948
R-312	Math II Introd. h.s. math	Predictors →		R290	InfoII R192	Mem.Wds. R212	Eng.*** R231-235	MathI R311	MathII R312	MathIII R333		Math X891'	SIB59	P*801
		Mult. R*	M	.3968	.5518	.5732	.6532	.6952	.7217	.7219		.7712	.7845	.7847
			F	.4676	.6266	.6462	.6856	.7037	.7331	.7334		.8080	.8170	.8172
		Part r**	M	.3968	.3834	.1552	.3132	.2380	.1938	-.0170		.2713	.1438	.0177
			F	.4676	.4171	.1579	.2291	.1586	.2055	.0210		.3391	.1209	.0181
R-333	Math III Advanced h.s. math	Predictors →		R290	InfoII R192	Mem.Wds. R212	Eng.*** R231-235	MathI R311	MathII R312	MathIII R333		Math X891'	SIB59	P*801
		Mult. R*	M	.3275	.4996	.5049	.5933	.6229	.6455	.6473		.7002	.7146	.7151
			F	.3705	.5159	.5353	.5642	.5810	.6013	.6052		.6711	.6808	.6812
		Part r**	M	.3275	.3773	.0730	.3116	.1897	.1693	.0482		.2670	.1427	.0267
			F	.3705	.3590	.1428	.1783	.1387	.1549	.0686		.2900	.1145	.0233
R-290	Abstract Reasoning	Predictors →			InfoII R192	Mem.Wds. R212	Eng.*** R231-235	MathI R311	MathII R312	MathIII R333	R290	Math X891'	SIB59	P*801
		Mult. R*	M		.3632	.3657	.4466	.4626	.4701	.4720	.6016	.6094	.6094	.6133
			F		.4890	.5007	.5525	.5650	.5774	.5786	.6617	.6617	.6632	.6653
		Part r**	M		.3632	.0427	.2563	.1206	.0836	-.0423	.3730	.0972	.0000	.0691
			F		.4890	.1076	.2336	.1182	.1190	-.0372	.3210	.0000	-.0446	.0528

*Multiple R of criterion with predictor(s) designated above it and all predictors to the left of it, in the predictor row.

**r between criterion and part of the specified predictor. (All preceding predictors are partialed out.)

***Part r's shown for a combination of two or more predictor variables apply to a weighted sum of the predictor variables concerned. The weights used for this purpose are beta weights corresponding to the multiple R based on all predictor variables up to and including the ones in the combination.

part correlations for college plans that are large enough to be significant are still quite low, the largest one in Table 8-7 being only about .16.

As for "number of courses in relevant area," here we begin to observe some sizable part correlations. The largest are for number of math courses (with R-106, R-312, and R-333) and number of physical science courses (with R-107 and, for the girls, with R-111). The correlation with R-111 (Electricity and Electronics Information) for the girls is probably due to the fact that girls tend not to know anything about electricity and electronics except what they may learn in the physics course if they happen to take it.

The correlation of number of math courses with Math I, Arithmetic Reasoning (R-311), was negligible, unlike the correlations with the other math variables (Math Information, Math II, and Math III). This, of course, is quite in line with what was to be expected since the type of skill covered by the Arithmetic Reasoning test is not taught at the high school level in college-preparatory math courses. If it is mastered at all it is usually mastered before that time. But even though the present finding that taking mathematics courses in high school does not improve one's mastery of pre-high-school mathematics (R-111) is hardly surprising, it is nonetheless noteworthy, in view of the fact that if the effects of mastery on entering high school (i.e., grade 9 score) had not been eliminated statistically, quite an opposite conclusion might have been reached.

As for number of foreign language courses taken, it apparently has no effect on performance on the English test as a whole (R-230) nor on those specific parts of it that it would be most likely to affect (Punctuation and English Usage), if it had an effect on any. Nor does it affect performance on the Memory for Words test (R-212). Since that test measures one aspect of aptitude for learning foreign languages it is interesting to note that the relationship is apparently not a reciprocal one. Studying foreign languages, which generally includes some memorization of foreign vocabulary, apparently does not, in itself, improve one's ability to do this sort of memorizing--or at any rate it doesn't improve ability to do short-term memorizing, the type measured by the test.

The results discussed in the two preceding paragraphs suggest that insofar as it is possible to distinguish between "aptitude measures" and "achievement measures," the Arithmetic Reasoning and Memory for Words tests fall in the former category.

Continuing on our backward (right to left) journey through Table 8-7, we note from the part correlations that in just about every case grade 9 ability in a particular area makes a very substantial contribution to grade 12 ability in the same area.

Abstract Reasoning (R-290), too, makes a very substantial contribution to the prediction of scores on every grade 12 test variable. The same thing is true of Vocabulary I (R-102), which has a substantial part correlation with every criterion variable for which the correlation was obtained (i.e., R-106, R-107, R-108, R-109, R-111). These two variables, Abstract Reasoning and Vocabulary I, together account for much of the general ability factor[1] entering into the various grade 12 scores.

THE ROLE OF VARIOUS FACTORS: CAUSE AND EFFECT

The Role of Socioeconomic Index

As has already been noted in the discussion of the partial canonical correlation analyses earlier in this chapter, whether socioeconomic status was among the variables partialed out made little or no difference in the results. Thus it would appear from these results that a major way in which socioeconomic factors affect high school achievement is by affecting other factors (aptitude levels, kinds of courses taken in high school, etc.) that in turn affect achievement more directly. Investigation of this point is pushed a bit further in the data of Table 8-7, in which the magnitude of the direct effects of socioeconomics factors on high school achievement is expressed in numerical terms, as correlation coefficients, so that we can see clearly just how small these direct effects are. More specifically, the part correlations in the last column of that table show the direct effect of socioeconomic factors on achievement after the effects of aptitude and achievement levels in the ninth grade have already been taken into

---

[1] This term, "general ability factor," is being used here in a somewhat different sense from its use in Chapter 6 to describe Factor F_1 (VERBL).

In the present chapter it is used in a non-factor-analytic sense, to represent a composite, not a single unitary trait.

account--in other words "partialed out" of the socioeconomic variable. The college plans variable has also been partialed out, to help clarify the direct effects of the socioeconomic variable. After the effects of these various causative (or possibly causative) factors--grade 9 aptitude and achievement levels, courses taken in high school, and college plans--have been eliminated from the socioeconomic variable statistically, the part correlations of the residuals with grade 12 test scores are negligible.

There is no intention here to depreciate the very real handicaps that a severely disadvantaged background can impose on a boy or girl, or the benefits that a good environment can produce. But it is clear that whatever effects background has on school achievement don't wait until the high school years to manifest themselves. Rather they are reflected in the scores the student obtains at the beginning of his high school career, in grade 9. At least insofar as achievement of the types measured by the TALENT tests under consideration is concerned, whatever direct effects socioeconomic background has on achievement develop before grade 9. The damage of a poor environment has already occurred by then or the extent of the benefits to be derived from a good one has already been established. After that point, during the period covered by the present study, the ninth-to-twelfth-grade interval, the role of socioeconomic level as a causative agent, insofar as it has a role, is indirect, operating on achievement partly through the medium of the effects of past achievement. Here the word "achievement" is being used broadly to encompass not only the so-called "achievement tests" but also the level achieved on the "aptitude" tests since ninth-grade achievement on both kinds of instruments determines aptitude for subsequent achievement.

Another indirect way in which socioeconomic background operates is in affecting the kind of program a student takes in high school--for instance whether he elects foreign language courses, mathematics courses, and other college-preparatory work--and his plans, if any, for a career and for further education after high school--for instance whether he plans to go to college. The part correlations in Table 8-8 suggest that such effects do exist. Even after the effects of initial ability level (grade 9 test scores) have been partialed out of socioeconomic index, it still has significant correlations with college plans and with number of foreign language courses, and (at

TABLE 8-8. Part correlations[a] showing relation between socioeconomic index residual (after partialing out grade 9 test scores) and "student actions"

		Part r with P*801 residual					
		Males			Females		
	Student action	A	D	E	A	D	E
X-891'	No. of math courses	.091	.073	.090	.154*	.174*	.171*
X-892'	No. of physical science courses	.103†	.067	.084	.099†	.159*	.161*
X-893'	No. of science courses	.002	.081	.059	.079	.037	.094
X-894'	No. of foreign language courses	.156*	.225*	.228*	.277*	.295*	.222*
SIB-59	College plans	.231*	.308*	.193*	.277*	.311*	.244*
SIB-156	Amount of counseling	.136*	.058	.073	.076	.225*	.201*

[a] Based on the six correlation matrices indicated in Table 8-1.

* Significant at .01 level

† Significant at .05 level

least for girls) with number of math courses and physical science courses. There is also some evidence that students in the lower brackets on socioeconomic status tend to have fewer contacts with a school counselor than their more privileged compeers. Whether this is because students not planning to enter college are less likely to seek such contacts or because counselors are less likely to be available in the schools such students are likely to attend is not entirely clear.

The Role of "Student Actions"

Plans for College. Is planning to go to college accompanied by greater motivation toward achievement in high school? The answer is not entirely clear. Table 8-4 shows that even after initial ability (as represented by grade 9 scores) and socioeconomic index (P*801) have been partialed out a significant relationship remains between whether a student plans to go to college and his or her achievement in subjects included in a college-preparatory curriculum in high school (literature, mathematics, physical science, English, etc.). But does this better achievement represent the results of greater motivation and harder work or does it represent mere exposure to courses? There is some evidence that the latter may be the case. If planning to go to college has any motivating effects they are apparently manifested primarily in choice of courses--insofar as the student has any option.(Students planning to go to college presumably are more motivated to take college-preparatory courses than are their non-college-bound classmates.) As has already been noted, the partial correlations of college plans with grade 12 scores are negligible on the whole after number of courses in a relevant subject-matter area is added to the variables partialed out. This suggests--and Table 8-5 confirms--that the part correlations between college plans and number of courses in various areas (after grade 9 scores have been partialed out) are substantial. All these correlations are significant at the .01 level. Since there is obviously some confounding of the course-taking variance and the college-plans variance it is not clear whether one or the other or both are causing the better grade 12 scores. It seems likely, however, that course-taking is responsible for at least a part of the effect, and probably for most, if not all, of it. Some evidence in support of this is provided by the significant negative part correlation in Table 8-4 between college plans (SIB-59) and grade 12 Mechanical Information (R-112), for the boys. This negative correlation is probably due to the fact that boys not planning to go to college are far more likely than the college-bound to be in vocational curricula, and taking shop courses.

Courses Taken in High School. As has already been suggested, there is considerable evidence pointing towards the effects of course work on changes in test scores between grades 9 and 12. Table 8-4, supplemented by Tables 8-7 and 8-5, provides the best evidence. In brief, taking math courses in high school improves the student's performance on Mathematics Information, Math II, and Math III (R-106, R-312, and R-333), but not on Arithmetic Reasoning (R-311); taking courses in physical science improves performance on the Physical Science Information test (R-107), and also, perhaps, on Biological Science Information (R-108); and studying foreign languages improves performance on the Word Functions in Sentences test (R-240).

The correlation of Word Functions in Sentences with number of foreign language courses is particularly interesting because Word Functions in Sentences is a measure of aptitude for foreign languages.[1] Specifically, what it measures is knowledge of formal grammar or, in the absence of such knowledge, aptitude for learning grammar. Thus it appears that study of foreign languages helps students learn something about English grammar. Some transfer of training seems to occur. Whether this tends to be true in all schools or only in those where the curriculum in English places little or no stress on grammar is not apparent from the available data.[2] (The significant partial correlations of Word Functions in Sentences with courses in other areas--science and math--are probably the result of the correlation of number of courses in these areas with number of foreign language courses.)

---

[1] This test was modeled on one of the subtests in Carroll and Sapon's *Psi-Lambda Foreign Language Aptitude Battery* (1955).

[2] At least one other investigator, Skelton, has had somewhat similar findings based on entirely different instruments and samples (Skelton, 1958).

Also noteworthy is the positive part correlation, low but significant, between number of math courses and Visualization in Three Dimensions (R-282), for the girls. This correlation helps confirm the notion, alluded to in the footnote on page 6-24, that students who have good knowledge of geometry in particular, may solve visualization problems geometrically rather than through a global type of visualization.

As for significant negative correlations, the part correlations of foreign language courses with aerospace information (R-110) and with electrical information (R-111) are negative for the girls, while the boys' correlation between foreign language courses and Mechanical Information (R-112) is also negative. Number of courses taken by the girls in math and science are also negatively correlated with Accounting, Business, and Sales Information (R-139). Most of these negative correlations probably reflect the effects of a vocational curriculum in raising scores on Mechanical Information, and the effects of a business curriculum in raising scores on Accounting, Business, and Sales Information.

Amount of Counseling in High School. Most of the part correlations with amount of counseling (SIB-156) in Table 8-4 are negligible. One of the few significant relationships that shows up for both sexes is with scores on Math Information (R-106) and Math II (R-312). Perhaps this is a result of the fact that the more counseling a student receives the more likely he is to take math courses in high school. (Perhaps that is the gist of the counseling he receives.) As a matter of fact, as Table 8-5 shows, amount of counseling is associated in a positive direction with course-taking in math, physical science, and foreign languages (all college-preparatory subjects), and with planning to attend college. Again, no causal relationship can be established definitely in either direction. Counseling contacts may be either a result or a cause (or both, in part) of plans to attend college.

The Role of Aptitude

We have considered the roles of socioeconomic status, college plans, courses taken, and counseling received in determining grade 12 achievement levels as measured by tests. These several factors turn out to be of varying importance--but far outweighing any of them in its effect is "initial aptitude" (as indicated by grade 9 test scores). Table 8-7 provides ample evidence of the major role played by ability as measured at grade 9, in the prediction of grade 12 test scores.

Of course there is no reason to think that aptitude as of grade 9 is necessarily independent of socioeconomic status. It probably isn't. After all environmental factors had been acting on the individual for 14 or 15 years at the time the grade 9 measurements were made, and it would be strange if they had had no effect at all, in all that time. Nevertheless, however the ability level existing at age 14 or 15 may have developed, aptitude measurements made at grade 9 more truly represent ability (or aptitude at that time)than would measurements of "native ability," made at birth if that were possible, or in infancy. This does not mean that environmental factors as typified by socioeconomic status can have no effect beyond grade 9. They can, of course. But their overall direct effect independent of aptitude does seem to be slight on the whole, during the high school years.

APTITUDE VERSUS ACHIEVEMENT: A NEW VIEWPOINT

Can measures of aptitude be distinguished from measures of achievement? This is a problem that we have touched on earlier in this report--first in Chapter 5 and then again in Chapter 7. The object was to determine whether certain tests were functioning as measures of invariant or nearly invariant abilities called "aptitudes" and other tests as measures of somewhat more malleable abilities referred to as kinds of "achievement." But the data in these earlier chapters turned out to provide no sound basis for making this distinction. In the present chapter, however, we do find some evidence of the type sought. Certain variables in the TALENT battery seem to function as aptitude measures and others as achievement measures. The evidence is found chiefly in Table 8-4, supplemented by Table 8-7. From those tables we can see that certain tests are virtually unaffected by course work in what would seem to be relevant areas. For instance the Memory for Words test (R-212) is not significantly correlated with foreign language courses even though foreign language study might reasonably be supposed to afford experience and practice in just the sort of memorizing tested by the Memory for Words test. In using the Table 8-4 and 8-7 data to draw inferences as to which tests may be functioning as aptitude measures we must bear in mind that some of the correlations between test score and number of courses might in some cases be spurious, being explained by an underlying variable such as college plans or socioeconomic index. Also to be taken into consideration is the nature of the test itself.

Bearing these various considerations in mind, we may tentatively conclude that the following nine tests provide a sufficiently stable picture between grades 9 and 12 that they may be regarded as constituting aptitude measures:

R-290	Abstract Reasoning
R-311	Arithmetic Reasoning
R-212	Memory for Words
R-220	Disguised Words
R-102	Vocabulary I
R-109	Scientific Attitude
R-260	Creativity
R-270	Mechanical Reasoning
R-281	Visualization in Two Dimensions

The first six of these are probably primarily measures of "general verbal ability" or "general mental ability"--in other words of the general factor (Factor F_1, VERBL) from the Chapter 6 factor analysis. The remaining three aptitude tests listed above (R-260, R-270, and R-281) probably should be regarded primarily as measures of specialized aptitudes--although at least two of these tests (R-260, R-270) also have substantial loadings on the general factor (VERBL), as seen in Table 6-10.

Of perhaps fully as much significance as the finding that it is justifiable to regard certain tests as aptitude tests is the finding that certain other tests which in the absence of specific evidence to the contrary might reasonably have been surmised to be aptitude measures at the high school level turn out to be substantially correlated with amount of course work in certain subjects. The two most noteworthy tests in this category are Reading Comprehension (R-250) and Visualization in Three Dimensions (R-282). As has already been noted, scores on the latter test, unlike Visualization in Two Dimensions (R-281) have a significant partial correlation with number of math courses. As for the Reading Comprehension test, there seems to be a tendency for performance on it to improve more if one plans to go to college and takes college-preparatory courses than if one doesn't. However the picture is not entirely clear-cut. Reading Comprehension may still be relatively independent of high school course-work effects. Further data analysis (to be undertaken in the future) is needed to sort out the cause-and-effect relationships.

Chapter 9. SUMMARY AND CONCLUSIONS

The high school students of America encountered Project TALENT for the first time in the spring of 1960. Nearly half a million students in grades 9, 10, 11, and 12 in schools in all parts of the country were tested at that time, with a comprehensive two-day battery of paper-and-pencil tests and inventories developed specially for the purpose. Three years later some of the students who had been in the grade 9 group tested in 1960 were retested as grade 12 students. The present report is concerned with the results of that retesting, the relationship of the results obtained in grade 12 to the corresponding grade 9 results, and the nature and magnitude of the changes that occurred in the interim.

THE RETEST STUDY: GENERAL DESCRIPTION

Purposes of the Study

Broadly speaking, the study has as its chief purposes to provide information about the students and the schools. The approach used is to investigate relationships of various characteristics of the student in grade 12 to corresponding characteristics possessed three years earlier in grade 9, and to the events of the intervening three years. An attempt is made to learn something about the factors that produce the changes occurring during the three years and the factors that inhibit them.

A secondary purpose of the study is to provide information about the tests. Findings in this category are of interest in the present study primarily because they help us to interpret findings about the students and the schools. But they have the additional value of being relevant not only in interpreting results obtained in the present study of students and schools but also in interpreting other research results based on Project TALENT data.

Design of the Study

The general outlines of the study are summarized very briefly below. The design itself is described in considerable detail in Chapter 2, and the technical problems that the design involves are discussed at some length in Chapter 3.

Sample. In 1963 the grade 12 students in over 100 public secondary schools that had been among the schools included in the original TALENT testing in 1960 were given an abridged TALENT battery. Approximately 10,000 grade 12 students were in the group tested. About three-quarters of them turned out to have also been in the original TALENT testing, in 1960, as grade 9 students. These 7,500 students were the core of the retest study.

Content and Organization of the Retest Batteries. The instruments used in the 1963 testing were identical with those in the original battery, with the exception that the biographical inventory (Student Information Blank) was abridged and revised for the retest and three of the original instruments (Student Activities Inventory, Memory for Sentences Test, and Preferences Test) were omitted entirely. Since only one day of testing time was available for the retesting, each student could take only about half of the total battery. The tests were therefore reorganized into a set of six partially overlapping batteries (Batteries A, B, C, D, E, and F), each including about half the tests. Each school retested (except for a few vocational high schools in which a seventh battery, Battery V, was used) was given one of these six batteries. The overlapping of the batteries was so arranged that each pair of tests was taken by at least one-sixth of the boys and one-sixth of the girls--so that the correlations between any two tests could be based on groups of at least that size. To provide a basis for checking on the comparability of the groups taking the various batteries, and for adjusting statistically to make them more comparable, one test, Abstract Reasoning, was included in every battery.

Additional details about the design are presented in Chapter 2.

Technical Problems. The system of overlapping batteries, each taken by no more than one-sixth of the retested students, engendered two technical problems: (1) how to insure a reasonable degree of comparability among the six groups taking the basic retest batteries (Batteries A-F), and (2) how to correct for missing data in obtaining correlation matrices. These problems are discussed in considerable detail in Chapter 3, and solutions are presented. Also discussed in Chapter 3 are the problems inherent in any attempt to measure change.

Data Analysis Operations

The data analysis involved use of a multiplicity of statistical techniques, including, among others, canonical correlation between grade 9 and grade 12 scores (presented in Chapter 6), factor analysis (also in Chapter 6), univariate analysis of variance among schools (Chapter 7), multivariate analysis of variance among schools (Chapter 7), multiple discriminant function analysis (Chapter 7), partial and part correlation matrices (Chapter 8), partial canonical correlation analysis (Chapter 8), and stepwise multiple correlation (Chapter 8).

THE STUDENTS AND THE SCHOOLS: FINDINGS AND CONCLUSIONS

Relation between Grade 9 and Grade 12 Scores

Amount of Growth. The average amount of growth, as represented by the difference between grade 9 score and grade 12 score, tends to be substantial not only in terms of raw score but also in relation to variation among raw scores. In other words the average gain is not merely statistically significant; it is also large enough to be important.

It is encouraging to note that the larger gains generally tend to be associated with school-taught subjects--or areas such as vocabulary that if not taught directly are at least fields in which most schools would like to increase their students' mastery and promote growth.

Sex Differences in Score Gain. The two sexes show somewhat different patterns of mental growth between grades 9 and 12. On most tests the sex showing the larger raw gain is also the one with the higher initial (i.e., grade 9) score.

Correlation between Grade 9 Scores and Grade 12 Scores on the Same Test. For the information scales these correlations, when corrected for attenuation, tend to be very high--particularly in areas not part of the regular high school curriculum. Except in areas such as mathematics, where formal instruction is received in different amounts by different students, the amount of information a student has sufficient ability and interest to acquire and retain is an excellent indicator of what his status in this respect will be three years later.

Aptitude versus Achievement

The distinction between "aptitude tests" and "achievement tests" is a shadowy one--and probably more often a matter of convention than of function. Historically, tests measuring certain kinds of abilities have been called "aptitude tests" while tests of other kinds of abilities have been called "achievement tests." But no really sharp distinction can be drawn on an empirical basis between these two categories of tests. The decision as to whether a test functions as one or the other should probably be based primarily on how and for what purpose it is being used, and on whatever relevant empirical data are available--rather than on its name, which all too often is the sole basis used for deciding what a test is measuring.

Pointing up the lack of conclusive empirical evidence identifying some tests as ones on which scores are unaffected by outside influences is the seemingly contradictory evidence presented by the Chapter 7 and Chapter 8 research. In Chapter 7 significant differences were shown to exist among schools with respect to score changes for virtually all tests, even after taking initial ability into account. In Chapter 8, on the other hand, it was shown that scores on certain tests (Arithmetic Reasoning and Memory for Words, for instance) are unaffected by amount of course work in various subjects (math, science, foreign languages). The best resolution of this dilemma (pending further research to clarify the situation) is probably to assume tentatively that while amount of formal course work in the areas for which these counts were included in the analysis may not be relevant, there are probably other aspects of the school that are relevant, and that are producing the school effects noted in Chapter 7.

It remains convenient, however, to retain the terminology "aptitude tests" and "achievement tests" to describe certain tests when used for certain purposes. The use of this terminology is defensible so long as it is borne in mind that a sharp distinction, except perhaps in purpose for which the test is used, probably does not really exist. It should also be borne in mind that what this discussion really refers to is students and their abilities, not tests and their statistical characteristics. When we proclaim the impossibility of distinguishing definitely between aptitude tests and achievement tests we are saying in effect that any measurable ability within the spectrum the TALENT battery is concerned with is apparently modifiable as a result of some sort of external effects, during the high school years.

School Effects

Some schools are doing a better job of educating their students than others. As was implied in the previous section, evidence has been presented (in Chapter 7) suggesting that schools are affecting performance in most areas tested, and that these effects extend beyond those fully explainable in terms of differences among the students in initial ability levels.

The performance-affecting dimensions along which schools differ are very numerous--almost as numerous, if we are to judge by the evidence presented in Chapter 7, as the aspects of performance measured separately. In other words there are almost as many independent and important ways in which school practices or other school characteristics differ as there are tests to measure differences in performance. (In the foregoing context a difference among schools is considered "important" if it related to a difference in student performance.)

Thus we see that the effects of school differences are both numerous and fairly substantial in magnitude, and that the school differences which bring these effects about are also numerous--though not entirely identifiable at this time.

Of course even a so-called "substantial" effect on measured ability does not necessarily affect a large part of its variance. On some basic abilities, such as Abstract Reasoning (R-290) and Reading Comprehension (R-250), it has been shown (see page 6-30) that as much as 80 percent of the variance is apparently invariant during the high school years. This leaves only about 20 percent for school policies, procedures, and practices (and non-school environmental factors) to affect. The absence of solid information as what the policies, procedures, and practices are that do affect performance on "aptitude tests" leaves us with more questions than answers on this topic--and with more hypotheses than firm facts. The sources of the changes in ability on these "aptitudes" may be something as vague and tenuous as the climate of the school, the ambience it provides. It may be a group of exceptionally good teachers; or exceptionally good administration. Then again, it may actually have nothing to do with characteristics of the school; instead the explanation might be in community characteristics--or even, conceivably, in student characteristics.

Effects of Socioeconomic Status

Just what are the non-school environmental factors that might be expected to affect performance in high school? A partial answer to this question is that socioeconomic index is a composite of many of them. What role, then, does socioeconomic index play in affecting the 20 percent, more or less, of reliable test score variance that seems to represent the proportion subject to modification? The answer to this question seems to be that by the time high school has been reached the direct effects, whatever they may be, have already had essentially their full effect. Presumably insofar as socioeconomic status has any new effects on achievement at the high school level they are indirect effects, operating by affecting other factors--for instance kind of courses taken--that in turn affect achievement more directly.

Effects of Courses Taken

The amount of course work taken in various subjects has a direct effect on test performance in those areas, in many instances. This is hardly surprising. After all, making some changes in students' knowledge and abilities, through the medium of courses, is a basic purpose of the school.

There seem to be a few areas, however, in which practice does <u>not</u> make perfect. It is in these areas that we suspect we are getting closest to measuring what might be regarded as basic aptitude. For instance, as has already been pointed out, foreign language instruction has no apparent effect on ability to memorize foreign vocabulary for short-term recall.

Of perhaps more interest than such cases, where instruction in what seems to be a directly relevant area <u>doesn't</u> have a direct effect on performance, are cases where instruction <u>does</u> seem to have an effect in an area to which it is only indirectly relevant. There are at least two instances of this latter phenomenon, one affecting Word Functions (R-240) and the other affecting Reading Comprehension (R-250). Foreign language instruction apparently improves performance on the Word Functions test, an indirect measure of understanding of the functional relationships with which grammar is concerned. Thus foreign language instruction affects mastery of an important element of <u>English</u>. Likewise performance on the Reading Comprehension test seems to be affected by course work even though formal instruction in reading is not usually a part of the high school curriculum. The kinds of course work that do seem related to improvement of reading comprehension are any sorts of courses in a college-preparatory curriculum (math, science, foreign language, etc.). Perhaps this is a result of the fact that more demands are made upon the student's reading ability in college-preparatory courses than in a vocational program.

<u>Factor Structure</u>

Factor analyses were carried out separately for each sex, on 95 variables (47 grade 9 test scores, the 47 corresponding grade 12 variables, and socioeconomic index). The results were as follows:

<u>General Factor</u>. A nearly general factor which seems to be essentially a measure of verbal intelligence was identified.

<u>Number of Common Factors</u>. Forty common factors were extracted for males and 40 for females.

<u>Important Common Factors</u>. Among the important common factors extracted, in addition to general verbal ability are mathematical ability, spatial, English, and technical information.

Comparison of Factors for Boys and Girls. There is almost complete overlap between the two sets of factors. Of the 40 factors for each sex, 35 are approximately the same for the two sexes.

Comparison of Factorial Complexity of Grade 9 and Grade 12 Test Variables. The general factor accounts for a larger proportion of the grade 9 variance than of the grade 12 variance. This provides some support for the theory that special abilities become differentiated out of the single general mental ability factor, as the child grows older.

Change Factors. Two factors with substantial loadings in certain grade 12 variables and zero or near-zero loadings on grade 9 variables showed up--one in English and one in information. These are "change factors" representing growth or other change in relative status between grades 9 and 12. These factors are entirely independent of other factors having loadings for grade 9 as well as grade 12, on the same tests.

"Test-specific" Factors. Twenty-three of the 40 common factors for each sex are "test-specific factors," having loadings on only two variables--the grade 9 and grade 12 scores for a single test.

FINDINGS ABOUT THE TALENT BATTERY

Speededness of the Tests

Empirical data confirmed that most of the tests were speeded (or unspeeded) to just about the degree that was specified in the original test rationale.

Accuracy of Answer-Sheet Marking

The accuracy of answer-sheet marking was studied empirically with particular reference to the Student Information Blank. Although there is of course some clerical inaccuracy in any large-scale answer-sheet-marking enterprise, its frequency of occurrence seems to be fairly low. The heaviest occurrence is concentrated among a limited number of items in such a way that it is entirely reasonable to suppose that the present study is not affected to any important degree.

Reliability

Test Reliability. The tests on the whole have very satisfactory reliability coefficients in relation to test length.

Reliability of Difference Scores. Reliability coefficients for differences between correlated scores tend to be low. But some of the TALENT tests turned out to have surprisingly high reliabilities for the difference between grade 9 and grade 12 scores.

Reliability of Residual Scores. Residual grade 12 scores (after elimination of the component predictable from the corresponding grade 9 scores) have satisfactory reliability. They are generally more reliable than difference scores.

MISCELLANEOUS METHODOLOGICAL FINDINGS AND CONCLUSIONS

Determination of Reliability Estimates

1. Empirical comparisons confirm that KR-21 reliability estimates are systematically lower and far less accurate than split-half reliability coefficients (corrected by Angoff formula 16).
2. KR-20 estimates also tend to be at least slightly lower (and less accurate) than split-half estimates.
3. An empirical check shows that the correction-for-range procedure for estimating the reliability of a group from that for a different group provides highly accurate estimates.

Obtaining Consistent Correlation Matrices

The need for correlation matrices based on students in all six of the basic retest-battery groups presented numerous technical difficulties. The matrices, needed for use in multivariate analyses, necessarily involved large amounts of missing data and possible inconsistencies resulting from the fact that the six retest-battery groups were almost certainly not entirely equivalent. The problems were solved by means of a trio of methodological innovations:

1. Weighting the cases to make the six retest-battery groups equivalent (within sex) on the one test all batteries shared, Abstract Reasoning.
2. Using a new method, specially developed for the purpose, to correct for missing data.
3. Following this by another new, specially developed technique to insure that the final matrix would be internally consistent.

Careful study of the characteristics of the resultant matrices and the intermediate data involved in their computation suggests that the trio of new techniques listed above works well.

Interpretation of Canonical Correlations

1. The concept of "canonical factors" is introduced (in Chapter 6), as an aid in interpreting canonical correlations. A "canonical factor" is defined as the hypothetical factor assumed to underlie two corresponding canonical variates and to account for the canonical correlation between them. Using this definition and a minimal number of supplementary assumptions, the canonical correlation coefficient (not its square) is shown to represent the proportion of the canonical variate's variance explained by the canonical factor.[1]
2. A formula that makes clear the analogy between the proportion of total reliable within-battery variance accounted for by the first k canonical factors and a zero-order correlation coefficient corrected for attenuation is derived.[1]

Factor Analysis Methodology

Several methodological innovations, and some other techniques that though not necessarily brand-new are relatively uncommon, were used in the factor analyses presented in Chapter 6. The reasons for using these relatively novel techniques are presented in that chapter. They seem to have worked well. Among these techniques are:

---

[1] The algebraic derivation is presented in Appendix H-3.

1. Use of the multiple correlation coefficients (not their squares) as the communality estimates inserted in the diagonal of the correlation matrix.
2. Inspection of the distribution of correlation residuals rather than use of some arbitrary cut-off on eigenvalues, as the basis for deciding how many principal factors to retain. (This procedure resulted in retention of considerably more factors than cutting off at an arbitrary eigenvalue would have.)
3. Subjectively determined rotations of factors, where analytic procedures (quartimax, varimax) did not give satisfactory results.
4. Arbitrary extraction of "test-specific" doublet factors having loadings on only two variables, the grade 9 and grade 12 scores for a single test.

Factor Analysis of Retest Data

Use of retest data (i.e., two administrations of a battery, with a substantial time interval between testings) provides insights that would be unavailable in the usual factor analysis, based on a single administration of the battery. More specifically these are some of the useful properties of a factor analysis of retest data:

1. It permits the extraction of test-specific common factors.
2. It reveals "change factors" that otherwise would not appear as separate factors--or if they did would almost certainly be misinterpreted.
3. It prevents misinterpretation and misunderstanding of some other common factors as well.

Of course retesting is not always feasible or desirable from an administrative viewpoint, but when retest data are available, much information can be gained by including both sets in a factor analysis.

IMPLICATIONS FOR EDUCATION

The outcomes of the research described in this report have implications for many aspects of education. A few of these implications are presented below.

The Disadvantaged Child. The handicap that disadvantaged youngsters are under appears to have taken root firmly by the time high school is reached. This finding that whatever direct effect socioeconomic factors have on abilities of the types measured by the TALENT battery occurs before grade 9 supports the idea that special efforts to help the disadvantaged child overcome the handicaps imposed by a deprived background should concentrate on younger age levels--as Project Headstart is doing, for instance. The very effective program developed by Carl Bereiter and Siegfried Engelmann at the University of Illinois' Institute for Research on Exceptional Children is another example--and a daringly novel one--of this approach. The implication of the present research findings is that postponement of remedial efforts until high school would sharply curtail the success of such efforts.

General Education versus Vocational Education. The preliminary finding that reading comprehension improves in high school somewhat more for students taking a lot of academic courses than for students taking less of this kind of classwork suggests that it would be worthwhile to focus attention on research concerning the academic-versus-vocational-education issue. Reading is undeniably an important skill. A deficiency in it imposes a great handicap on adults. Therefore it would be well to find out, through research designed especially for the purpose, whether the boy or girl taking a vocational program in high school will as an indirect and unsought consequence have less reading competence in adult life than he otherwise would. If it is found out that this is indeed the case, redesigning vocational courses in such a way as to provide more practice in reading and more motivation to read, thus bolstering the student's competence in this area, would be well worth while. Steps in this direction have already been taken in some vocational high schools. A strong research finding supporting such steps might result in other schools following suit.

Effective and Ineffective High Schools. Evidence has been uncovered that some schools are doing a better job of educating their students than other schools are. It isn't just a matter of some schools having more able students than others (although this is a factor that explains part of the difference, of course). Furthermore schools differ in regard to the subject-matter areas in which they are especially successful. These are encouraging findings. If it had developed that schools don't differ in regard to the characteristics of the graduates they turn out, it would be very difficult indeed to find evidence in support of the notion that <u>any</u> schools do <u>anything</u> that is especially effective--which would be a most discouraging conclusion for those who have any stake in the effectiveness of American schools. And that includes just about everybody.

Although the conclusion that schools do differ in effectiveness bodes well for the prospects of future improvements in education, to put the potential improvements into effect we have to know what they are. Further research is the key to that. The finding that schools differ in effectiveness provides a very important guideline for future research, focusing on the problem of identifying the crucial ways in which the more effective schools differ from the less effective ones. Such research is necessarily complex and difficult, but if it could throw light on what schools can do to improve their effectiveness it would be well worth the effort.

REFERENCES

Angoff, W. H. Test reliability and effective test length. *Psychometrika*, 1953, *18*, 1-14.

Carroll, J. B. The prediction of success in intensive foreign language training. In Robert Glaser (Ed.), *Training research and education*. Pittsburgh: Univer. of Pittsburgh Press, 1962.

Carroll, J. B., & Sapon, S. M. *Psi-lambda foreign language aptitude battery*. New York: Psychol. Corp., 1955.

Cooley, W. W., & Lohnes, P. R. *Multivariate procedures for the behavioral sciences*. New York: Wiley & Sons, 1962.

Cooley, W. W. *Vocational interests*. In press.

Davis, F. B. *Educational measurements and their interpretation*. Belmont, Calif.: Wadsworth Publishing Co., 1964.

DuBois, P. H. *Multivariate correlation analysis*. New York: Harper & Brothers, 1957.

DuBois, P. H. On relationships between numbers and behavior. *Psychometrika*, 1962, *27* (4).

Flanagan, J. C., Dailey, J. T., Shaycoft, Marion F., Orr, D. B., Gorham, W. A., & Goldberg, I. *Designing the study*. (Technical report to the U. S. Office of Education, Cooperative Research Project No. 635.) Washington, D. C.: Project TALENT Office, Univer. of Pittsburgh, 1960.

Flanagan, J. C., Dailey, J. T., Shaycoft, Marion F., Gorham, W. A., Orr, D. B., & Goldberg, I. *The talents of American youth*. Vol. 1. *Design for a study of American youth*. Boston: Houghton Mifflin, 1962. (a)

Flanagan, J. C., Dailey, J. T., Shaycoft, Marion F., Orr, D. B., & Goldberg, I. *Studies of the American high school*. (Final report to the U. S. Office of Education, Cooperative Research Project No. 226.) Washington, D. C.: Project TALENT Office, Univer. of Pittsburgh, 1962. (b)

Flanagan, J. C., Davis, F. B., Dailey, J. T., Shaycoft, Marion F., Orr, D. B., Goldberg, I., & Neyman, C. A., Jr. *The American high-school student*. (Final report to the U. S. Office of Education, Cooperative Research Project No. 635.) Pittsburgh: Project TALENT Office, Univer. of Pittsburgh, 1964.

Flanagan, J. C., Cooley, W. W., Lohnes, P. R., Schoenfeldt, L. F., Holdeman, R. W., Combs, Janet, & Becker, Susan J. *Project TALENT one-year follow-up studies.* (Final report to the U. S. Office of Education, Cooperative Research Project No. 2333.) Pittsburgh: Project TALENT Office, Univer. of Pittsburgh, 1966.

French, J. W. The relationship of problem-solving styles to the factor composition of tests. *Educ. psychol. Measmt,* 1965, *25*, 9-28.

Hall, C. E. *Three papers in multivariate analysis.* (Interim report 2 to the U. S. Office of Education, Cooperative Research Project No. 3051.) Pittsburgh: Project TALENT Office, American Institutes for Research and Univer. of Pittsburgh, 1967.

Hall, C. E., & Cramer, E. M. *A general purpose program to compute multivariate analyses of variance on an IBM 7090 computer.* The George Washington University Biometric Laboratory, Washington, D. C., 1962.

Harris, C. W. Some problems in the description of change. *Educ. psychol. Measmt,* 1962, *22* (2), 303-319.

Harris, C. W. (Ed.) *Problems in measuring change.* Madison: Univer. of Wisconsin Press, 1963.

Humphreys, L. G. Number of cases and number of factors: An example where N is very large. *Educ. psychol. Measmt,* 1964, *24* (3), 457-466.

Kaiser, H. F. *The best approximation of a common-factor space.* Paper read at Amer. Educ. Res. Assn, St. Louis, February, 1958.

Kaiser, H. F. *Comments on communalities and the number of factors.* Paper read at informal conference, "The Communality Problem in Factor Analysis," Washington Univer., St. Louis, May, 1960.

Kaiser, H. F. *Psychometric approaches to factor analysis.* Paper read at Invitational Conf. on Testing Problems, Princeton, 1964.

Kaiser, H. F., & Caffrey, J. *A psychometric method of factor analysis.* Preliminary draft, Center for the Advanced Study in the Behavioral Sciences, March, 1962.

Kuder, G. F., & Richardson, M. W. The theory of test reliability. *Psychometrika,* 1937, *2,* 151-160.

Loevinger, Jane. Person and population as psychometric concepts. *Psychol. Rev.,* 1965, *72,* 143-155.

Lohnes, P. R. *Measuring adolescent personality.* (Interim report 1 to the U. S. Office of Education, Cooperative Research Project No. 3051.) Pittsburgh: Project TALENT Office, Univer. of Pittsburgh, 1966.

Lord, F. M. The measurement of growth. *Educ. psychol. Measmt,* 1956, *16,* 421-437.

Lord, F. M. Further problems in the measurement of growth. *Educ. psychol. Measmt,* 1958, *18,* 437-451.

McNemar, Q. On growth measurement. *Educ. psychol. Measmt,* 1958, *18,* 47-55.

Nichols, R. C. The National Merit twin study. In Steven G. Vandenberg (Ed.), *Human behavior genetics.* New York: Academic Press, 1965.

Shaycoft, Marion F., Dailey, J. T., Orr, D. B., Neyman, C. A., Jr., & Sherman, S. E. *Studies of a complete age group--Age 15.* (Final report to the U. S. Office of Education, Cooperative Research Project No. 635.) Pittsburgh: Project TALENT Office, Univer. of Pittsburgh, 1963.

Skelton, R. B. High-school foreign language study and freshman performance. *The modern Language J.,* 1958, *42* (1), 8-10.

Thorndike, R. L. *The concepts of over- and underachievement.* New York: Bureau of Publications, Teachers College, Columbia University, 1963.

Thorndike, R. L. Intellectual status and intellectual growth. *J. educ. Psychol.,* 1966, *57* (3), 121-127.

APPENDIX A

SYSTEM OF TALENT VARIABLE NUMBER DESIGNATIONS

Appendix A. System of TALENT Variable Number Designations

I. General format

The code for a variable consists of the three-digit variable number prefixed by a capital letter representing the kind of score.

II. Letter code for kind of score

The capital letters used as standard prefixes for individual score variables have the following meanings:

R = Number of Right responses

W = Number of Wrong responses

A = Number of items Attempted

This means the number of items to which some response is marked. Items that are deliberately omitted and items that are not reached are not included in this count.

O = Number of Omitted items

K = Correction-for-chance score (Estimated number Known)[1]

P = Per item score[1]

P* = Standardized Per-item score[2]

F = Other Formula score

This score is usually a function of the R and A scores, or of R and W, or of variable weights for item responses. The F scores may represent either empirical or *a priori* scoring formulas.[1]

L = Item number of Last item marked

X = Scores not obtainable from responses to the regular TALENT battery (e.g., scores involving responses to items in the 1963 SIB (Form B), but not in the regular SIB administered in 1960).[3]

---

[1] See Appendix D-1 for details concerning specific scoring formulas used.

[2] For instance, P*801, Socioeconomic index. (See Appendix E for details.)

[3] See Appendix D-2 for details concerning scores in this category.

Appendix A (continued)

Basic formulas involving the above kinds of scores are:

$$\left.\begin{array}{l} R + W = A \\ A + 0 = N \\ K = R - \frac{W}{n-1} = \frac{nR - A}{n-1} \end{array}\right\} \text{ where } \left\{\begin{array}{l} N = \text{Number of items in test} \\ n = \text{Number of options per item} \end{array}\right.$$

III. Three-digit variable-number code (test number code)

The following is the system used for the first digit of the three-digit numbers that follow the "kind-of-score" letter and represent individual variables:[1]

1. Information test scores

2-4. Other aptitude and achievement tests
    2. Verbal, spatial, mechanical, etc.
    3. Mathematics
    4. Speed and accuracy
        (Perceptual, clerical, and computational)

5. Special

6. Student Activities Inventory (SAI)

7. Interest Inventory

8. Student Information Blank (SIB)

9. Other

---

[1] For specific three-digit codes for individual variables, see second column of Appendix B.

APPENDIX B

COMPOSITION OF THE PROJECT TALENT BATTERY (1960)

Appendix B. Composition of the Project TALENT Battery (1960)

Variable # Code[a]					
Kind of score[b]	Test Code # (3 digits)		Options per item	No. of items	No. of minutes working time[c]
		APTITUDE AND ACHIEVEMENT TESTS			
		Information Test:		(395)	(125)
		Part I	5	(252)	90
		Subscales			
R	101	1. Screening		12	
R	102	2. Vocabulary		21	
R	103	3. Literature		24	
R	104	4. Music		13	
R	105	5. Social Studies		24	
R	106	6. Mathematics		23	
R	107	7. Physical Science		18	
R	108	8. Biological Science		11	
R	109	9. Scientific Attitude		10	
R	110	10. Aeronautics and Space		10	
R	111	11. Electricity and Electronics		20	
R	112	12. Mechanics		19	
		a. Tools and construction		(10)	
		b. Motors and mechanisms		(9)	
R	113	13. Farming		12	
R	114	14. Home economics		21	
		a. Cooking		(11)	
		b. Other		(10)	
R	115	15. Sports		14	
R	190	Part I Total		(252)	

Appendix B (continued)

Variable # Code[a]					
Kind of score[b]	Test Code # (3 digits)		Options per item	No. of items	No. of minutes working time[c]
		Information Test (continued)			
		Part II	5	(143)	35
		Subscales			
R,K	131	1. Art		12	
R,K	132	2. Law		9	
R,K	133	3. Health		9	
R,K	134	4. Engineering		6	
R,K	135	5. Architecture		6	
R,K	136	6. Journalism		3	
R,K	137	7. Foreign Travel		5	
R,K	138	8. Military		7	
R,K	139	9. Accounting, Business, Sales		10	
R,K	140	10. Practical Knowledge		4	
R,K	141	11. Clerical		3	
R,K	142	12. Bible		15	
R,K	143	13. Colors		3	
R,K	144	14. Etiquette		2	
R,K	145	15. Hunting		5	
R,K	146	16. Fishing		5	
R,K	147	17. Outdoor Activities (other)		9	
R,K	148	18. Photography		3	
R,K	149	19. Games (sedentary)		5	
R,K	150	20. Theater and ballet		8	
		a. Theater		(6)	
		b. Ballet		(2)	
R,K	151	21. Foods		4	
R,K	152	22. Miscellaneous		10	
R,K,L	192	Part II Total (including 10 misc. items)		(143)	
R,K	162	Vocabulary (overlapping other scales)		(9)	
		Parts I and II combined		(395)	(125)
R	172	Vocabulary scale (Variables 102 and 162)		(30)	
R	100	Grand Total (Variables 190 and 192)		(395)	

Appendix B (continued)

Variable # Code[a]					
Kind of score[b]	Test Code # (3 digits)		Options per item	No. of items	No. of minutes working time[c]
R	211	Memory for sentences			
		Study	-	(40 sentences)	6
		Test	5	16	10
R	212	Memory for Words			
		Study	-	(24 words)	2
		Practice	-	(24)	2
		Test	5	24	4
R	220	Disguised words	5	30	3
		English		(113)	52
R	231	1. Spelling	5	16	
R	232	2. Capitalization	2	33	
R	233	3. Punctuation	3-5	27	
		a. Punctuation marks	3-5	(16)	
		b. Sentence structure	3	(11)	
R	234	4. English usage	3-5	25	
R	235	5. Effective expression	3-5	12	
R	230	Total		(113)	
R	240	Word Functions			
		Directions	-	-	2½
		Test	5	24	15
R	250	Reading comprehension	5	48	30
R	260	Creativity	5	20	20
R	270	Mechanical reasoning	3-5	20	11
R	281	Visualization in 2 dimensions	5	24	4
R	282	Visualization in 3 dimensions	5	16	9
R	290	Abstract reasoning	5	15	11
		Mathematics		(54)	50
R	311	Part I. Arithmetic reasoning	4-5	16	
R	312	Part II. Introductory high school math.	5	24	
R	320	Math I and II		(40)	
R	333	Part III. Advanced high school math.	5	14	
R	334	High school Math (Parts II and III)		(38)	
R	340	Total (Parts I, II, and III)		(54)	
F,R,A	410	Arithmetic computation	5	72	9
F,R,A	420	Table reading	5	72	3
F,R,A	430	Clerical checking	2	74	3
F,R,A	440	Object inspection	5	40	3

Appendix B (continued)

Variable # Code[a] Kind of score[b]	Variable # Code[a] Test Code # (3 digits)		Options per item	No. of items	No. of minutes working time[c]
		MISCELLANEOUS			
A	500	Preferences test	2	166	3
		Themes	-	2	10+
		"My Views about an Ideal Occupation"			
		"What High School Means to Me"			
		INVENTORIES			
	600	Student Activities Inventory	5	(150)	20
		Regular scales		(108)	
R	601	Sociability		12	
R	602	Social sensitivity		9	
R	603	Impulsiveness		9	
R	604	Vigor		7	
R	605	Calmness		9	
R	606	Tidiness		11	
R	607	Culture		10	
R	608	Leadership		5	
R	609	Self-confidence		12	
R	610	Mature personality		24	
		Experimental scales		(18)	
	611	Conventionality		4	
	612	Theoreticality		8	
	613	Group centeredness		6	
		Miscellaneous		24	

Appendix B (continued)

Variable # Code[a]					
Kind of score[b]	Test Code # (3 digits)		Options per item	No. of items	No. of minutes working time[c]
L	700	Interest Inventory	5	205	20
		Part I. Occupations		(122)	
		Part II. Activities		(83)	
		Scales:		(173)	
P,F*	701	Physical Science,Engineering,Mathematics		16	
P,F*	702	Biological Science, and Medicine		8	
P,F*	703	Public service		11	
P,F*	704	Literary-linguistic		16	
P,F*	705	Social service		12	
P,F*	706	Artistic		7	
P,F*	707	Musical		5	
P,F*	708	Sports		8	
P,F*	709	Hunting and fishing		3	
P,F*	710	Business management		14	
P,F*	711	Sales		6	
P,F*	712	Computation		10	
P,F*	713	Office work		7	
P,F*	714	Mechanical-technical		15	
P,F*	715	Skilled trades		18	
P,F*	716	Farming		7	
P,F*	717	Labor		10	
		Other items		(32)	
L	800	Student Information Blank	2-36	(394)	80
P*	801	Socioeconomic index		9	

---

[a] The system of variable-number codes is explained in Appendix A.

[b] This column shows the kind(s) of score available or obtainable. When more than one letter appears, the first one represents the kind of scores most frequently used in this report for the particular test. The letter is thus the most common prefix for the three-digit number in the complete variable-number code.

[c] Does not include the time used for giving directions except where otherwise indicated. (The exceptions occur where comprehension of directions is considered an integral part of the testing time allowance.)

APPENDIX C

ORGANIZATION OF RETEST STUDY

Appendix C-1. Revision of 1960 Instruments for Use in Retest

Variable # Code					
Kind of score	Test Code # (3 digits)		Options per item	No. of items	No. of minutes working time
	800'	Revised Student Info.Blank (Form B)	2-36	158	50
		No. of courses taken[a]			
X	891'	No.of math courses taken		(7)	
X	892'	No.of phys.sci.courses taken		(2)	
X	893'	No.of science courses taken		(5)	
X	894'	No.of foreign language courses taken		(6)	
		"Goof scores"[b]			
X	801'	Goof-1		(10)	
X	802'	Goof-2		(19)	
X	803'	Goof-3		(29)	
X	804'	Goof-4		(40)	
X	805'	Goof-5		(52)	
X	806'	Goof-6		(42)	
X	807'	Goof-7		(33)	
X	808'	Goof-8		(23)	
X	809'	Goof-9		(12)	
		Themes			
		"My Views about an Ideal Occupation"			5
		Theme on help received from testing and counseling			15

Note: Except for the SIB and the themes, as indicated above, <u>all</u> of the tests and inventories used in the 1963 retesting were identical with the ones used in 1960 in the original testing.

[a] See Appendix D-2 for details about these four variables.

[b] "Goof-scores" are special scores intended to provide some indication of the validity of the SIB responses in general. The procedure for obtaining these scores is described in Appendix D-2. The scores are further discussed, and results obtained from analyzing them are presented, in Appendix F.

Appendix C-2. Composition of the Seven Retest Batteries (Spring 1963)

Test Code #	Test	Battery						
190	Information I	A	B	C				V
192	Information II	A			D	E		
211	Memory for Sentences*							
212	Memory for Words		B		D		F	
220	Disguised Words			C		E	F	
230	English		B		D		F	V
240	Word Functions in Sentences			C		E	F	
250	Reading Comprehension			C		E	F	V
260	Creativity			C		E	F	V
270	Mechanical Reasoning			C		E	F	V
281	Visualization in Two Dimensions			C		E	F	
282	Visualization in Three Dimensions			C		E	F	V
290	Abstract Reasoning	A	B	C	D	E	F	V
311	Math I. Arithmetic Reasoning		B		D		F	V
312	Math II. Introductory H.S. Math		B		D		F	
333	Math III. Advanced H.S. Math		B		D		F	
410	Arithmetic Computation		B		D		F	V
420	Table Reading			C		E	F	
430	Clerical Checking			C		E	F	V
440	Object Inspection			C		E	F	V
500	Preferences*							
600	Student Activities Inventory*							
700	Interest Inventory	A			D	E		
800'	Revised Student Information Blank	A			D	E		
Themes								
	"My Views about an Ideal Occupation"	A			D	E		
	Theme on help received from testing and counseling	A			D	E		

---

*Not included in any retest battery.

Appendix C-3. Test Administration Categories

TABLE C3-1. Retest battery combinations corresponding to administration categories

Administration Category	Retest Battery Combination[a]
0	A-F, V
1	A-C, V
2	A, D, E
3a	B, D, F, V
3b	B, D, F
4a	C, E, F, V
4b	C, E, F
5	A

[a] Any test included in all of the retest batteries included in the combination and in no other retest battery is in the corresponding administration category.

TABLE C3-2. Administration category of each test

Test Code #	Tests	Administration Category[a]
101-115,190	Info. I scales and total	1
131-152,162,192	Info. II scales and total	2
172,100	Info. I + II scales and total	5
211	Memory for Sentences	-
212	Memory for Words	3b
220	Disguised Words	4b
231-235,230	English subscores and total	3a
240	Word Functions in Sentences	4b
250	Reading Comprehension	4a
260	Creativity	4a
270	Mechanical Reasoning	4a
281	Visualization in Two Dimensions	4b
282	Visualization in Three Dimensions	4a
290	Abstract Reasoning	0
311	Math I.Arithmetic Reasoning	3a
312,333,334	Math II, Math III, and sum	3b
320,340	Math I + II, Math total	3b
410	Arithmetic Computation	3a
420	Table Reading	4b
430	Clerical Checking	4a
440	Object Inspection	4a
600	Student Activities Inventory	-
700	Interest Inventory	2
800	Student Information Blank (1960 version)	-
800'	Student Information Blank (1963, Form B)	2

---

[a] Tests in the same administration category were included in exactly the same combination of retest batteries.

Appendix C-4. Battery Overlap

TABLE C4-1. Retest batteries taken by the students (represented in the previous table) on whom correlations are based

NOTE: In this table, each grade 12 variable is represented by the "administration category" in which it falls.

		Retest battery taken[a]								
	Admin. Category	Grade 12 variables - 1963								Gr.9 1960
		0	1	2	3a	3b	4a	4b	5	
Grade 12 variables-1963	0	A-F,V	ABCV	ADE	BDFV	BDF	CEFV	CEF	A	A-F,V
	1		ABCV	A	BV	B	CV	C	A	ABCV
	2			ADE	D	D	E	E	A	ADE
	3a				BDFV	BDF	FV	F	-	BDFV
	3b					BDF	F	F	-	BDF
	4a						CEFV	CEF	-	CEFV
	4b							CEF	-	CEF
	5								A	A
Grade 9-1960										A-F,V

---

[a] Battery V cases are automatically eliminated when Retest Weight Z is applied, since the weight is 0 for all Battery V cases.

Appendix C-5. Retest Case Classification Code

A "retest case classification code" indicating whether the student has complete test data, both in 1960 and 1963, for the tests he was supposed to take in 1963, has been added to the retest tape. The following code has been used:

0. Complete on 1963 data (for the retest battery taken), and corresponding 1960 data.
1. Complete on 1963 data (for the retest battery taken); and a matching 1960 record has been located, but some or all of the 1960 variables corresponding to those in the 1963 retest battery taken are missing.
2. Complete on 1963 data (for the retest battery taken), but there is no record that the student was tested in 1960.
3. Incomplete on 1963 data, but a matching 1960 record (not necessarily complete) has been located.
4. Incomplete on 1963 data and no corresponding 1960 master file record has been located.

In determining what the relevant variables were for students taking retest batteries A, B, C, D, E, F, and V respectively, Appendix C-2 was used but the "Themes" (which were part of retest batteries A, D, and E) were excluded from consideration.

APPENDIX D

SCORING FORMULAS

Appendix D-1. Scores Derivable from Regular TALENT Battery

F-scores

$F\text{-}410 = R - 3W = 4R - 3A$

$F\text{-}420 = R - W = 2R - A$

$F\text{-}430 = R - 3W = 4R - 3A$

$F\text{-}440 = R - W = 2R - A$

K-scores

Information Test scores

$$K = R - \frac{W}{4} = \frac{5R - A}{4}$$

English Test scores

$K\text{-}232 = R - W = 2R - A$

$$K\text{-}233a = R - \frac{W}{3} = \frac{4R - A}{3}$$

$$K\text{-}233b = R - \frac{W}{2} = \frac{3R - A}{2}$$

$K\text{-}233 = (K\text{-}233a) + (K\text{-}233b)$

$$K\text{-}234 = R - \frac{W}{4} = \frac{5R - A}{4}$$

$$K\text{-}235 = R - \frac{W}{2} = \frac{3R - A}{2}$$

$K\text{-}230 = (K\text{-}231) + (K\text{-}232) + (K\text{-}233) + (K\text{-}234) + (K\text{-}235)$

Mechanical Reasoning scores

$$K\text{-}270 = R - \frac{W}{3} = \frac{4R - A}{3}$$

All other aptitude and achievement tests

$$K = R - \frac{W}{4} = \frac{5R - A}{4}$$

Appendix D-1 (continued)

P-scores and F*scores for Interest Inventory

There are two different sets of Interest Inventory scores that have been used extensively. They are designated respectively F*701 through F*717 and P-701 through P-717. The latter is the one recommended for most purposes. In these two Interest Inventory scoring systems, each item is scored as follows:

		Item Score (w)		Weight for Answering Item
Response	Option	F*701 Through F*717	P-701 Through P-717	(w')
A	Like very much	4	4	1
B	Like fairly well	3	3	1
C	Indifferent or don't know	2	2	1
D	Dislike a little	1	1	1
E	Dislike very much	0	0	1
Omit		2	0	0
Scoring formula		Σw	$\frac{\Sigma w}{\Sigma w'}$	

In the above scoring procedures, response weights have the following interpretation:

w = Item score
w' = Weight for answering item

If $\Sigma w' = 0$, scores on P-701 through P-717 are indeterminate, and are therefore represented on the tape by -0.

P* scores

For details concerning P*801 (Socioeconomic index), see Appendix E.

Appendix D-2. Scores derivable from revised SIB (Form B, 1963) only

1. Number of courses taken

The following four variables representing approximate number of semesters of high school course work in specified areas were defined:

Variable X-891'. Number of courses in mathematics
Variable X-892'. Number of courses in physical science
Variable X-893'. Number of courses in science
Variable X-894'. Number of courses in foreign language

Scores on these four "number of courses" variables are obtained from the responses to items 91-108, which are as follows:

Starting with the ninth grade, how many *years* of each of the following kinds of courses have you taken? *Include courses which you are taking now.* Mark your answers as follows:

A. None
B. ½ or 1 year
C. 1½ or 2 years
D. 2½ years
E. 3 years
F. 3½ years or more

91. First year algebra
92. Second year algebra
93. Plane geometry
94. Solid geometry
95. Trigonometry
96. Analytic geometry and/or calculus
97. Other math courses, covering some or all of the above topics
98. Biology
99. Chemistry
100. Physics
101. General science
102. Other science courses
103. Latin
104. French
105. Spanish
106. German
107. Russian
108. Other foreign language courses

The procedure used for determining an individual's score on these variables was to assign a score to each item response (on the basis indicated in Table D2-1, and then to add the item scores. In this table a dash (-) appearing in the place of an item response score represents an invalid response. If any of an individual's responses to items entering into the Variable X-891', X-892',X-893', or X-894' score are invalid, his score on that entire variable is regarded as invalid--in other words as missing data.

TABLE D2-1. Obtaining "number-of-courses" scores on variables X-891', X-892', X-893', and X-894'

Variable	Number of courses in:	SIB items on which based	Response	Item Score[a]						
				SIB 91	SIB 92	SIB 93	SIB 94	SIB 95	SIB 96	SIB 97
X-891'	Math	91-97	A	0	0	0	0	0	0	0
			B	2	2	2	1	1	2	2
			C	2	2	2	1	1	2	4
			D	-	-	-	-	-	-	5
			E	-	-	-	-	-	-	6
			F	-	-	-	-	-	-	8
			Omit	-	-	-	-	-	-	-
				SIB 99	SIB 100					
X-892'	Physical Sciences	99-100	A	0	0					
			B	2	2					
			C	2	2					
			D	-	-					
			E	-	-					
			F	-	-					
			Omit	-	-					
				SIB 98	SIB 99	SIB 100	SIB 101	SIB 102		
X-893'	Science[b]	98-102	A	0	0	0	0	0		
			B	2	2	2	2	2		
			C	4	2	2	4	4		
			D	-	-	-	5	5		
			E	-	-	-	6	6		
			F	-	-	-	8	8		
			Omit	-	-	-	-	-		
				SIB 103	SIB 104	SIB 105	SIB 106	SIB 107	SIB 108	
X-894'	Foreign Languages	103-108	A	0	0	0	0	0	0	
			B	2	2	2	2	2	2	
			C	4	4	4	4	4	4	
			D	5	5	5	5	5	5	
			E	6	6	6	6	6	6	
			F	8	8	8	8	8	8	
			Omit	-	-	-	-	-	-	

---

[a] A dash (-) represents an item response which is assumed to be invalid.

[b] X-893' includes both of the SIB items that go into X-892', and three others as well.

2. Goof scores

A student's SIB "goof scores" are measures of the extent to which he marked answer spaces corresponding to nonexistent options. (These variables are discussed in Appendix F.) The scores were obtained in the following manner.

1) The 52 items for which there were more answer spaces than options were divided into five sets, as follows:

		Lowest and highest item nos. in set
Set 1	First 10 items	57-161
Set 2	Next 9 items	177-211
Set 3	Next 10 items	213-222
Set 4	Next 11 items	225-240
Set 5	Last 12 items	337-356

2) Counts were obtained of the number of items to which the student gave a nonexistent response. These counts were then combined to get the following nine "goof scores."

Variable #	Name of score	Item sets included	No. of items included
X-801'	Goof-1	1	10
X-802'	Goof-2	1-2	19
X-803'	Goof-3	1-3	29
X-804'	Goof-4	1-4	40
X-805'	Goof-5	1-5	52
X-806'	Goof-6	2-5	42
X-807'	Goof-7	3-5	33
X-808'	Goof-8	4-5	23
X-809'	Goof-9	5	12

APPENDIX E

DESCRIPTION OF THE SOCIOECONOMIC INDEX (P*801)

Appendix E. Description of the socioeconomic index (P*801)*

Variable P*801 is a socioeconomic index computed for each student on the basis of nine 1960 Student Information Blank questions. The items are listed below; the weight assigned to each response appears to its left in parentheses. A dash (-) appears before options that were not applicable. Items to which a student gave these responses were not included in the computation of his P*801 socioeconomic index.

Item 172. If your family has bought (or is buying) your home what is its present value?

(1) Under $6,000
(2) $6,000 to $10,000
(3) $10,000 to $15,000
(4) $15,000 to $22,000
(5) More than $22,000
(-) We are renting our home.

Item 173. Please make the best estimate you can of your family's total income for last year (1959). Include money earned by both parents or anyone else in the household who worked.

(1) Less than $3,000
(2) $3,000 to $5,999
(3) $6,000 to $8,999
(4) $9,000 to $11,999
(5) $12,000 or more
(-) I can't estimate this.

Item 176. How many books are in your home?

(1) None, or very few (0-10)
(2) A few books (11-25)
(3) One bookcase full (26-100)
(4) Two bookcases full (101-250)
(5) Three or four bookcases full (251-500)
(6) A room full--a library (501 or more)

---

*This variable was originally developed by William W. Cooley for use in a recent report (Flanagan and Cooley, 1966). Appendix E in that report documents the data analysis on which the choice of component items was based, and summarizes the computational procedure and the characteristics of the resulting index.

Items 190, 191, 195. How many of the following articles are in your home?

Item 190. Automatic washer, automatic clothes dryer, electric dishwasher, electric or gas refrigerator, vacuum cleaner, home food freezer (separate from refrigerator)

(1) None
(2) One
(3) Two
(4) Three
(5) Four
(6) Five or six

Item 191. Telephone, television set, radio, phonograph

(1) None
(2) One
(3) Two
(4) Three
(5) Four

Item 195. A room of my own, my own study desk, a typewriter

(1) None
(2) One
(3) Two
(4) Three

Item 206. Which one of the following comes closest to describing the work of your father (or the male head of your household)?

(1) Farm or ranch worker
Workman or laborer
Private household worker

(2) Service worker
Semi-skilled worker

(3) Farm or ranch foreman
Protective worker
Skilled worker or foreman
Clerical worker

(4) Farm or ranch owner
Salesman
Manager
Proprietor or owner
Technical

(5) Official
Professional

(-) I don't know

Item 218. Mark the one answer indicating the highest level of education your father reached.

(1) None, or some grade school
(2) Completed grade school
(3) Some high school, but did not graduate
(4) Graduated from high school
(5) Vocational or business school after high school
(6) Some junior or regular college, but did not graduate
(7) Graduated from a regular 4-year college
(8) Master's degree
(9) Some work toward doctorate or professional degree
(10) Completed doctorate or professional degree
(-) I don't know

Item 219. Mark the one answer indicating the highest level of education your mother reached.

(1) None, or some grade school
(2) Completed grade school
(3) Some high school, but did not graduate
(4) Graduated from high school
(5) Vocational or business school after high school
(6) Some junior or regular college, but did not graduate
(7) Graduated from a regular 4-year college
(8) Master's degree
(9) Some work toward doctorate or professional degree
(10) Completed doctorate or professional degree
(-) I don't know

Each student's responses to each of these items (excluding those items which he omitted or to which he gave a "not applicable" response) were converted, on the basis of Grade 12 boys in Subsample A-10.0-3* (N = 2946), to standard scores (z) with a mean of 0 and a standard deviation of 1. The means and standard deviations used in computing these standard scores are shown in Table E-1.

The usual formula for converting the raw score (X) on each item to a standard score (z) was used:

$$z_i = \frac{X_i - \overline{X}_i}{\sigma_i}$$

(In this formula the subscript i identifies the item.)

---

*This subsample is described in an earlier report (Flanagan et al., 1964, pages 2-12 and Appendix A, Table A-1).

In order to be able to convert the sum of each student's z_i values to an overall score (P*801) on a standard score scale it was necessary to have an approximation of the standard deviation of the sum of n items. This approximation, k_n, was computed separately for each possible value of n (the number of items entering into the sum) from 1 to 9. The formula used was:

$$k_n = \sqrt{n + n(n-1)\,\bar{r}}$$

where $\bar{r}$ was the mean of the 36 intercorrelations among the nine items, for grade 12 boys in subsample A-10.0-3, with each of the correlations based on only those boys who had applicable responses for both of the items involved in it. (This formula gives an exact value of the standard deviation of the sum of the standard scores on n items if all the correlations on which $\bar{r}$ is based are exactly equal, and a good approximation otherwise.

The values of k_n are shown in Table E-2.

Each student's z_i values for all n of the items to which he had applicable responses were then used to compute his P*801 score, by means of the following formula:

$$P{*}801 = 10\left(\frac{\sum_{i=1}^{n} z_i}{k_n} + 10\right)$$

P*801 is thus an approximation of a standard score with a mean of 100 and a standard deviation of 10. The possible range turns out to be from 58 to 135.

TABLE E-1. Means and standard deviations on items entering into P*801

Based on Grade 12 boys in Subsample A-10.0-3 (N = 2946*)

Item No. (i)	$\bar{X}_i$	σ_i
172	3.21	1.25
173	3.04	1.13
176	3.29	1.16
190	4.29	1.34
191	4.57	.86
195	2.82	1.01
206	3.06	1.26
218	5.07	2.13
219	4.97	1.65

---

*Somewhat fewer cases than the total number (2946) were used in determining the means and standard deviations, since only those cases with applicable responses to an item could be included in the computation of the statistics for that item.

TABLE E-2. Approximate standard deviations of sums of various numbers of items selected from the nine on which P*801 is based

n (No. of items)	k_n (Approx. S. D.)*
1	1.000
2	1.609
3	2.186
4	2.748
5	3.305
6	3.858
7	4.409
8	4.958
9	5.506

---

*The procedure used in computing these approximate standard deviations is described on page E-5 of this appendix.

APPENDIX F

DESCRIPTION AND ANALYSIS OF SIB "GOOF SCORES"

APPENDIX F. Description and Analysis of SIB "Goof Scores"

Description of the Nine Special "Goof Scores" (X-801'--X-809')

SIB Form B (used in 1963) contains 52 items with fewer options than are printed in the 1960 answer sheet, which had to be retained in 1963. These 52 items are the basis of the "goof scores." The method of determining these scores is explained in Appendix D-2, Section 2. They are measures of the extent to which a student marked answer spaces corresponding to nonexistent options. Nine goof scores (each based on a different combination of SIB items) were obtained for each student who took Retest Battery A, D, or E (the three batteries that included the SIB).

Purpose of Goof Scores

The goof scores are intended to serve as measures of the extent to which a student gave unintended answers on the SIB. High goof scores for an individual might be regarded as casting doubt on the accuracy of his responses to all of the SIB items in the 1963 retest.

Differential Functions of the Nine Goof-Score Variables

X-801' to X-804'. The first four goof scores (X-801' to X-804'), especially the first, involve items towards the beginning, and are intended to help identify students who may have been confused when they first encountered items which the answer sheet didn't match.

X-806' to X-809'. The last four goof scores (X-806' to X-809'), especially the last, involve items towards the end, and are intended to help identify students who became bored and careless after a while.

X-805'. The middle goof score (X-805') is the one based on all 52 of the SIB items involved. Relatively high scores on it would probably be characteristic of students whose answer-sheet-marking behavior, for one reason or another, is characterized by considerable clerical error.

Theoretical Statistical Characteristics of Goof Scores

Goof scores on the most inclusive scale (Goof-5) can range from 0 (best possible) to 52 (worst possible). If all items were marked on the answer sheet strictly at random, the average Goof-5 score (X-805') would be 16.8, with a standard deviation[1] of approximately 3.4. Nonexistent options would be marked for 32.3 percent, or approximately one in three, of the items. Table F-1 shows similar theoretical data for all nine goof scores and also for the five sets of items that make them up.

Empirical Data on Goof Scores

Distributions of goof scores based on all students taking the SIB in 1963 were obtained. These distributions, based on about 4,300 students, showed that about 54 percent of them had Goof-5 scores greater than 0. In other words, 54 percent of the students marked a nonexistent option for at least one of the 52 items. The mean Goof-5 score was 1.18. In other words this was the average number of items (out of 52) for which nonexistent options were marked. This probably does not represent an abnormally high rate of clerical errors, at least not for students who are particularly prone to clerical error. However, since it *was* a large enough error rate to be cause for some concern, distributions of the other goof scores (goof scores 1-4, and 6-9) and of responses to specific SIB items were examined. It turned out that the great preponderance of error occurred in the first 10 of the 52 items (in other words, the items constituting the Goof-1 score)--and more specifically, in the first four of these items (i.e., items 57-60)--although item 340, which was in the last of the five sets, also accounted for considerable error. The fact that there were far fewer 0 scores on the first four goof-score variables than on the last four, on which *almost all* of the scores were 0, strongly suggests that error-producing boredom and fatigue did *not* occur towards the end of the inventory in any important amount.

---

[1] Estimated by the procedure indicated in Table F-1.

TABLE F-1. Theoretical characteristics of goof scores, assuming random response and binomial distribution

Variable #	Goof score	Item set no(s).	n	$\bar{p}$	μ	σ
		1	10	.323	3.23	1.48
		2	9	.329	2.96	1.41
		3	10	.306	3.06	1.46
		4	11	.336	3.70	1.57
		5	12	.319	3.83	1.62
X-801'	Goof-1	1	10	.323	3.23	1.48
X-802'	Goof-2	1-2	19	.326	6.19	2.04
X-803'	Goof-3	1-3	29	.319	9.25	2.51
X-804'	Goof-4	1-4	40	.324	12.96	2.96
X-805'	Goof-5	1-5	52	.323	16.80	3.37
X-806'	Goof-6	2-5	42	.323	13.57	3.03
X-807'	Goof-7	3-5	33	.321	10.59	2.68
X-808'	Goof-8	4-5	23	.327	7.52	2.25
X-809'	Goof-9	5	12	.319	3.83	1.62

Notation in this table:

n = number of items

$\bar{p}$ = average chance probability of marking an invalid option for an item

$\bar{q} = 1 - \bar{p}$

μ = theoretical mean assuming random responses

σ = theoretical standard deviation (approximate), estimated from the following formula:

$$\sigma = \sqrt{n \bar{p} \bar{q}}$$

This is of course the formula for standard deviation of a binomial distribution. (This assumption that the distribution is binomial simplifies things enormously; however the distribution actually would not be quite binomial, since the probability of marking an invalid answer space if answering at random is not identical for all 52 items involved.)

Examination of appropriate joint distributions made it apparent that if students with bad responses (nonexistent options marked) on item 57, 58, 59, or 60 were eliminated from analyses involving the SIB, this would eliminate almost all of the cases with Goof-1 scores greater than 0.

Table F-2 summarizes the empirical data derived from the analysis of goof scores. This table shows that systematic elimination of cases with Goof-1 scores greater than 0 would reduce the total number of cases by almost 45 percent (although we can surmise that the percentage of loss in the matched cases, which are less likely to involve a high rate of clerical error than the unmatched cases, would be considerably lower); but it would have the desirable effect of eliminating over 80 percent of the cases with any goof score greater than 0, reducing the 54 percent to a mere 10 percent (of the remaining students) having any nonexistent option marked, and reducing the mean Goof-5 score (overall goof score) from the original 1.18 items to only .27 items out of 52, or about half of one percent of the items. This would represent a substantial purification of the SIB data though at some cost in terms of loss of cases.

Chapter 4 (pp. 4-31 to 4-34) contains a brief discussion of the goof scores, with particular emphasis on the implications of the findings.

TABLE F-2. Empirical data on goof scores
Based on grade 12 cases taking revised SIB (unweighted data)

N = 4310

Variable #	Goof score	Maximum possible score	All Cases			Cases with goof-1 score = 0			Percent of cases with				Total % (cols. a+c+d)
									Indicated goof score		Indic. goof sc. >0 and		
			Observed range	M	σ	Observed range	M	σ	= 0	> 0	Goof-1>0	Goof-1=0	
									(a)	(b)	(c)	(d)	(e)
X-801'	Goof-1	10	0-7	.86	1.17	0	.00	.00	56.0	44.0	44.0	-	100.0
X-802'	Goof-2	19	0-9	.97	1.24	0-5	.10	.34	50.9	49.1	44.0	5.1	100.0
X-803'	Goof-3	29	0-10	1.00	1.30	0-7	.12	.40	50.3	49.7	44.0	5.7	100.0
X-804'	Goof-4	40	0-15	1.05	1.40	0-14	.15	.56	49.4	50.6	44.0	6.6	100.0
X-805'	Goof-5	52	0-18	1.18	1.55	0-18	.27	.74	46.0	54.0	44.0	10.0	100.0
X-806'	Goof-6	42	0-18	.32	.91	0-18	.27	.74	80.0	20.0	10.0	10.0	100.0
X-807'	Goof-7	33	0-16	.21	.79	0-16	.17	.64	88.1	11.9	6.2	5.7	100.0
X-808'	Goof-8	23	0-11	.18	.68	0-11	.15	.58	89.7	10.3	5.2	5.1	100.0
X-809'	Goof-9	12	0-5	.13	.48	0-5	.12	.45	91.5	8.5	4.2	4.3	100.0
N				4310			2413				1897	2413	4310

APPENDIX G

MATERIALS RELATED TO SAMPLE OF SCHOOLS

Appendix G-1. High School Taxonomy Code

01-64. Public secondary schools

- 01. Junior high schools
- 10. Vocational senior high schools

  All vocational and trade high schools

- 21-64. Non-vocational senior high schools: (General comprehensive, academic or college preparatory, university high schools, and schools for superior students)
  - 21-22. Largest cities (1,500,000 or more)
    - 21. Low economic level[1]
    - 22. Moderate and high economic level[1]
  - 31-32. Large cities (250,000-1,499,999)
    - 31. Low economic level[1]
    - 32. Moderate and high economic level[1]
  - 41-44. Northeast: U.S.O.E. Regions 1 and 2 (Me., N.H., Vt., Mass., R.I., Conn., N.Y., N.J., Pa., Del., Md., D.C.)
    - 41. Urban (5,000-249,999) - low economic level[1]
    - 42. Urban (5,000-249,999) - moderate and high economic level[1]
    - 43. Small town
    - 44. Rural
  - 51-54. Southeast: U.S.O.E. Region 5 (Va., W.Va., N.C., S.C., Ga., Fla., Ky., Tenn., Ala., Miss., Ark., La.)
    - 51. Urban (5,000-249,999) - low economic level[1]
    - 52. Urban (5,000-249,999) - moderate and high economic level[1]
    - 53. Small town
    - 54. Rural
  - 61-64. Midwest and West: U.S.O.E. Regions 3, 4, 6, 7, 8, 9 (All states other than those listed above)
    - 61. Urban (5,000-249,999) - low economic level[1]
    - 62. Urban (5,000-249,999) - moderate and high economic level[1]
    - 63. Small town
    - 64. Rural

90-99. Non-public secondary schools

- 91. Parochial
- 92. Private

---

[1] Economic level is based on response to Item 87 of the General School Characteristics Questionnaire filled out in 1960 by each participating school. Item 87 is shown on the next page

Item 87 of the General School Characteristics Questionnaire is:

87. The residences in the area served by your school are best described as <u>primarily</u>

( ) 1. expensive private homes.
( ) 2. moderate-priced homes.
( ) 3. low-cost homes.
( ) 4. high-rental apartments.
( ) 5. moderate-rental apartments.
( ) 6. low-rental apartments.
( ) 7. low-income areas.
( ) 8. about equally apartments and homes.
( ) 9. students are resident students--cannot estimate.

The "low economic level" categories (i.e., taxonomy groups 21, 31, 41, 51, and 61) mean responses 3, 6, 7.

The "moderate and high economic level" categories (i.e., taxonomy groups 22, 32, 42, 52, and 62) mean responses 1, 2, 4, 5, 8, 9.

Appendix G-2. Selection of the sample of high schools to be retested, and assignment of retest batteries

H. S. Taxonomy Group	No. of high schools in main retest study (Batteries A - F)								No. of high schools retested with Battery V	Total no. of participating schools
	Invited	Participating								
		Total	A	B	C	D	E	F		
01	0*	0*							0*	-
10	7	7	1	1	1	1	1	2	10	17
21	0**	0**							0***	-
22	0**	0**							0***	-
31	2	1	1						0***	1
32	5	4	1	1	1	1			0***	4
41	2	2				1	1		0***	2
42	14	12	2	1	3	2	2	2	0***	12
43	8	7	1	2	1	1	1	1	0***	7
44	8	7	2	1	1	1	1	1	0***	7
51	5	4		1	1	1	1		0***	4
52	10	7	2	1	2	1		1	0***	7
53	8	6	1	1	1	1		2	0***	6
54	16	13	2	2	3	2	1	3	0***	13
61	3	2			1			1	0***	2
62	18	13	3	2	3	1	1	3	0***	13
63	20	11	1	3	1	2	2	2	0***	11
64	18	12	1	3	1	2	3	2	0***	12
91	0**	0**							0**	-
92	0**	0**							0**	-
Total	144	108	18	19	20	17	14	20	10	118

---

[*] Not applicable; no grade 12 cases.

[**] Non-public schools and schools in the largest cities (with an exception for Battery V) were excluded from the retest study, for administrative reasons.

[***] Battery V was limited to selected vocational high schools.

APPENDIX H

MISCELLANEOUS DERIVATIONS

APPENDIX H-1. Determination of Weight Z Values

A. Characteristics of Weight Z

1. Function of Weight Z

When each case is weighted by its Weight Z value, the resultant percentage distributions of Grade 12 Abstract Reasoning raw scores (R-290), within sex, should be identical for all six basic retest batteries.

2. Scaling of Weight Z

The weighted N for each battery-and-sex combination equals the corresponding unweighted N. This, in combination with the basic characteristic indicated in paragraph 1 above, makes the weighted and unweighted frequency distributions identical, within sex, when the six basic retest batteries (A-F) are combined.

B. Notation:

f_{ij} = no. of cases in battery i with score j

T_j = no. of cases with score j = column j total

$$= \sum_{i=A}^{F} f_{ij}$$

N_i = no. of cases in battery i = row i total

$$= \sum_{j=0}^{15} f_{ij}$$

N = total no. of cases = $\sum_{i=A}^{F} N_i = \sum_{j=0}^{15} T_j = \sum_{i=A}^{F} \sum_{j=0}^{15} f_{ij}$

w_{ij} = weight to be applied to each of the f_{ij} cases in cell ij

C. Formula for weights:

For batteries A, B, C, D, E, F

$$w_{ij} = \frac{T_j}{f_{ij}} \cdot \frac{N_i}{N} = \frac{\frac{N_i}{N} \cdot T_j}{f_{ij}}$$

For battery V

$$w_{ij} = 0$$

TABLE H1-1. Values of Retest Weight Z*

R-190	MALE						FEMALE					
	A	B	C	D	E	F	A	B	C	D	E	F
15	.769	1.004	.907	1.466	.938	1.169	.692	2.167	1.362	.786	.918	.913
14	1.000	.936	.920	1.012	.998	1.179	.926	.990	1.070	.892	.834	1.429
13	.873	1.059	1.044	1.045	.922	1.053	.816	1.039	.998	1.154	1.112	.977
12	1.202	.925	.936	1.023	.822	1.168	1.023	1.030	1.011	.914	1.001	1.029
11	1.006	1.048	1.100	.932	.997	.922	1.076	.972	1.195	.963	.953	.861
10	1.099	.919	.980	.837	1.130	1.127	1.057	1.038	.845	1.060	1.061	1.023
9	.976	1.094	1.043	1.013	.947	.929	1.146	1.074	1.081	.833	.923	.976
8	1.014	.959	1.013	1.084	1.138	.878	1.030	.940	.945	.919	1.355	.985
7	.955	1.155	1.092	1.003	1.104	.800	1.064	1.033	.995	1.182	.880	.881
6	.906	1.430	1.013	.951	1.229	.769	.943	1.154	.896	1.270	.810	1.040
5	.921	.721	.945	1.426	1.192	1.155	1.248	.753	1.010	1.185	.957	1.014
4	1.125	1.087	.826	1.393	.777	1.025	.742	.750	1.012	1.462	1.363	1.197
3	.631	.850	.988	1.111	2.787	1.165	.837	.990	.989	.738	1.415	1.531
2	.946	.888	1.807	.625	.941	1.310	.625	.979	1.108	2.308	.932	1.008
1	2.995	.469	.477	2.968	2.483	3.458	1.004	.655	.989	.824	.999	4.862
0	1.222	5.355	.691	1.614	.579	.806	1.171	1.020	.629	5.771	.666	1.134

*These weights are based on the distributions of Table 3-1.

APPENDIX H-2. A theorem about measurement of change

In this appendix, the following theorem about the partial residuals of gains scores is proved.

Theorem:

The partial residuals of <u>gains score</u> if original score is among the set partialed out equals the partial residuals of <u>final score</u> with the same variables partialed out.

Notation:

N = number of cases

X_{ij} = score of individual i on variable X_j

Scales:

X = raw score scale

x_{ij} = deviation of raw score X_{ij} from mean $\overline{X}_j$.

$$x_{ij} = X_{ij} - \frac{\sum_{i=1}^{N} X_{ij}}{N} = X_{ij} - \overline{X}_j$$

z_{ij} = standard score = $\frac{x_{ij}}{s_{ij}}$

where s_{ij} = sample standard deviation

$\overline{z}_j = 0$

$s_{z_j} = 1$

$$t_{ij} = \frac{z_{ij}}{\sqrt{N}}$$

= standard score scaled in such a way that

$$\sum_{i=1}^{N} t_{ij} = 0 \quad \text{and} \quad \sum_{i=1}^{N} t_{ij}^{2} = 1$$

$$\bar{t}_j = 0$$

$$s_{t_j} = \frac{1}{\sqrt{N}}$$

$$s_{t_j}^{2} = \frac{1}{N}$$

Variables:

$$X_1 = \text{initial score}$$

$$\left.\begin{matrix} X_2 \\ X_3 \\ \cdot \\ \cdot \\ \cdot \\ X_m \end{matrix}\right\} \text{other covariates}$$

$$X_o = \text{final score}$$

$$X_d = \text{raw gain} = X_o - X_1$$

Theorem:

$X_{d.123...m}$ is a linear function of $X_{o.123...m}$

Proof:

N x (m + 2) score matrix T with elements t_{ij} is as follows:

$i = 1, 2,\ldots N$

$j = d, 0, 1, 2,\ldots m$

$$\begin{array}{c||c|c|c||} & & & \text{covariates} \\ & d & o & 1\ 2\ 3\ldots m \\ \hline \begin{matrix}1\\2\\3\\ \cdot\\ \cdot\\ \cdot\\ N\end{matrix} & T_d & T_o & T_c \\ \hline \end{array} = \text{Score Matrix } T$$

T_d and T_o are column vectors

Matrix X is matrix of deviation scores x_{ij} corresponding to matrix T

Partitioning of correlation matrix R:

$$\begin{array}{cc||c|c|c||} & & & & \text{covariates} \\ & & d & o & 1\ 2\ 3\ldots m \\ \hline & d & 1 & r_{do} & R_{dc} \\ \hline & o & r_{od} & 1 & R_{oc} \\ \hline \text{covariates} & \begin{matrix}1\\2\\3\\ \cdot\\ \cdot\\ \cdot\\ m\end{matrix} & R_{cd} & R_{co} & R_{cc} \\ \hline \end{array}$$

Vectors of residuals (of t)

Δ_j = column vector of N residuals of t_{ij} unexplained by covariates $t_{i1}, t_{i2}, \ldots t_{im}$

$\therefore \Delta_o$ = column vector of N residuals of t_{io} unexplained by covariates $t_{i1}, t_{i2}, \ldots t_{im}$

and

Δ_d = column vector of N residuals of t_{id} unexplained by $t_{i1}, t_{i2}, \ldots t_{im}$

$$t_{ij} = \frac{z_{ij}}{\sqrt{N}} = \frac{x_{ij} \Big/ \sqrt{\dfrac{\sum\limits_{i=1}^{N} x_{ij}^2}{N}}}{\sqrt{N}} = \frac{x_{ij}}{\sqrt{\sum\limits_{i=1}^{N} x_{ij}^2}}$$

Dropping subscript i:

$$t_j = \frac{x_j}{\sqrt{\Sigma x_j^2}} = x_j \, k_j$$

$$\text{where} \quad k_j = \frac{1}{\sqrt{\Sigma \, x_j^2}} = \frac{1}{s_{x_j} \sqrt{N}}$$

$$\therefore t_d = \frac{x_d}{\sqrt{\Sigma x_d^2}} = \frac{x_o - x_1}{\sqrt{\Sigma (x_o - x_1)^2}} = \frac{x_o - x_1}{s_{x_o - x_1}\sqrt{N}} = k_d \left(x_o - x_1\right)$$

$$\text{where } k_d = \frac{1}{s_{x_o - x_1}\sqrt{N}} = \frac{1}{s_{x_d}\sqrt{N}}$$

$$= 1 \Bigg/ \sqrt{N\left(s_{x_o}^{\ 2} + s_{x_1}^{\ 2} - 2r_{o1}\ s_{x_o} s_{x_1}\right)}$$

$$r_{cd} = r_{c(o-1)} = \frac{r_{co}\ s_{x_o} - r_{c1}\ s_{x_1}}{s_{x_d}}$$

$$= k_d \sqrt{N} \left(r_{co}\ s_{x_o} - r_{c1}\ s_{x_1}\right)$$

Column vector:

$$R_{cd} = \left(R_{co}\ s_{x_o} - R_{c1}\ s_{x_1}\right)\left(k_d \sqrt{N}\right)$$

$$\Delta_o = T_o - T_c\ R_{cc}^{-1}\ R_{co}$$

$$\Delta_d = T_d - T_c\ R_{cc}^{-1}\ R_{cd}$$

$$T_d = \left(X_o - X_1\right) k_d$$

$$= \left(T_o\ s_{x_o} \sqrt{N} - T_1\ s_{x_1} \sqrt{N}\right) k_d$$

$$\Delta_d = \left(T_o\, s_{x_o} - T_1\, s_{x_1}\right) k_d \sqrt{N} - T_c\, R_{cc}^{-1} \left(R_{co}\, s_{x_o} - R_{c1}\, s_{x_1}\right) \left(k_d \sqrt{N}\right)$$

$$= \left(T_o s_{x_o} - T_c R_{cc}^{-1}\, R_{co} s_{x_o}\right) k_d \sqrt{N} - \left(T_1 s_{x_1} - T_c R_{cc}^{-1}\, R_{c1} s_{x_1}\right) k_d \sqrt{N}$$

$$= \left(T_o - T_c R_{cc}^{-1}\, R_{co}\right) s_{x_o}\; k_d \sqrt{N} - \left(T_1 - T_c R_{cc}^{-1}\, R_{c1}\right) s_{x_1}\; k_d \sqrt{N}$$

$$= \left(T_o - T_c R_{cc}^{-1}\, R_{co}\right) \frac{s_{x_o}}{s_{x_d}} - \left(T_1 - T_c R_{cc}^{-1}\, R_{c1}\right) \frac{s_{x_1}}{s_{x_d}}$$

$$= \Delta_o \frac{s_{x_o}}{s_{x_d}} - \Delta_1 \frac{s_{x_1}}{s_{x_d}}$$

The vector of residuals $\Delta_1 = 0$ since t_1, the criterion variable, is itself included in the set of predictor variables c, and since therefore the multiple correlation $R_{1 \cdot c}$ equals 1.

$$\therefore\ \Delta_d = \Delta_o \frac{s_{x_o}}{s_{x_d}}$$

$$\therefore\ t_{d \cdot 12 \ldots m} = t_{o \cdot 123 \ldots m} \frac{s_{x_o}}{s_{x_d}}$$

Thus $t_{d \cdot 12 \ldots m}$ is a linear function of $t_{o \cdot 12 \ldots m}$

$\therefore$ Since X is a linear function of t,

$X_{d \cdot 123 \ldots m}$ is a linear function of $X_{o \cdot 123 \ldots m}$

General conclusion:

In studying change, analysis of variance of final measures will give the same results as analysis of variance of net change (final measure minus initial measure) as long as the initial measure is among the set of covariates in either case.

Corollary:

$$X_{d.123...m} = X_{o.123...m}$$

Proof:

$$\left\{\begin{aligned} t_o s_{x_o} &= \frac{x_o}{\sqrt{N}} \\ t_d s_{x_d} &= \frac{x_d}{\sqrt{N}} \end{aligned}\right\}$$

From definition of t scales

$$\therefore \left\{\begin{aligned} \frac{x_o}{t_o} &= s_{x_o} \sqrt{N} \\ \frac{x_d}{t_d} &= s_{x_d} \sqrt{N} \end{aligned}\right.$$

t is a linear transformation of x

$\therefore$ Their standard score forms are equal.

$$z_{t_{o.123...m}} = z_{x_{o.123...m}}$$

$$\frac{t_{o.123...m} - \overline{t}_{o.123...m}}{s_{t_{o.123...m}}} = \frac{x_{o.123...m} - \overline{x}_{o.123...m}}{s_{x_{o.123...m}}}$$

$$\begin{cases} \overline{t}_{o.123...m} = 0 \\ \overline{x}_{o.123...m} = 0 \end{cases}$$

$$\therefore \frac{t_{o.123...m}}{s_{t_{o.123...m}}} = \frac{x_{o.123...m}}{s_{x_{o.123...m}}}$$

$$\therefore \frac{x_{o.123...m}}{t_{o.123...m}} = \frac{s_{x_{o.123...m}}}{s_{t_{o.123...m}}}$$

$$\begin{cases} R^2_{o.123...m} = 1 - \frac{s^2_{x_{o.123...m}}}{s^2_x} \\ R^2{}_{o.123...m} = 1 - \frac{s^2_{t_{o.123...m}}}{s^2_{t_o}} \end{cases}$$

$$\therefore \frac{s^2_{t_{o.123...m}}}{s^2_{t_o}} = \frac{s^2_{x_{o.123...m}}}{s^2_x}$$

$$\therefore \frac{s_{t_{o.123...m}}}{s_{t_o}} = \frac{s_{x_{o.123...m}}}{s_{x_o}}$$

$$\therefore \frac{s_{x_{o.123...m}}}{s_{t_{o.123...m}}} = \frac{s_{x_o}}{s_{t_o}}$$

$$\therefore \frac{x_{o.123...m}}{t_{o.123...m}} = \frac{s_{x_o}}{s_{t_o}} = s_{x_o} \sqrt{N}$$

$$\therefore x_{o.123...m} = t_{o.123...m} \; s_{x_o} \sqrt{N}$$

Similarly:

$$x_{d.123...m} = t_{d.123...m} \; s_{x_d} \sqrt{N}$$

$$\therefore x_{d.123...m} = \left(t_{o.123...m} \cdot \frac{s_{x_o}}{s_{x_d}} \right) s_{x_d} \sqrt{N}$$

$$= t_{o.123...m} \; s_{x_o} \sqrt{N}$$

$$= x_{o.123...m}$$

$$X_{d.123...m} = x_{d.123...m} + \overline{X}_{d.123...m}$$

$$= x_{o.123...m} + \overline{X}_{(o-1).123...m}$$

$$= x_{o.123...m} + \overline{X}_{o.123...m} - \overline{X}_{1.123...m}$$

$$= x_{o.123...m} + \overline{X}_{o.123...m} - 0$$

$$= x_{o.123...m} + \overline{X}_{o.123...m}$$

$$= X_{o.123...m}$$

APPENDIX H-3. Derivation of formulas for determining how much of a battery's variance is attributable to first k canonical factors

A_k = k^{th} canonical variate for grade 9

B_k = k^{th} canonical variate for grade 12

$$\sigma_A = \sigma_B = 1$$

$r_{A_k B_k}$ = k^{th} canonical r

$\bar{r}_{aa}$ = average test reliability for grade 9

$\bar{r}_{bb}$ = average test reliability for grade 12

m_a = rank of grade 9 matrix

m_b = rank of grade 12 matrix

n_a = no. of variables in grade 9 matrix

n_b = no. of variables in grade 12 matrix

n' = no. of canonical correlations

m' = m_a or m_b (whichever is lower)

Factor scores:

F_k = canonical factor[1] underlying canonical variates A_k and B_k

S_k = unique factor for A_k

T_k = unique factor for B_k

---

[1] See page 6-26 for an explanation of the "canonical factor" concept.

Note:

F_k is a hypothetical construct containing only common variance, and therefore only reliable variance.

$$\sigma_F = \sigma_S = \sigma_T = 1$$

$$r_{FS} = r_{FT} = r_{ST} = 0$$

Factor loadings:

α_k is factor loading of A_k on F_k

β_k is factor loading of B_k on F_k

ε_k is factor loading of A_k on S_k

ω_k is factor loading of B_k on T_k

$$r_{A_iB_j} = 0 \qquad (i \neq j)$$

$$r_{F_iF_j} = 0 \qquad (i \neq j)$$

$$r_{A_iF_j} = r_{B_iF_j} = 0 \qquad (i \neq j)$$

$$A_k = \alpha_k F_k + \varepsilon_k S_k$$

$$B_k = \beta_k F_k + \omega_k T_k$$

$$r_{A_kB_k} = \alpha_k \beta_k$$

(At this point, in the interests of simplicity, we shall drop the subscript k.)

$$r_{AF} = \alpha$$

$$r_{BF} = \beta$$

Proportion of variance of A attributable to F

$$= r_{AF}^2 = \alpha^2$$

Proportion of variance of B attributable to F

$$= r_{BF}^2 = \beta^2$$

Converting "proportion" of variance to "amount of variance":

Variance on A attributable to F

$$= \sigma_{\underset{\sim}{A}}^2 = \sigma_A^2 \, r_{AF}^2 = \sigma_A^2 \alpha^2 = \alpha^2$$

Variance on B attributable to F

$$= \sigma_{\underset{\sim}{B}}^2 = \sigma_B^2 \, r_{BF}^2 = \sigma_B^2 \beta^2 = \beta^2$$

$$r_{\underset{\sim}{A}_i \underset{\sim}{A}_j} = 0 \qquad (i \neq j)$$

$$\sigma^2_{\underset{\sim}{A}_1 + \underset{\sim}{A}_2 + \dots + \underset{\sim}{A}_k} = \sigma_{\underset{\sim}{A}_i}^2 + \sigma_{\underset{\sim}{A}_2}^2 + \dots + \sigma_{\underset{\sim}{A}_k}^2 = \alpha_1^2 + \alpha_2^2 + \dots + \alpha_k^2$$

$$= \sum_{i=1}^{k} \alpha_i^2$$

= Variance on first k canonical variates in Battery A, attributable to first k canonical factors

Similarly $\sum_{i=1}^{k} \beta_i^2$ = variance on first k canonical variates in Battery B attributable to first k canonical factors

Defining total-battery variance

A battery of rank m has m principal components. All variables in the battery may be fully defined in terms of these m principal components, each of which is scaled to have a standard deviation of 1.

With this scaling the variance of the sum of m principal components is the sum of their variances since they are uncorrelated. Therefore the variance of the sum equals m.

Total battery variance

Total grade 9 variance = m_a

Total grade 12 variance = m_b

Defining total reliable variance of a battery

r_{xx} = reliability coefficient of test x

= proportion of test x's variance that is reliable

$1-r_{xx}$= proportion of test x's variance that is unreliable

$$X_o = X_\infty \sqrt{r_{xx}} + X_\varepsilon \sqrt{1-r_{xx}}$$

where X_o = observed score

X_∞ = true score

X_ε = unreliable component

$$\left(r_{\infty\varepsilon} = 0\right)$$

$$\sigma_{x_o} = \sigma_{x_\infty} = \sigma_{x_\varepsilon} = 1$$

Each of the n tests has its own X_ε error component and they are all uncorrelated. Therefore the sum of the variances they account for equals the total unreliable variance of the battery.

The unreliable variance of each test is $1 - r_{xx}$

Therefore the total unreliable variance of the n-test battery equals

$$\sum_{1}^{n} \left(1-r_{xx}\right) = n - \sum_{1}^{n} r_{xx}$$

Total reliable variance of a battery equals total battery variance minus total unreliable variance

$$= m - \left(n - \sum_{1}^{n} r_{xx}\right) = \sum_{1}^{n} r_{xx} - (n - m)$$

Percent of total Battery A variance attributable to first k canonical factors:

$$\% = \frac{100 \sum_{i=1}^{k} \alpha_i^{\,2}}{m_a}$$

Corresponding percent for Battery B

$$\% = \frac{100 \sum_{i=1}^{k} \beta_i^{\,2}}{m_b}$$

Percent of total <u>reliable</u> <u>Battery A</u> variance attributable to first k canonical factors

$$\% = \frac{100 \sum_{i=1}^{k} \alpha_i^{\,2}}{\sum_{1}^{n_a} r_{xx} - \left(n_a - m_a\right)} = \frac{100 \sum_{i=1}^{k} \alpha_i^{\,2}}{n_a \bar{r}_{aa} - \left(n_a - m_a\right)}$$

Corresponding percent for Battery B

$$\% = \frac{100 \sum_{i=1}^{k} \beta_i^{\,2}}{n_b \bar{r}_{bb} - \left(n_b - m_b\right)}$$

Special cases

Case I.

Assign α and β (factor loadings) in such a way that the proportions of Battery A variance and Battery B variance attributable to first k canonical factors are proportional to the average test reliability coefficients.

Simultaneous equations

$$\frac{\alpha^2}{\beta^2} = \frac{\bar{r}_{aa}}{\bar{r}_{bb}}$$

$$\alpha\beta = r_{AB} \qquad (1)$$

Solving these simultaneous equations

$$\frac{\alpha}{\beta} = \sqrt{\frac{\bar{r}_{aa}}{\bar{r}_{bb}}}$$

$$\therefore \beta = \frac{\alpha\sqrt{\bar{r}_{bb}}}{\sqrt{\bar{r}_{aa}}} \qquad (2)$$

Substituting (2) in (1)

$$\frac{\alpha^2\sqrt{\bar{r}_{bb}}}{\sqrt{\bar{r}_{aa}}} = r_{AB}$$

$$\therefore \alpha^2 = r_{AB} \frac{\sqrt{\bar{r}_{aa}}}{\sqrt{\bar{r}_{bb}}}$$

Similarly:

$$\beta^2 = r_{AB} \frac{\sqrt{\bar{r}_{bb}}}{\sqrt{\bar{r}_{aa}}}$$

Solution
to
simultaneous
equations

$$\sum_{i=1}^{k} \alpha_i^2 = \frac{\sqrt{\bar{r}_{aa}}}{\sqrt{\bar{r}_{bb}}} \sum_{i=1}^{k} r_{A_iB_i}$$

$$\sum_{i=1}^{k} \beta_i^2 = \frac{\sqrt{\bar{r}_{bb}}}{\sqrt{\bar{r}_{aa}}} \sum_{i=1}^{k} r_{A_iB_i}$$

Percent of total reliable Battery A variance attributable to first k canonical factors:

$$\% = \frac{100 \sum_{i=1}^{k} \alpha_i^2}{n_a \bar{r}_{aa} - \left(n_a - m_a\right)} = \frac{100 \sum_{i=1}^{k} \alpha_i^2}{n_a \bar{r}_{aa} \left(1 - \frac{n_a - m_a}{n_a \bar{r}_{aa}}\right)}$$

$$= \frac{100 \frac{\sqrt{\bar{r}_{aa}}}{\sqrt{\bar{r}_{bb}}} \sum_{i=1}^{k} r_{A_iB_i}}{n_a \bar{r}_{aa} \left(1 - \frac{n_a - m_a}{n_a \bar{r}_{aa}}\right)}$$

$$= \left(\frac{n_a \bar{r}_{aa}}{n_a \bar{r}_{aa} - \left(n_a - m_a\right)}\right) \frac{100 \sum_{i=1}^{k} r_{A_iB_i}}{n_a \sqrt{\bar{r}_{aa}} \sqrt{\bar{r}_{bb}}} \qquad (3)$$

Corresponding percent for Battery B:

$$\% = \left(\frac{n_b \bar{r}_{bb}}{n_b \bar{r}_{bb} - \left(n_b - m_b \right)} \right) \frac{100 \sum_{i=1}^{k} r_{A_i B_i}}{n_b \sqrt{\bar{r}_{aa}} \sqrt{\bar{r}_{bb}}} \qquad (4)$$

Note that in Case I if the battery matrix is of full rank, n = m and the expression in parentheses drops out, so that the formula becomes

$$\% = \frac{100 \sum_{i=1}^{k} r_{A_i B_i}}{n \sqrt{\bar{r}_{aa}} \sqrt{\bar{r}_{bb}}} \qquad (5)$$

Note also that if $n_a = m_a = n_b = m_b$ the percentages (given by formulas 3 and 4) for the two batteries are identical.

Formula 5 above bears a close resemblance to the formula for correcting a correlation coefficient for attenuation. As a matter of fact when n = 1, formula 5 reduces to the correction-for-attenuation formula if the 100 is dropped, thus changing <u>percentage</u> of reliable variance to <u>proportion</u> of reliable variance.

APPENDIX I

"PSEUDO-MATRICES" CORRESPONDING TO CONSISTENT CORRELATION MATRICES OF TABLES 6-1a AND 6-1b

(Based on Matched Cases)

TABLE I-1. Pseudo-matrix[a] of correlations based on males[b]

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
Information Test	1. R-102 63 Vocab. I		.7301	.6673	.7396	.7145	.7522	.6466	.6086	.6918	.6491	.5819	.4731
	2. R-103 63 Literature	.7301		.6671	.7459	.6725	.6936	.6645	.5411	.6022	.5081	.3915	.4127
	3. R-104 63 Music	.6673	.6671		.6255	.6059	.6165	.5651	.4030	.5571	.5047	.3875	.3337
	4. R-105 63 Soc. Stud.	.7396	.7459	.6255		.6582	.7312	.6216	.5411	.6203	.5487	.4514	.4576
	5. R-106 63 Math	.7145	.6725	.6059	.6582		.7743	.5525	.5262	.5903	.6118	.3910	.3268
	6. R-107 63 Phys. Sci.	.7522	.6936	.6165	.7312	.7743		.6550	.5438	.6890	.7315	.5040	.4216
	7. R-108 63 Bio. Sci.	.6466	.6645	.5651	.5216	.5525	.6550		.4952	.5568	.5503	.4891	.4713
	8. R-109 63 Scient.Att	.6086	.5411	.4030	.5411	.5262	.5438	.4952		.5053	.4704	.4381	.3539
	9. R-110 63 Aero-Space	.6918	.6022	.5571	.6203	.5903	.6890	.5568	.5053		.6431	.5464	.3932
	10. R-111 63 Electronic	.6491	.5081	.5047	.5487	.6118	.7315	.5503	.4704	.6431		.6236	.4039
	11. R-112 63 Mechanics	.5819	.3915	.3875	.4514	.3910	.5040	.4891	.4381	.5464	.6236		.4891
	12. R-113 63 Farming	.4731	.4127	.3337	.4576	.3268	.4216	.4713	.3539	.3932	.4039	.4891	
	13. R-114 63 Home Ec.	.4946	.4342	.4424	.4314	.4047	.4689	.4452	.3942	.4424	.4563	.4254	.3417
	14. R-115 63 Sports	.5504	.5561	.5036	.3978	.5256	.4911	.3866	.4367	.4510	.3351	.3034	.3121
	15. R-131 63 Art	.6142	.6718	.6229	.4131	.5489	.5780	.5420	.4762	.5627	.4538	.3977	.3365
	16. R-132 63 Law	.6300	.6208	.5434	.5776	.5196	.5693	.5248	.4960	.5726	.4795	.4619	.4030
	17. R-133 63 Health	.6421	.6602	.5553	.5134	.5341	.5974	.5438	.4452	.5049	.4904	.4514	.4627
	18. R-134 63 Engin.	.5455	.4758	.4028	.5195	.4116	.5280	.4506	.3863	.5104	.5084	.5426	.4398
	19. R-135 63 Arch.	.5539	.5376	.4844	.5220	.4867	.4916	.4368	.3619	.4726	.4299	.3662	.3078
	20. R-138 63 Military	.4806	.5216	.4861	.4787	.6369	.4425	.3501	.2996	.4468	.3555	.2839	.1947
	21. R-139 63 Acct,Busi.	.6269	.5375	.4875	.5764	.5156	.5175	.4581	.4821	.5369	.4689	.4456	.3687
	22. R-140 63 Prac.Knowl	.5205	.4994	.4173	.4263	.4089	.4131	.3771	.3320	.4031	.3557	.3750	.3771
	23. R-142 63 Bible	.5990	.6468	.5466	.6227	.5438	.6089	.5455	.4423	.4986	.4216	.2936	.3871
	24. R-145 63 Hunting	.1620	.0795	.0718	.1067	.0710	.1555	.2645	.0764	.1778	.2620	.3670	.3575
	25. R-146 63 Fishing	.3689	.2594	.2058	.2706	.2345	.2699	.3386	.2019	.2999	.2892	.3835	.3493
	26. R-147 63 Outdoor	.6355	.5543	.4068	.5741	.5368	.5391	.4691	.4439	.5235	.5020	.5551	.4245
	27. R-150 63 Theater	.6561	.6270	.5966	.6026	.5376	.5648	.4531	.4509	.5671	.4423	.3933	.4036
	28. R-102 63 Vocab. II	.7352	.6473	.6022	.5866	.5839	.6273	.5464	.4974	.5909	.4919	.4897	.4269
	29. R-212 63 Mem. Words	.3654	.3716	.3134	.3358	.3757	.3512	.2770	.2422	.2249	.2623	.1440	.1913
	30. R-220 63 Diag. Wds.	.5232	.5008	.4856	.4139	.5103	.4786	.3579	.3744	.3795	.3753	.2329	.1950
English Test	31. R-231 63 Spelling	.4049	.4613	.3819	.4362	.4686	.4233	.3297	.3193	.2696	.2174	.1324	.2433
	32. R-232 63 Capital.	.3000	.3156	.2563	.3346	.2865	.2929	.2355	.2741	.2140	.1983	.1753	.2334
	33. R-233 63 Punct.	.5224	.5278	.4707	.5159	.5991	.5267	.3938	.3911	.3690	.3562	.2341	.2668
	34. R-234 63 Eng. Usage	.4599	.4743	.4354	.4501	.4673	.4416	.3645	.3469	.3842	.3450	.3152	.3121
	35. R-235 63 Eff. Exp.	.4772	.4405	.3910	.4125	.4115	.4241	.3672	.3775	.3347	.3127	.2801	.2782
	36. R-240 63 Word.Funct	.5494	.5550	.5139	.5778	.6416	.5787	.4015	.4421	.4339	.4069	.2494	.3047
	37. R-250 63 Rdg. Compr	.7443	.7113	.6377	.7304	.6349	.6899	.6411	.6113	.6313	.5471	.4850	.5209
	38. R-260 63 Creativity	.6401	.5689	.5541	.5649	.5880	.6044	.5228	.5047	.5839	.6035	.5109	.4282
	39. R-270 63 Mech.Reas	.5525	.4572	.4400	.4795	.5110	.5701	.4751	.5035	.5963	.5960	.5714	.4549
	40. R-281 63 Vis. 2 Dim	.4170	.3422	.3198	.3659	.4072	.4184	.3308	.3629	.4164	.4152	.4017	.2743
	41. R-282 63 Vis. 3 Dim	.4527	.3828	.3579	.3826	.4501	.4784	.3900	.4089	.4702	.4713	.4480	.3028
	42. R-290 63 Abst.Reas	.5047	.4431	.4151	.4636	.5586	.5272	.4120	.4212	.4351	.4495	.3697	.3017
Math Test	43. R-311 63 Arith.Reas	.5671	.4871	.4065	.5106	.6096	.5618	.4227	.4781	.4123	.4648	.3926	.3326
	44. R-312 63 Int.HSMath	.5709	.5165	.4591	.5662	.8004	.6323	.4406	.4220	.4307	.4742	.3068	.2390
	45. R-333 63 Adv.HSMath	.4757	.4906	.4430	.4582	.7382	.5541	.3658	.3705	.4284	.3989	.1906	.1897
	46. F-410 63 Arith.Comp	.2818	.2228	.1858	.3080	.3354	.2840	.1933	.2365	.1483	.2045	.1723	.2404
	47. F-420 63 Table Read	.2828	.2479	.2348	.2754	.2720	.2686	.1494	.2419	.2249	.2303	.1974	.1643
	48. F-430 63 Cler.Check	.3578	.3485	.2929	.3325	.3507	.3395	.2203	.2627	.2501	.2634	.1979	.2042
	49. F-440 63 Obj.Insp.	.2794	.2205	.1937	.2310	.2078	.2552	.1734	.2681	.2864	.2585	.2866	.1805
Information Test	50. R-102 60 Vocab. I	.7411	.6519	.6217	.6256	.6499	.6791	.5672	.5241	.6308	.6032.	.4848	.3791
	51. R-103 60 Literature	.6163	.7152	.6249	.5866	.5573	.5686	.4940	.4267	.5292	.4473	.2849	.2694
	52. R-104 60 Music	.5644	.5850	.7188	.4931	.5310	.5136	.4083	.4009	.4853	.4301	.3065	.2485
	53. R-105 60 Soc. Stud.	.6670	.6838	.5927	.7449	.6409	.6669	.5511	.4912	.5693	.5178	.3752	.3353
	54. R-106 60 Math	.5859	.5739	.5266	.5483	.7157	.6248	.4640	.4385	.5082	.4980	.3357	.2596
	55. R-107 60 Phys. Sci.	.6321	.6004	.5251	.6084	.6427	.7502	.5673	.4549	.5753	.6210	.4017	.3373
	56. R-108 60 Bio. Sci.	.5709	.5415	.4669	.5504	.5359	.5798	.6380	.4209	.5223	.4930	.4385	.3995
	57. R-109 60 Scient.Att	.5163	.4457	.4055	.4504	.4308	.4498	.3832	.5522	.4220	.4015	.3511	.2881
	58. R-110 60 Aero-Space	.5747	.5251	.5244	.5085	.5229	.5787	.4870	.4209	.6726	.5754	.4384	.2834
	59. R-111 60 Electronic	.5445	.4354	.4343	.4403	.5124	.5954	.4698	.4027	.5528	.7033	.4884	.2920
	60. R-112 60 Mechanics	.5654	.4067	.4284	.4272	.4518	.4886	.4452	.3995	.5205	.5897	.6476	.3931
	61. R-113 60 Farming	.5020	.4372	.3760	.4452	.3967	.4480	.4753	.3718	.4306	.4400	.4447	.6283
	62. R-114 60 Home Ec.	.4339	.3843	.4017	.3767	.3928	.4153	.3669	.3226	.3735	.4069	.3547	.2754
	63. R-115 60 Sports	.4951	.4933	.4952	.5169	.5182	.4414	.3245	.3774	.4063	.3044	.2348	.2341
	64. R-131 60 Art	.5760	.5910	.5676	.5241	.4923	.5171	.4351	.4078	.4863	.4556	.3497	.2575
	65. R-132 60 Law	.5177	.5182	.4801	.4991	.4860	.4893	.4111	.4100	.4841	.4281	.3297	.2413
	66. R-133 60 Health	.5670	.5463	.5097	.5124	.5328	.5435	.4556	.4014	.4858	.4568	.3487	.3028
	67. R-134 60 Engin.	.4517	.3856	.3747	.3970	.3928	.4250	.3493	.3230	.4268	.4490	.3880	.2704
	68. R-135 60 Arch.	.3544	.3600	.3381	.3307	.3112	.3193	.2757	.2328	.3171	.2965	.2216	.1795
	69. R-138 60 Military	.4335	.4603	.4650	.4177	.4133	.3893	.2933	.3134	.4036	.3422	.2470	.1667
	70. R-139 60 Acct,Busi.	.4858	.4767	.4506	.4545	.4803	.4547	.3548	.3639	.4140	.4270	.3337	.2424
	71. R-140 60 Prac.Knowl	.4943	.4554	.4581	.4548	.4375	.4340	.3683	.3571	.4084	.3876	.3268	.2427
	72. R-142 60 Bible	.4715	.5468	.4755	.4824	.4509	.4479	.4174	.3388	.3905	.3484	.2514	.3055
	73. R-145 60 Hunting	.1667	.0917	.0374	.1290	.0654	.1630	.2472	.1118	.1578	.1795	.2955	.3178
	74. R-146 60 Fishing	.2494	.1778	.1902	.1785	.1837	.2122	.2718	.1545	.2404	.2162	.2453	.2415
	75. R-147 60 Outdoor	.5474	.4874	.4647	.4625	.4967	.4954	.4136	.4170	.4600	.4649	.3943	.2924
	76. R-150 60 Theater	.5372	.5465	.5366	.4580	.4743	.4678	.3688	.3906	.4805	.3939	.2964	.2346
	77. R-162 60 Vocab. II	.6531	.6030	.5877	.5562	.5929	.5856	.4599	.4635	.5396	.5214	.4144	.3084
	78. R-212 60 Mem. Words	.3710	.3755	.3641	.3617	.4023	.3678	.2726	.2360	.2657	.2618	.1602	.1881
	79. R-220 60 Diag. Wds.	.5219	.5222	.4968	.4442	.5109	.4803	.3690	.3780	.3889	.3712	.2740	.2570
English Test	80. R-231 60 Spelling	.4135	.4279	.4034	.3942	.4601	.3964	.2579	.2769	.2834	.2561	.1521	.2254
	81. R-232 60 Capital.	.3422	.3203	.3205	.3543	.3391	.3182	.2392	.2418	.2557	.2578	.2127	.2050
	82. R-233 60 Punct.	.5359	.5016	.4709	.5004	.5940	.5366	.3917	.4242	.3976	.4277	.2907	.2861
	83. R-234 60 Eng. Usage	.4743	.4282	.4174	.4268	.4492	.4349	.3692	.3628	.3822	.3743	.3017	.2928
	84. R-235 60 Eff. Exp.	.4104	.3801	.3418	.3670	.3920	.3652	.2952	.3541	.2995	.3043	.2525	.2355
	85. R-240 60 Word.Funct	.4442	.4715	.4311	.4383	.5772	.4785	.3627	.3617	.3674	.3715	.2244	.2275
	86. R-250 60 Rdg. Compr	.6897	.6669	.6056	.6450	.6408	.6397	.5299	.5279	.5812	.5135	.3907	.3617
	87. R-260 60 Creativity	.5220	.4630	.4462	.4356	.4853	.4844	.4093	.3875	.4855	.4826	.3884	.2722
	88. R-270 60 Mech.Reas	.5312	.4027	.4129	.4299	.5070	.5434	.4416	.4060	.5330	.6137	.5108	.3430
	89. R-281 60 Vis. 2 Dim	.3070	.2494	.2388	.2569	.3369	.3081	.2013	.2443	.2895	.3152	.2463	.1963
	90. R-282 60 Vis. 3 Dim	.3631	.3098	.3166	.3119	.4183	.4006	.2980	.2995	.3690	.4410	.3188	.1982
	91. R-290 60 Abst.Reas	.4278	.3597	.3742	.3898	.5015	.4611	.3368	.3769	.3793	.3988	.2835	.2236
Math Test	92. R-311 60 Arith.Reas	.5554	.4856	.4523	.5179	.6269	.5760	.4293	.4566	.4529	.4804	.3513	.2934
	93. R-312 60 Int.HSMath	.5387	.5422	.4833	.5184	.6849	.5745	.3999	.4408	.4226	.4337	.2787	.2603
	94. R-333 60 Adv.HSMath	.1507	.1355	.1687	.1473	.1992	.1745	.1386	.1305	.1364	.1454	.0796	.0536
	95. F-410 60 Arith.Comp	.3051	.2595	.2744	.3165	.3293	.3072	.1836	.2326	.2080	.2114	.1572	.1815
	96. F-420 60 Table Read	.1997	.1711	.1649	.1957	.2057	.1773	.1093	.1601	.1498	.1354	.0969	.1217
	97. F-430 60 Cler.Check	.1865	.1946	.2036	.1761	.2270	.1840	.0970	.1494	.1502	.0935	.0469	.0976
	98. F-440 60 Obj.Insp.	.1463	.1675	.1347	.1367	.1693	.1668	.1122	.1655	.1455	.1158	.1107	.0837
	99. P*801 60 Socioecon.	.3717	.3643	.3929	.2818	.4062	.3483	.2232	.2682	.3172	.2991	.2145	.0673

TABLE I-1 (continued)

13	14	15	16	17	18	19	20	21	22	23	24	25	Variable
.4788	.5564	.6342	.6300	.6421	.5455	.5539	.4806	.6269	.5205	[illegible]	.1626	.3669	1. R-102 63
.4141	.5581	.6718	.6258	.6062	.4758	.5376	.5216	.5395	.4994	.7466	.1775	.2594	2. R-103 63
.4464	.5634	.6225	.5434	.5053	.4026	.4044	.4801	.4875	.4173	.3466	.1700	.2058	3. R-104 63
.4312	.5990	.6131	.6720	.6194	.5155	.5226	.4787	.5764	.5203	.6727	.1167	.2706	4. R-105 63
.4047	.5256	.5489	.5196	.5361	.4118	.4867	.4369	.5156	.4089	.5438	.0710	.2345	5. R-106 63
.4688	.4711	.5780	.5693	.5974	.5280	.4716	.4425	.5175	.4131	.6389	.1555	.2699	6. R-107 63
.4452	.3466	.5426	.5248	.5438	.4508	.4360	.3501	.4581	.3771	.3495	.2645	.1366	7. R-108 63
.3762	.4367	.4762	.4960	.4452	.3063	.3619	.2996	.4821	.3320	.4423	.1704	.2019	8. R-109 63
.4424	.4510	.5627	.5726	.5049	.5104	.4726	.4468	.5389	.4031	[illegible]	.1778	.2999	9. R-110 63
.4563	.3351	.4530	.4735	.4964	.5084	.4297	.3555	.4609	.3557	.6215	.2620	.2892	10. R-111 63
.4254	.3034	.3977	.4619	.4514	.5426	.3662	.2839	.4436	.3750	.2456	.3673	.3835	11. R-112 63
.3417	.3121	.3365	.4030	.4627	.4396	.3078	.1947	.4687	.3271	.3571	.3575	.3493	12. R-113 63
	.3183	.4626	.4262	.4635	.4253	.4110	.2883	.4113	.3405	.3837	.1747	.2128	13. R-114 63
.3183		.5087	.4893	.4944	.3901	.4088	.4229	.4396	.4400	.4394	.0937	.2822	14. R-115 63
.4626	.5087		.5688	.5651	.4622	.4921	.4950	.5081	.4809	.5166	.0976	.2446	15. R-131 63
.4262	.4893	.5688		.5056	.4390	.4074	.4984	.5436	.4966	.5128	.1525	.2592	16. R-132 63
.4635	.4944	.5651	.5056		.4692	.3788	.4323	.5025	.5231	.4711	.1705	.3044	17. R-133 63
.4253	.3901	.4622	.4390	.4692		.3415	.3323	.4148	.4490	.3704	.2421	.3271	18. R-134 63
.4110	.4088	.4921	.4074	.3788	.3415		.3706	.3623	.2990	.4101	.1113	.2076	19. R-135 63
.2883	.4229	.4950	.4984	.4323	.3323	.3706		.3957	.3815	.4531	.1063	.2007	20. R-138 63
.4113	.4396	.5081	.5436	.5025	.4148	.3623	.3957		.4704	.4316	.1130	.2384	21. R-139 63
.3405	.4460	.4809	.4966	.5231	.4490	.2990	.3815	.4704		.4016	.1227	.2643	22. R-140 63
.3837	.4394	.5166	.5128	.4711	.3704	.4101	.4531	.4316	.4016		.1142	.2239	23. R-142 63
.1747	.0937	.0976	.1525	.1705	.2421	.1113	.1063	.1130	.1227	.1142		.4066	24. R-145 63
.2128	.2822	.2446	.2592	.3044	.3271	.2076	.2007	.2384	.2643	.2239	.4066		25. R-146 63
.4490	.4883	.5065	.5206	.5625	.4708	.4114	.4100	.4422	.4984	.4405	.2076	.3681	26. R-147 63
.4519	.5117	.6106	.5305	.5130	.4093	.4386	.4632	.5068	.4818	.4951	.1669	.2271	27. R-150 63
.4734	.5472	.6449	.6291	.6376	.4851	.4158	.4494	.6500	.5289	.5217	.1516	.2984	28. R-162 63
.1789	.2466	.3016	.3067	.2533	.1695	.1985	.2821	.2758	.2900	.3653	.0175	.1063	29. R-212 63
.2855	.3444	.4083	.2523	.2821	.1808	.2346	.2667	.2440	.1412	.3331	.0646	.0850	30. R-220 63
.1887	.3182	.4332	.3683	.3641	.2253	.2329	.3746	.3715	.3560	.3605	-.0194	.1760	31. R-231 63
.2337	.2613	.2503	.2990	.2525	.2138	.1554	.3162	.2585	.3272	.2722	.0071	.0935	32. R-232 63
.2613	.3601	.4471	.4551	.4554	.3001	.2613	.4176	.4415	.3625	.4559	.0138	.1681	33. R-233 63
.2422	.3145	.4670	.4178	.4066	.2406	.2599	.3500	.3909	.3243	.4227	.0418	.1517	34. R-234 63
.2466	.2874	.3692	.3724	.3253	.2696	.2514	.2934	.3313	.2917	.3551	.0302	.1291	35. R-235 63
.3054	.4114	.3859	.3397	.3570	.2013	.3774	.3420	.2986	.2213	.3830	-.0011	.1885	36. R-240 63
.4468	.5392	.5140	.4765	.5071	.3290	.4978	.4137	.3947	.3484	.4720	.1225	.2403	37. R-250 63
.4285	.4104	.4456	.3227	.3878	.2726	.3926	.3020	.2905	.2759	.3702	.1508	.1872	38. R-260 63
.4038	.2958	.3811	.3167	.3492	.2722	.3385	.2454	.2856	.2620	.2986	.1885	.2428	39. R-270 63
.3300	.2443	.1878	.1540	.1055	.0996	.1634	.0941	.1286	.0852	.1210	.0534	.0610	40. R-281 63
.3488	.2249	.3477	.2310	.3332	.2144	.3539	.2082	.2344	.2756	.2434	.0575	.1366	41. R-282 63
.3062	.3341	.3639	.3371	.3186	.2777	.3006	.2889	.3041	.2687	.3554	.0575	.1578	42. R-290 63
.3509	.3630	.4552	.4818	.4265	.3537	.2743	.4052	.4808	.3972	.4206	.0481	.2111	43. R-311 63
.2954	.4651	.4818	.4530	.4275	.3054	.3128	.3924	.4039	.3461	.3756	-.0112	.1410	44. R-312 63
.2664	.3964	.4066	.4051	.3231	.3025	.3553	.3408	.3547	.2776	.3173	-.0031	.1801	45. R-333 63
.1542	.2915	.2394	.2013	.2380	.2261	.1007	.2767	.2485	.2635	.2469	-.0233	.1341	46. F-410 63
.1988	.2309	.1319	.1518	.1803	.1644	.0981	.1257	.2270	.2820	.1285	.0408	.0841	47. F-420 63
.2017	.2717	.2561	.1350	.1805	.1059	.1790	.1927	.1596	.0898	.1408	.0887	.0664	48. F-430 63
.1874	.1963	.1998	.0831	.2322	.2013	.1612	.1163	.2307	.2077	.0884	.0114	.1168	49. F-440 63
.4187	.4673	.5988	.5539	.5364	.4531	.4720	.4580	.4752	.4135	.5350	.1321	.3368	50. R-102 60
.3497	.4159	.5716	.4742	.4551	.3275	.4541	.4677	.4108	.3435	.5212	.0681	.2199	51. R-103 60
.3684	.4057	.5146	.4252	.4076	.2889	.4211	.4096	.3888	.3179	.4703	.0172	.1556	52. R-104 60
.3622	.5154	.6009	.5600	.5073	.4257	.4816	.5079	.4903	.4173	.5566	.0909	.2444	53. R-105 60
.3388	.4204	.4913	.4527	.4280	.3466	.4224	.3687	.4206	.3309	.4508	.0613	.2116	54. R-106 60
.3623	.3979	.5060	.4513	.4725	.3675	.4193	.3653	.3907	.3260	.4750	.1062	.2694	55. R-107 60
.3734	.3437	.4777	.4727	.4468	.3634	.3819	.3794	.3750	.3137	.4334	.1910	.3518	56. R-108 60
.3030	.3424	.4040	.4088	.3640	.3177	.3192	.3184	.3738	.2926	.3780	.1174	.2211	57. R-109 60
.3653	.3838	.4942	.4587	.4115	.3384	.3994	.4038	.3924	.3000	.4209	.1273	.2498	58. R-110 60
.3691	.2542	.4188	.3870	.3931	.3480	.3558	.2982	.3885	.2382	.3485	.1060	.2035	59. R-111 60
.4032	.2929	.4363	.4310	.4149	.4247	.3501	.3231	.4091	.3194	.3064	.2623	.3492	60. R-112 60
.3499	.2955	.3655	.3899	.3649	.3487	.3025	.2826	.3428	.2787	.3633	.2800	.2979	61. R-113 60
.5609	.2932	.3867	.3288	.3317	.3253	.2805	.2403	.3495	.2682	.2869	.1624	.2137	62. R-114 60
.2627	.7060	.4352	.4139	.4027	.3029	.3390	.4153	.3527	.3426	.3704	.0216	.2327	63. R-115 60
.3712	.3816	.6286	.4624	.4426	.3800	.4387	.4229	.4227	.3769	.4505	.0697	.2237	64. R-131 60
.8241	.3691	.4777	.5302	.4017	.3541	.3509	.4193	.4029	.3413	.4444	.0985	.2049	65. R-132 60
.8531	.3848	.4977	.4735	.5102	.3662	.3630	.4002	.4214	.3747	.4343	.0883	.2397	66. R-133 60
.3073	.2980	.3939	.3483	.3798	.4142	.2946	.2794	.3436	.3031	.3072	.1313	.2380	67. R-134 60
.2250	.2391	.3273	.2291	.2470	.2084	.3781	.2141	.2578	.1660	.2677	.0217	.1384	68. R-135 60
.2172	.3335	.4171	.3761	.3199	.2655	.3485	.4771	.3455	.2925	.3967	.0647	.1685	69. R-138 60
.3223	.3479	.4439	.4439	.3798	.3400	.3549	.3328	.4678	.3602	.3858	.0977	.2141	70. R-139 60
.3163	.3530	.4546	.3817	.4092	.3505	.2922	.3187	.3835	.4779	.3455	.0338	.2055	71. R-140 60
.2581	.3299	.4496	.4156	.3379	.3024	.3460	.3894	.3700	.2991	.7371	.0880	.1956	72. R-142 60
.1407	.0737	.0992	.1193	.1626	.1966	.0776	.1035	.1224	.1364	.0901	.5227	.3428	73. R-145 60
.1918	.1717	.1498	.1606	.1990	.1935	.1224	.1369	.1532	.1404	.1634	.2987	.5377	74. R-146 60
.3267	.3909	.4433	.4268	.4163	.3839	.3498	.3408	.4136	.3868	.3604	.1427	.2599	75. R-147 60
.3496	.3890	.5200	.4289	.4049	.3382	.3543	.4057	.3986	.3601	.3894	.0563	.1734	76. R-150 60
.3771	.4301	.5717	.5335	.4921	.4099	.4146	.4408	.5237	.4267	.4830	.0925	.2763	77. R-162 60
.1651	.2858	.3026	.2879	.2561	.1706	.2344	.2227	.2410	.1644	.3145	.0215	.1986	78. R-212 60
.2793	.3883	.4642	.3585	.4175	.2804	.3179	.3464	.3382	.3750	.4019	.0805	.2149	79. R-220 60
.2075	.3516	.3658	.3309	.3289	.2058	.2570	.3275	.2807	.2837	.3613	.0525	.1827	80. R-231 60
.2112	.3141	.3586	.3210	.3640	.3026	.2643	.2976	.3119	.3117	.3267	-.0048	.1654	81. R-232 60
.2735	.3764	.4138	.3812	.4220	.3182	.3268	.3534	.3722	.3323	.4235	.0190	.1829	82. R-233 60
.2754	.3130	.3928	.3776	.3582	.3096	.3106	.3297	.3615	.2978	.3861	.1336	.2191	83. R-234 60
.2282	.3179	.3658	.3199	.3155	.2662	.2588	.2826	.3043	.2535	.3314	.0467	.1442	84. R-235 60
.2426	.3443	.3665	.3206	.3445	.2397	.3110	.3007	.3057	.2097	.4051	-.0031	.1538	85. R-240 60
.3826	.4685	.5806	.5228	.5072	.4061	.4701	.4781	.4728	.3952	.5589	.1321	.2991	86. R-250 60
.3421	.3027	.4704	.3901	.3815	.3504	.3671	.3617	.4103	.3367	.3754	.1295	.2384	87. R-260 60
.3464	.2611	.3982	.3520	.3833	.3676	.3429	.2780	.3267	.2784	.3228	.2003	.2505	88. R-270 60
.1968	.1689	.2147	.1895	.2316	.1993	.1827	.1520	.1803	.1848	.1212	.0697	.1086	89. R-281 60
.2547	.1432	.2783	.2388	.2540	.2311	.2765	.2162	.2309	.1837	.2268	.1093	.1432	90. R-282 60
.2543	.2881	.3433	.2862	.2775	.2603	.2925	.2244	.2751	.2267	.3139	.0477	.1195	91. R-290 60
.3172	.3882	.3956	.4458	.3828	.3229	.3585	.3529	.4376	.2016	.4119	.0686	.2207	92. R-311 60
.3041	.4086	.4341	.4281	.3960	.3112	.3746	.3609	.3844	.3211	.4305	.0471	.1957	93. R-312 60
.0951	.1296	.1283	.1250	.1060	.0705	.1112	.0490	.0618	.0698	.0596	.0009	.0826	94. R-333 60
.1841	.3051	.2391	.2111	.2268	.2181	.1703	.2028	.2346	.2138	.2174	.0337	.1414	95. F-410 60
.1258	.1905	.1442	.1578	.1558	.1449	.0759	.1188	.1753	.2015	.1108	-.0355	.0830	96. F-420 60
.0766	.1898	.1515	.1341	.1390	.0902	.1201	.1476	.1525	.1728	.1315	-.0495	.0476	97. F-430 60
.1028	.1012	.1335	.0982	.1160	.0932	.1023	.0815	.0962	.1397	.0616	.0552	.0843	98. F-440 60
.2109	.2796	.3359	.2900	.2777	.2068	.2736	.2664	.2948	.2264	.2046	-.0573	.0842	99. P*801 60

TABLE I-1 (continued)

	Variable	26	27	28	29	30	31	32	33	34	35	36	37
Information Test	1. R-102 63 Vocab. I	.4355	.6581	.7352	.3654	.5232	.4049	.3000	.5224	.5597	.4772	.3494	.7443
	2. R-103 63 Literature	.5543	.6270	.6473	.3716	.5088	.4613	.3156	.5278	.4731	.4409	.3556	.7113
	3. R-104 63 Music	.4808	.5966	.7022	.3134	.4896	.3819	.2563	.4707	.4424	.3710	.5133	.6377
	4. R-105 63 Soc. Stud.	.5741	.6026	.6666	.3330	.4139	.4362	.3340	.5199	.4661	.4125	.3775	.7304
	5. R-106 63 Math	.5368	.5470	.6879	.3757	.5163	.4686	.2885	.5991	.4723	.4119	.4416	.6349
	6. R-107 63 Phys. Sci.	.5391	.5640	.6273	.3512	.4716	.4233	.2929	.5267	.4416	.4241	.5747	.6839
	7. R-108 63 Bio. Sci.	.4631	.4531	.5664	.2770	.3577	.3297	.2355	.3938	.3645	.3672	.4619	.6411
	8. R-109 63 Scient.Att	.4439	.4507	.4974	.2422	.3744	.3193	.2741	.3911	.3467	.3775	.4421	.6113
	9. R-110 63 Aero-Space	.5235	.5671	.5909	.2249	.3795	.2696	.2140	.3690	.3642	.3347	.4339	.6413
	10. R-111 63 Electronic	.5020	.4423	.4917	.2023	.3753	.2174	.1343	.3562	.3450	.3127	.4067	.5471
	11. R-112 63 Mechanics	.5551	.3933	.4857	.1446	.2327	.1324	.1713	.2341	.3152	.2801	.2494	.4656
	12. R-113 63 Farming	.4245	.4346	.4267	.1313	.1950	.2433	.2334	.2608	.3121	.2752	.3347	.5209
	13. R-114 63 Home Ec.	.4490	.4519	.4734	.1789	.2855	.1887	.2337	.2613	.2622	.2646	.3254	.4468
	14. R-115 63 Sports	.4883	.5117	.5472	.2666	.3444	.3162	.2613	.3601	.3140	.2674	.4114	.5392
	15. R-131 63 Art	.5065	.6106	.6449	.3010	.4603	.4332	.2563	.4471	.4476	.3672	.3457	.5140
	16. R-132 63 Law	.5206	.5305	.6291	.3067	.2523	.3683	.2930	.4551	.4178	.3724	.3397	.4765
	17. R-133 63 Health	.5025	.5130	.6376	.2333	.2821	.3641	.2525	.4554	.4066	.3253	.3370	.5071
	18. R-134 63 Engin.	.4708	.4093	.4851	.1095	.1868	.2253	.2130	.3001	.2406	.2090	.2313	.3290
	19. R-135 63 Arch.	.4114	.4386	.4158	.1355	.2346	.2324	.1554	.2613	.2539	.2514	.3774	.4976
	20. R-138 63 Military	.4100	.4632	.4494	.2021	.2667	.3746	.3162	.4176	.3550	.2934	.3420	.4137
	21. R-139 63 Acct,Busi.	.4422	.5068	.6506	.2756	.2440	.3715	.2595	.4415	.3909	.3313	.2968	.3947
	22. R-140 63 Prac.Knowl	.4984	.4418	.5289	.2906	.1412	.3560	.3272	.3625	.3243	.2917	.2213	.3484
	23. R-142 63 Bible	.4405	.4951	.5217	.3653	.3331	.3805	.2722	.4559	.4227	.3551	.3330	.4720
	24. R-145 63 Hunting	.2076	.1009	.1516	.0175	.0646	-.0194	.0071	.0138	.0418	.0302	-.0011	.1225
	25. R-146 63 Fishing	.3681	.2271	.2984	.1063	.0850	.1760	.0935	.1681	.1517	.1291	.1015	.2403
	26. R-147 63 Outdoor		.4712	.5810	.3089	.2238	.3561	.2328	.3684	.3372	.3389	.3146	.4569
	27. R-150 63 Theater	.4712		.6137	.2940	.4223	.4318	.2929	.4246	.4218	.3259	.3752	.4942
	28. R-162 63 Vocab. II	.5810	.6137		.2926	.3945	.4535	.2905	.4927	.4936	.3930	.3987	.5619
	29. R-212 63 Mem. Words	.3089	.2940	.2926		.3397	.3833	.2949	.4485	.3584	.3225	.4857	.4890
	30. R-220 63 Disg. Wds.	.2238	.4223	.3945	.3397		.5031	.3750	.5023	.4412	.4320	.4682	.5082
English Test	31. R-231 63 Spelling	.3561	.4318	.4535	.3833	.5031		.4239	.5669	.5058	.4473	.5179	.4972
	32. R-232 63 Capital.	.2328	.2929	.2905	.2989	.3750	.4239		.4978	.4375	.4010	.4012	.4988
	33. R-233 63 Punct.	.3684	.4246	.4927	.4485	.5023	.5669	.4978		.6048	.5551	.6550	.6190
	34. R-234 63 Eng. Usage	.3372	.4218	.4936	.3584	.4412	.5058	.4375	.6048		.5157	.4423	.5450
	35. R-235 63 Eff. Exp.	.3389	.3259	.3930	.3225	.4320	.4473	.4010	.5551	.5157		.4681	.5526
	36. R-240 63 Word.Funct	.3146	.3752	.3987	.4857	.4682	.5179	.4012	.6550	.4423	.4681		.6387
	37. R-250 63 Rdg. Compr	.4569	.4942	.5619	.4890	.5082	.4972	.4988	.6190	.5450	.5526	.6387	
	38. R-260 63 Creativity	.3621	.3845	.4360	.3708	.4645	.3610	.3676	.4674	.4133	.4383	.5001	.6320
	39. R-270 63 Mech.Reas	.4105	.3135	.3585	.3335	.4043	.2339	.3084	.4199	.3378	.3501	.4088	.5184
	40. R-281 63 Vis. 2 Dim	.1752	.1426	.2222	.1859	.3358	.1293	.2124	.2338	.1243	.2301	.3031	.3480
	41. R-282 63 Vis. 3 Dim	.3250	.2664	.3423	.2851	.3286	.1691	.2605	.3478	.2260	.3005	.4424	.4764
	42. R-290 63 Abst.Reas	.3270	.3261	.3887	.3457	.4111	.3009	.3296	.4855	.3650	.3825	.5106	.5435
Math Test	43. R-311 63 Arith.Reas	.4084	.3903	.5440	.3777	.4514	.4332	.3856	.6098	.4911	.4975	.5356	.6399
	44. R-312 63 Int.HSMath	.3928	.3728	.4977	.4246	.4972	.5154	.3610	.6483	.4962	.4448	.6662	.6496
	45. R-333 63 Adv.HSMath	.3242	.3337	.3830	.3654	.4194	.4293	.2876	.5475	.3946	.3583	.6319	.5417
	46. F-410 63 Arith.Comp	.2389	.2569	.3042	.2502	.3090	.3462	.3312	.3670	.3154	.3005	.3086	.3850
	47. F-420 63 Table Read	.1661	.1836	.1656	.0759	.2345	.0687	.1522	.1037	.0817	.1616	.2007	.2218
	48. F-430 63 Cler.Check	.1232	.2067	.2220	.1803	.4180	.2263	.2878	.2482	.1962	.2094	.2672	.2876
	49. F-440 63 Obj.Insp.	.2240	.1909	.2110	.2071	.2602	.1020	.1436	.1583	.0957	.1756	.2235	.2341
Information Test	50. R-102 60 Vocab. I	.5284	.5781	.6276	.3915	.5192	.4360	.3042	.5374	.4710	.4280	.5270	.6447
	51. R-103 60 Literature	.4097	.5311	.4968	.3627	.4768	.4239	.2671	.4598	.4227	.3900	.4881	.5816
	52. R-104 60 Music	.3671	.5222	.4680	.2832	.4533	.3528	.2332	.4010	.3629	.3290	.4377	.5012
	53. R-105 60 Soc. Stud.	.4791	.5252	.5806	.3847	.4368	.4499	.3130	.5174	.4577	.4133	.5062	.6178
	54. R-106 60 Math	.4278	.4609	.4828	.3523	.4367	.4185	.2427	.5232	.3937	.3582	.5663	.5339
	55. R-107 60 Phys. Sci.	.4255	.4299	.5026	.3456	.4277	.4103	.2682	.4924	.3884	.3485	.5109	.5825
	56. R-108 60 Bio. Sci.	.4533	.4404	.4572	.3187	.3446	.3618	.2571	.4317	.3896	.3418	.4073	.5148
	57. R-109 60 Scient.Att	.3701	.3857	.4198	.2825	.3392	.3046	.2755	.4231	.3671	.3594	.3713	.4831
	58. R-110 60 Aero-Space	.4375	.4666	.4540	.2342	.3641	.2632	.2010	.3585	.3436	.3036	.3887	.4950
	59. R-111 60 Electronic	.3788	.3660	.4425	.2181	.3374	.2400	.1520	.3422	.2906	.2749	.3247	.4207
	60. R-112 60 Mechanics	.4656	.4151	.5142	.1962	.3993	.2517	.2151	.3307	.3326	.2820	.3048	.4660
	61. R-113 60 Farming	.3765	.3616	.4081	.2635	.2772	.2898	.2583	.3379	.3426	.3061	.2998	.4410
	62. R-114 60 Home Ec.	.3229	.3494	.3788	.2024	.2664	.2663	.2093	.2931	.2692	.2361	.2917	.3617
	63. R-115 60 Sports	.3991	.4544	.4396	.3070	.3408	.3490	.2640	.3958	.3321	.3186	.4036	.4703
	64. R-131 60 Art	.3942	.5403	.5178	.3129	.4477	.3729	.2707	.4329	.3936	.3876	.4221	.5292
	65. R-132 60 Law	.3780	.4473	.4538	.2644	.3227	.2998	.2203	.3786	.3503	.3118	.3812	.4528
	66. R-133 60 Health	.4159	.4913	.5104	.2953	.4066	.3924	.2777	.4077	.3805	.3327	.4329	.5069
	67. R-134 60 Engin.	.3709	.3636	.4206	.2250	.3104	.2678	.2059	.3225	.2807	.2583	.3142	.4045
	68. R-135 60 Arch.	.2333	.2771	.2556	.1940	.2464	.2203	.1511	.2609	.2372	.2253	.2838	.3212
	69. R-138 60 Military	.3355	.4213	.3816	.1918	.2966	.2478	.1690	.3103	.2643	.2503	.3365	.3795
	70. R-139 60 Acct,Busi.	.3518	.4097	.4538	.2520	.3166	.2967	.2126	.3651	.3231	.2964	.3807	.4313
	71. R-140 60 Prac.Knowl	.3877	.4188	.4785	.2511	.3483	.3195	.2702	.4066	.3480	.3076	.3471	.4504
	72. R-142 60 Bible	.3514	.4176	.4129	.3170	.2899	.3237	.2475	.4225	.3437	.3283	.4329	.4925
	73. R-145 60 Hunting	.2302	.1039	.1469	.0452	.0418	.0463	.0308	.0832	.0837	.0980	.0385	.1317
	74. R-146 60 Fishing	.2234	.1467	.1865	.1079	.1041	.1105	.0908	.1313	.1373	.1253	.1256	.1962
	75. R-147 60 Outdoor	.5289	.4401	.4699	.2738	.3578	.3191	.2627	.3909	.3363	.3305	.3940	.4923
	76. R-150 60 Theater	.3613	.5818	.4590	.2731	.4172	.3511	.2493	.3938	.3616	.3268	.3858	.4725
	77. R-162 60 Vocab. II	.4833	.5688	.6344	.3439	.4821	.4299	.2993	.4902	.4269	.3974	.4843	.5779
	78. R-212 60 Mem. Words	.2430	.2853	.3330	.5044	.3286	.3176	.2146	.3506	.2869	.2667	.3790	.3545
	79. R-220 60 Disg. Wds.	.3710	.4670	.4546	.3469	.5848	.4779	.2889	.4625	.4453	.3701	.4345	.4635
English Test	80. R-231 60 Spelling	.3204	.3870	.3831	.3095	.4361	.6399	.2943	.4493	.4025	.3381	.4316	.4114
	81. R-232 60 Capital.	.3570	.3208	.3734	.2933	.2599	.3554	.3368	.4208	.3482	.3650	.3258	.4000
	82. R-233 60 Punct.	.3720	.4208	.4532	.3773	.4389	.4968	.3631	.6605	.4693	.4321	.5482	.5203
	83. R-234 60 Eng. Usage	.3933	.3948	.4569	.2953	.4019	.4001	.2973	.4773	.5220	.4361	.4106	.4722
	84. R-235 60 Eff. Exp.	.3115	.3681	.3787	.2546	.3146	.3135	.2536	.3961	.3578	.4506	.3841	.4381
	85. R-240 60 Word.Funct	.2949	.3924	.3529	.3425	.4138	.4287	.2540	.5268	.4780	.3642	.6154	.4809
	86. R-250 60 Rdg. Compr	.4878	.5601	.5814	.4270	.5154	.4753	.3544	.5598	.4845	.4727	.5652	.7119
	87. R-260 60 Creativity	.4036	.4714	.4543	.3115	.3787	.3150	.2457	.4082	.3872	.3531	.4080	.5102
	88. R-270 60 Mech.Reas	.4058	.3596	.4147	.2428	.3676	.1711	.2110	.3747	.2991	.2651	.3825	.4539
	89. R-281 60 Vis. 2 Dim	.2082	.2326	.2440	.2035	.2702	.1038	.1763	.2511	.1665	.1810	.2731	.2841
	90. R-282 60 Vis. 3 Dim	.2689	.2222	.2906	.2045	.2580	.1141	.1462	.2917	.1745	.2178	.3559	.3522
	91. R-290 60 Abst.Reas	.3098	.2952	.3395	.3188	.3294	.2577	.2632	.4275	.3008	.3206	.4202	.4477
Math Test	92. R-311 60 Arith.Reas	.3729	.4015	.4686	.3225	.3988	.3675	.2673	.5224	.3815	.3924	.5512	.5535
	93. R-312 60 Int.HSMath	.4128	.4261	.4464	.3564	.3987	.4444	.2948	.5496	.3927	.3762	.5814	.5355
	94. R-333 60 Adv.HSMath	.0797	.0669	.0842	.0905	.1224	.0798	.0460	.1416	.0865	.0632	.1545	.1530
	95. F-410 60 Arith.Comp	.2280	.2374	.2620	.1923	.1918	.2558	.1960	.2563	.2136	.2379	.2905	.3050
	96. F-420 60 Table Read	.1416	.1769	.1848	.1575	.1474	.2059	.2112	.2293	.1676	.2133	.2092	.2038
	97. F-430 60 Cler.Check	.1122	.1730	.1450	.1961	.2410	.3076	.2064	.2476	.1935	.2129	.2526	.2234
	98. F-440 60 Obj.Insp.	.1047	.1226	.1295	.0863	.1602	.0996	.0878	.1033	.0809	.0884	.1612	.1365
	99. P*801 60 Socioecon.	.3268	.3266	.3565	.1355	.3140	.1715	.1384	.2696	.2344	.2297	.3231	.3245

TABLE I-1 (continued)

38	39	40	41	42	43	44	45	46	47	48	49	50	Variable
.6401	.5525	.4170	.4527	.5047	.5671	.5709	.4757	.2819	.2620	.3578	.2734	.7411	1. R-102 63
.5689	.4572	.3422	.3828	.4481	.4871	.5163	.4766	.2229	.2479	.3495	.2205	.6519	2. R-103 63
.5541	.4460	.3198	.3579	.4151	.4065	.4591	.4430	.1151	.2363	.2927	.1937	.6217	3. R-104 63
.5647	.4795	.3659	.3828	.4636	.5106	.5662	.4162	.3022	.2754	.3325	.2310	.6258	4. R-105 63
.5880	.5110	.4072	.4501	.5586	.6096	.8004	.7162	.1154	.1729	.1507	.2078	.6449	5. R-106 63
.6044	.4761	.4184	.4784	.5272	.5018	.6323	.5541	.2840	.2000	.1395	.2552	.6791	6. R-107 63
.5228	.4751	.3308	.3900	.4120	.4227	.4406	.3658	.1933	.1504	.2203	.1734	.5672	7. R-108 63
.5047	.5035	.3629	.4089	.4212	.4781	.4220	.3725	.2363	.2417	.2627	.2681	.5241	8. R-109 63
.5839	.5963	.4164	.4702	.4351	.4123	.4307	.4266	.1453	.2245	.2561	.2864	.6300	9. R-110 63
.6035	.5960	.4152	.4713	.4495	.4648	.4742	.3767	.2645	.2303	.2634	.2585	.6032	10. R-111 63
.5109	.5714	.4017	.4480	.3697	.3926	.3068	.1706	.1723	.1374	.1977	.2866	.4840	11. R-112 63
.4282	.4549	.2743	.3028	.3017	.3326	.2390	.1877	.2614	.1443	.2042	.1805	.3791	12. R-113 63
.4265	.4038	.3300	.3488	.3062	.3509	.2954	.2664	.1542	.1366	.2017	.1874	.4187	13. R-114 63
.4164	.2958	.2443	.2249	.3341	.3630	.4651	.3764	.2915	.2307	.2717	.1963	.4673	14. R-115 63
.4456	.3811	.1878	.3477	.3639	.4552	.4818	.4166	.2376	.1317	.2561	.1998	.5988	15. R-131 63
.3227	.3167	.1540	.2310	.3371	.4818	.4530	.4051	.2113	.1518	.1350	.0831	.5539	16. R-132 63
.3878	.3492	.1055	.3332	.3186	.4265	.4275	.3231	.2303	.1803	.1805	.2322	.5364	17. R-133 63
.2728	.2722	.0996	.2144	.2777	.3537	.3054	.3925	.2201	.1644	.1059	.2013	.4531	18. R-134 63
.3926	.3385	.1634	.3539	.3006	.2743	.3128	.3653	.1017	.0961	.1740	.1612	.4720	19. R-135 63
.3020	.2454	.0941	.2082	.2889	.4052	.3924	.3408	.2767	.1257	.1927	.1163	.4580	20. R-138 63
.2905	.2856	.1286	.2844	.3041	.4808	.4039	.3547	.2485	.2275	.1596	.2307	.4752	21. R-139 63
.2759	.2620	.0852	.2756	.2607	.3972	.3461	.2776	.2135	.2523	.1848	.2077	.4135	22. R-140 63
.3702	.2988	.1210	.2434	.3554	.4206	.3756	.3173	.2469	.1265	.1408	.0884	.5350	23. R-142 63
.1508	.1885	.0534	.0575	.0575	.0461	-.0112	-.0031	-.0233	.0408	.0887	.0114	.1321	24. R-145 63
.1872	.2428	.0610	.1366	.1578	.2111	.1410	.1801	.1341	.0841	.0664	.1168	.3368	25. R-146 63
.3621	.4105	.1752	.3250	.3270	.4084	.3928	.3242	.2339	.1061	.1232	.2240	.5284	26. R-147 63
.3845	.3175	.1426	.2664	.3261	.3903	.3728	.3337	.2509	.1136	.2067	.1909	.5781	27. R-150 63
.4360	.3585	.2222	.3423	.3887	.5440	.4977	.3630	.3042	.1656	.2220	.2110	.6276	28. R-162 63
.3708	.3335	.1859	.2851	.3457	.3777	.4246	.3654	.2502	.0759	.1803	.2071	.3915	29. R-212 63
.4645	.4043	.3358	.3286	.4111	.4514	.4972	.4194	.3030	.2345	.4180	.2602	.5192	30. R-220 63
.3610	.2339	.1293	.1691	.3009	.4332	.5154	.4293	.3402	.0687	.2263	.1020	.4360	31. R-231 63
.3626	.3084	.2124	.2605	.3296	.3856	.3610	.2876	.3312	.1522	.2878	.1436	.3042	32. R-232 63
.4674	.4199	.2338	.3478	.4855	.6098	.6483	.5475	.3670	.1037	.2482	.1583	.5374	33. R-233 63
.4133	.3378	.1243	.2260	.3650	.4911	.4962	.3746	.3154	.0817	.1962	.0957	.4710	34. R-234 63
.4383	.3501	.2301	.3005	.3825	.4975	.4448	.3563	.3065	.1616	.2034	.1756	.4280	35. R-235 63
.5001	.4088	.3031	.4424	.5106	.5356	.6662	.6319	.4055	.2007	.2672	.2235	.5270	36. R-240 63
.6320	.5164	.3480	.4764	.5435	.6399	.6496	.5417	.3859	.2218	.2876	.2341	.6447	37. R-250 63
	.5683	.3972	.4862	.4884	.4971	.5009	.4323	.2668	.1689	.2441	.2654	.5593	38. R-260 63
.5683		.5021	.5906	.5817	.5233	.5000	.4126	.2762	.1629	.2088	.3224	.4753	39. R-270 63
.3972	.5021		.5073	.4352	.2509	.2862	.2273	.1893	.1791	.2254	.3608	.3080	40. R-281 63
.4862	.5906	.5073		.5604	.4139	.4224	.3650	.2129	.2394	.2062	.3827	.3816	41. R-282 63
.4884	.5817	.4352	.5604		.5285	.5158	.4161	.3231	.2350	.2750	.3032	.4417	42. R-290 63
.4971	.5233	.2509	.4139	.5285		.6834	.5500	.3679	.1195	.1548	.1503	.5689	43. R-311 63
.5009	.5000	.2862	.4224	.5158	.6834		.7376	.4052	.1364	.2581	.1644	.5763	44. R-312 63
.4323	.4126	.2273	.3650	.4161	.5500	.7376		.3048	.0827	.1514	.1364	.4869	45. R-333 63
.2668	.2762	.1893	.2129	.3231	.3879	.4052	.3048		.2771	.2614	.2012	.2951	46. F-410 63
.1689	.1629	.1791	.2394	.2350	.1195	.1364	.0827	.2771		.4021	.3541	.1302	47. F-420 63
.2441	.2088	.2254	.2062	.2750	.1548	.2581	.1514	.2614	.4021		.3164	.2400	48. F-430 63
.2654	.3224	.3608	.3827	.3032	.1503	.1644	.1364	.2012	.3541	.3164		.1754	49. F-440 63
.5593	.4753	.3080	.3816	.4417	.5689	.5763	.4869	.2951	.1382	.2400	.1754		50. R-102 60
.4765	.3387	.2252	.3136	.3579	.4509	.4784	.4564	.1941	.1434	.2279	.1278	.6805	51. R-103 60
.4526	.3200	.2325	.2765	.3292	.3873	.4282	.3902	.1906	.1184	.2201	.1216	.6131	52. R-104 60
.4568	.3719	.2295	.3284	.4106	.5461	.5994	.5065	.3078	.1167	.2322	.1076	.7230	53. R-105 60
.4674	.3962	.3017	.3755	.4322	.5357	.6468	.6171	.2616	.1376	.1985	.1286	.6448	54. R-106 60
.5129	.4802	.2816	.3746	.4236	.5078	.5582	.4937	.2489	.1439	.2479	.1459	[illegible]	55. R-107 60
.4310	.3911	.1942	.3223	.3398	.4537	.4623	.4272	.2209	.0235	.1222	.1239	.6251	56. R-108 60
.4177	.3611	.1993	.2859	.3526	.4850	.4403	.3819	.2213	.0714	.1325	.0904	.5479	57. R-109 60
.4672	.4432	.2484	.3417	.3575	.3969	.4044	.3951	.1591	.0999	.1499	.1342	.6324	58. R-110 60
.4640	.4572	.2663	.3379	.3218	.4318	.4183	.3633	.1564	.0916	.1753	.1142	.5962	59. R-111 60
.4850	.4452	.2507	.3167	.3207	.4218	.3451	.2828	.2068	.0830	.1493	.1278	.6102	60. R-112 60
.3721	.3559	.1834	.2088	.2714	.4148	.3532	.2928	.2523	.0532	.1098	.0587	.5244	61. R-113 60
.3507	.3147	.1772	.2187	.2414	.3494	.3194	.2696	.1589	.0967	.1228	.0925	.4818	62. R-114 60
.3231	.2312	.1685	.1879	.3212	.4375	.4993	.4474	.3037	.1605	.2111	.1351	.5427	63. R-115 60
.4751	.3458	.2463	.2999	.3434	.4315	.4369	.3598	.2390	.1195	.2205	.1347	.6255	64. R-131 60
.3779	.2904	.1620	.2496	.2954	.4025	.4268	.3403	.2197	.0724	.1493	.0669	.5562	65. R-132 60
.4253	.3145	.1540	.2371	.3265	.4176	.4337	.3656	.2683	.1240	.2029	.1038	.5973	66. R-133 60
.3933	.3421	.1958	.2304	.2919	.3893	.3562	.2980	.2349	.0602	.1231	.1146	.5028	67. R-134 60
.2847	.2193	.1434	.2175	.2227	.2780	.2785	.2599	.1513	.0925	.1125	.0704	.3958	68. R-135 60
.3440	.2474	.1249	.1977	.2327	.3264	.3331	.2916	.1579	.0713	.1487	.0666	.4579	69. R-138 60
.3825	.2981	.1918	.2529	.3018	.4475	.4174	.3476	.2239	.1112	.1725	.0963	.5498	70. R-139 60
.3722	.2974	.1921	.2599	.3218	.4172	.4006	.3265	.2446	.1630	.1927	.1814	.5124	71. R-140 60
.3859	.2973	.1626	.2545	.3083	.3995	.3780	.3299	.2084	.0900	.1368	.0540	.5082	72. R-142 60
.1466	.1450	.0293	.0921	.0714	.1330	.0554	.0464	.0938	.0017	.0245	.0548	.1527	73. R-145 60
.1919	.1561	.0817	.1102	.1124	.1722	.1559	.1370	.1019	-.0245	.0480	.0464	.2716	74. R-146 60
.4026	.3805	.2165	.2751	.3346	.4331	.4537	.3665	.2618	.1009	.1548	.1745	.5721	75. R-147 60
.4237	.2896	.1966	.2214	.2959	.3755	.3867	.3340	.2095	.1181	.1812	.1019	.5877	76. R-150 60
.4805	.3832	.2371	.3221	.3851	.5184	.5137	.4319	.2657	.1070	.2273	.1357	.6822	77. R-162 60
.3090	.2546	.1848	.2160	.2905	.3196	.3710	.3227	.1757	.0955	.2007	.0982	.3918	78. R-212 60
.4028	.3489	.2258	.2601	.3628	.4240	.4764	.4101	.2984	.1622	.2454	.1794	.5441	79. R-220 60
.3025	.1799	.1262	.1787	.2818	.3555	.4597	.4008	.2888	.1436	.2498	.1113	.4615	80. R-231 60
.2855	.2335	.1491	.1826	.2887	.3999	.4257	.3236	.2776	.1360	.1576	.1167	.3947	81. R-232 60
.4376	.3643	.2474	.3151	.4351	.5513	.6078	.5155	.3516	.1261	.2306	.1196	.5439	82. R-233 60
.3704	.3374	.1796	.2423	.3442	.4528	.4444	.3917	.2706	.1216	.1530	.1453	.4928	83. R-234 60
.3659	.2735	.1935	.2465	.3316	.3892	.3821	.3199	.2267	.0921	.1286	.1087	.4205	84. R-235 60
.3935	.3217	.2345	.3011	.3817	.4602	.5599	.5512	.2671	.1364	.2257	.1206	.4880	85. R-240 60
.5600	.4403	.2542	.3666	.4601	.5664	.5923	.5148	.3068	.1406	.2745	.1498	.7155	86. R-250 60
.5491	.4248	.2902	.3792	.4112	.4804	.4524	.3814	.2061	.1084	.1998	.1627	.5747	87. R-260 60
.4846	.6581	.4182	.5215	.4772	.4588	.4310	.3930	.1679	.1053	.1622	.2267	.5131	88. R-270 60
.3302	.3984	.4915	.3906	.3469	.2757	.2876	.2389	.1940	.1298	.1799	.2557	.2924	89. R-281 60
.3984	.4901	.4169	.6007	.4588	.3610	.3753	.3426	.1210	.0847	.0924	.2009	.3592	90. R-282 60
.4096	.4654	.3815	.4396	.5678	.4981	.5007	.4260	.2567	.1263	.1695	.2182	.4266	91. R-290 60
.4853	.4371	.2825	.3941	.4574	.6504	.6259	.5431	.3052	.1219	.1843	.1161	.5840	92. R-311 60
.4519	.4125	.3004	.3899	.4723	.5667	.6875	.6204	.3304	.1743	.2250	.1240	.5595	93. R-312 60
.1302	.1334	.0997	.1480	.1278	.1574	.2057	.2291	.0692	.0644	.0415	.0366	.1750	94. R-333 60
.2554	.1888	.1626	.2044	.2689	.3393	.3307	.2400	.4653	.1128	.1635	.1401	.2950	95. F-410 60
.1704	.1649	.1491	.1821	.1989	.2332	.2340	.1700	.2747	.1553	.1601	.1462	.1857	96. F-420 60
.1600	.1232	.1184	.1587	.1948	.2016	.2619	.2142	.2765	.1799	.2703	.1768	.2088	97. F-430 60
.1580	.1566	.1892	.2094	.1766	.0962	.1381	.0942	.1355	.1441	.1651	.2866	.1236	98. F-440 60
.2843	.2528	.1887	.2164	.2822	.3206	.3301	.3193	.1271	.1442	.1788	.1246	.4128	99. F-801 60

TABLE I-1 (continued)

	Variable	51	52	53	54	55	56	57	58	59	60	61	62
Information Test	1. R-102 63 Vocab. I	.6163	.5644	.6670	.5899	.6321	[illegible]	[illegible]	.5767	.5449	.5654	.5020	.4339
	2. R-103 63 Literature	.7152	.5850	.6838	.5739	.6004	[illegible]	[illegible]	[illegible]	.4354	.4067	.4372	.3843
	3. R-104 63 Music	.6249	.7188	.5927	.5266	.5251	[illegible]	[illegible]	[illegible]	.4343	.4284	.3760	.4017
	4. R-105 63 Soc. Stud.	.5866	.4931	.7449	.5483	.6084	[illegible]	[illegible]	[illegible]	.4483	.4272	.4452	.3767
	5. R-106 63 Math	.5573	.5310	.6409	.7177	.6427	[illegible]	[illegible]	[illegible]	.5124	.4518	.3967	.3928
	6. R-107 63 Phys. Sci.	.5686	.5136	.6669	.6248	.7502	[illegible]	[illegible]	.5747	.5954	.4806	.4480	.4153
	7. R-108 63 Bio. Sci.	.4940	.4083	.5511	.4640	.5673	[illegible]	[illegible]	[illegible]	.6698	.4452	.4753	.3069
	8. R-109 63 Scient.Att	.4267	.4009	.4912	.4385	.4549	[illegible]	[illegible]	[illegible]	.4027	.3995	[illegible]	.3226
	9. R-110 63 Aero-Space	.5292	.4853	.5693	.5082	.5753	[illegible]	[illegible]	[illegible]	.5528	.5205	[illegible]	.3735
	10. R-111 63 Electronic	.4473	.4361	.5178	.4980	.6210	[illegible]	[illegible]	.5714	.7033	.5897	.4400	.4069
	11. R-112 63 Mechanics	.2849	.3065	.3792	.3337	.4017	[illegible]	.3511	.4364	.4884	.6476	.4447	.3947
	12. R-113 63 Farming	.2694	.2465	.3353	.2546	.3373	[illegible]	[illegible]	.2834	.2926	.3931	.6283	.2754
	13. R-114 63 Home Ec.	.3497	.3684	.3622	.3388	.3623	.3734	[illegible]	.3693	.3691	.4032	.3499	.5609
	14. R-115 63 Sports	.4159	.4057	.5154	.4204	.3979	.3637	[illegible]	[illegible]	.2542	.2929	.2955	.2932
	15. R-131 63 Art	.5716	.5146	.6069	.4913	.5060	.4777	[illegible]	.4342	.4188	.4363	.3655	.3867
	16. R-132 63 Law	.4742	.4252	.5600	.4527	.4513	.4727	[illegible]	.4967	.3870	.4310	.3899	.3288
	17. R-133 63 Health	.4551	.4076	.5073	.4280	.4725	.4468	.3640	.4115	.3931	.4149	.3649	.3317
	18. R-134 63 Engin.	.3275	.2889	.4257	.3466	.3675	.3634	.3177	.3384	.3460	.4247	.3487	.3253
	19. R-135 63 Arch.	.4541	.4211	.4816	.4274	.4193	.3819	.3192	.3994	.3558	.3501	.3025	.2805
	20. R-138 63 Military	.4677	.4096	.5079	.3687	.3653	.3794	.3184	.4018	.2982	.3231	.2826	.2403
	21. R-139 63 Acct,Busi.	.4108	.3888	.4903	.4206	.3907	.3750	.3738	.3924	.3885	.4091	.3428	.3495
	22. R-140 63 Prac.Knowl	.3435	.3179	.4173	.3309	.3260	.3137	.2926	.3000	.2382	.3194	.2787	.2682
	23. R-142 63 Bible	.5212	.4703	.5566	.4508	.4750	.4334	.3730	.4209	.3485	.3064	.3633	.2869
	24. R-145 63 Hunting	.0681	.0172	.0909	.0613	.1062	.1910	.1174	.1273	.1060	.2623	.2800	.1624
	25. R-146 63 Fishing	.2199	.1556	.2444	.2116	.2694	.3510	.2211	.2498	.2035	.3492	.2979	.2137
	26. R-147 63 Outdoor	.4097	.3671	.4791	.4278	.4255	.4533	.3701	.4375	.3788	.4656	.3765	.3229
	27. R-150 63 Theater	.5311	.5222	.5252	.4609	.4299	.4404	.3857	.4066	.3660	.4151	.3616	.3494
	28. R-162 63 Vocab. II	.4968	.4680	.5806	.4828	.5026	.4572	.4198	.4540	.4425	.5182	.4081	.3788
	29. R-212 63 Mem. Words	.3627	.2832	.3847	.3523	.3456	.3187	.2825	.2342	.2181	.1962	.2635	.2024
	30. R-220 63 Disg. Wds.	.4768	.4533	.4368	.4367	.4277	.3446	.3372	.3641	.3374	.3493	.2772	.2664
English Test	31. R-231 63 Spelling	.4239	.3528	.4499	.4185	.4103	.3618	.3046	.2632	.2400	.2517	.2898	.2663
	32. R-232 63 Capital.	.2671	.2332	.3130	.2427	.2682	.2571	.2755	.2010	.1520	.2151	.2583	.2093
	33. R-233 63 Punct.	.4598	.4010	.5174	.5232	.4924	.4317	.4221	.3585	.3422	.3307	.3379	.2931
	34. R-234 63 Eng. Usage	.4227	.3629	.4577	.3937	.3884	.3896	.3671	.3436	.2906	.3326	.3426	.2692
	35. R-235 63 Eff. Exp.	.3900	.3290	.4133	.3582	.3485	.3418	.3594	.3036	.2749	.2820	.3061	.2361
	36. R-240 63 Word.Funct	.4881	.4377	.5062	.5663	.5109	.4073	.3713	.3887	.3247	.3048	.2998	.2917
	37. R-250 63 Rdg. Compr	.5816	.5012	.6178	.5339	.5825	.5148	.4831	.4950	.4207	.4660	.4410	.3617
	38. R-260 63 Creativity	.4765	.4526	.4568	.4674	.5129	.4310	.4177	.4672	.4640	.4850	.3721	.3507
	39. R-270 63 Mech.Reas	.3387	.3200	.3719	.3962	.4802	.3911	.3611	.4432	.4572	.4452	.3559	.3147
	40. R-281 63 Vis. 2 Dim	.2252	.2325	.2295	.3017	.2816	.1942	.1993	.2484	.2663	.2507	.1834	.1772
	41. R-282 63 Vis. 3 Dim	.3136	.2765	.3284	.3755	.3746	.3223	.2859	.3417	.3379	.3167	.2088	.2187
	42. R-290 63 Abst.Reas	.3579	.3292	.4106	.4322	.4236	.3348	.3526	.3575	.3218	.3207	.2714	.2414
Math Test	43. R-311 63 Arith.Reas	.4509	.3873	.5461	.5357	.5078	.4537	.4850	.3769	.4318	.4218	.4148	.3494
	44. R-312 63 Int.HSMath	.4784	.4282	.5994	.6468	.5582	.4623	.4463	.4044	.4183	.3451	.3532	.3194
	45. R-333 63 Adv.HSMath	.4564	.3902	.5085	.6171	.4937	.4272	.3819	.3951	.3633	.2828	.2928	.2696
	46. F-410 63 Arith.Comp	.1941	.1906	.3078	.2616	.2489	.2209	.2213	.1591	.1564	.2068	.2523	.1589
	47. F-420 63 Table Read	.1434	.1184	.1167	.1376	.1439	.0235	.0714	.0999	.0916	.0830	.0532	.0967
	48. F-430 63 Cler.Check	.2279	.2201	.2322	.1985	.2479	.1222	.1325	.1499	.1753	.1493	.1098	.1228
	49. F-440 63 Obj.Insp.	.1278	.1214	.1076	.1286	.1459	.1239	.0904	.1342	.1142	.1278	.0587	.0925
Information Test	50. R-102 60 Vocab. I	.6805	.6131	.7230	.6448	.6893	.6251	.5479	.6324	.5962	.6102	.5244	.4818
	51. R-103 60 Literature		.6296	.6917	.5881	.5964	.5625	.4513	.5479	.4578	.4440	.4212	.4088
	52. R-104 60 Music	.6296		.6019	.5639	.5129	.4683	.3951	.5071	.4302	.4221	.3826	.3991
	53. R-105 60 Soc. Stud.	.6917	.6019		.6340	.6788	.5969	.5023	.5712	.5080	.4987	.4852	.4368
	54. R-106 60 Math	.5881	.5639	.6340		.6185	.5173	.4498	.5254	.4922	.4446	.3869	.4039
	55. R-107 60 Phys. Sci.	.5964	.5129	.6788	.6185		.6027	.4506	.5995	.6348	.5127	.4716	.4256
	56. R-108 60 Bio. Sci.	.5625	.4683	.5969	.5173	.6027		.4588	.5312	.4853	.4883	.4922	.3878
	57. R-109 60 Scient.Att	.4513	.3951	.5023	.4498	.4566	.4588		.4187	.3965	.4264	.3698	.3167
	58. R-110 60 Aero-Space	.5479	.5071	.5712	.5254	.5995	.5312	.4187		.5608	.5195	.4000	.3722
	59. R-111 60 Electronic	.4578	.4302	.5080	.4922	.6348	.4853	.3965	.5608		.5797	.4092	.3966
	60. R-112 60 Mechanics	.4440	.4221	.4987	.4446	.5127	.4883	.4264	.5195	.5797		.5079	.4386
	61. R-113 60 Farming	.4212	.3826	.4852	.3869	.4716	.4922	.3698	.4000	.4092	.5079		.3900
	62. R-114 60 Home Ec.	.4088	.3991	.4368	.4039	.4256	.3878	.3167	.3722	.3966	.4386	.3900	
	63. R-115 60 Sports	.5073	.4780	.5779	.4976	.4404	.4004	.3974	.4102	.3016	.3607	.3433	.3323
	64. R-131 60 Art	.6182	.5560	.6028	.5070	.5310	.4718	.4270	.5293	.4441	.4592	.3951	.3976
	65. R-132 60 Law	.5355	.4531	.5625	.4667	.4651	.4281	.3954	.4656	.4030	.4008	.3398	.3332
	66. R-133 60 Health	.5441	.4942	.5880	.4914	.5265	.4896	.4211	.4530	.4137	.4598	.4339	.3996
	67. R-134 60 Engin.	.3952	.3869	.4480	.4057	.4505	.4036	.3514	.4238	.4452	.4699	.3547	.3513
	68. R-135 60 Arch.	.4253	.3882	.3899	.3642	.3433	.3067	.2368	.3383	.2892	.2855	.2474	.2753
	69. R-138 60 Military	.4854	.4412	.5005	.4221	.3997	.3461	.3032	.4181	.3393	.3205	.2496	.2553
	70. R-139 60 Acct,Busi.	.4739	.4423	.5356	.4768	.4658	.4238	.3772	.4369	.4016	.4311	.3562	.3698
	71. R-140 60 Prac.Knowl	.4412	.3944	.4914	.4048	.4190	.3676	.3672	.3808	.3395	.4116	.3178	.3362
	72. R-142 60 Bible	.5358	.4596	.5373	.4409	.4489	.4341	.3775	.4033	.3263	.3185	.3820	.2896
	73. R-145 60 Hunting	.1022	.0685	.1162	.0648	.1538	.2084	.1360	.1460	.1505	.2624	.2910	.1421
	74. R-146 60 Fishing	.1979	.1517	.2080	.1795	.2339	.2972	.2243	.2313	.1918	.2871	.2540	.1920
	75. R-147 60 Outdoor	.4868	.4300	.5413	.4763	.4921	.4612	.4263	.4763	.4348	.4635	.3983	.3845
	76. R-150 60 Theater	.5642	.5324	.5321	.4762	.4632	.4080	.3811	.4796	.3776	.4147	.3552	.3657
	77. R-162 60 Vocab. II	.6126	.5639	.6486	.5703	.5704	.5272	.4612	.5370	.4878	.5140	.4443	.4200
	78. R-212 60 Mem. Words	.3865	.3491	.3803	.3897	.3657	.3229	.2834	.2739	.2670	.2451	.2639	.2223
	79. R-220 60 Disg. Wds.	.5093	.4646	.4701	.4795	.4347	.3966	.3809	.3929	.3367	.3840	.3468	.3083
English Test	80. R-231 60 Spelling	.4354	.3834	.4440	.4645	.3999	.3334	.2995	.3088	.2593	.2735	.2976	.2436
	81. R-232 60 Capital.	.3389	.3089	.4030	.3411	.3624	.3021	.3064	.2661	.2486	.2966	.2871	.2461
	82. R-233 60 Punct.	.4735	.4452	.5362	.5575	.5066	.4338	.4201	.4031	.3802	.3722	.3661	.3148
	83. R-234 60 Eng. Usage	.4106	.3580	.4549	.4236	.4074	.3973	.3726	.3619	.3207	.3766	.3591	.2903
	84. R-235 60 Eff. Exp.	.3598	.3109	.3840	.3704	.3456	.3192	.3689	.3022	.2609	.3060	.2796	.2355
	85. R-240 60 Word.Funct	.4583	.4276	.4895	.5657	.4620	.4020	.3502	.3766	.3453	.2792	.2934	.2623
	86. R-250 60 Rdg. Compr	.6650	.5875	.7031	.6160	.6240	.5851	.5377	.5653	.4937	.5008	.4830	.4199
	87. R-260 60 Creativity	.4851	.4501	.4812	.4979	.4839	.4420	.4013	.4917	.4769	.4805	.3757	.3769
	88. R-270 60 Mech.Reas	.3651	.3639	.4174	.4598	.4899	.4401	.3736	.4918	.5255	.5023	.3740	.3204
	89. R-281 60 Vis. 2 Dim	.2202	.2069	.2256	.2819	.2610	.2038	.2234	.2366	.2641	.2556	.2074	.1943
	90. R-282 60 Vis. 3 Dim	.2878	.2852	.3176	.3913	.3601	.2988	.2718	.3444	.3536	.3176	.2379	.2402
	91. R-290 60 Abst.Reas	.3679	.3414	.4221	.4803	.4220	.3482	.3758	.3625	.3435	.3166	.2888	.2668
Math Test	92. R-311 60 Arith.Reas	.4763	.4332	.5653	.6069	.5507	.4655	.4672	.4436	.4587	.4350	.3870	.3436
	93. R-312 60 Int.HSMath	.5132	.4795	.5696	.6815	.5336	.4403	.4143	.4243	.3988	.3736	.3420	.3367
	94. R-333 60 Adv.HSMath	.1790	.1527	.1580	.2566	.1709	.1244	.1248	.1543	.1474	.1296	.0894	.1093
	95. F-410 60 Arith.Comp	.2348	.2262	.3126	.2846	.2524	.1968	.2302	.1742	.1707	.1871	.2220	.1840
	96. F-420 60 Table Read	.1524	.1504	.1788	.1497	.1626	.1414	.1540	.1098	.0954	.1169	.1391	.1219
	97. F-430 60 Cler.Check	.2085	.1863	.2073	.2264	.1851	.1414	.1725	.1373	.0928	.1084	.1244	.1196
	98. F-440 60 Obj.Insp.	.1235	.1193	.0967	.1013	.0976	.0962	.1013	.0955	.0635	.1033	.0610	.0803
	99. F*801 60 Socioecon.	.3824	.3854	.3776	.3746	.3207	.2615	.2877	.3363	.2985	.2837	.1759	.2211

TABLE I-1 (continued)

63	64	65	66	67	68	69	70	71	72	73	74	75	Variable
.4951	.5760	.5177	.5670	.4517	.3544	.4335	.4858	.4943	.4715	.1667	.2494	.5474	1. R-102 63
.4933	.5910	.5182	.5463	.3896	.3600	.4603	.4767	.4554	.5468	.0917	.1778	.4874	2. R-103 63
.4952	.5676	.4801	.5097	.3747	.3381	.4650	.4506	.4581	.4755	.0374	.1902	.4647	3. R-104 63
.5169	.5241	.4991	.5124	.3970	.3307	.4177	.4545	.4548	.4824	.1290	.1785	.4625	4. R-105 63
.5182	.4923	.4860	.5328	.3928	.3112	.4133	.4803	.4375	.4509	.0654	.1837	.4967	5. R-106 63
.4414	.5171	.4893	.5435	.4250	.3193	.3893	.4547	.4340	.4479	.1630	.2122	.4954	6. R-107 63
.3245	.4351	.4111	.4556	.3493	.2757	.2933	.3548	.3683	.4174	.2472	.2718	.4136	7. R-108 63
.3774	.4078	.4100	.4014	.3230	.2328	.3134	.3639	.3571	.3388	.1118	.1545	.4170	8. R-109 63
.4063	.4863	.4841	.4858	.4268	.3171	.4036	.4140	.4084	.3905	.1578	.2404	.4600	9. R-110 63
.3044	.4556	.4281	.4568	.4490	.2965	.3422	.4270	.3876	.3484	.1795	.2162	.4649	10. R-111 63
.2348	.3497	.3297	.3487	.3880	.2216	.2470	.3337	.3268	.2514	.2955	.2453	.3943	11. R-112 63
.2341	.2575	.2413	.3028	.2764	.1795	.1667	.2424	.2427	.3055	.3178	.2415	.2924	12. R-113 63
.2627	.3712	.3241	.3531	.3073	.2250	.2172	.3223	.3163	.2581	.1407	.1918	.3267	13. R-114 63
.7060	.3816	.3691	.3848	.2980	.2391	.3335	.3479	.3530	.3299	.0737	.1717	.3909	14. R-115 63
.4352	.6286	.4777	.4977	.3939	.3273	.4171	.4439	.4546	.4496	.0992	.1498	.4433	15. R-131 63
.4139	.4624	.5302	.4735	.3483	.2291	.3761	.4439	.3817	.4156	.1193	.1606	.4268	16. R-132 63
.4027	.4426	.4017	.5102	.3798	.2470	.3199	.3798	.4092	.3379	.1626	.1990	.4163	17. R-133 63
.3029	.3800	.3541	.3662	.4142	.2004	.2655	.3400	.3505	.3024	.1966	.1935	.3839	18. R-134 63
.3390	.4387	.3509	.3630	.2946	.3781	.3485	.3549	.2922	.3460	.0776	.1224	.3498	19. R-135 63
.4153	.4229	.4193	.4002	.2794	.2141	.4771	.3328	.3187	.3894	.1035	.1369	.3408	20. R-138 63
.3527	.4227	.4029	.4214	.3436	.2578	.3455	.4678	.3835	.3700	.1224	.1532	.4136	21. R-139 63
.3426	.3769	.3413	.3747	.3031	.1660	.2925	.3602	.4779	.2991	.1364	.1404	.3868	22. R-140 63
.3704	.4505	.4444	.4343	.3072	.2677	.3967	.3858	.3455	.7371	.0901	.1634	.3604	23. R-142 63
.0216	.0697	.0985	.0883	.1313	.0217	.0647	.0977	.0338	.0880	.5227	.2987	.1427	24. R-145 63
.2327	.2237	.2049	.2397	.2380	.1314	.1605	.2141	.2055	.1956	.3428	.5377	.2599	25. R-146 63
.3991	.3942	.3780	.4159	.3709	.2333	.3355	.3518	.3877	.3514	.2302	.2234	.5289	26. R-147 63
.4544	.5403	.4473	.4913	.3636	.2771	.4213	.4097	.4188	.4176	.1039	.1467	.4401	27. R-150 63
.4396	.5178	.4538	.5104	.4206	.2556	.3816	.4538	.4785	.4129	.1469	.1865	.4699	28. R-162 63
.3070	.3129	.2644	.2953	.2250	.1940	.1918	.2520	.2511	.3170	.0452	.1079	.2738	29. R-212 63
.3408	.4477	.3227	.4066	.3104	.2464	.2966	.3166	.3483	.2899	.0418	.1041	.3578	30. R-220 63
.3490	.3729	.2998	.3924	.2678	.2203	.2478	.2967	.3195	.3237	.0463	.1105	.3191	31. R-231 63
.2640	.2707	.2203	.2777	.2059	.1511	.1690	.2126	.2702	.2475	.0568	.0908	.2627	32. R-232 63
.3958	.4329	.3786	.4077	.3225	.2609	.3103	.3651	.4066	.4225	.0832	.1313	.3909	33. R-233 63
.3321	.3936	.3503	.3805	.2802	.2372	.2643	.3231	.3480	.3437	.0837	.1373	.3363	34. R-234 63
.3186	.3876	.3118	.3327	.2563	.2253	.2503	.2964	.3076	.3283	.0980	.1253	.3305	35. R-235 63
.4036	.4221	.3812	.4329	.3142	.2638	.3365	.3807	.3471	.4329	.0385	.1256	.3948	36. R-240 63
.4703	.5292	.4528	.5069	.4045	.3212	.3795	.4313	.4504	.4925	.1317	.1962	.4923	37. R-250 63
.3231	.4751	.3779	.4253	.3933	.2847	.3440	.3825	.3722	.3859	.1466	.1919	.4026	38. R-260 63
.2312	.3458	.2904	.3145	.3421	.2193	.2474	.2981	.2974	.2973	.1450	.1561	.3005	39. R-270 63
.1685	.2463	.1620	.1540	.1958	.1434	.1249	.1918	.1921	.1626	.0293	.0817	.2165	40. R-281 63
.1879	.2999	.2496	.2371	.2384	.2175	.1977	.2529	.2599	.2545	.0921	.1102	.2751	41. R-282 63
.3212	.3434	.2954	.3265	.2919	.2227	.2327	.3018	.3218	.3083	.0714	.1124	.3346	42. R-290 63
.4375	.4315	.4025	.4176	.3893	.2780	.3264	.4475	.4172	.3995	.1330	.1722	.4331	43. R-311 63
.4993	.4369	.4268	.4337	.3562	.2785	.3331	.4174	.4006	.3780	.0594	.1559	.4587	44. R-312 63
.4474	.3598	.3403	.3656	.2980	.2599	.2916	.3476	.3265	.3299	.0464	.1370	.3665	45. R-333 63
.3037	.2390	.2197	.2683	.2349	.1513	.1579	.2239	.2446	.2084	.0938	.1019	.2618	46. F-410 63
.1605	.1195	.0724	.1240	.0602	.0925	.0713	.1112	.1630	.0900	.0017	-.0245	.1009	47. F-420 63
.2111	.2205	.1493	.2029	.1231	.1125	.1487	.1725	.1927	.1368	.0245	.0480	.1548	48. F-430 63
.1351	.1347	.0669	.1038	.1146	.0704	.0666	.0963	.1814	.0540	.0548	.0464	.1745	49. F-440 63
.5427	.6255	.5562	.5973	.5020	.3958	.4579	.5498	.5124	.5082	.1527	.2716	.5721	50. R-102 60
.5073	.6182	.5355	.5441	.3952	.4253	.4854	.4739	.4412	.5358	.1022	.1979	.4868	51. R-103 60
.4780	.5580	.4531	.4942	.3869	.3882	.4412	.4423	.3944	.4596	.0685	.1517	.4300	52. R-104 60
.5779	.6028	.5625	.5880	.4480	.3999	.5005	.5356	.4914	.5373	.1162	.2080	.5413	53. R-105 60
.4976	.5070	.4667	.4914	.4057	.3642	.4221	.4768	.4048	.4409	.0648	.1795	.4763	54. R-106 60
.4404	.5310	.4651	.5265	.4505	.3433	.3997	.4658	.4190	.4489	.1538	.2339	.4021	55. R-107 60
.4004	.4718	.4281	.4896	.4036	.3087	.3461	.4238	.3676	.4341	.2084	.2972	.4612	56. R-108 60
.3974	.4270	.3954	.4211	.3514	.2368	.3032	.3772	.3672	.3775	.1360	.2243	.4263	57. R-109 60
.4102	.5293	.4656	.4530	.4238	.3383	.4181	.4369	.3808	.4033	.1460	.2313	.4763	58. R-110 60
.3016	.4441	.4030	.4137	.4452	.2892	.3393	.4016	.3395	.3263	.1505	.1918	.4348	59. R-111 60
.3607	.4592	.4008	.4598	.4699	.2855	.3205	.4311	.4116	.3185	.2624	.2871	.4635	60. R-112 60
.3433	.3951	.3398	.4339	.3547	.2474	.2496	.3562	.3178	.3820	.2910	.2540	.3983	61. R-113 60
.3323	.3976	.3332	.3996	.3513	.2753	.2553	.3698	.3362	.2896	.1421	.1920	.3848	62. R-114 60
	.4305	.4262	.4433	.3154	.2849	.4016	.4071	.4039	.3592	.0917	.1964	.4358	63. R-115 60
.4305		.5189	.5726	.4509	.3968	.4387	.4997	.5041	.4847	.1148	.2198	.5020	64. R-131 60
.4262	.5189		.4752	.3645	.3026	.4235	.4853	.4312	.4660	.1402	.1860	.4477	65. R-132 60
.4433	.5726	.4752		.4632	.3254	.3703	.4982	.5030	.4468	.1422	.2282	.5099	66. R-133 60
.3154	.4509	.3645	.4632		.2896	.2866	.3797	.4341	.3293	.1614	.2063	.4481	67. R-134 60
.2849	.3968	.3026	.3254	.2896		.3104	.3096	.2739	.3299	.0602	.1665	.3185	68. R-135 60
.4016	.4387	.4235	.3703	.2866	.3104		.3945	.3255	.3803	.0521	.1505	.3600	69. R-138 60
.4071	.4997	.4853	.4982	.3797	.3096	.3945		.4367	.4179	.1295	.1946	.4431	70. R-139 60
.4039	.5041	.4312	.5030	.4341	.2739	.3255	.4367		.3964	.1176	.2084	.5040	71. R-140 60
.3592	.4847	.4660	.4468	.3293	.3299	.3803	.4179	.3964		.1381	.2086	.4050	72. R-142 60
.0917	.1148	.1402	.1422	.1614	.0602	.0521	.1295	.1176	.1381		.3161	.2048	73. R-145 60
.1964	.2198	.1860	.2282	.2063	.1665	.1505	.1946	.2084	.2086	.3161		.2714	74. R-146 60
.4358	.5020	.4477	.5099	.4481	.3185	.3600	.4431	.5040	.4050	.2048	.2714		75. R-147 60
.4399	.5592	.4826	.4963	.3829	.3473	.4175	.4860	.4425	.4110	.0658	.1540	.4556	76. R-150 60
.5025	.6529	.5858	.6388	.4806	.3814	.4398	.6388	.5307	.4978	.1406	.2450	.5916	77. R-162 60
.3046	.3271	.2808	.3226	.2521	.2272	.2367	.2626	.2563	.3032	.0592	.1370	.2672	78. R-212 60
.4225	.4651	.3762	.4553	.3214	.3048	.3344	.3592	.3830	.3799	.1020	.1970	.4855	79. R-220 60
.3766	.3647	.3351	.4117	.2553	.2432	.2895	.3095	.2889	.3266	.0543	.1410	.3136	80. R-231 60
.3602	.3549	.2890	.3553	.2894	.1997	.2390	.2859	.3367	.2981	.0674	.1435	.3358	81. R-232 60
.4118	.4405	.3943	.4502	.3565	.2686	.3295	.4077	.3951	.4120	.0693	.1578	.4166	82. R-233 60
.3653	.3868	.3586	.4052	.2912	.2398	.2956	.3680	.3390	.3564	.1273	.1601	.3629	83. R-234 60
.3340	.3570	.3281	.3495	.2758	.1882	.2404	.3109	.2986	.2984	.1055	.1184	.3358	84. R-235 60
.3776	.4016	.3660	.4028	.3167	.2708	.3211	.3599	.3070	.4166	.0458	.1140	.3704	85. R-240 60
.5182	.6179	.5452	.5904	.4776	.3719	.4455	.5280	.5074	.5547	.1575	.2474	.5689	86. R-250 60
.3642	.4922	.4151	.4359	.3917	.3222	.3589	.4223	.3858	.3813	.1537	.2107	.4552	87. R-260 60
.2924	.3831	.3321	.3411	.3833	.2564	.2536	.3364	.3281	.2958	.1945	.2189	.4174	88. R-270 60
.2014	.2474	.2062	.2032	.1982	.1753	.1530	.2037	.2134	.1730	.1036	.0973	.2457	89. R-281 60
.1908	.3078	.2477	.2320	.2567	.1991	.2012	.2496	.2184	.2243	.0798	.1057	.2824	90. R-282 60
.3377	.3392	.2934	.3021	.2975	.2279	.2473	.2981	.3075	.2706	.0660	.1115	.3479	91. R-290 60
.4374	.4506	.4316	.4436	.3798	.3045	.3470	.4624	.3856	.4068	.0983	.1799	.4352	92. R-311 60
.4642	.4494	.4171	.4557	.3561	.2943	.3474	.4223	.3708	.4073	.0631	.1331	.4316	93. R-312 60
.1648	.1441	.1321	.1175	.1067	.1335	.1190	.1357	.1122	.1522	.0316	.0717	.1394	94. R-333 60
.2905	.2370	.2380	.2653	.2239	.1468	.1635	.2340	[illegible]	.2176	.0393	.0955	.2572	95. F-410 60
.1735	.1586	.1519	.1811	.1351	.0620	.1077	.1849	.2107	.1280	.0453	.0563	.1728	96. F-420 60
.2178	.2023	.1755	.2095	.1339	.1353	.1410	.1583	.1938	.1564	.0158	.0871	.1641	97. F-430 60
.0997	.1467	.0956	.1097	.0984	.0617	.0454	.0935	.1527	.0536	.0528	.0922	.1339	98. F-440 60
.3253	.3334	.2819	.3298	.2459	.2174	.2591	.2977	.2693	.2187	-.0042	.0628	.3484	99. F-801 60

TABLE I-1 (continued)

	Variable	76	77	78	79	80	81	82	83	84	85	86	87
Information Test	1. R-102 63 Vocab. I	.5372	.6531	.3710	.5219	.4135	.3422	.5359	.4743	.4104	.4442	.6897	.5220
	2. R-103 63 Literature	.5465	.6030	.3755	.5222	.4279	.3203	.5016	.4282	.3801	.4715	.6669	.4630
	3. R-104 63 Music	.5366	.5877	.3641	.4968	.4034	.3205	.4709	.4174	.3418	.4311	.6056	.4462
	4. R-105 63 Soc. Stud.	.4580	.5562	.3617	.4442	.3962	.3543	.5004	.4768	.3670	.4383	.6450	.4356
	5. R-106 63 Math	.4743	.5929	.4023	.5109	.4601	.3391	.5940	.4492	.3920	.5772	.6408	.4853
	6. R-107 63 Phys. Sci.	.4678	.5856	.3678	.4003	.3964	.3182	.5366	.4349	.3652	.4785	.6397	.4844
	7. R-108 63 Bio. Sci.	.3688	.4599	.2726	.3690	.2579	.2392	.3917	.3692	.2952	.3627	.5299	.4093
	8. R-109 63 Scient.Att	.3906	.4635	.2360	.3780	.2769	.2418	.4242	.3628	.3541	.3617	.5279	.3875
	9. R-110 63 Aero-Space	.4805	.5396	.2657	.3889	.2834	.2557	.3976	.3822	.2995	.3674	.5812	.4855
	10. R-111 63 Electronic	.3939	.5214	.2618	.3712	.2561	.2578	.4277	.3743	.3043	.3715	.5135	.4826
	11. R-112 63 Mechanics	.2964	.4144	.1602	.2740	.1521	.2127	.2907	.3017	.2525	.2244	.3907	.3884
	12. R-113 63 Farming	.2346	.3084	.1681	.2570	.2254	.2050	.2861	.2928	.2355	.2275	.3617	.2722
	13. R-114 63 Home Ec.	.3496	.3771	.1651	.2773	.2075	.2112	.2735	.2754	.2282	.2426	.3826	.3421
	14. R-115 63 Spor's	.3890	.4301	.2858	.3883	.3516	.3141	.3764	.3130	.3179	.3443	.4685	.3027
	15. R-131 63 Art	.5200	.5717	.3026	.4642	.3658	.3580	.4138	.3928	.3658	.3665	.5806	.4704
	16. R-132 63 Law	.4289	.5335	.2879	.3565	.3409	.3210	.3812	.3776	.3199	.3206	.5228	.3901
	17. R-133 63 Health	.4049	.4921	.2561	.4175	.3289	.3640	.4220	.3582	.3155	.3445	.5072	.3815
	18. R-134 63 Engin.	.3382	.4099	.1706	.2604	.2058	.3026	.3182	.3096	.2662	.2397	.4061	.3504
	19. R-135 63 Arch.	.3543	.4146	.2344	.3179	.2570	.2643	.3268	.3106	.2588	.3110	.4701	.3671
	20. R-138 63 Military	.4057	.4408	.2227	.3464	.3275	.2976	.3534	.3297	.2826	.3007	.4781	.3617
	21. R-139 63 Acct,Busi.	.3986	.5237	.2410	.3382	.2807	.3119	.3722	.3615	.3043	.3057	.4728	.4103
	22. R-140 63 Prac.Knowl	.3601	.4267	.1644	.3750	.2833	.3117	.3323	.2978	.2535	.2097	.3952	.3367
	23. R-142 63 Bible	.3894	.4830	.3145	.4019	.3613	.3267	.4235	.3861	.3314	.4051	.5589	.3754
	24. R-145 63 Hunting	.0563	.0925	.0215	.0805	.0425	-.0048	.0190	.1336	.0467	-.0031	.1321	.1295
	25. R-146 63 Fishing	.1734	.2763	.1506	.2149	.1827	.1654	.1829	.2191	.1442	.1538	.2991	.2384
	26. R-147 63 Outdoor	.3613	.4833	.2430	.3710	.3204	.3570	.3720	.3933	.3115	.2949	.4878	.4036
	27. R-150 63 Theater	.5818	.5688	.2853	.4670	.3870	.3208	.4208	.3948	.3681	.3924	.5601	.4714
	28. R-162 63 Vocab. II	.4590	.6344	.3330	.4546	.3831	.3734	.4532	.4569	.3787	.3529	.5814	.4543
	29. R-212 63 Mem. Words	.2731	.3439	.5044	.3469	.3095	.2933	.3773	.2953	.2546	.3425	.4270	.3115
	30. R-220 63 Diag. Wds.	.4172	.4821	.3286	.5848	.4361	.2599	.4389	.4019	.3146	.4138	.5154	.3787
English Test	31. R-231 63 Spelling	.3511	.4299	.3176	.4779	.6399	.3554	.4968	.4001	.3135	.4287	.4753	.3150
	32. R-232 63 Capital.	.2493	.2993	.2146	.2889	.2943	.3368	.3631	.2973	.2536	.2540	.3544	.2457
	33. R-233 63 Punct.	.3938	.4902	.3506	.4625	.4493	.4208	.6605	.4773	.3961	.5268	.5598	.4082
	34. R-234 63 Eng. Usage	.3616	.4269	.2869	.4453	.4025	.3482	.4693	.5220	.3578	.4280	.4845	.3872
	35. R-235 63 Eff. Exp.	.3268	.3974	.2657	.3701	.3381	.3650	.4321	.4361	.4506	.3642	.6727	.3531
	36. R-240 63 Word.Funct	.3858	.4883	.3780	.4346	.4318	.3256	.5482	.4106	.3841	.6154	.5652	.4080
	37. R-250 63 Rdg. Compr	.4725	.5779	.3545	.4635	.4114	.4000	.5203	.4722	.4381	.4869	.7119	.5102
	38. R-260 63 Creativity	.4237	.4805	.3090	.4028	.3025	.2855	.4376	.3704	.3659	.3935	.5600	.5491
	39. R-270 63 Mech.Reas	.2896	.3832	.2546	.3489	.1799	.2335	.3643	.3374	.2735	.3217	.4403	.4248
	40. R-281 63 Vis. 2 Dim	.1966	.2371	.1848	.2258	.1262	.1491	.2474	.1796	.1935	.2345	.2542	.2902
	41. R-282 63 Vis. 3 Dim	.2214	.3221	.2160	.2601	.1787	.1826	.3151	.2423	.2465	.3011	.3666	.3792
	42. R-290 63 Abst.Reas	.2959	.3851	.2905	.3628	.2818	.2887	.4351	.3442	.3316	.3817	.4601	.4112
Math Test	43. R-311 63 Arith.Reas	.3755	.5184	.3196	.4240	.3555	.3999	.5513	.4528	.3892	.4602	.5664	.4804
	44. R-312 63 Int.HSMath	.3867	.5137	.3710	.4764	.4597	.4257	.6078	.4444	.3821	.5599	.5923	.4524
	45. R-333 63 Adv.HSMath	.3340	.4319	.3227	.4101	.4008	.3236	.5155	.3917	.3199	.5512	.5148	.3814
	46. F-410 63 Arith.Comp	.2095	.2657	.1767	.2984	.2888	.2776	.3516	.2706	.2267	.2671	.3068	.2061
	47. F-420 63 Table Read	.1181	.1070	.0955	.1622	.1436	.1360	.1261	.1216	.0921	.1364	.1406	.1084
	48. F-430 63 Cler.Check	.1812	.2273	.2007	.2454	.2498	.1576	.2306	.1530	.1286	.2257	.2745	.1998
	49. F-440 63 Obj.Insp.	.1019	.1357	.0982	.1794	.1113	.1167	.1196	.1453	.1087	.1206	.1498	.1627
Information Test	50. R-102 60 Vocab. I	.5877	.6822	.3918	.5441	.4615	.3947	.5439	.4928	.4205	.4880	.7155	.5747
	51. R-103 60 Literature	.5642	.6126	.3865	.5093	.4354	.3389	.4735	.4106	.3598	.4583	.6650	.4851
	52. R-104 60 Music	.5324	.5639	.3491	.4646	.3834	.3089	.4452	.3580	.3109	.4276	.5875	.4501
	53. R-105 60 Soc. Stud.	.5321	.6486	.3803	.4701	.4440	.4030	.5362	.4549	.3840	.4895	.7031	.4812
	54. R-106 60 Math	.4762	.5703	.3897	.4795	.4645	.3411	.5575	.4236	.3704	.5657	.6160	.4979
	55. R-107 60 Phys. Sci.	.4632	.5704	.3657	.4347	.3999	.3624	.5066	.4074	.3456	.4620	.6240	.4839
	56. R-108 60 Bio. Sci.	.4080	.5272	.3229	.3966	.3334	.3021	.4338	.3973	.3192	.4020	.5851	.4420
	57. R-109 60 Scient.Att	.3811	.4612	.2834	.3899	.2995	.3064	.4201	.3726	.3689	.3502	.5377	.4013
	58. R-110 60 Aero-Space	.4796	.5370	.2739	.3927	.3088	.2661	.4031	.3619	.3022	.3766	.5653	.4917
	59. R-111 60 Electronic	.3776	.4878	.2678	.3367	.2593	.2486	.3802	.3207	.2609	.3453	.4937	.4769
	60. R-112 60 Mechanics	.4147	.5140	.2451	.3840	.2735	.2966	.3722	.3766	.3060	.2792	.5008	.4805
	61. R-113 60 Farming	.3552	.4443	.2639	.3468	.2976	.2871	.3661	.3591	.2796	.2934	.4830	.3757
	62. R-114 60 Home Ec.	.3657	.4200	.2223	.3083	.2436	.2461	.3148	.2903	.2355	.2623	.4199	.3769
	63. R-115 60 Sports	.4399	.5025	.3046	.4225	.3766	.3602	.4118	.3653	.3340	.3776	.5182	.3642
	64. R-131 60 Art	.5592	.6529	.3271	.4651	.3647	.3549	.4405	.3868	.3570	.4016	.6179	.4922
	65. R-132 60 Law	.4826	.5858	.2608	.3762	.3351	.2890	.3943	.3586	.3281	.3660	.5452	.4151
	66. R-133 60 Health	.4963	.6388	.3226	.4553	.4117	.3553	.4502	.4052	.3495	.4028	.5904	.4359
	67. R-134 60 Engin.	.3829	.4806	.2521	.3214	.2553	.2894	.3565	.2912	.2758	.3167	.4776	.3917
	68. R-135 60 Arch.	.3473	.3814	.2272	.3048	.2432	.1997	.2686	.2398	.1882	.2708	.3719	.3222
	69. R-138 60 Military	.4175	.4398	.2367	.3344	.2895	.2390	.3295	.2956	.2404	.3211	.4455	.3589
	70. R-139 60 Acct,Busi.	.4860	.6388	.2626	.3592	.3095	.2859	.4077	.3680	.3109	.3599	.5280	.4223
	71. R-140 60 Prac.Knowl	.4425	.5307	.2563	.3830	.2889	.3367	.3951	.3390	.2986	.3070	.5074	.3858
	72. R-142 60 Bible	.4110	.4978	.3032	.3799	.3266	.2981	.4120	.3564	.2984	.4166	.5547	.3813
	73. R-145 60 Hunting	.0658	.1406	.0591	.1020	.0543	.0674	.0693	.1273	.1055	.0458	.1575	.1537
	74. R-146 60 Fishing	.1548	.2450	.1370	.1970	.1410	.1435	.1578	.1601	.1184	.1140	.2474	.2107
	75. R-147 60 Outdoor	.4556	.5916	.2672	.4055	.3136	.3350	.4166	.3629	.3358	.3704	.5689	.4552
	76. R-150 60 Theater		.6263	.2924	.4496	.3799	.3102	.4208	.3740	.3258	.3835	.5730	.4465
	77. R-162 60 Vocab. II	.6263		.3627	.5162	.4270	.3680	.5240	.4506	.4067	.4586	.6745	.5055
	78. R-212 60 Mem. Words	.2924	.3627		.3395	.3522	.2843	.3924	.3115	.2716	.3582	.4252	.3002
	79. R-220 60 Diag. Wds.	.4496	.5162	.3395		.4951	.3460	.4954	.4654	.3506	.4503	.5746	.4617
English Test	80. R-231 60 Spelling	.3799	.4270	.3522	.4951		.3861	.5347	.4337	.3506	.4302	.4933	.3303
	81. R-232 60 Capital.	.3102	.3680	.2843	.3460	.3861		.4746	.4194	.3509	.3170	.4409	.3161
	82. R-233 60 Punct.	.4208	.5240	.3924	.4954	.5347	.4746		.5358	.4544	.5586	.6017	.4396
	83. R-234 60 Eng. Usage	.3740	.4506	.3115	.4654	.4337	.4134	.5358		.4505	.4020	.5227	.3895
	84. R-235 60 Eff. Exp.	.3258	.4067	.2716	.3506	.3506	.3509	.4544	.4505		.3697	.5019	.3670
	85. R-240 60 Word.Funct	.3835	.4586	.3582	.4503	.4302	.3170	.5586	.4020	.3697		.5838	.4581
	86. R-250 60 Rdg. Compr	.5730	.6745	.4252	.5746	.4933	.4409	.6017	.5227	.5019	.5838		.6237
	87. R-260 60 Creativity	.4465	.5055	.3002	.4617	.3303	.3161	.4396	.3895	.3670	.4581	.6237	
	88. R-270 60 Mech.Reas	.3292	.4236	.2468	.4115	.2181	.2917	.4105	.3700	.3154	.3954	.5243	.5150
	89. R-281 60 Vis. 2 Dim	.2022	.2613	.1598	.3039	.1389	.1810	.2661	.2241	.2058	.2635	.3119	.3210
	90. R-282 60 Vis.' 3 Dim	.2407	.3135	.2032	.2825	.1398	.1906	.3303	.2442	.2281	.3355	.3846	.4120
	91. R-290 60 Abst.Reas	.3123	.3882	.2926	.3493	.2640	.3036	.4538	.3384	.3541	.4257	.5034	.4365
Math Test	92. R-311 60 Arith.Reas	.4046	.5357	.3563	.4234	.4101	.3820	.5735	.4720	.4235	.5368	.6012	.4954
	93. R-312 60 Int.HSMath	.4309	.5172	.3854	.4401	.4719	.3958	.6099	.4485	.3993	.5790	.5969	.4625
	94. R-333 60 Adv.HSMath	.1350	.1406	.1540	.1520	.1480	.1121	.1744	.1179	.0958	.1844	.1542	.1656
	95. F-410 60 Arith.Comp	.2485	.2833	.1978	.2337	.3060	.2954	.3362	.2852	.2868	.2758	.3543	.2258
	96. F-420 60 Table Read	.1616	.2026	.0914	.2030	.1815	.1948	.2271	.1869	.1889	.1786	.2385	.1864
	97. F-630 60 Cler.Check	.1891	.2197	.1611	.3351	.2954	.1831	.2679	.1901	.1864	.2469	.2787	.1968
	98. F-440 60 Obj.Insp.	.0938	.1298	.0948	.2034	.0834	.0961	.1325	.0921	.1170	.1271	.1555	.1818
	99. F*801 60 Socioecon.	.3382	.3734	.1848	.2740	.2026	.1922	.2722	.2571	.2166	.2949	.3561	.3065

TABLE I-1 (continued)

88	89	90	91	92	93	94	95	96	97	98	99	Variable
.5312	.3670	.3631	.4278	.3554	.5347	.1507	.3051	.1997	.1865	.1463	.3717	1. R-102 63
.4027	.2494	.3048	.3597	.4856	.5422	.1355	.2595	.1711	.1946	.1675	.3643	2. R-103 63
.4129	.2365	.3166	.3742	.4523	.4833	.1667	.2744	.1649	.2036	.1347	.3929	3. R-104 63
.4299	.2569	.3119	.3898	.5179	.5144	.1473	.3165	.1957	.1761	.1367	.2818	4. R-105 63
.5070	.3369	.4163	.5015	.6269	.6643	.1992	.3293	.2057	.2270	.1643	.4062	5. R-106 63
.5434	.3081	.4606	.4611	.5706	.5745	.1745	.3072	.1773	.1840	.1666	.3483	6. R-107 63
.4416	.2013	.2980	.3368	.4293	.3977	.1386	.1836	.1093	.0970	.1122	.2232	7. R-108 63
.4060	.2443	.2975	.3767	.4566	.4468	.1305	.2326	.1601	.1494	.1655	.2682	8. R-109 63
.5330	.2895	.3630	.3793	.4529	.4226	.1364	.2080	.1498	.1502	.1455	.3172	9. R-110 63
.6137	.3152	.4410	.3986	.4804	.4337	.1454	.2114	.1354	.0935	.1158	.2991	10. R-111 63
.5108	.2463	.3188	.2835	.3513	.2787	.0796	.1572	.0969	.0469	.1187	.2145	11. R-112 63
.3430	.1963	.1962	.2236	.2934	.2603	.0536	.1815	.1217	.0976	.0837	.0673	12. R-113 63
.3464	.1968	.2547	.2543	.3172	.3041	.0951	.1841	.1258	.0766	.1028	.2109	13. R-114 63
.2611	.1687	.1432	.2881	.3882	.4036	.1296	.3051	.1905	.1898	.1012	.2796	14. R-115 63
.3982	.2147	.2783	.3433	.3956	.4341	.1283	.2391	.1442	.1515	.1335	.3359	15. R-131 63
.3520	.1995	.2388	.2362	.4458	.4281	.1250	.2111	.1578	.1341	.0982	.2900	16. R-132 63
.3833	.2316	.2540	.2775	.3828	.3960	.1080	.2268	.1558	.1390	.1140	.2777	17. R-133 63
.3676	.1993	.2311	.2613	.3229	.3112	.0765	.2181	.1449	.0902	.0932	.2068	18. R-134 63
.3429	.1827	.2765	.2925	.3585	.3746	.1112	.1703	.0759	.1201	.1023	.2736	19. R-135 63
.2780	.1520	.2162	.2244	.3529	.3609	.0490	.2028	.1188	.1476	.0815	.2664	20. R-138 63
.3267	.1803	.2309	.2751	.4376	.3844	.0618	.2346	.1753	.1525	.0962	.2948	21. R-139 63
.2784	.1848	.1837	.2267	.2816	.3211	.0698	.2138	.2015	.1728	.1397	.2264	22. R-140 63
.3228	.1212	.2268	.3139	.4119	.4305	.0596	.2174	.1108	.1315	.0616	.2046	23. R-142 63
.2003	.0897	.1093	.0477	.0686	.0471	.0009	.0337	-.0355	-.0495	.0552	-.0573	24. R-145 63
.2505	.1066	.1432	.1155	.2207	.1957	.0826	.1414	.0830	.0476	.0843	.0842	25. R-146 63
.4058	.2082	.2669	.3098	.3729	.4128	.0797	.2280	.1416	.1122	.1047	.3268	26. R-147 63
.3596	.2326	.2222	.2952	.4015	.4261	.0669	.2374	.1769	.1730	.1226	.3266	27. R-150 63
.4147	.2440	.2906	.3395	.4686	.4464	.0842	.2620	.1848	.1450	.1295	.3565	28. R-162 63
.2428	.2035	.2045	.3188	.3225	.3564	.0905	.1923	.1575	.1961	.0863	.1355	29. R-212 63
.3676	.2702	.2580	.3294	.3988	.3987	.1224	.1918	.1474	.2410	.1602	.3140	30. R-220 63
.1711	.1038	.1141	.2577	.3675	.4444	.0798	.2558	.2059	.3076	.0996	.1715	31. R-231 63
.2110	.1763	.1462	.2632	.2673	.2948	.0460	.1960	.2112	.2064	.0878	.1384	32. R-232 63
.3747	.2511	.2917	.4275	.5224	.5496	.1416	.2563	.2293	.2476	.1033	.2696	33. R-233 63
.2991	.1665	.1745	.3008	.3815	.3927	.0805	.2136	.1676	.1935	.0809	.2344	34. R-234 63
.2851	.1810	.2178	.3206	.3924	.3762	.0632	.2379	.2133	.2129	.0884	.2297	35. R-235 63
.3825	.2731	.3559	.4202	.5512	.5814	.1545	.2905	.2092	.2526	.1612	.3231	36. R-240 63
.4539	.2841	.3522	.4477	.5535	.5355	.1530	.3050	.2038	.2254	.1365	.3245	37. R-250 63
.4846	.3302	.3984	.4096	.4653	.4519	.1302	.2554	.1704	.1600	.1580	.2843	38. R-260 63
.6581	.3984	.4901	.4654	.4371	.4125	.1334	.1888	.1649	.1232	.1566	.2528	39. R-270 63
.4182	.4915	.4169	.3815	.2825	.3004	.0997	.1626	.1491	.1184	.1892	.1887	40. R-281 63
.5215	.3906	.6007	.4396	.3941	.3899	.1480	.2044	.1821	.1587	.2094	.2164	41. R-282 63
.4772	.3469	.4588	.5678	.4574	.4723	.1278	.2689	.1989	.1948	.1766	.2822	42. R-290 63
.4588	.2757	.3610	.4981	.6504	.5667	.1574	.3393	.2332	.2016	.0962	.3206	43. R-311 63
.4310	.2876	.3753	.5007	.6259	.6875	.2057	.3307	.2340	.2619	.1381	.3301	44. R-312 63
.3930	.2389	.3426	.4260	.5431	.6204	.2291	.2400	.1700	.2142	.0942	.3193	45. R-333 63
.1679	.1940	.1210	.2567	.3052	.3304	.0692	.4653	.2747	.2768	.1355	.1271	46. F-410 63
.1053	.1298	.0847	.1263	.1219	.1743	.0644	.1128	.1553	.1799	.1441	.1442	47. F-420 63
.1622	.1799	.0924	.1695	.1843	.2259	.0415	.1635	.1601	.2703	.1651	.1788	48. F-430 63
.2267	.2557	.2009	.2182	.1161	.1240	.0366	.1401	.1462	.1768	.2866	.1246	49. F-440 63
.5131	.2924	.3592	.4266	.5840	.5595	.1750	.2950	.1857	.2088	.1236	.4128	50. R-102 60
.3651	.2202	.2878	.3679	.4763	.5132	.1790	.2348	.1524	.2085	.1235	.3824	51. R-103 60
.3639	.2069	.2852	.3414	.4332	.4795	.1527	.2262	.1504	.1863	.1193	.3854	52. R-104 60
.4174	.2256	.3176	.4221	.5653	.5696	.1580	.3126	.1788	.2073	.0967	.3776	53. R-105 60
.4598	.2819	.3913	.4803	.6069	.6815	.2566	.2846	.1497	.2264	.1013	.3746	54. R-106 60
.4899	.2610	.3604	.4220	.5507	.5336	.1709	.2524	.1626	.1851	.0976	.3207	55. R-107 60
.4401	.2038	.2988	.3482	.4655	.4403	.1244	.1968	.1414	.1414	.0962	.2615	56. R-108 60
.3736	.2234	.2718	.3758	.4672	.4143	.1248	.2302	.1540	.1725	.1013	.2877	57. R-109 60
.4918	.2366	.3444	.3625	.4436	.4243	.1543	.1742	.1098	.1373	.0955	.3363	58. R-110 60
.5255	.2641	.3536	.3435	.4587	.3988	.1474	.1707	.0954	.0928	.0635	.2985	59. R-111 60
.5023	.2556	.3176	.3166	.4350	.3736	.1296	.1871	.1169	.1084	.1033	.2837	60. R-112 60
.3740	.2074	.2379	.2888	.3870	.3420	.0894	.2220	.1391	.1244	.0610	.1759	61. R-113 60
.3204	.1943	.2402	.2668	.3436	.3367	.1093	.1840	.1219	.1196	.0803	.2211	62. R-114 60
.2924	.2014	.1908	.3377	.4374	.4642	.1648	.2905	.1735	.2178	.0997	.3253	63. R-115 60
.3831	.2474	.3078	.3392	.4506	.4494	.1441	.2370	.1586	.2023	.1467	.3334	64. R-131 60
.3321	.2062	.2477	.2934	.4316	.4171	.1321	.2380	.1519	.1755	.0956	.2819	65. R-132 60
.3411	.2032	.2320	.3021	.4436	.4557	.1175	.2653	.1811	.2095	.1097	.3298	66. R-133 60
.3833	.1982	.2567	.2975	.3798	.3561	.1067	.2239	.1351	.1339	.0964	.2459	67. R-134 60
.2564	.1753	.1991	.2279	.3045	.2943	.1335	.1468	.0620	.1353	.0617	.2174	68. R-135 60
.2536	.1530	.2012	.2473	.3470	.3474	.1190	.1635	.1077	.1410	.0454	.2591	69. R-138 60
.3364	.2037	.2496	.2961	.4624	.4223	.1357	.2340	.1849	.1583	.0935	.2977	70. R-139 60
.3281	.2134	.2184	.3075	.3856	.3708	.1122	.2906	.2107	.1938	.1527	.2693	71. R-140 60
.2958	.1730	.2243	.2706	.4068	.4073	.1522	.2176	.1280	.1564	.0536	.2187	72. R-142 60
.1945	.1036	.0798	.0660	.0983	.0631	.0316	.0393	.0453	.0158	.0528	-.0042	73. R-145 60
.2189	.0973	.1057	.1115	.1799	.1331	.0717	.0955	.0563	.0871	.0922	.0628	74. R-146 60
.4174	.2457	.2824	.3479	.4352	.4316	.1394	.2572	.1728	.1641	.1339	.3484	75. R-147 60
.3292	.2022	.2407	.3123	.4046	.4309	.1350	.2485	.1616	.1891	.0938	.3382	76. R-150 60
.4236	.2613	.3135	.3882	.5357	.5172	.1406	.2833	.2026	.2197	.1298	.3734	77. R-162 60
.2468	.1598	.2032	.2926	.3563	.3854	.1540	.1978	.0914	.1611	.0948	.1848	78. R-212 60
.4115	.3039	.2825	.3493	.4234	.4401	.1520	.2337	.2030	.3351	.2034	.2740	79. R-220 60
.2181	.1389	.1398	.2640	.4101	.4719	.1480	.3060	.1815	.2954	.0834	.2026	80. R-231 60
.2917	.1810	.1906	.3036	.3820	.3958	.1121	.2954	.1948	.1831	.0961	.1922	81. R-232 60
.4105	.2661	.3303	.4538	.5735	.6099	.1744	.3362	.2271	.2679	.1325	.2722	82. R-233 60
.3700	.2241	.2442	.3384	.4720	.4485	.1179	.2852	.1869	.1901	.0921	.2571	83. R-234 60
.3154	.2058	.2281	.3541	.4235	.3993	.0958	.2868	.1889	.1864	.1170	.2166	84. R-235 60
.3954	.2635	.3355	.4257	.5368	.5790	.1844	.2758	.1786	.2469	.1271	.2949	85. R-240 60
.5243	.3119	.3846	.5034	.6012	.5969	.1542	.3543	.2385	.2787	.1555	.3561	86. R-250 60
.5150	.3210	.4120	.4365	.4954	.4625	.1656	.2258	.1864	.1968	.1818	.3065	87. R-260 60
	.4725	.5706	.5282	.4769	.4466	.1502	.2030	.1671	.1389	.2037	.2657	88. R-270 60
.4725		.4488	.3884	.2917	.2816	.0814	.1931	.2206	.1940	.2926	.1659	89. R-281 60
.5706	.4488		.5041	.4086	.3740	.1269	.1709	.1494	.1330	.2147	.2153	90. R-282 60
.5282	.3484	.5041		.4887	.4862	.1421	.2984	.2181	.2146	.1998	.2857	91. R-290 60
.4769	.2917	.4086	.4887		.6390	.1885	.3422	.1846	.1840	.1090	.3308	92. R-311 60
.4466	.2816	.3740	.4862	.6390		.2440	.3506	.1830	.2215	.1123	.3299	93. R-312 60
.1502	.0814	.1269	.1421	.1885	.2440		.0471	-.0046	.0267	-.0068	.0830	94. R-333 60.
.2030	.1931	.1709	.2984	.3422	.3506	.0471		.3037	.2954	.1351	.1282	95. F-410 60
.1671	.2206	.1494	.2181	.1846	.1830	-.0046	.3037		.3588	.3479	.1158	96. F-420 60
.1389	.1940	.1330	.2146	.1840	.2215	.0267	.2954	.3588		.3252	.1110	97. F-430 60
.2037	.2926	.2147	.1998	.1090	.1123	-.0068	.1351	.3479	.3252		.1115	98. F-440 60
.2657	.1659	.2153	.2857	.3308	.3299	.0830	.1282	.1158	.1110	.1115		99. F*801 60

---

[a] Each correlation in this table is based on all cases having valid scores for both of the variables correlated.

[b] The unweighted numbers of cases on which each correlation coefficient is based may be determined form Table 2-5.

TABLE I-2. Pseudo-matrix[a] of correlations based on females[b]

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
Information Test	1. R-102 63 Vocab. I		.7318	.6693	.7223	.6661	.7171	.6085	.5650	.4976	.4907	.5053	.5789
	2. R-103 63 Literature	.7318		.6513	.7248	.6591	.6630	.5922	.4886	.4448	.4186	.3949	.5044
	3. R-104 63 Music	.6693	.6513		.6306	.5576	.5958	.5140	.4536	.4308	.4132	.4159	.4453
	4. R-105 63 Soc. Stud.	.7223	.7248	.6306		.6310	.6932	.5958	.4724	.4450	.4446	.3965	.5264
	5. R-106 63 Math	.6661	.6591	.5576	.6310		.7205	.5369	.4419	.4508	.4747	.4009	.4363
	6. R-107 63 Phys. Sci.	.7171	.6630	.5958	.6932	.7205		.6345	.4691	.5240	.5933	.4962	.5192
	7. R-108 63 Bio. Sci.	.6085	.5922	.5140	.5958	.5369	.6345		.4306	.4479	.4283	.4460	.5087
	8. R-109 63 Scient.Att	.5650	.4886	.4536	.4724	.4419	.4691	.4306		.3791	.3297	.3850	.4163
	9. R-110 63 Aero-Space	.4976	.4448	.4308	.4450	.4508	.5240	.4479	.3791		.4611	.4423	.3730
	10. R-111 63 Electronic	.4907	.4186	.4132	.4446	.4747	.5933	.4283	.3297	.4611		.4962	.4091
	11. R-112 63 Mechanics	.5053	.3949	.4159	.3965	.4009	.4962	.4460	.3850	.4423	.4962		.5400
	12. R-113 63 Farming	.5789	.5044	.4453	.5264	.4363	.5192	.5087	.4163	.3730	.4091	.5400	
	13. R-114 63 Home Ec.	.4681	.3794	.4065	.4152	.3329	.4082	.4175	.3676	.3143	.3259	.4557	.4679
	14. R-115 63 Sports	.5496	.5132	.5176	.5292	.5034	.5023	.4217	.3964	.4062	.3526	.3933	.4156
	15. R-131 63 Art	.6731	.6269	.5706	.5762	.4672	.5185	.4887	.4561	.4172	.2961	.4475	.4528
	16. R-132 63 Law	.5877	.5649	.5294	.5710	.4387	.4726	.4319	.4334	.4353	.3527	.4392	.4479
	17. R-133 63 Health	.5803	.5370	.5228	.5225	.4211	.4775	.4577	.4253	.3653	.3127	.4255	.4820
	18. R-134 63 Engin.	.4582	.3948	.4169	.3777	.3737	.4312	.3755	.3674	.3253	.3576	.4511	.4361
	19. R-135 63 Arch.	.4255	.4274	.4193	.4158	.3487	.4166	.3928	.2821	.3027	.3427	.3175	.3084
	20. R-138 63 Military	.4408	.4380	.4179	.4682	.3073	.3681	.2995	.2503	.2912	.3061	.2796	.2593
	21. R-139 63 Acct,Busi.	.6182	.5590	.5674	.6237	.4755	.4821	.3864	.4412	.3970	.2827	.4025	.4669
	22. R-140 63 Prac.Knowl	.4492	.4288	.4053	.4195	.3111	.3316	.2980	.3542	.2385	.2484	.3080	.3048
	23. R-142 63 Bible	.5314	.5585	.4839	.5304	.4048	.5005	.4367	.3645	.3212	.3354	.3578	.3896
	24. R-145 63 Hunting	.1151	.0502	.0424	.1188	.0509	.1451	.1665	.0239	.1083	.2038	.2498	.2370
	25. R-146 63 Fishing	.0580	.0485	.0781	.0467	.0251	.0731	.1182	.0615	.0963	.1907	.2208	.0969
	26. R-147 63 Outdoor	.5530	.5125	.4801	.5064	.5051	.4790	.4468	.3927	.4015	.3436	.3935	.3961
	27. R-150 63 Theater	.6967	.6446	.6377	.6136	.5730	.5358	.4773	.4755	.4529	.2914	.3978	.4191
	28. R-162 63 Vocab. II	.7179	.6513	.6158	.6592	.5688	.5747	.5173	.4937	.4477	.3225	.4397	.5156
	29. R-212 63 Mem. Words	.4136	.3927	.3661	.3991	.4054	.3463	.2978	.2505	.2189	.2324	.1948	.2022
English Test	30. R-220 63 Diag. Wds.	.5174	.4861	.4453	.4120	.4630	.4680	.3818	.3537	.2903	.3299	.2820	.2932
	31. R-231 63 Spelling	.4598	.4801	.3581	.4215	.3842	.3401	.3067	.2510	.1208	.2133	.1693	.2474
	32. R-232 63 Capital.	.3279	.3447	.2707	.3230	.2540	.2985	.2480	.1997	.1529	.1681	.1827	.3105
	33. R-233 63 Punct.	.5847	.6283	.4983	.5789	.5547	.5112	.4437	.3907	.2301	.2846	.2971	.4339
	34. R-234 63 Eng. Usage	.5085	.5104	.3797	.4640	.4627	.4270	.3690	.3601	.2652	.2742	.2450	.4126
	35. R-235 63 Eff. Exp.	.4675	.4469	.3921	.4491	.4413	.4133	.3717	.4025	.2061	.2575	.2843	.3969
	36. R-240 63 Word.Funct	.5599	.5551	.4941	.5737	.5904	.5588	.4594	.4400	.3616	.3098	.3425	.4248
	37. R-250 63 Rdg. Compr	.6919	.6834	.6130	.6952	.5756	.6207	.5511	.5656	.4627	.4168	.4563	.5505
	38. R-260 63 Creativity	.5800	.5278	.4393	.4759	.5186	.5194	.4985	.4466	.4393	.4155	.4597	.4400
	39. R-270 63 Mech.Reas	.5223	.4237	.4295	.4306	.5505	.5515	.4787	.3906	.4774	.4258	.4407	.3925
	40. R-281 63 Vis. 2 Dim	.2914	.2344	.2302	.2421	.3228	.3073	.2776	.2112	.2552	.2515	.2386	.2549
	41. R-282 63 Vis. 3 Dim	.4653	.3762	.3639	.3630	.4494	.4619	.4111	.3742	.3930	.3722	.4147	.3540
	42. R-290 63 Abst.Reas	.5123	.4560	.4258	.4650	.4781	.4766	.3929	.4289	.3208	.2930	.3439	.3772
Math Test	43. R-311 63 Arith.Reas	.6340	.5532	.4908	.5935	.6316	.5928	.4745	.4659	.2967	.3817	.3886	.4995
	44. R-312 63 Int.HSMath	.5520	.5676	.4988	.5837	.8069	.6218	.4716	.3946	.3115	.4253	.3230	.3804
	45. R-333 63 Adv.HSMath	.3516	.3870	.3326	.3690	.6327	.4746	.2919	.2311	.2520	.3066	.1937	.2139
	46. F-410 63 Arith.Comp	.3907	.2895	.3228	.3436	.3541	.3136	.2131	.2729	.1307	.2603	.2566	.3218
	47. F-420 63 Table Read	.2915	.2007	.1981	.2247	.2502	.2794	.1689	.2367	.1968	.2037	.1842	.1686
	48. F-430 63 Cler.Check	.2608	.1938	.1355	.2157	.2631	.2404	.1860	.1374	.1674	.2048	.1328	.1346
	49. F-440 63 Obj.Insp.	.3035	.2059	.2187	.2027	.2454	.2782	.2377	.1990	.2412	.2523	.2852	.2142
Information Test	50. R-102 60 Vocab. I	.7641	.6729	.6388	.6570	.6087	.6642	.5830	.4960	.4703	.4663	.4630	.5159
	51. R-103 60 Literature	.6214	.7182	.5769	.6019	.5493	.5691	.4805	.4183	.3861	.3745	.3326	.3831
	52. R-104 60 Music	.6127	.5946	.7414	.5870	.5281	.5547	.4570	.3947	.3896	.3830	.3784	.3983
	53. R-105 60 Soc. Stud.	.7006	.6908	.6178	.7971	.6208	.6682	.5726	.4636	.4131	.4369	.3897	.4778
	54. R-106 60 Math	.5787	.5660	.5020	.5461	.6860	.5929	.4720	.3760	.3645	.3512	.3346	.3789
	55. R-107 60 Phys. Sci.	.6032	.5600	.4887	.5949	.5569	.7163	.5380	.3876	.4009	.4628	.3724	.4137
	56. R-108 60 Bio. Sci.	.5311	.5162	.4514	.5175	.4579	.5465	.6154	.3899	.3581	.3013	.4029	.4689
	57. R-109 60 Scient.Att	.5060	.4499	.4181	.4476	.4000	.4423	.3893	.5186	.3121	.3003	.3323	.3957
	58. R-110 60 Aero-Space	.4061	.3904	.3577	.3728	.3880	.4311	.3418	.2733	.4737	.3210	.2812	.2476
	59. R-111 60 Electronic	.3651	.3195	.2772	.3342	.3355	.4211	.3125	.2283	.2697	.4486	.2988	.2820
	60. R-112 60 Mechanics	.4372	.3557	.3601	.3563	.3449	.4160	.3961	.3065	.3394	.3752	.5748	.4451
	61. R-113 60 Farming	.5585	.4935	.4450	.5092	.4296	.5179	.5148	.3926	.3828	.3897	.5185	.6956
	62. R-114 60 Home Ec.	.4818	.4277	.4300	.4250	.3996	.4238	.4137	.3914	.3069	.3249	.4243	.4368
	63. R-115 60 Sports	.4926	.4669	.4658	.4761	.4652	.4405	.3531	.3338	.3344	.2871	.3488	.3929
	64. R-131 60 Art	.6442	.6192	.5751	.5722	.5095	.5321	.4949	.4379	.3898	.3590	.3973	.4306
	65. R-132 60 Law	.4476	.4344	.3936	.4179	.3741	.4119	.3520	.3349	.3205	.2936	.3100	.3326
	66. R-133 60 Health	.5879	.5426	.5020	.5291	.4421	.5100	.4770	.4042	.3446	.3359	.3636	.4096
	67. R-134 60 Engin.	.4225	.3560	.3813	.3569	.3347	.3690	.3565	.3132	.2723	.3229	.3587	.3369
	68. R-135 60 Arch.	.3487	.3325	.3026	.3344	.2962	.3078	.2606	.1940	.2143	.2213	.2039	.2541
	69. R-138 60 Military	.2933	.2686	.2806	.2919	.2817	.2696	.2164	.1756	.1858	.2011	.2019	.1949
	70. R-139 60 Acct,Busi.	.5562	.5296	.4688	.5253	.4856	.4913	.4081	.3755	.3343	.3359	.3387	.3883
	71. R-140 60 Prac.Knowl	.4342	.3877	.3545	.4037	.3382	.3548	.3180	.3840	.2507	.2306	.2810	.2898
	72. R-142 60 Bible	.4789	.5233	.4296	.5057	.4227	.4576	.4199	.3568	.3078	.3031	.3165	.4031
	73. R-145 60 Hunting	.1077	.0395	.0513	.0936	.0660	.0992	.0857	.0483	.0889	.0960	.1428	.1377
	74. R-146 60 Fishing	.0547	.0575	.0564	.0510	.0671	.0616	.0956	.0437	.0604	.0599	.0776	.0656
	75. R-147 60 Outdoor	.5400	.4751	.4831	.4755	.4438	.4779	.4180	.3970	.3566	.3229	.3498	.3796
	76. R-150 60 Theater	.5894	.5794	.5362	.5232	.4799	.4700	.3949	.3805	.3684	.3095	.3199	.3794
	77. R-162 60 Vocab. II	.6774	.6336	.5901	.6164	.5467	.5775	.5126	.4785	.3877	.3872	.4169	.4680
	78. R-212 60 Mem. Words	.4369	.4360	.3779	.4266	.4104	.4055	.3346	.2951	.2334	.2440	.2396	.2728
English Test	79. R-220 60 Diag. Wds.	.5508	.4954	.4943	.4640	.4599	.4501	.4136	.3703	.2910	.2876	.2978	.3590
	80. R-231 60 Spelling	.4647	.4459	.3878	.4159	.4297	.4042	.3153	.2962	.1982	.2448	.2089	.3052
	81. R-232 60 Capital.	.3739	.3669	.3214	.3627	.3094	.3167	.2647	.2746	.1896	.2029	.2298	.3108
	82. R-233 60 Punct.	.5963	.5704	.5075	.5616	.5658	.5463	.4495	.4389	.3288	.3524	.3396	.4396
	83. R-234 60 Eng. Usage	.4891	.4835	.4069	.4492	.4131	.4142	.3352	.3517	.2606	.2851	.2906	.3561
	84. R-235 60 Eff. Exp.	.4311	.4302	.3686	.3910	.3821	.3822	.3206	.3513	.2370	.2304	.2369	.2852
	85. R-240 60 Word.Funct	.5514	.5501	.4372	.5195	.5947	.5274	.4332	.4081	.3296	.3242	.2848	.3724
	86. R-250 60 Rdg. Compr	.7460	.7079	.6259	.6958	.6144	.6534	.5931	.5379	.4508	.4140	.4489	.5324
	87. R-260 60 Creativity	.5353	.4734	.4549	.4549	.4754	.4937	.4622	.3914	.3713	.3672	.4291	.4054
	88. R-270 60 Mech.Reas	.4964	.4035	.4105	.4153	.4775	.5131	.4246	.3870	.4241	.3896	.4315	.3839
	89. R-281 60 Vis. 2 Dim	.3367	.2889	.2764	.3006	.3531	.3262	.2565	.3183	.2491	.2395	.2874	.3002
	90. R-282 60 Vis. 3 Dim	.3930	.3345	.3185	.3534	.4074	.4073	.3304	.3327	.3008	.2972	.3151	.2907
	91. R-290 60 Abst.Reas	.5136	.4345	.4322	.4548	.4982	.4862	.4052	.4114	.3355	.3169	.3368	.3549
Math Test	92. R-311 60 Arith.Reas	.6123	.5443	.4885	.5696	.6008	.5942	.4645	.4557	.3736	.3811	.3990	.4452
	93. R-312 60 Int.HSMath	.5892	.5715	.4877	.5635	.6760	.5943	.4484	.4203	.3789	.3967	.3602	.3942
	94. R-333 60 Adv.HSMath	.1170	.0847	.1017	.0969	.1577	.1291	.1047	.1144	.0796	.0999	.0858	.0639
	95. F-410 60 Arith.Comp	.3336	.3059	.3031	.3220	.3321	.2966	.2430	.2421	.1763	.1986	.1751	.2425
	96. F-420 60 Table Read	.2015	.1965	.1849	.1681	.1823	.1732	.1144	.1763	.1304	.1356	.1447	.1697
	97. F-430 60 Cler.Check	.1849	.1959	.1613	.1654	.1971	.1626	.1231	.1367	.1084	.0884	.0634	.1427
	98. F-440 60 Obj.Insp.	.2138	.2000	.2028	.1724	.2268	.2002	.1708	.1948	.1496	.1382	.1582	.1638
	99. P*801 60 Socioecon.	.4249	.4361	.4632	.3991	.4217	.3675	.2942	.3119	.2668	.2111	.1954	.2095

TABLE I-2 (continued)

13	14	15	16	17	18	19	20	21	22	23	24	25	Variable
.4681	.5496	.6731	.5877	.5803	.4582	.4255	.4408	.6182	.4492	.5314	.1151	.0380	1. R-102 63
.3784	.5142	.6269	.5649	.5370	.3948	.4274	.4380	.5590	.4288	.5545	.0562	.0445	2. R-103 63
.4065	.5176	.5706	.5294	.5228	.4169	.4193	.4179	.5674	.4053	.4839	.0626	.0741	3. R-104 63
.4152	.5292	.5762	.5710	.5275	.3777	.4158	.4682	.6237	.4195	.5304	.1148	.0467	4. R-105 63
.3520	.5034	.4672	.4387	.4211	.3737	.3487	.3093	.4755	.3111	.4048	.0557	.0251	5. R-106 63
.4082	.5023	.5185	.4726	.4775	.4312	.4166	.3681	.4821	.3316	.5605	.1451	.0731	6. R-107 63
.4175	.4217	.4887	.4319	.4577	.3755	.3928	.2995	.3864	.2980	.4367	.1665	.1182	7. R-108 63
.3676	.3964	.4561	.4334	.4253	.3674	.2821	.2503	.4412	.3542	.3645	.0231	.0615	8. R-109 63
.3143	.4062	.4172	.4353	.3653	.3253	.3027	.2912	.3970	.2385	.3212	.1385	.0363	9. R-110 63
.3262	.3522	.2961	.3522	.3128	.3572	.3429	.3061	.2827	.2489	.3354	.2036	.1707	10. R-111 63
.4557	.3933	.4475	.4392	.4255	.4511	.3175	.2796	.4025	.3080	.3578	.2499	.2208	11. R-112 63
.4679	.4156	.4528	.4470	.4820	.4361	.3084	.2593	.4669	.3048	.3896	.2370	.0969	12. R-113 63
	.3628	.4217	.3775	.4456	.4129	.2721	.2490	.4684	.2989	.3137	.2009	.0708	13. R-114 63
.3628		.4396	.4748	.4122	.3069	.3526	.3540	.4624	.3573	.4070	.0820	.0648	14. R-115 63
.4217	.4396		.5117	.5088	.3769	.4515	.3981	.4790	.4296	.4518	.0505	.1069	15. R-131 63
.3775	.4748	.5117		.4263	.3479	.3595	.3990	.4874	.3668	.4423	.0859	.0947	16. R-132 63
.4456	.4122	.5088	.4263		.3328	.3264	.3341	.4195	.3940	.4262	.0826	.0759	17. R-133 63
.4129	.3069	.3769	.3479	.3328		.2427	.2472	.3183	.3029	.3158	.1536	.1249	18. R-134 63
.2721	.3526	.4515	.3595	.3263	.2427		.2965	.3130	.2574	.3385	.0632	.1024	19. R-135 63
.2490	.3540	.3981	.3990	.3341	.2472	.2965		.3194	.2588	.3276	.0880	.0896	20. R-138 63
.4684	.4624	.4790	.4874	.4195	.3183	.3130	.3194		.3764	.3527	.0620	.0752	21. R-139 63
.2989	.3573	.4296	.3668	.3940	.3029	.2574	.2588	.3764		.3082	.0440	.0510	22. R-140 63
.3137	.3070	.4518	.4423	.4262	.3158	.3385	.3276	.3527	.3082		.1092	.0719	23. R-142 63
.2009	.0820	.0505	.0859	.0806	.1536	.0632	.0880	.0620	.0440	.1092		.0969	24. R-145 63
.0708	.0688	.1069	.0947	.0759	.1249	.1024	.0896	.0752	.0510	.0719	.0969		25. R-146 63
.4043	.4504	.4689	.4077	.3916	.3555	.3113	.2898	.3876	.3482	.3292	.0809	.1166	26. R-147 63
.4005	.5232	.6292	.5198	.4916	.3656	.4040	.3876	.5170	.4134	.4089	.0539	.0761	27. R-150 63
.4902	.4709	.5951	.5456	.5511	.3527	.3638	.3678	.6165	.3893	.4328	.0651	.0680	28. R-162 63
.1737	.3180	.4240	.4143	.3422	.2048	.3390	.3427	.3138	.2661	.4266	.0710	.0818	29. R-212 63
.1829	.3752	.4341	.2859	.3197	.1325	.2682	.2189	.3268	.2138	.2826	.0267	.0023	30. R-220 63
.1861	.3040	.3856	.3580	.3366	.2014	.3142	.2858	.3062	.2645	.2990	.0414	.1113	31. R-231 63
.2036	.2574	.2548	.2599	.3006	.1316	.1787	.2154	.2068	.2060	.2136	.0394	-.0168	32. R-232 63
.2864	.4210	.3978	.4226	.3816	.2296	.3315	.3302	.4198	.3042	.3609	.0187	.0886	33. R-233 63
.2573	.3438	.3776	.3515	.4174	.2101	.3080	.2972	.3064	.2355	.3789	-.0240	.0844	34. R-234 63
.3300	.3345	.3706	.3247	.2879	.1996	.2633	.2871	.3354	.2164	.3253	.0301	.0146	35. R-235 63
.3027	.3958	.4215	.4730	.4105	.2828	.3452	.3173	.4319	.3416	.4262	.0327	-.0137	36. R-240 63
.4233	.4270	.6543	.5912	.5330	.3704	.4480	.3865	.5509	.4321	.5767	.0870	.0594	37. R-250 63
.3476	.4326	.4399	.3929	.3337	.2331	.2873	.3343	.4043	.2642	.3331	.0610	.1261	38. R-260 63
.3153	.3374	.3534	.3028	.2357	.2328	.1935	.3045	.3241	.2079	.2554	.0768	.0557	39. R-270 63
.1856	.2341	.1891	.1166	.1729	.2044	.0984	.1420	.1967	.1146	.1703	.0196	.0721	40. R-281 63
.3527	.2737	.2881	.2642	.2893	.2478	.2298	.2266	.2822	.2084	.3233	.0316	.0487	41. R-282 63
.3599	.3795	.4394	.4011	.3713	.2957	.2916	.2535	.4197	.3209	.3400	.0599	.0868	42. R-290 63
.3925	.4502	.4493	.4788	.3925	.2952	.3550	.3176	.5241	.2827	.4259	.0408	.0752	43. R-311 63
.3087	.4135	.4323	.4293	.3956	.2493	.3820	.3711	.4216	.2924	.3910	.0287	.0723	44. R-312 63
.1415	.3064	.3925	.3645	.3081	.2470	.3766	.3331	.2941	.2279	.3104	.0008	.0929	45. R-333 63
.2394	.2829	.2685	.2711	.2545	.1240	.1864	.2187	.3343	.2826	.2761	.0550	.0700	46. F-410 63
.0803	.2141	.2249	.1237	.3193	.1083	.1165	.0958	.1960	.2159	.1768	.0314	.0491	47. F-420 63
.0147	.1703	.0790	.1315	.1569	.0864	.1033	.1110	.1541	.0789	.0393	.0685	.0913	48. F-430 63
.1170	.2060	.1713	.0881	.2238	.2028	.0870	.1072	.1308	.1703	.0650	.0114	.0317	49. F-440 63
.4253	.5143	.5896	.5268	.5048	.3557	.4698	.4317	.5206	.3634	.4780	.0700	.0748	50. R-102 60
.3247	.4292	.5745	.4484	.4318	.2616	.4435	.3750	.4314	.3116	.4516	.0588	.0572	51. R-103 60
.3824	.4993	.5439	.4571	.4252	.3076	.4177	.4089	.4652	.3294	.3912	.0386	.0549	52. R-104 60
.3874	.5236	.5873	.5513	.4803	.3408	.4513	.4401	.5027	.3552	.5024	.0962	.0435	53. R-105 60
.3275	.4149	.4376	.4357	.3812	.3147	.3908	.3550	.4251	.2859	.3689	.0336	.0731	54. R-106 60
.3311	.4280	.4806	.4330	.4255	.3394	.3794	.3227	.4211	.2783	.3949	.1025	.0607	55. R-107 60
.3970	.3710	.4401	.4118	.4067	.2997	.3297	.2948	.3528	.2646	.3787	.1072	.1137	56. R-108 60
.3371	.3220	.4111	.3970	.3728	.2898	.2766	.2912	.3738	.3128	.3669	.0813	.0423	57. R-109 60
.2227	.3007	.3229	.3108	.2874	.2104	.2554	.2729	.2730	.2016	.2682	.0603	.0993	58. R-110 60
.2321	.2410	.2596	.2466	.2232	.2033	.2592	.1951	.2425	.1569	.2261	.0781	.0936	59. R-111 60
.3735	.3126	.3527	.3564	.2935	.2970	.2557	.2643	.3276	.2174	.2596	.1582	.1644	60. R-112 60
.4527	.3846	.4517	.4546	.4178	.3930	.3180	.2763	.4284	.2765	.3776	.1718	.1044	61. R-113 60
.6477	.3913	.3913	.3901	.3656	.3404	.3094	.2489	.3782	.2956	.2782	.1002	.0753	62. R-114 60
.3269	.6054	.4213	.4116	.3653	.2518	.3266	.3211	.3787	.3128	.2722	.0374	.0899	63. R-115 60
.3540	.4439	.6646	.4470	.4567	.3312	.4056	.3552	.4409	.3618	.3874	.0343	.0635	64. R-131 60
.2753	.3529	.4063	.4483	.3376	.2379	.2864	.2861	.3750	.2636	.3350	.0351	.0238	65. R-132 60
.3749	.4008	.4830	.4082	.5414	.3470	.3618	.3078	.4266	.3074	.3624	.0425	.0472	66. R-133 60
.3151	.2981	.3396	.3197	.3143	.4121	.2708	.2077	.3270	.2502	.2431	.0629	.0966	67. R-134 60
.2331	.2698	.3172	.2693	.2527	.1765	.3555	.2313	.2656	.2110	.2527	.0394	.0433	68. R-135 60
.1579	.2448	.2666	.2865	.2224	.1648	.2012	.3379	.2525	.2098	.2496	.0423	.0443	69. R-138 60
.3232	.3670	.4350	.3888	.3316	.2270	.3275	.3050	.5166	.2847	.3345	.0303	.0270	70. R-139 60
.2830	.3151	.4116	.3243	.2909	.2495	.2548	.2462	.3569	.4232	.2638	.0071	-.0092	71. R-140 60
.3190	.2928	.4243	.3681	.3858	.2563	.3216	.3041	.3287	.2929	.7606	.0717	.0241	72. R-142 60
.0822	.0528	.0732	.0601	.0672	.1172	.0216	.0586	.0638	.0315	.0580	.2387	.0720	73. R-145 60
.0557	.0974	.0702	.0438	.0471	.0384	.0193	.0246	.0579	.0457	.0197	.0521	.2353	74. R-146 60
.3599	.4118	.4408	.3858	.3725	.3098	.3407	.2621	.3781	.3325	.2981	.0004	.1009	75. R-147 60
.3134	.4446	.5367	.4221	.3903	.2997	.3878	.3316	.4467	.3205	.3145	.0103	.0487	76. R-150 60
.4052	.4334	.5771	.4710	.4769	.3330	.3923	.3571	.4973	.3713	.4321	.0052	.0459	77. R-162 60
.2165	.3135	.3353	.2886	.3061	.1945	.2685	.2311	.2847	.2121	.2818	.0297	-.0024	78. R-212 60
.2621	.3834	.4433	.3714	.3991	.2764	.3279	.2972	.3770	.3123	.3274	.0351	.0566	79. R-220 60
.2010	.3067	.3464	.3086	.3300	.2075	.2937	.2565	.3258	.2232	.2744	.0480	.0315	80. R-231 60
.2391	.2761	.3796	.3490	.3533	.2354	.2567	.2341	.3674	.2692	.2874	.0075	.0352	81. R-232 60
.3221	.3955	.4557	.4563	.4259	.2925	.3650	.3268	.4472	.3248	.4073	.0625	.0432	82. R-233 60
.2621	.3062	.4197	.3705	.3631	.2415	.3044	.2805	.3539	.2623	.3117	.0324	.0528	83. R-234 60
.2724	.2706	.3612	.3407	.3184	.2111	.2564	.2229	.3316	.2472	.4123	.0218	.0407	84. R-235 60
.2605	.3772	.4326	.4076	.3739	.2608	.3972	.3011	.4028	.2953	.3987	.0212	.0270	85. R-240 60
.4160	.4987	.6151	.5570	.5204	.3714	.4414	.3970	.5083	.3729	.5457	.0561	.0670	86. R-250 60
.3502	.3666	.4433	.3876	.3516	.2949	.3178	.2368	.3998	.2626	.3406	.0514	.0799	87. R-260 60
.3361	.3577	.3907	.3350	.3070	.2889	.2621	.2698	.3257	.2449	.2967	.0795	.1001	88. R-270 60
.2554	.2702	.2821	.2133	.2277	.2201	.1352	.1569	.2524	.2106	.1834	.0136	.0725	89. R-281 60
.2900	.2704	.2974	.2833	.2586	.2355	.2143	.1701	.2758	.2085	.2504	.0248	.0520	90. R-282 60
.3213	.3421	.4079	.3685	.3571	.2667	.2987	.2645	.3617	.2688	.3277	.0425	.0638	91. R-290 60
.3518	.3886	.4077	.4594	.3790	.2977	.3292	.3268	.4884	.3027	.3947	.0620	.0301	92. R-311 60
.3245	.4309	.4449	.4282	.3993	.2928	.3393	.3096	.4362	.3088	.3995	.0182	.0407	93. R-312 60
.0648	.1074	.0819	.0536	.0747	.0793	.0677	.0372	.0750	.0946	.0548	.0326	.0449	94. R-333 60
.1971	.2787	.2572	.2566	.3016	.1695	.1967	.1661	.3327	.2581	.1987	.0299	.0116	95. F-410 60
.1431	.1780	.1675	.1538	.2178	.1336	.0857	.1110	.1646	.1760	.1336	.0393	.0065	96. F-420 60
.0692	.1444	.1486	.1345	.1201	.0844	.1492	.0963	.1071	.1392	.0744	.0205	.0231	97. F-430 60
.1580	.1827	.1616	.1202	.1682	.1001	.0854	.0834	.1066	.1300	.0662	.0268	.0201	98. F-440 60
.1950	.3533	.3885	.3000	.2557	.2044	.3006	.2603	.2783	.2462	.1590	-.0492	-.0099	99. F*801 60

TABLE I-2 (continued)

	Variable	26	27	28	29	30	31	32	33	34	35	36	37
Information Test	1. R-102 63 Vocab. I	.5530	.6967	.7179	.4136	.5174	.4598	.3279	.5847	.5085	.4675	.5599	.6319
	2. R-103 63 Literatura	.5125	.6446	.6513	.3927	.4861	.4801	.3447	.6283	.5104	.4469	.5551	.6834
	3. R-104 63 Music	.4801	.6377	.6158	.3661	.4453	.3581	.2707	.4983	.3737	.3921	.4941	.6130
	4. R-105 63 Soc. Stud.	.5064	.6136	.6592	.3991	.4120	.4215	.3230	.5789	.4640	.4491	.5737	.6352
	5. R-106 63 Math	.5051	.5730	.5688	.4054	.4630	.3842	.2540	.5547	.4627	.4413	.5304	.5756
	6. R-107 63 Phys. Sci.	.4790	.5358	.5747	.3463	.4680	.3401	.2985	.5112	.4270	.4133	.5598	.6207
	7. R-108 63 Bio. Sci.	.4468	.4773	.5173	.2978	.3818	.3067	.2480	.4437	.3630	.3717	.4534	.5511
	8. R-109 63 Scient.Att	.3927	.4755	.4937	.2505	.3537	.2510	.1937	.3907	.3601	.4025	.4400	.5656
	9. R-110 63 Aero-Space	.4015	.4529	.4477	.2189	.2903	.1208	.1525	.2301	.2652	.2061	.3616	.4627
	10. R-111 63 Electronic	.3436	.2914	.3225	.2324	.3299	.2133	.1681	.2846	.2742	.2575	.3038	.4168
	11. R-112 63 Mechanics	.3935	.3978	.4397	.1948	.2820	.1693	.1827	.2971	.2450	.2843	.3425	.4563
	12. R-113 63 Farming	.3961	.4191	.5156	.2622	.2932	.2974	.3105	.4339	.4126	.3369	.4248	.5505
	13. R-114 63 Home Ec.	.4043	.4005	.4902	.1737	.1829	.1861	.2036	.2864	.2573	.3300	.3027	.4233
	14. R-115 63 Sports	.4504	.5232	.4709	.3180	.3752	.3040	.2574	.4210	.3438	.3345	.3938	.4270
	15. R-131 63 Art	.4689	.6292	.5951	.4240	.4341	.3856	.2548	.3978	.3776	.3706	.4215	.6543
	16. R-132 63 Law	.4077	.5198	.5456	.4143	.2859	.3580	.2519	.4226	.3515	.3247	.4730	.5912
	17. R-133 63 Health	.3916	.4716	.5511	.3422	.3197	.3366	.3006	.3816	.4174	.2879	.4105	.5330
	18. R-134 63 Engin.	.3555	.3656	.3527	.2048	.1325	.2014	.1316	.2296	.2101	.1596	.2828	.3704
	19. R-135 63 Arch.	.3113	.4040	.3638	.3390	.2682	.3142	.1787	.3315	.3080	.2633	.3452	.4480
	20. R-138 63 Military	.2898	.3376	.3678	.3427	.2189	.2858	.2154	.3302	.2972	.2871	.3173	.3865
	21. R-139 63 Acct,Busi.	.3876	.5170	.6165	.3138	.3268	.3062	.2066	.4198	.3064	.3354	.4319	.5509
	22. R-140 63 Prac.Knowl	.3482	.4133	.3893	.2661	.2138	.2645	.2060	.3042	.2355	.2164	.3416	.4321
	23. R-142 63 Bible	.3292	.4087	.4328	.4266	.2826	.2990	.2136	.3609	.3788	.3253	.4262	.5767
	24. R-145 63 Hunting	.0809	.0539	.0691	.0710	.0267	.0414	.0394	.0187	-.0240	.0301	.0327	.0870
	25. R-146 63 Fishing	.1166	.0761	.0680	.0818	.0023	.1113	-.0168	.0886	.0844	.0146	-.0137	.0594
	26. R-147 63 Outdoor		.4436	.5204	.3245	.2332	.3067	.2176	.3791	.3024	.2996	.3609	.5195
	27. R-150 63 Theater	.4436		.5817	.4242	.3540	.3631	.2374	.4129	.3506	.3714	.4065	.5588
	28. R-162 63 Vocab. II	.5204	.5817		.3877	.3611	.3530	.2445	.3988	.4171	.3208	.4703	.6193
	29. R-212 63 Mem. Words	.3245	.4242	.3877		.3628	.3876	.2684	.4833	.4256	.3625	.4941	.5332
	30. R-220 63 Disg. Wds.	.2332	.3540	.3611	.3628		.5086	.3568	.5479	.4758	.4373	.4713	.5125
English Test	31. R-231 63 Spelling	.3067	.3631	.3530	.3876	.5086		.4319	.5818	.5192	.4048	.5003	.4938
	32. R-232 63 Capital.	.2176	.2374	.2445	.2684	.3568	.4319		.5045	.4965	.4147	.2669	.3529
	33. R-233 63 Punct.	.3791	.4129	.3988	.4833	.5479	.5818	.5045		.6264	.5571	.6259	.6480
	34. R-234 63 Eng. Usage	.3024	.3506	.4171	.4256	.4758	.5192	.4965	.6264		.5294	.4323	.5161
	35. R-235 63 Eff. Exp.	.2996	.3714	.3208	.3625	.4373	.4048	.4147	.5571	.5294		.4531	.5343
	36. R-240 63 Word.Funct	.3609	.4065	.4703	.4941	.4713	.5003	.2669	.6259	.4323	.4531		.6639
	37. R-250 63 Rdg. Compr	.5195	.5588	.6193	.5332	.5125	.4938	.3529	.6480	.5161	.5343	.6639	
	38. R-260 63 Creativity	.2974	.3407	.4396	.3746	.4646	.3698	.3167	.5261	.4284	.4617	.5156	.5924
	39. R-270 63 Mech.Reas	.3869	.2862	.3146	.3337	.3697	.3122	.2847	.5149	.4088	.3883	.4584	.4926
	40. R-281 63 Vis. 2 Dim	.2415	.1221	.1790	.1849	.3045	.1380	.2152	.3193	.2303	.2802	.2790	.2936
	41. R-282 63 Vis. 3 Dim	.3170	.1697	.2952	.3212	.3181	.2260	.2161	.4122	.3064	.3188	.4442	.4571
	42. R-290 63 Abst.Reas	.4016	.4054	.4541	.4041	.3606	.3381	.3272	.5424	.3977	.4544	.5096	.5252
Math Test	43. R-311 63 Arith.Reas	.3706	.4554	.5031	.4439	.4263	.4260	.3256	.6076	.4698	.4781	.5822	.6288
	44. R-312 63 Int.HSMath	.4303	.4155	.4320	.4285	.4240	.4208	.3099	.5795	.4828	.4254	.6085	.5794
	45. R-333 63 Adv.HSMath	.3845	.3633	.3141	.3172	.3316	.2608	.1956	.4104	.3518	.2717	.4611	.4128
	46. F-410 63 Arith.Comp	.2282	.2401	.2380	.3401	.3318	.3730	.2914	.4486	.3226	.3448	.3575	.3993
	47. F-420 63 Table Read	.1178	.2234	.1905	.2601	.3090	.2271	.1903	.2247	.1978	.2019	.2382	.2301
	48. F-430 63 Cler.Check	.1061	.1186	.1766	.1936	.3905	.3302	.2355	.3207	.2316	.2918	.2496	.2241
	49. F-440 63 Obj.Insp.	.1386	.1486	.1294	.2443	.2890	.1930	.2141	.2235	.1591	.2592	.2664	.2437
Information Test	50. R-102 60 Vocab. I	.4689	.5742	.5870	.4358	.5343	.4512	.2782	.5287	.4548	.4349	.5452	.6552
	51. R-103 60 Literature	.3918	.5301	.4952	.3813	.4569	.3941	.2746	.4622	.4178	.4076	.4614	.5848
	52. R-104 60 Music	.4159	.5343	.5145	.3990	.4596	.3872	.2610	.4632	.4035	.3784	.4634	.5393
	53. R-105 60 Soc. Stud.	.4174	.5410	.5833	.4496	.4387	.4370	.3035	.5529	.4538	.4270	.5458	.6471
	54. R-106 60 Math	.3831	.4477	.4584	.4061	.3942	.3521	.2307	.4789	.3904	.3731	.5346	.5069
	55. R-107 60 Phys. Sci.	.3859	.4661	.4697	.3442	.4389	.3510	.2464	.4390	.3871	.3491	.5258	.5739
	56. R-108 60 Bio. Sci.	.3719	.3989	.4516	.3538	.3499	.3267	.2143	.4093	.3603	.3490	.4412	.5015
	57. R-109 60 Scient.Att	.3298	.3771	.4368	.3018	.3354	.2546	.1886	.3988	.3299	.3577	.3970	.5030
	58. R-110 60 Aero-Space	.2932	.3240	.3148	.2318	.2176	.1669	.1244	.2104	.2118	.1878	.2611	.3315
	59. R-111 60 Electronic	.2495	.2445	.2703	.1951	.2132	.2080	.1281	.2417	.2211	.2022	.2377	.2754
	60. R-112 60 Mechanics	.3190	.3170	.3549	.2508	.2712	.2065	.1484	.2818	.2522	.2458	.3065	.3999
	61. R-113 60 Farming	.3517	.4141	.4726	.3502	.3242	.3256	.2613	.4251	.3806	.3778	.4263	.5369
	62. R-114 60 Home Ec.	.3770	.3616	.4298	.3107	.3029	.2820	.2194	.3820	.3203	.3316	.3913	.4419
	63. R-115 60 Sports	.3491	.4360	.4054	.3197	.2703	.2767	.1922	.3528	.2930	.3026	.3463	.4040
	64. R-131 60 Art	.4178	.5315	.5273	.3603	.4295	.3714	.2284	.4379	.3846	.3685	.4410	.5780
	65. R-132 60 Law	.3148	.3776	.4193	.3016	.2652	.2544	.1904	.3459	.3016	.2595	.3000	.4308
	66. R-133 60 Health	.3624	.4610	.5124	.3463	.3729	.3865	.2650	.4374	.4002	.3756	.4188	.5214
	67. R-134 60 Engin.	.3254	.3098	.3444	.2433	.2658	.2580	.1401	.2913	.2139	.2159	.3450	.3848
	68. R-135 60 Arch.	.2519	.2858	.2857	.2612	.2443	.2549	.1680	.2778	.2393	.2287	.2937	.3231
	69. R-138 60 Military	.2348	.2764	.2738	.1990	.1400	.1466	.0835	.1944	.1687	.1550	.1764	.2562
	70. R-139 60 Acct,Busi.	.3302	.4187	.4557	.2700	.3343	.3001	.1992	.3598	.3022	.2856	.4184	.4845
	71. R-140 60 Prac.Knowl	.3099	.3699	.4093	.2425	.2980	.2434	.2045	.3308	.2451	.2971	.3321	.4297
	72. R-142 60 Bibla	.3087	.3745	.3966	.3855	.3052	.2987	.1865	.3988	.3358	.3047	.4094	.5429
	73. R-145 60 Hunting	.0611	.0654	.0928	.0314	.0272	.0231	.0493	.0407	.0406	.0207	.0225	.0575
	74. R-146 60 Fishing	.0404	.0778	.0866	.0358	-.0208	.0377	-.0147	.0152	.0150	.0158	.0408	.0363
	75. R-147 60 Outdoor	.5062	.4042	.4320	.3356	.3551	.2985	.2272	.3870	.3222	.3656	.3841	.4630
	76. R-150 60 Theater	.3936	.6234	.4815	.3692	.4209	.3802	.2329	.3992	.3835	.3575	.4215	.5224
	77. R-162 60 Vocab. II	.4420	.5411	.6204	.4110	.4593	.3995	.2636	.4849	.4204	.3870	.4992	.6099
	78. R-212 60 Mem. Words	.2651	.3213	.3680	.5539	.3480	.3268	.1930	.3795	.3327	.3085	.4193	.4352
	79. R-220 60 Disg. Wds.	.3416	.4544	.4498	.3751	.6073	.4482	.2420	.4657	.4477	.3460	.4702	.4888
English Test	80. R-231 60 Spelling	.2418	.3480	.3818	.3608	.4396	.5897	.2315	.4677	.3609	.3021	.4728	.4172
	81. R-232 60 Capital.	.3305	.3929	.4182	.2648	.2902	.3276	.3051	.4094	.3181	.3203	.3352	.3834
	82. R-233 60 Punct.	.3909	.4542	.5047	.4421	.4625	.4936	.3367	.6876	.5156	.4545	.6266	.5838
	83. R-234 60 Eng. Usage	.3436	.4010	.4235	.3168	.4033	.3839	.2640	.4761	.4930	.3829	.4368	.4906
	84. R-235 60 Eff. Exp.	.2886	.3840	.4162	.3172	.3432	.3353	.2463	.4182	.3810	.4745	.4142	.4906
	85. R-240 60 Word.Funct	.3827	.4270	.4370	.4441	.4604	.4204	.2451	.5570	.4418	.4002	.6671	.5389
	86. R-250 60 Rdg. Compr	.4475	.5656	.5898	.4806	.5010	.4869	.3420	.6020	.5180	.5025	.6145	.7714
	87. R-260 60 Creativity	.3478	.4119	.4050	.3328	.3349	.2842	.2143	.4093	.3427	.3552	.4301	.4870
	88. R-270 60 Mech.Reas	.3693	.3317	.3762	.2960	.3225	.2324	.1901	.4096	.3456	.3252	.3973	.4214
	89. R-281 60 Vis. 2 Dim	.2742	.2495	.2629	.2337	.2933	.1722	.1859	.3180	.2472	.2783	.3173	.3062
	90. R-282 60 Vis. 3 Dim	.2605	.2576	.2932	.2602	.2759	.1823	.1937	.3528	.2471	.2800	.3774	.3790
	91. R-290 60 Abst.Reas	.3314	.3793	.4328	.3782	.3809	.2977	.2410	.4963	.3823	.4069	.4962	.4866
Math Test	92. R-311 60 Arith.Reas	.3673	.4187	.5015	.4067	.4121	.3869	.2542	.5321	.4162	.4171	.5638	.5826
	93. R-312 60 Int.HSMath	.3824	.4612	.4649	.4127	.4079	.4013	.2362	.5378	.4211	.3937	.5936	.5429
	94. R-333 60 Adv.HSMath	.1298	.0903	.0717	.0884	.0631	.0677	.0463	.0847	.0501	.0666	.0750	.0829
	95. F-410 60 Arith.Comp	.2134	.2657	.3009	.2851	.3111	.3608	.2596	.4194	.3271	.3456	.3964	.3909
	96. F-420 60 Table Read	.1524	.1726	.1468	.1226	.2049	.1601	.2180	.2462	.1544	.1546	.2074	.1922
	97. F-430 60 Cler.Check	.1130	.1514	.1267	.2029	.3129	.2810	.2120	.2741	.2248	.1586	.2539	.2160
	98. F-440 60 Obj.Insp.	.1490	.1195	.1000	.1423	.2096	.1337	.1515	.2073	.1376	.1401	.1893	.1841
	99. P*801 60 Socioecon.	.3916	.3680	.3306	.2537	.2962	.1874	.1747	.2650	.2470	.2793	.2782	.3272

TABLE I-2 (continued)

38	39	40	41	42	43	44	45	46	47	48	49	50	Variable
.5800	.5223	.2914	.4653	.5123	.6340	.5520	.3516	.3907	.2715	.2608	.3045	.7641	1. R-102 63
.5278	.4237	.2344	.3762	.4560	.5532	.5676	.1870	.2895	.2007	.1938	.2059	.6729	2. R-103 63
.4393	.4295	.2302	.3639	.4258	.4908	.4988	.3326	.3224	.1381	.1355	.2147	.6388	3. R-104 63
.4759	.4306	.2421	.3630	.4650	.5935	.5837	.1670	.3436	.2247	.2157	.2027	.6570	4. R-105 63
.5186	.5305	.3228	.4494	.4781	.6316	.8069	.6327	.3541	.2502	.2631	.2434	.6087	5. R-106 63
.5194	.5515	.3073	.4619	.4766	.5928	.6218	.4746	.3136	.2794	.2404	.2782	.6642	6. R-107 63
.4985	.4787	.2776	.4111	.3929	.4745	.4716	.2919	.2131	.1689	.1860	.2377	.5830	7. R-108 63
.4466	.3906	.2112	.3742	.4289	.4659	.3946	.2311	.2729	.2367	.1374	.1990	.4960	8. R-109 63
.4393	.4774	.2552	.3930	.3208	.2967	.3115	.2520	.1307	.1968	.1674	.2412	.4703	9. R-110 63
.4155	.4258	.2515	.3722	.2930	.3817	.4253	.3066	.2603	.2037	.2048	.2523	.4663	10. R-111 63
.4597	.4407	.2386	.4147	.3439	.3886	.3230	.1937	.2566	.1442	.1328	.2852	.4630	11. R-112 63
.4400	.3925	.2549	.3540	.3772	.4995	.3804	.2139	.3218	.1686	.1346	.2142	.5159	12. R-113 63
.3476	.3153	.1856	.3527	.3599	.3925	.3087	.1415	.2394	.0803	.0147	.1170	.4153	13. R-114 63
.4326	.3374	.2341	.2737	.3795	.4502	.4135	.3064	.2829	.2141	.1703	.2060	.5143	14. R-115 63
.4399	.3534	.1891	.2881	.4394	.4493	.4323	.3925	.2685	.2249	.0790	.1713	.5896	15. R-131 63
.3929	.3028	.1166	.2642	.4011	.4788	.4293	.3645	.2711	.1237	.1315	.0881	.5268	16. R-132 63
.3337	.2357	.1729	.2893	.3713	.3925	.3956	.3081	.2545	.3193	.1569	.2238	.5048	17. R-133 63
.2331	.2328	.2044	.2478	.2957	.2952	.2493	.2470	.1240	.1093	.0864	.2028	.3557	18. R-134 63
.2873	.1935	.0984	.2298	.2916	.3550	.3820	.3766	.1864	.1163	.1033	.0870	.4698	19. R-135 63
.3343	.3045	.1420	.2266	.2535	.3176	.3711	.3331	.2187	.0958	.1110	.1072	.4317	20. R-138 63
.4043	.3241	.1967	.2822	.4197	.5241	.4216	.2941	.3343	.1960	.1541	.1308	.5206	21. R-139 63
.2642	.2079	.1146	.2084	.3209	.2827	.2924	.2279	.2826	.2159	.0789	.1703	.3634	22. R-140 63
.3331	.2554	.1703	.3233	.3400	.4259	.3910	.3104	.2761	.1768	.0343	.0650	.4780	23. R-142 63
.0610	.0768	.0196	.0316	.0599	.0408	.0287	.0008	.0550	.0314	.0685	.0114	.0700	24. R-145 63
.1261	.0557	.0721	.0487	.0868	.0752	.0723	.0929	.0700	.0491	.0913	.0317	.0748	25. R-146 63
.2974	.3869	.2415	.3170	.4016	.3706	.4303	.3845	.2282	.1178	.1061	.1386	.4689	26. R-147 63
.3407	.2862	.1221	.1697	.4054	.4554	.4155	.3633	.2501	.2234	.1186	.1486	.5742	27. R-150 63
.4396	.3146	.1790	.2952	.4541	.5031	.4320	.3141	.2380	.1905	.1766	.1294	.5870	28. R-162 63
.3746	.3337	.1849	.3212	.4041	.4439	.4285	.3172	.3401	.2601	.1936	.2443	.4358	29. R-212 63
.4646	.3697	.3045	.3181	.3606	.4263	.4240	.3316	.3318	.3090	.3905	.2890	.5343	30. R-220 63
.3698	.3122	.1380	.2260	.3381	.4260	.4208	.2608	.3780	.2271	.3302	.1930	.4512	31. R-231 63
.3167	.2847	.2152	.2161	.3272	.3256	.3099	.1956	.2914	.1903	.2355	.2141	.2782	32. R-232 63
.5261	.5149	.3193	.4122	.5424	.6076	.5795	.4104	.4486	.2247	.3207	.2255	.5287	33. R-233 63
.4284	.4088	.2303	.3064	.3977	.4698	.4828	.3518	.3226	.1978	.2316	.1591	.4548	34. R-234 63
.4617	.3883	.2802	.3188	.4544	.4781	.4254	.2717	.3448	.2019	.2918	.2592	.4349	35. R-235 63
.5156	.4584	.2790	.4442	.5096	.5822	.6085	.4611	.3575	.2382	.2496	.2664	.5452	36. R-240 63
.5924	.4926	.2936	.4571	.5252	.6288	.5794	.4128	.3993	.2301	.2241	.2437	.6552	37. R-250 63
	.4927	.3317	.4558	.4707	.5229	.4639	.3702	.2797	.2410	.2395	.2474	.5403	38. R-260 63
.4927		.4627	.5664	.5125	.4850	.4761	.4062	.2373	.2197	.2157	.3043	.4550	39. R-270 63
.3317	.4627		.4594	.3776	.2864	.2404	.2084	.2369	.2535	.2522	.3342	.2625	40. R-281 63
.4558	.5664	.4594		.5092	.4591	.4057	.3526	.2480	.2500	.2169	.3478	.3822	41. R-282 63
.4707	.5125	.3776	.5092		.5716	.5007	.3326	.3898	.2458	.2252	.2961	.4381	42. R-290 63
.5229	.4850	.2864	.4591	.5716		.6482	.4752	.4069	.2155	.2456	.2142	.5768	43. R-311 63
.4639	.4761	.2404	.4057	.5007	.6482		.6643	.4160	.2166	.2588	.1392	.5442	44. R-312 63
.3702	.4062	.2084	.3526	.3326	.4752	.6643		.2342	.1552	.2123	.1128	.4205	45. R-333 63
.2797	.2373	.2369	.2480	.3898	.4069	.4160	.2342		.4004	.3975	.2920	.3109	46. F-410 63
.2410	.2197	.2535	.2500	.2458	.2155	.2166	.1552	.4004		.3772	.4528	.1941	47. F-420 63
.2395	.2157	.2522	.2169	.2252	.2456	.2588	.2123	.3975	.3772		.3705	.2318	48. F-430 63
.2474	.3043	.3342	.3478	.2961	.2142	.1392	.1128	.2920	.4528	.3705		.2215	49. F-440 63
.5403	.4550	.2625	.3822	.4381	.5768	.5442	.4205	.3109	.1941	.2318	.2215		50. R-102 60
.4473	.3684	.2272	.3256	.3760	.4696	.4958	.3982	.2543	.1848	.2034	.1796	.6493	51. R-103 60
.4361	.3742	.2262	.3149	.3817	.4803	.4829	.3721	.2902	.1641	.2006	.2065	.6215	52. R-104 60
.4700	.4066	.2204	.3628	.4499	.5747	.5770	.4415	.3098	.1757	.2220	.1581	.6886	53. R-105 60
.4468	.4180	.2673	.3730	.4175	.5543	.6209	.3289	.2856	.2094	.2318	.1855	.5821	54. R-106 60
.4442	.4576	.2690	.3673	.4135	.5073	.4920	.3985	.2263	.1826	.2327	.2076	.6143	55. R-107 60
.4062	.3563	.1953	.3174	.3332	.4496	.4526	.3756	.2160	.0338	.1191	.1284	.5627	56. R-108 60
.3690	.3067	.2008	.3071	.3676	.4539	.3929	.2796	.2152	.0975	.1403	.1125	.4821	57. R-109 60
.2927	.3351	.1729	.2439	.2359	.2781	.2818	.2385	.1036	.1244	.1100	.1290	.4037	58. R-110 60
.2775	.2394	.1651	.1820	.2160	.2941	.2803	.2264	.1507	.1034	.1279	.0657	.3686	59. R-111 60
.3924	.4003	.2275	.3406	.2854	.3749	.3201	.2696	.1736	.1062	.1166	.1624	.4747	60. R-112 60
.4150	.3696	.2263	.3447	.3743	.4955	.4182	.2977	.2666	.1006	.1333	.1566	.5352	61. R-113 60
.4135	.3498	.2394	.3579	.3632	.4398	.3808	.2841	.2837	.1404	.1175	.1651	.4983	62. R-114 60
.3454	.2952	.2075	.2459	.3241	.4040	.4072	.3162	.2666	.1977	.2000	.2110	.4873	63. R-115 60
.4689	.3871	.2390	.3338	.4039	.4387	.4330	.3418	.2585	.1442	.1828	.1616	.6206	64. R-131 60
.3524	.2526	.1420	.2282	.2842	.3965	.3797	.3000	.2057	.1046	.1166	.0831	.4605	65. R-132 60
.3867	.2867	.1933	.2645	.3640	.4329	.3923	.2717	.2354	.1630	.1751	.1691	.5648	66. R-133 60
.3278	.3082	.2040	.2660	.2837	.3069	.2902	.2032	.1944	.1230	.1351	.1504	.4167	67. R-134 60
.2835	.2372	.1594	.2316	.2307	.2834	.2796	.2427	.2084	.1078	.1469	.1545	.3922	68. R-135 60
.2010	.1780	.0971	.1298	.1716	.2151	.2309	.1856	.1159	.0662	.0573	.0633	.3160	69. R-138 60
.4011	.3003	.1924	.2706	.3175	.4207	.3765	.2921	.2310	.1488	.1848	.1309	.5286	70. R-139 60
.3453	.2832	.2001	.2632	.3181	.3131	.3088	.2086	.2460	.2168	.1755	.1020	.4166	71. R-140 60
.3700	.2766	.1695	.2913	.3132	.4238	.4217	.2999	.2437	.0979	.0762	.0893	.4851	72. R-142 60
.0585	.0373	-.0119	.0417	.0505	.0708	.0416	-.0213	.0747	.0334	.0177	.0346	.0825	73. R-145 60
.0720	.0331	.0325	.0163	.0228	.0210	.0160	.0154	.0139	-.0100	-.0035	.0065	.0533	74. R-146 60
.3839	.3401	.2372	.3249	.3660	.4383	.4057	.3229	.2694	.2166	.1713	.2037	.5059	75. R-147 60
.4226	.3199	.1835	.2696	.3469	.4149	.3901	.3060	.2374	.1686	.1842	.1738	.5920	76. R-150 60
.4744	.3556	.2203	.3328	.4085	.5004	.4543	.3474	.2783	.1604	.1802	.1734	.6366	77. R-162 60
.3631	.3157	.2071	.2944	.3260	.3794	.3800	.2914	.2565	.1338	.1805	.1405	.4171	78. R-212 60
.4252	.3539	.2442	.2991	.3821	.4028	.3978	.2904	.2831	.2409	.2841	.2352	.5364	79. R-220 60
.3621	.2422	.1532	.2254	.3036	.3843	.4063	.2806	.3283	.1972	.2550	.1268	.4629	80. R-231 60
.2848	.2532	.1788	.2090	.3540	.3640	.3520	.2018	.2922	.1647	.1531	.1603	.3478	81. R-232 60
.4499	.4267	.2664	.3946	.4826	.5834	.5875	.4241	.3914	.1968	.2197	.1967	.5567	82. R-233 60
.3508	.3114	.1989	.2810	.3518	.4195	.3853	.2671	.2963	.1445	.1622	.1718	.4661	83. R-234 60
.3404	.3112	.1855	.2443	.3634	.4059	.3594	.2524	.2723	.0995	.1207	.1212	.4112	84. R-235 60
.4605	.4078	.2528	.3540	.4339	.5586	.5751	.4615	.3279	.1627	.2401	.2085	.5442	85. R-240 60
.5390	.4458	.2762	.4038	.5058	.6252	.5735	.4309	.3541	.2065	.2446	.2008	.7141	86. R-250 60
.5373	.3828	.2450	.3606	.4069	.4723	.4190	.3433	.2488	.1343	.1737	.1768	.5195	87. R-260 60
.4219	.6399	.3826	.4916	.4600	.4843	.4412	.3640	.2233	.1759	.1688	.2349	.4629	88. R-270 60
.2996	.4142	.5709	.4188	.4010	.3431	.3175	.2242	.2520	.2034	.2033	.2757	.3047	89. R-281 60
.3899	.5000	.4279	.5925	.4650	.4050	.3944	.3200	.2104	.1622	.1634	.2483	.3481	90. R-282 60
.4438	.4774	.3644	.4723	.6006	.5233	.4675	.3471	.3115	.2209	.2386	.3032	.4635	91. R-290 60
.4770	.4595	.2936	.4413	.4953	.6794	.5710	.4421	.3537	.1846	.2145	.1924	.5641	92. R-311 60
.4606	.4608	.2852	.4269	.4821	.6017	.6742	.5244	.3663	.2375	.2228	.2276	.5519	93. R-312 60
.1035	.1043	.0420	.0701	.0798	.0966	.1279	.1518	.0650	.0485	.0441	.0305	.1107	94. R-333 60
.2936	.2486	.2196	.2571	.3396	.3670	.3450	.2209	.4611	.2318	.2183	.2036	.3383	95. F-410 60
.1709	.1699	.1498	.1516	.2222	.1793	.1679	.0774	.2239	.2406	.1697	.1997	.1784	96. F-420 60
.1881	.1379	.1527	.1670	.1948	.2241	.2600	.1602	.2704	.2026	.2779	.1967	.2218	97. F-430 60
.1884	.2286	.2280	.2693	.2696	.1874	.1826	.1115	.2146	.2471	.2353	.4070	.1794	98. F-440 60
.2803	.2795	.1394	.2075	.3093	.3320	.3721	.2886	.1461	.1038	.1366	.1509	.4125	99. P*801 60

TABLE I-2 (continued)

	Variable	51	52	53	54	55	56	57	58	59	60	61	62
Information Test	1. R-102 63 Vocab. I	.6214	.6127	.7006	.5787	.6032	.5311	.5060	.4061	.3651	.4372	.5585	.4818
	2. R-103 63 Literature	.7182	.5946	.6908	.5660	.5600	.5162	.4499	.3704	.3135	.3557	.4935	.4277
	3. R-104 63 Music	.5769	.7414	.6178	.5020	.4887	.4514	.4181	.3577	.2772	.3601	.4450	.4300
	4. R-105 63 Soc. Stud.	.6019	.5870	.7971	.5461	.5949	.5175	.4476	.3728	.3342	.3563	.5072	.4250
	5. R-106 63 Math	.5493	.5281	.6208	.6860	.5563	.4579	.4060	.3880	.3355	.3449	.4296	.3996
	6. R-107 63 Phys. Sci.	.5691	.5547	.6682	.5929	.7163	.5465	.4423	.4311	.4211	.4160	.5179	.4238
	7. R-108 63 Bio. Sci.	.4805	.4570	.5726	.4720	.5380	.6154	.3893	.3418	.3125	.3961	.5148	.4137
	8. R-109 63 Scient.Att	.4183	.3947	.4636	.3760	.3876	.3899	.5186	.2733	.2283	.3065	.3726	.3914
	9. R-110 63 Aero-Space	.3861	.3896	.4131	.3645	.4009	.3581	.3121	.4717	.2697	.3394	.3828	.3069
	10. R-111 63 Electronic	.3735	.3830	.4369	.3512	.4628	.3833	.3033	.3210	.4486	.3752	.3897	.3249
	11. R-112 63 Mechanics	.3326	.3784	.3897	.3346	.3724	.4029	.3323	.2612	.2388	.5748	.5185	.4243
	12. R-113 63 Farming	.3831	.3983	.4778	.3789	.4137	.4689	.3957	.2476	.2820	.4451	.6956	.4368
	13. R-114 63 Home Ec.	.3247	.3824	.3874	.3275	.3311	.3970	.3371	.2227	.2321	.3735	.4527	.6477
	14. R-115 63 Sports	.4292	.4993	.5236	.4149	.4280	.3710	.3220	.3007	.2410	.3126	.3846	.3913
	15. R-131 63 Art	.5745	.5439	.5873	.4376	.4806	.4401	.4111	.3229	.2596	.3527	.4517	.3913
	16. R-132 63 Law	.4484	.4571	.5513	.4357	.4330	.4118	.3370	.3108	.2466	.3564	.4546	.3901
	17. R-133 63 Health	.4318	.4252	.4803	.3812	.4255	.4067	.3728	.2874	.2232	.2935	.4178	.3656
	18. R-134 63 Engin.	.2616	.3076	.3408	.3147	.3394	.2997	.2898	.2104	.2033	.2970	.3930	.3404
	19. R-135 63 Arch.	.4435	.4177	.4513	.3908	.3794	.3297	.2766	.2554	.2592	.2557	.3180	.3094
	20. R-138 63 Military	.3750	.4089	.4401	.3550	.3227	.2948	.2312	.2729	.1351	.2643	.2763	.2489
	21. R-139 63 Acct,Busi.	.4314	.4652	.5027	.4251	.4211	.3528	.3738	.2730	.2425	.3276	.4284	.3782
	22. R-140 63 Prac.Knowl	.3116	.3294	.3552	.2859	.2783	.2646	.3128	.2016	.1569	.2174	.2765	.2956
	23. R-142 63 Bible	.4516	.3912	.5024	.3689	.3949	.3787	.3669	.2682	.2261	.2596	.3776	.2782
	24. R-145 63 Hunting	.0588	.0386	.0962	.0336	.1025	.1072	.0813	.0003	.0781	.1582	.1718	.1002
	25. R-146 63 Fishing	.0572	.0549	.0455	.0731	.0607	.1137	.0423	.0993	.0936	.1644	.1044	.0753
	26. R-147 63 Outdoor	.3918	.4159	.4174	.3831	.3859	.3719	.3258	.2932	.2495	.3190	.3517	.3770
	27. R-150 63 Theater	.5301	.5343	.5410	.4477	.4661	.3989	.3771	.3240	.2445	.3170	.4141	.3616
	28. R-162 63 Vocab. II	.4952	.5145	.5833	.4584	.4697	.4516	.4368	.3148	.2703	.3549	.4726	.4298
	29. R-212 63 Mem. Words	.3813	.3990	.4496	.4061	.3442	.3528	.3018	.2318	.1951	.2508	.3502	.3187
	30. R-220 63 Diag. Wds.	.4569	.4596	.4387	.3942	.4389	.3499	.3354	.2176	.2132	.2712	.3242	.3029
English Test	31. R-231 63 Spelling	.3941	.3872	.4370	.3521	.3510	.3267	.2546	.1669	.2080	.2065	.3256	.2820
	32. R-232 63 Capital.	.2746	.2610	.3035	.2307	.2464	.2143	.1886	.1244	.1281	.1484	.2613	.2194
	33. R-233 63 Punct.	.4622	.4632	.5529	.4789	.4390	.4093	.3988	.2104	.2417	.2818	.4251	.3820
	34. R-234 63 Eng. Usage	.4178	.4035	.4538	.3904	.3871	.3603	.3299	.2118	.2211	.2522	.3806	.3203
	35. R-235 63 Eff. Exp.	.4076	.3784	.4270	.3731	.3491	.3490	.3577	.1878	.2022	.2458	.3778	.3316
	36. R-240 63 Word.Funct	.4614	.4634	.5458	.5346	.5258	.4412	.3970	.2611	.2377	.3065	.4263	.3913
	37. R-250 63 Rdg. Compr	.5848	.5393	.6471	.5069	.5739	.5015	.5030	.3315	.2756	.3999	.5369	.4419
	38. R-260 63 Creativity	.4473	.4361	.4700	.4468	.4442	.4062	.3690	.2927	.2775	.3924	.4150	.4135
	39. R-270 63 Mech.Reas	.3684	.3742	.4066	.4180	.4576	.3563	.3067	.3351	.2394	.4003	.3696	.3498
	40. R-281 63 Vis. 2 Dim	.2272	.2262	.2204	.2673	.2690	.1953	.2008	.1729	.1651	.2275	.2263	.2394
	41. R-282 63 Vis. 3 Dim	.3256	.3149	.3628	.3730	.3673	.3174	.3071	.2439	.1820	.3406	.3447	.3579
	42. R-290 63 Abst.Reas	.3760	.3817	.4499	.4175	.4135	.3432	.3676	.2359	.2160	.2854	.3743	.3632
Math Test	43. R-311 63 Arith.Reas	.4696	.4803	.5747	.5543	.5073	.4496	.4539	.2781	.2941	.3749	.4955	.4398
	44. R-312 63 Int.HSMath	.4958	.4829	.5770	.6209	.4920	.4526	.3929	.2818	.2803	.3201	.4182	.3808
	45. R-333 63 Adv.HSMath	.3982	.3721	.4415	.5289	.3985	.3756	.2796	.2385	.2264	.2696	.2977	.2841
	46. F-410 63 Arith.Comp	.2543	.2902	.3098	.2856	.2263	.2160	.2152	.1036	.1507	.1796	.2656	.2837
	47. F-420 63 Table Read	.1818	.1641	.1757	.2094	.1826	.0938	.0975	.1244	.1034	.1062	.1006	.1404
	48. F-430 63 Cler.Check	.2044	.2006	.2220	.2318	.2327	.1191	.1403	.1100	.1279	.1166	.1333	.1175
	49. F-440 63 Obj.Insp.	.1796	.2065	.1581	.1855	.2076	.1284	.1125	.1290	.0657	.1624	.1566	.1651
Information Test	50. R-102 60 Vocab. I	.6493	.6215	.6886	.5821	.6143	.5627	.4821	.4037	.3686	.4747	.5352	.4983
	51. R-103 60 Literature		.5903	.6531	.5243	.5358	.4906	.4003	.3683	.3138	.3590	.4335	.4010
	52. R-104 60 Music	.5903		.6180	.5267	.4916	.4448	.4051	.3459	.3057	.3563	.4341	.4428
	53. R-105 60 Soc. Stud.	.6531	.6180		.5920	.6232	.5374	.4596	.3763	.3435	.4028	.5243	.4686
	54. R-106 60 Math	.5243	.5267	.5920		.5390	.4369	.3740	.3406	.3312	.3648	.4185	.4173
	55. R-107 60 Phys. Sci.	.5358	.4916	.6232	.5390		.5191	.3910	.3811	.4675	.3864	.4706	.4187
	56. R-108 60 Bio. Sci.	.4906	.4448	.5374	.4369	.5191		.3944	.3211	.3041	.3868	.4917	.4187
	57. R-109 60 Scient.Att	.4003	.4051	.4596	.3740	.3910	.3944		.2501	.2271	.3102	.3828	.3785
	58. R-110 60 Aero-Space	.3683	.3459	.3763	.3406	.3811	.3211	.2501		.2677	.2932	.2709	.2719
	59. R-111 60 Electronic	.3138	.3057	.3435	.3312	.4675	.3041	.2271	.2677		.3293	.3062	.2952
	60. R-112 60 Mechanics	.3590	.3563	.4028	.3648	.3864	.3868	.3102	.2932	.3293		.4667	.4000
	61. R-113 60 Farming	.4335	.4341	.5243	.4185	.4706	.4917	.3828	.2709	.3062	.4667		.4808
	62. R-114 60 Home Ec.	.4010	.4428	.4686	.4173	.4187	.4187	.3785	.2719	.2952	.4000	.4808	
	63. R-115 60 Sports	.4314	.4542	.4692	.4259	.3946	.3656	.3073	.3112	.2577	.3342	.3941	.3620
	64. R-131 60 Art	.5857	.5782	.5926	.4889	.4900	.4514	.4204	.3579	.3224	.3983	.4404	.4166
	65. R-132 60 Law	.4158	.3886	.4515	.3611	.3386	.3441	.3111	.2923	.2464	.3007	.3445	.3162
	66. R-133 60 Health	.4734	.4870	.5369	.4133	.4664	.4553	.3997	.3041	.2823	.3602	.4440	.4352
	67. R-134 60 Engin.	.3363	.3537	.3742	.3416	.3436	.3375	.2771	.2366	.2664	.3574	.3386	.3562
	68. R-135 60 Arch.	.3930	.3625	.3971	.3368	.3295	.2986	.2379	.2215	.2346	.2581	.2764	.2651
	69. R-138 60 Military	.2994	.2776	.3297	.2784	.2502	.2231	.1910	.2231	.1868	.2191	.2056	.1837
	70. R-139 60 Acct,Busi.	.4548	.4584	.5140	.4333	.4220	.3745	.3651	.2807	.2805	.3495	.3918	.3599
	71. R-140 60 Prac.Knowl	.3643	.3829	.4210	.3269	.3114	.2903	.3243	.2070	.2235	.2738	.3120	.3363
	72. R-142 60 Bible	.4946	.4133	.5130	.3999	.4060	.4150	.3674	.2650	.2531	.2978	.4160	.3206
	73. R-145 60 Hunting	.0578	.0544	.0678	.0493	.0761	.0804	.0424	.0382	.0947	.1468	.1320	.0887
	74. R-146 60 Fishing	.0654	.0634	.0623	.0602	.0461	.0705	.0343	.0578	.0394	.0914	.0803	.0498
	75. R-147 60 Outdoor	.4473	.4560	.4779	.4172	.4085	.3831	.3561	.2841	.2522	.3418	.3826	.3909
	76. R-150 60 Theater	.5606	.5353	.5498	.4507	.4313	.4001	.3633	.3114	.2705	.3250	.4051	.3812
	77. R-162 60 Vocab. II	.5403	.5406	.6087	.4967	.5123	.4609	.4359	.3146	.3062	.3905	.4806	.4564
	78. R-212 60 Mem. Words	.3905	.3903	.4363	.3979	.3575	.3440	.2997	.2119	.2154	.2094	.3094	.2830
	79. R-220 60 Diag. Wds.	.4767	.4650	.4689	.4350	.4179	.3815	.3591	.2683	.2186	.2893	.3630	.3475
English Test	80. R-231 60 Spelling	.3964	.3869	.4443	.4143	.3644	.3098	.2946	.1695	.2077	.2123	.3279	.2774
	81. R-232 60 Capital.	.3141	.3136	.3624	.2690	.2996	.2530	.2588	.1605	.1762	.1936	.2974	.2783
	82. R-233 60 Punct.	.4760	.4835	.5526	.5198	.4706	.4095	.4227	.2619	.2522	.3096	.4389	.3818
	83. R-234 60 Eng. Usage	.4158	.3970	.4409	.3670	.3774	.3191	.3483	.2158	.1847	.2603	.3582	.3083
	84. R-235 60 Eff. Exp.	.3619	.3562	.3874	.3406	.3469	.3037	.3513	.2121	.1831	.2044	.3096	.3015
	85. R-240 60 Word.Funct	.4754	.4522	.5289	.5495	.4806	.4250	.3901	.2834	.2545	.2844	.3794	.3370
	86. R-250 60 Rdg. Compr	.6348	.5929	.6964	.5498	.5803	.5429	.5313	.3701	.3319	.4230	.5477	.4673
	87. R-260 60 Creativity	.4581	.4334	.4721	.4435	.4239	.4000	.3758	.3099	.2901	.3993	.4239	.3849
	88. R-270 60 Mech.Reas	.3590	.3807	.3878	.4201	.4318	.3599	.3461	.3296	.2767	.3976	.3862	.3662
	89. R-281 60 Vis. 2 Dim	.2589	.2467	.2534	.2825	.2544	.2180	.2229	.1726	.1535	.2304	.2767	.2426
	90. R-282 60 Vis. 3 Dim	.3216	.3004	.3468	.3664	.3422	.2761	.2825	.2212	.2021	.2902	.3309	.2918
	91. R-290 60 Abst.Reas	.3854	.4141	.4486	.4288	.4241	.3331	.3846	.2480	.2207	.2686	.3803	.3351
Math Test	92. R-311 60 Arith.Reas	.4611	.4603	.5598	.5347	.5184	.4180	.4553	.2867	.3032	.3598	.4482	.4226
	93. R-312 60 Int.HSMath	.5030	.4894	.5677	.6349	.5059	.4076	.3938	.3030	.2965	.3212	.4169	.4007
	94. R-333 60 Adv.HSMath	.1218	.1225	.1253	.1750	.1089	.1035	.0865	.1294	.0832	.0959	.0742	.0866
	95. F-410 60 Arith.Comp	.2579	.2926	.3527	.3146	.2744	.2300	.2381	.1302	.1806	.1964	.2816	.2640
	96. F-420 60 Table Read	.1296	.1283	.1256	.1184	.1456	.1004	.1262	.0674	.0918	.1240	.1354	.1248
	97. F-430 60 Cler.Check	.2024	.1777	.1950	.1780	.1584	.1206	.1426	.0866	.0816	.0856	.1406	.1153
	98. F-440 60 Obj.Insp.	.1608	.1392	.1350	.1476	.1319	.1310	.1263	.1053	.0698	.1213	.1460	.1495
	99. P*801 60 Socioecon.	.3857	.4517	.3918	.3514	.3089	.2341	.2771	.2308	.1464	.1769	.2118	.2428

TABLE I-2 (continued)

63	64	65	66	67	68	69	70	71	72	73	74	75	Variable
.4926	.6442	.4476	.5879	.4225	.3487	.2333	.5562	.4342	.4789	.1077	.0547	.5400	1. R-102 63
.4669	.6192	.4344	.5426	.3960	.3325	.2686	.5276	.3877	.5233	.0395	.0575	.4751	2. R-103 63
.4658	.5751	.3936	.5020	.3813	.3026	.2806	.4688	.3545	.4296	.0513	.0564	.4831	3. R-104 63
.4761	.5722	.4179	.5291	.3569	.3344	.2313	.5253	.4037	.5057	.0936	.0510	.4755	4. R-105 63
.4652	.5095	.3741	.4421	.3347	.2962	.2817	.4856	.3382	.4227	.0660	.0621	.4438	5. R-106 63
.4405	.5321	.4119	.5100	.3690	.3078	.2636	.4913	.3548	.4576	.0992	.0616	.4779	6. R-107 63
.3531	.4949	.3520	.4770	.3565	.2606	.2164	.4081	.3180	.4199	.0857	.0956	.4180	7. R-108 63
.3338	.4379	.3349	.4042	.3132	.1940	.1756	.3755	.3840	.3568	.0483	.0437	.3970	8. R-109 63
.3344	.3898	.3205	.3446	.2723	.2143	.1858	.3943	.2507	.3078	.0889	.0604	.3566	9. R-110 63
.2871	.3590	.2936	.3359	.3229	.2213	.2011	.3359	.2306	.3031	.0960	.0599	.3229	10. R-111 63
.3488	.3973	.3100	.3636	.3587	.2039	.2019	.3387	.2810	.3165	.1428	.0776	.3498	11. R-112 63
.3929	.4306	.3326	.4096	.3369	.2541	.1947	.3883	.2898	.4031	.1377	.0656	.3796	12. R-113 63
.3269	.3540	.2753	.3749	.3151	.2331	.1579	.3232	.2830	.3190	.0822	.0557	.3599	13. R-114 63
.6054	.4439	.3529	.4008	.2981	.2698	.2448	.3670	.3151	.2928	.0528	.0974	.4118	14. R-115 63
.4213	.6646	.4063	.4830	.3396	.3172	.2666	.4350	.4116	.4243	.0732	.0702	.4408	15. R-131 63
.4116	.4470	.4483	.4082	.3197	.2633	.2865	.3888	.3243	.3681	.0601	.0438	.3858	16. R-132 63
.3653	.4567	.3376	.5414	.3143	.2527	.2224	.3316	.2909	.3858	.0672	.0471	.3725	17. R-133 63
.2518	.3312	.2379	.3470	.4121	.1765	.1648	.2270	.2495	.2563	.1172	.0384	.3098	18. R-134 63
.3266	.4056	.2864	.3618	.2708	.3555	.2012	.3275	.2548	.3216	.0216	.0193	.3407	19. R-135 63
.3211	.3552	.2861	.3078	.2077	.2313	.3379	.3050	.2462	.3041	.0586	.0256	.2621	20. R-138 63
.3787	.4409	.3750	.4266	.3270	.2656	.2525	.5166	.3569	.3287	.0638	.0579	.3781	21. R-139 63
.3128	.3618	.2636	.3074	.2502	.2110	.2098	.2847	.4232	.2929	.0315	.0457	.3325	22. R-140 63
.2722	.3874	.3350	.3624	.2431	.2527	.2496	.3345	.2638	.7606	.0580	.0197	.2901	23. R-142 63
.0374	.0343	.0351	.0425	.0629	.0394	.0423	.0303	.0071	.0717	.2387	.0521	.0004	24. R-145 63
.0899	.0635	.0238	.0472	.0966	.0433	.0443	.0270	-.0092	.0241	.0720	.2353	.1009	25. R-146 63
.3491	.4178	.3148	.3624	.3254	.2519	.2348	.3302	.3099	.3087	.0611	.0404	.5062	26. R-147 63
.4360	.5315	.3776	.4610	.3098	.2858	.2764	.4187	.3699	.3745	.0654	.0778	.4042	27. R-150 63
.4054	.5273	.4193	.5124	.3444	.2857	.2738	.4557	.4093	.3966	.0928	.0866	.4320	28. R-162 63
.3197	.3603	.3016	.3463	.2433	.2612	.1990	.2700	.2425	.3855	.0314	.0358	.3356	29. R-212 63
.2703	.4295	.2652	.3729	.2658	.2443	.1400	.3343	.2980	.3052	.0272	-.0208	.3551	30. R-220 63
.2767	.3714	.2544	.3065	.2580	.2549	.1466	.3001	.2434	.2987	.0231	.0377	.2985	31. R-231 63
.1922	.2284	.1904	.2650	.1401	.1680	.0835	.1992	.2045	.1865	.0493	-.0147	.2272	32. R-232 63
.3528	.4379	.3459	.4374	.2913	.2778	.1944	.3598	.3308	.3988	.0407	.0152	.3870	33. R-233 63
.2930	.3846	.3016	.4002	.2139	.2393	.1687	.3022	.2451	.3358	.0406	.0150	.3222	34. R-234 63
.3026	.3685	.2595	.3756	.2159	.2287	.1550	.2856	.2971	.3047	.0207	.0158	.3656	35. R-235 63
.3463	.4410	.3000	.4188	.3350	.2937	.1764	.4184	.3321	.4094	.0225	.0408	.3841	36. R-240 63
.4040	.5780	.4308	.5214	.3848	.3231	.2562	.4845	.4297	.5429	.0575	.0363	.4630	37. R-250 63
.3454	.4689	.3524	.3867	.3278	.2835	.2010	.4011	.3453	.3700	.0585	.0720	.3839	38. R-260 63
.2952	.3871	.2526	.2867	.3082	.2372	.1780	.3003	.2832	.2766	.0373	.0331	.3401	39. R-270 63
.2075	.2390	.1420	.1933	.2040	.1594	.0971	.1924	.2001	.1695	-.0119	.0325	.2372	40. R-281 63
.2459	.3338	.2282	.2645	.2660	.2316	.1298	.2706	.2632	.2913	.0417	.0163	.3249	41. R-282 63
.3241	.4039	.2842	.3640	.2837	.2307	.1716	.3175	.3181	.3132	.0505	.0228	.3660	42. R-290 63
.4040	.4387	.3965	.4329	.3069	.2834	.2151	.4207	.3131	.4238	.0708	.0210	.4383	43. R-311 63
.4072	.4330	.3797	.3923	.2902	.2796	.2309	.3765	.3088	.4217	.0416	.0160	.4057	44. R-312 63
.3162	.3418	.3000	.2717	.2032	.2427	.1856	.2921	.2086	.2999	-.0213	.0154	.3229	45. R-333 63
.2666	.2585	.2057	.2954	.1944	.2084	.1159	.2310	.2460	.2437	.0747	.0139	.2694	46. F-410 63
.1977	.1442	.1046	.1630	.1230	.1078	.0662	.1488	.2168	.0979	.0334	-.0100	.2166	47. F-420 63
.2000	.1828	.1166	.1751	.1351	.1469	.0573	.1848	.1755	.0762	.0177	-.0035	.1713	48. F-430 63
.2110	.1616	.0831	.1691	.1504	.1545	.0633	.1309	.1820	.0893	.0346	.0065	.2037	49. F-440 63
.4873	.6206	.4605	.5648	.4167	.3922	.3160	.5286	.4166	.4851	.0825	.0533	.5059	50. R-102 60
.4314	.5857	.4158	.4734	.3363	.3930	.2994	.4548	.3643	.4946	.0578	.0654	.4473	51. R-103 60
.4542	.5782	.3886	.4870	.3537	.3625	.2776	.4584	.3829	.4133	.0544	.0634	.4560	52. R-104 60
.4692	.5926	.4513	.5369	.3742	.3971	.3297	.5140	.4210	.5130	.0678	.0623	.4779	53. R-105 60
.4259	.4889	.3611	.4133	.3416	.3368	.2784	.4333	.3269	.3999	.0493	.0602	.4172	54. R-106 60
.3946	.4900	.3386	.4664	.3436	.3295	.2502	.4220	.3114	.4060	.0761	.0461	.4085	55. R-107 60
.3656	.4514	.3441	.4553	.3375	.2986	.2231	.3745	.2903	.4150	.0804	.0705	.3831	56. R-108 60
.3073	.4204	.3111	.3997	.2771	.2379	.1910	.3651	.3243	.3674	.0424	.0343	.3561	57. R-109 60
.3112	.3579	.2923	.3041	.2366	.2215	.2231	.2807	.2070	.2650	.0382	.0578	.2841	58. R-110 60
.2577	.3224	.2464	.2823	.2664	.2346	.1868	.2805	.2235	.2531	.0947	.0394	.2522	59. R-111 60
.3342	.3983	.3007	.3602	.3574	.2581	.2191	.3495	.2738	.2978	.1468	.0914	.3418	60. R-112 60
.3941	.4404	.3445	.4440	.3386	.2764	.2056	.3918	.3120	.4160	.1320	.0803	.3826	61. R-113 60
.3620	.4166	.3162	.4352	.3562	.2651	.1837	.3599	.3363	.3206	.0887	.0498	.3509	62. R-114 60
	.4212	.3558	.3704	.2826	.2728	.2459	.3547	.3173	.3091	.0508	.0802	.3807	63. R-115 60
.4212		.4091	.5310	.3958	.3584	.2901	.4774	.4171	.4487	.0692	.0751	.4826	64. R-131 60
.3558	.4091		.3729	.2710	.2726	.2695	.3978	.3128	.3797	.0704	.0403	.3347	65. R-132 60
.3704	.5310	.3729		.3776	.3088	.2287	.4338	.4047	.4008	.0804	.0605	.4247	66. R-133 60
.2826	.3958	.2710	.3776		.2312	.1761	.3134	.2871	.2776	.0897	.0769	.3449	67. R-134 60
.2728	.3584	.2726	.3088	.2312		.2175	.3142	.2424	.3087	.0910	.0677	.2666	68. R-135 60
.2459	.2901	.2695	.2287	.1761	.2175		.2653	.1714	.2514	.0525	.0555	.2211	69. R-138 60
.3947	.4774	.3978	.4338	.3134	.3142	.2653		.3449	.3833	.0651	.0636	.3972	70. R-139 60
.3173	.4171	.3128	.4047	.2871	.2424	.1714	.3449		.3106	.0692	.0376	.3742	71. R-140 60
.3091	.4487	.3797	.4002	.2776	.3087	.2514	.3833	.3106		.0755	.0613	.3446	72. R-142 60
.0508	.0692	.0704	.0804	.0897	.0910	.0525	.0651	.0692	.0755		.0517	.0848	73. R-145 60
.0802	.0751	.0403	.0605	.0769	.0677	.0555	.0636	.0376	.0613	.0517		.0858	74. R-146 60
.3807	.4826	.3347	.4247	.3449	.2666	.2211	.3972	.3742	.3446	.0848	.0858		75. R-147 60
.4208	.5793	.3922	.4698	.3490	.3242	.2679	.4712	.3917	.3846	.0494	.0340	.4306	76. R-150 60
.4061	.6307	.4907	.5958	.3759	.3295	.2662	.6089	.4303	.4555	.0751	.0749	.5326	77. R-162 60
.2852	.3015	.2549	.3190	.2221	.2353	.1674	.3217	.2632	.3172	.0287	.0370	.2892	78. R-212 60
.3350	.4515	.2891	.4489	.2931	.2729	.2129	.3630	.3146	.3437	.0382	.0615	.3852	79. R-220 60
.3034	.3814	.2510	.3776	.2471	.2515	.1835	.3154	.2575	.3034	.0435	.0443	.2939	80. R-231 60
.2641	.3148	.2241	.3316	.2184	.1741	.1374	.2611	.2965	.2546	.0338	.0299	.2761	81. R-232 60
.3696	.4634	.3414	.4384	.3028	.2829	.2065	.4068	.3417	.4100	.0505	.0294	.3829	82. R-233 60
.2872	.3928	.2852	.3920	.2523	.2525	.1675	.3267	.2889	.3325	.0417	.0147	.3212	83. R-234 60
.2498	.3517	.2698	.3499	.2290	.1886	.1288	.3125	.2820	.2891	.0205	.0026	.2878	84. R-235 60
.3441	.4334	.3228	.3926	.2929	.3020	.2137	.4106	.2930	.4041	.0304	.0292	.3720	85. R-240 60
.4417	.6194	.4586	.5743	.3885	.3770	.2813	.5278	.4343	.5630	.0581	.0558	.5026	86. R-250 60
.3548	.4578	.3447	.4077	.3427	.3204	.2308	.4016	.3218	.3503	.0900	.0658	.3834	87. R-260 60
.3110	.3830	.2993	.3305	.3179	.2391	.2120	.3114	.2746	.2910	.0824	.0517	.3865	88. R-270 60
.2203	.2664	.1977	.2412	.2121	.1653	.1272	.1989	.2312	.1952	.0409	.0142	.2883	89. R-281 60
.2354	.3079	.2112	.2492	.2458	.2169	.1562	.2689	.2152	.2228	.0363	.0238	.2890	90. R-282 60
.3120	.4116	.2931	.3564	.2601	.2438	.1827	.3303	.3126	.3192	.0401	.0352	.3620	91. R-290 60
.3689	.4511	.3890	.4207	.3191	.2906	.2195	.4607	.3424	.4107	.0758	.0295	.4185	92. R-311 60
.4002	.4576	.3487	.4166	.3202	.3040	.2267	.4142	.3332	.4127	.0445	.0453	.4210	93. R-312 60
.1260	.1043	.0845	.0780	.0877	.0768	.0358	.1004	.0798	.0909	.0291	.0273	.0817	94. R-333 60
.2561	.2833	.1989	.3211	.2040	.1874	.1252	.2661	.2867	.2221	.0106	.0486	.2697	95. F-410 60
.1424	.1538	.0822	.1885	.1170	.0852	.0203	.1204	.1788	.1296	.0515	.0099	.1706	96. F-420 60
.1504	.1595	.1400	.1800	.0994	.1262	.0711	.1562	.1646	.1325	.0296	.0473	.1648	97. F-430 60
.1430	.1631	.0801	.1562	.1308	.0988	.0613	.1378	.1474	.0826	.0205	.0242	.1776	98. F-440 60
.3299	.3874	.2504	.2988	.1981	.2287	.1820	.3102	.2681	.1769	-.0005	-.0004	.3758	99. P*801 60

TABLE I-2 (continued)

	Variable	76	77	78	79	80	81	82	83	84	85	86	87
Information Test	1. R-102 63 Vocab. I	.5894	.6774	.4369	.5508	.4647	.3739	.5963	.4891	.4311	.5514	.7460	.5353
	2. R-103 63 Literature	.5794	.6336	.4300	.4954	.4453	.3669	.5704	.4835	.4302	.5501	.7079	.4734
	3. R-104 63 Music	.5362	.5901	.3779	.4943	.3878	.3214	.5975	.4067	.3686	.4372	.6259	.4549
	4. R-105 63 Soc. Stud.	.5232	.6164	.4266	.4640	.4159	.3647	.5616	.4492	.3910	.5195	.6958	.4549
	5. R-106 63 Math	.4799	.5467	.4104	.4599	.4297	.3094	.5658	.4131	.3821	.5947	.6144	.4754
	6. R-107 63 Phys. Sci.	.4700	.5775	.4055	.4501	.4042	.3167	.5463	.4142	.3822	.5274	.6534	.4937
	7. R-108 63 Bio. Sci.	.3949	.5126	.3346	.4136	.3153	.2647	.4495	.3352	.3206	.4332	.5931	.4622
	8. R-109 63 Scient.Att	.3805	.4785	.2951	.3733	.2962	.2746	.4389	.3517	.3513	.4081	.5379	.3914
	9. R-110 63 Aero-Space	.3684	.3077	.2334	.2410	.1982	.1936	.3288	.2606	.2370	.3296	.4508	.3713
	10. R-111 63 Electronic	.3095	.3072	.2446	.2826	.2448	.2023	.3524	.2851	.2394	.3242	.4140	.3672
	11. R-112 63 Mechanics	.3199	.4169	.2396	.2478	.2089	.2298	.3336	.2906	.2369	.2848	.4489	.4291
	12. R-113 63 Farming	.3794	.4680	.2728	.3570	.3652	.3108	.4396	.3561	.2852	.3724	.5324	.4054
	13. R-114 63 Home Ec.	.3134	.4052	.2165	.2621	.2010	.2391	.3221	.2621	.2724	.2605	.4160	.3502
	14. R-115 63 Sports	.4446	.4334	.3135	.3934	.3067	.2761	.3955	.3062	.2706	.3772	.4987	.3666
	15. R-131 63 Art	.5367	.5771	.3353	.4433	.3464	.3796	.4557	.4137	.3612	.4326	.6151	.4433
	16. R-132 63 Law	.4221	.4710	.2886	.3714	.3086	.3490	.4563	.3705	.3407	.4076	.5570	.3876
	17. R-133 63 Health	.3903	.4769	.3061	.3991	.3360	.3533	.4259	.3631	.3184	.3739	.5204	.3516
	18. R-134 63 Engin.	.2997	.3330	.1945	.2764	.2379	.2354	.2925	.2415	.2111	.2608	.3714	.2949
	19. R-135 63 Arch.	.3878	.3923	.2685	.3277	.2337	.2567	.3690	.3044	.2564	.3972	.4414	.3178
	20. R-138 63 Military	.3316	.3571	.2311	.2972	.2565	.2341	.3268	.2805	.2229	.3011	.3970	.2368
	21. R-139 63 Acct,Busi.	.4467	.4973	.2847	.3770	.3258	.3674	.4472	.3539	.3316	.4028	.5083	.3998
	22. R-140 63 Prac.Knowl	.3205	.3713	.2121	.3123	.2232	.2632	.3248	.2673	.2472	.2953	.3729	.2626
	23. R-142 63 Bible	.3145	.4321	.2818	.3274	.2744	.2874	.4073	.3117	.3123	.3987	.5457	.3406
	24. R-145 63 Hunting	.0103	.0052	.0297	.0351	.0490	.0075	.0625	.0324	.0218	.0212	.0561	.0514
	25. R-146 63 Fishing	.0487	.0459	-.0024	.0566	.0315	.0352	.0432	.0528	.0407	.0270	.0670	.0799
	26. R-147 63 Outdoor	.3936	.4420	.2651	.3416	.2418	.3305	.3909	.3436	.2886	.3827	.4475	.3478
	27. R-150 63 Theater	.6234	.5411	.3213	.4544	.3480	.3929	.4542	.4010	.3840	.4270	.5656	.4119
	28. R-162 63 Vocab. II	.4815	.6204	.3680	.4498	.3818	.4182	.5047	.4235	.4162	.4370	.5898	.4050
	29. R-212 63 Mem. Words	.3692	.4110	.5539	.3751	.3608	.2648	.4421	.3168	.3172	.4441	.4806	.3328
	30. R-220 63 Diag. Wds.	.4209	.4593	.3480	.6073	.4396	.2902	.4625	.4033	.3432	.4604	.5010	.3349
English Test	31. R-231 63 Spelling	.3802	.3995	.3268	.4482	.5897	.3276	.4936	.3839	.3353	.4204	.4869	.2842
	32. R-232 63 Capital.	.2329	.2636	.1930	.2420	.2315	.3051	.3367	.2640	.2463	.2451	.3420	.2143
	33. R-233 63 Punct.	.3992	.4849	.3795	.4657	.4677	.4094	.6876	.4761	.4182	.5570	.6020	.4093
	34. R-234 63 Eng. Usage	.3835	.4204	.3327	.4477	.3609	.3181	.5156	.4930	.3810	.4418	.5180	.3427
	35. R-235 63 Eff. Exp.	.3575	.3870	.3085	.3460	.3021	.3203	.4545	.3829	.4745	.4002	.5025	.3552
	36. R-240 63 Word.Funct	.4215	.4992	.4193	.4702	.4728	.3352	.6266	.4368	.4142	.6671	.6145	.4301
	37. R-250 63 Rdg. Compr	.5224	.6099	.4352	.4888	.4172	.3834	.5838	.4906	.4906	.5389	.7714	.4870
	38. R-260 63 Creativity	.4226	.4744	.3631	.4252	.3621	.2848	.4499	.3508	.3404	.4605	.5390	.5373
	39. R-270 63 Mech.Reas	.3199	.3556	.3157	.3539	.2422	.2532	.4267	.3114	.3112	.4078	.4458	.3828
	40. R-281 63 Vis. 2 Dim	.1835	.2203	.2071	.2442	.1532	.1788	.2664	.1989	.1855	.2528	.2762	.2450
	41. R-282 63 Vis. 3 Dim	.2696	.3328	.2944	.2991	.2254	.2090	.3946	.2810	.2443	.3540	.4038	.3606
	42. R-290 63 Abst.Reas	.3469	.4085	.3260	.3821	.3036	.3540	.4826	.3518	.3634	.4339	.5058	.4069
Math Test	43. R-311 63 Arith.Reas	.4149	.5004	.3794	.4028	.3843	.3640	.5834	.4195	.4059	.5586	.6252	.4723
	44. R-312 63 Int.HSMath	.3901	.4543	.3800	.3978	.4063	.3520	.5875	.3053	.3594	.5751	.5735	.4190
	45. R-333 63 Adv.HSMath	.3060	.3474	.2914	.2904	.2806	.2018	.4241	.2671	.2524	.4615	.4309	.3433
	46. F-410 63 Arith.Comp	.2374	.2783	.2565	.2831	.3283	.2922	.3914	.2963	.2723	.3279	.3541	.2488
	47. F-420 63 Table Read	.1686	.1604	.1338	.2409	.1972	.1647	.1968	.1445	.0995	.1627	.2065	.1343
	48. F-430 63 Cler.Check	.1842	.1802	.1805	.2841	.2550	.1531	.2197	.1622	.1207	.2401	.2446	.1737
	49. F-440 63 Obj.Insp.	.1738	.1734	.1405	.2352	.1268	.1603	.1967	.1718	.1212	.2085	.2008	.1768
Information Test	50. R-102 60 Vocab. I	.5920	.6366	.4171	.5364	.4629	.3478	.5567	.4661	.4112	.5442	.7141	.5195
	51. R-103 60 Literature	.5606	.5403	.3905	.4767	.3964	.3141	.4760	.4158	.3619	.4754	.6348	.4581
	52. R-104 60 Music	.5353	.5406	.3903	.4650	.3869	.3136	.4835	.3970	.3562	.4522	.5929	.4334
	53. R-105 60 Soc. Stud.	.5498	.6087	.4363	.4689	.4443	.3624	.5526	.4409	.3874	.5289	.6964	.4721
	54. R-106 60 Math	.4507	.4967	.3979	.4350	.4143	.2690	.5198	.3670	.3406	.5495	.5498	.4435
	55. R-107 60 Phys. Sci.	.4313	.5123	.3575	.4179	.3644	.2996	.4706	.3774	.3469	.4806	.5803	.4239
	56. R-108 60 Bio. Sci.	.4001	.4609	.3440	.3815	.3098	.2530	.4095	.3191	.3037	.4250	.5429	.4000
	57. R-109 60 Scient.Att	.3633	.4359	.2997	.3591	.2946	.2588	.4227	.3483	.3513	.3901	.5313	.3758
	58. R-110 60 Aero-Space	.3114	.3146	.2119	.2683	.1695	.1605	.2619	.2158	.2121	.2834	.3701	.3099
	59. R-111 60 Electronic	.2705	.3062	.2154	.2186	.2077	.1762	.2522	.1847	.1831	.2545	.3319	.2901
	60. R-112 60 Mechanics	.3250	.3905	.2094	.2893	.2123	.1936	.3096	.2603	.2044	.2844	.4230	.3993
	61. R-113 60 Farming	.4051	.4806	.3094	.3630	.3279	.2974	.4389	.3582	.3096	.3794	.5477	.4239
	62. R-114 60 Home Ec.	.3812	.4564	.2830	.3475	.2774	.2783	.3818	.3083	.3015	.3370	.4673	.3849
	63. R-115 60 Sports	.4208	.4061	.2852	.3350	.3034	.2641	.3696	.2872	.2493	.3441	.4417	.3548
	64. R-131 60 Art	.5793	.6307	.3815	.4515	.3814	.3148	.4634	.3928	.3517	.4334	.6194	.4578
	65. R-132 60 Law	.3922	.4907	.2549	.2891	.2510	.2241	.3414	.2852	.2690	.3228	.4586	.3447
	66. R-133 60 Health	.4698	.5958	.3190	.4489	.3776	.3316	.4384	.3920	.3499	.3926	.5743	.4077
	67. R-134 60 Engin.	.3490	.3759	.2221	.2931	.2471	.2184	.3028	.2523	.2290	.2929	.3885	.3427
	68. R-135 60 Arch.	.3242	.3295	.2353	.2729	.2515	.1741	.2829	.2525	.1886	.3020	.3770	.3204
	69. R-138 60 Military	.2679	.2662	.1674	.2129	.1835	.1374	.2065	.1675	.1288	.2137	.2813	.2308
	70. R-139 60 Acct,Busi.	.4712	.6089	.3217	.3630	.3154	.2611	.4068	.3267	.3123	.4106	.5278	.4016
	71. R-140 60 Prac.Knowl	.3917	.4303	.2632	.3146	.2575	.2965	.3417	.2889	.2820	.2980	.4343	.3218
	72. R-142 60 Bible	.3846	.4555	.3172	.3437	.3034	.2546	.4100	.3325	.2891	.4041	.5630	.3503
	73. R-145 60 Hunting	.0494	.0751	.0287	.0382	.0435	.0338	.0505	.0417	.0205	.0304	.0581	.0900
	74. R-146 60 Fishing	.0340	.0749	.0370	.0615	.0443	.0299	.0294	.0147	.0026	.0292	.0558	.0658
	75. R-147 60 Outdoor	.4306	.5326	.2892	.3852	.2939	.2761	.3829	.3212	.2878	.3720	.5026	.3834
	76. R-150 60 Theater		.5881	.3493	.4511	.3768	.3137	.4269	.3908	.3500	.4020	.5664	.3995
	77. R-162 60 Vocab. II	.5881		.3944	.4951	.4123	.3408	.5126	.4440	.4090	.4685	.6498	.4613
	78. R-212 60 Mem. Words	.3493	.3944		.3653	.3687	.3026	.4467	.3357	.2904	.4200	.6513	.3367
	79. R-220 60 Diag. Wds.	.4511	.4951	.3653		.4976	.3385	.5109	.4388	.3699	.4696	.5774	.4467
English Test	80. R-231 60 Spelling	.3768	.4123	.3687	.4976		.4050	.5531	.4287	.3690	.4624	.4969	.3383
	81. R-232 60 Capital.	.3137	.3408	.3026	.3385	.4050		.4966	.4250	.3593	.3313	.4293	.2862
	82. R-233 60 Punct.	.4269	.5126	.4467	.5109	.5531	.4966		.5432	.4669	.6093	.6218	.4379
	83. R-234 60 Eng. Usage	.3908	.4440	.3357	.4388	.4287	.4250	.5432		.4521	.4081	.5127	.3439
	84. R-235 60 Eff. Exp.	.3500	.4090	.2904	.3699	.3690	.3593	.4669	.4521		.3812	.4968	.3294
	85. R-240 60 Word.Funct	.4020	.4685	.4200	.4696	.4624	.3313	.6093	.4081	.3812		.6194	.4726
	86. R-250 60 Rdg. Compr	.5664	.6498	.4513	.5774	.4969	.4293	.6718	.5127	.4968	.6194		.5875
	87. R-260 60 Creativity	.3995	.4613	.3367	.4467	.3383	.2862	.4379	.3439	.3294	.4726	.5875	
	88. R-270 60 Mech.Reas	.3265	.3942	.2937	.3724	.2147	.2345	.4102	.3161	.3183	.4135	.4841	.4419
	89. R-281 60 Vis. 2 Dim	.2309	.2550	.2106	.3173	.1915	.2097	.3120	.2336	.2246	.2935	.3445	.3096
	90. R-282 60 Vis. 3 Dim	.2343	.3107	.2626	.2796	.2006	.2188	.3588	.2278	.2499	.3717	.4103	.3703
	91. R-290 60 Abst.Reas	.3498	.4120	.3366	.4260	.3189	.3372	.5043	.3632	.3672	.4845	.5574	.4475
Math Test	92. R-311 60 Arith.Reas	.4277	.5258	.4018	.4357	.4425	.3845	.5850	.4353	.4493	.5712	.6310	.4732
	93. R-312 60 Int.HSMath	.4414	.4852	.4133	.4404	.4837	.3881	.6169	.4341	.4014	.5780	.5901	.4599
	94. R-333 60 Adv.HSMath	.0995	.0886	.0918	.0961	.1073	.0743	.1210	.0712	.0746	.0862	.0914	.1096
	95. F-410 60 Arith.Comp	.2783	.3226	.2778	.3324	.3537	.3131	.4026	.3343	.2741	.3384	.3873	.2812
	96. F-420 60 Table Read	.1539	.1650	.1214	.2307	.1608	.1948	.2028	.1820	.1300	.1978	.2175	.1567
	97. F-430 60 Cler.Check	.1881	.1735	.1960	.3498	.2662	.1843	.2544	.1991	.1392	.2416	.2528	.1830
	98. F-440 60 Obj.Insp.	.1546	.1571	.1586	.2412	.1059	.1751	.1838	.1335	.1206	.2080	.2153	.1949
	99. P*801 60 Socioecon.	.3693	.3439	.2376	.3065	.2198	.2147	.2916	.2449	.2395	.2887	.3671	.2944

TABLE I-2 (continued)

88	89	90	91	92	93	94	95	96	97	98	99	Variable
.4964	.3367	.3930	.5136	.6123	.5872	.1170	.3336	.2015	.1849	.2138	.4249	1. R-102 63
.4035	.2889	.3345	.4345	.5443	.5715	.0847	.3059	.1965	.1959	.2000	.4361	2. R-103 63
.4105	.2764	.3185	.4322	.4885	.4877	.1017	.3031	.1849	.1613	.2028	.4632	3. R-104 63
.4153	.3006	.3534	.4548	.5696	.5635	.0969	.3220	.1681	.1654	.1724	.3991	4. R-105 63
.4775	.3531	.4074	.4982	.6008	.6760	.1577	.3321	.1823	.1971	.2268	.4217	5. R-106 63
.5131	.3262	.4073	.4862	.5942	.5943	.1291	.2966	.1732	.1626	.2002	.3675	6. R-107 63
.4246	.2565	.3304	.4052	.4645	.4484	.1047	.2430	.1144	.1231	.1708	.2942	7. R-108 63
.3870	.3183	.3327	.4114	.4557	.4203	.1144	.2421	.1763	.1367	.1948	.3119	8. R-109 63
.4241	.2491	.3008	.3355	.3736	.3789	.0796	.1763	.1304	.1084	.1496	.2668	9. R-110 63
.3896	.2395	.2972	.3169	.3811	.3967	.0999	.1986	.1356	.0884	.1382	.2111	10. R-111 63
.4315	.2874	.3151	.3368	.3990	.3602	.0858	.1751	.1447	.0634	.1582	.1954	11. R-112 63
.3839	.3002	.2907	.3549	.4452	.3942	.0639	.2425	.1697	.1427	.1638	.2095	12. R-113 63
.3361	.2554	.2900	.3213	.3518	.3245	.0648	.1971	.1431	.0692	.1580	.1950	13. R-114 63
.3577	.2702	.2704	.3421	.3986	.4309	.1074	.2787	.1780	.1444	.1827	.3533	14. R-115 63
.3907	.2821	.2974	.4079	.4077	.4449	.0819	.2572	.1675	.1486	.1616	.3885	15. R-131 63
.3350	.2133	.2833	.3685	.4594	.4282	.0536	.2566	.1538	.1345	.1202	.3000	16. R-132 63
.3070	.2277	.2586	.3571	.3790	.3993	.0747	.3016	.2178	.1201	.1682	.2557	17. R-133 63
.2889	.2201	.2355	.2667	.2977	.2928	.0733	.1695	.1336	.0844	.1001	.2044	18. R-134 63
.2621	.1352	.2143	.2987	.3202	.3393	.0677	.1967	.0857	.1492	.0854	.3006	19. R-135 63
.2698	.1569	.1701	.2645	.3268	.3096	.0372	.1661	.1110	.0963	.0834	.2603	20. R-138 63
.3257	.2524	.2758	.3617	.4884	.4362	.0750	.3327	.1646	.1071	.1066	.2783	21. R-139 63
.2449	.2106	.2085	.2688	.3027	.3088	.0946	.2561	.1760	.1392	.1300	.2462	22. R-140 63
.2967	.1834	.2504	.3277	.3947	.3335	.0548	.1987	.1336	.0744	.0662	.1590	23. R-142 63
.0795	.0136	.0248	.0425	.0620	.0182	.0326	.0299	.0393	.0205	.0268	-.0492	24. R-145 63
.1001	.0725	.0520	.0538	.0301	.0407	.0449	.0116	.0065	.0231	.0201	-.0099	25. R-146 63
.3693	.2742	.2605	.3314	.3673	.3824	.1298	.2134	.1524	.1130	.1490	.3916	26. R-147 63
.3317	.2495	.2576	.3793	.4187	.4612	.0903	.2657	.1726	.1514	.1195	.3600	27. R-150 63
.3762	.2629	.2932	.4328	.5015	.4649	.0717	.3009	.1468	.1267	.1000	.3306	28. R-162 63
.2960	.2337	.2602	.3782	.4067	.4127	.0884	.2851	.1226	.2029	.1423	.2537	29. R-212 63
.3225	.2933	.2759	.3809	.4121	.4079	.0631	.3111	.2049	.3129	.2096	.2962	30. R-220 63
.2324	.1722	.1823	.2977	.3869	.4013	.0677	.3608	.1601	.2810	.1337	.1874	31. R-231 63
.1901	.1859	.1937	.2410	.2542	.2362	.0463	.2596	.2180	.2120	.1515	.1747	32. R-232 63
.4096	.3180	.3528	.4963	.5321	.5378	.0847	.4194	.2462	.2741	.2073	.2650	33. R-233 63
.3456	.2472	.2471	.3823	.4167	.4211	.0501	.3271	.1544	.2248	.1376	.2470	34. R-234 63
.3252	.2783	.2800	.4069	.4171	.3737	.0666	.3456	.1546	.1586	.1401	.2793	35. R-235 63
.3973	.3173	.3774	.4962	.5638	.5936	.0750	.3964	.2074	.2539	.1893	.2782	36. R-240 63
.4214	.3062	.3790	.4866	.5826	.5429	.0829	.3909	.1922	.2160	.1841	.3272	37. R-250 63
.4219	.2996	.3899	.4438	.4770	.4606	.1035	.2936	.1709	.1881	.1884	.2803	38. R-260 63
.6399	.4142	.5000	.4774	.4595	.4608	.1043	.2486	.1699	.1379	.2286	.2795	39. R-270 63
.3826	.5709	.4279	.3644	.2936	.2852	.0420	.2196	.1498	.1527	.2280	.1394	40. R-281 63
.4916	.4188	.5925	.4723	.4413	.4269	.0701	.2571	.1516	.1670	.2693	.2075	41. R-282 63
.4600	.4010	.4650	.6006	.4953	.4821	.0798	.3396	.2222	.1948	.2696	.3093	42. R-290 63
.4843	.3431	.4050	.5233	.6794	.6017	.0966	.3670	.1793	.2241	.1874	.3320	43. R-311 63
.4412	.3175	.3944	.4675	.5710	.6742	.1279	.3450	.1679	.2600	.1826	.3721	44. R-312 63
.3640	.2242	.3200	.3471	.4421	.5244	.1518	.2209	.0774	.1602	.1115	.2886	45. R-333 63
.2233	.2520	.2104	.3115	.3537	.3663	.0650	.4611	.2239	.2704	.2146	.1461	46. F-410 63
.1759	.2034	.1622	.2209	.1846	.2375	.0485	.2318	.2406	.2026	.2471	.1038	47. F-420 63
.1688	.2033	.1634	.2386	.2145	.2226	.0441	.2183	.1697	.2779	.2353	.1966	48. F-430 63
.2349	.2757	.2483	.3032	.1924	.2276	.0305	.2036	.1997	.1967	.4070	.1509	49. F-440 63
.4629	.3047	.3481	.4635	.5641	.5519	.1107	.3383	.1784	.2218	.1794	.4125	50. R-102 60
.3590	.2589	.3216	.3854	.4611	.5030	.1218	.2579	.1296	.2024	.1608	.3857	51. R-103 60
.3807	.2467	.3004	.4141	.4603	.4894	.1225	.2926	.1283	.1777	.1392	.4517	52. R-104 60
.3878	.2534	.3468	.4486	.5598	.5677	.1253	.3527	.1256	.1950	.1350	.3918	53. R-105 60
.4201	.2825	.3664	.4288	.5347	.6349	.1750	.3146	.1184	.1780	.1478	.3514	54. R-106 60
.4318	.2544	.3422	.4241	.5184	.5059	.1089	.2744	.1456	.1584	.1319	.3089	55. R-107 60
.3599	.2180	.2761	.3331	.4180	.4076	.1035	.2300	.1004	.1206	.1310	.2341	56. R-108 60
.3461	.2225	.2825	.3846	.4553	.3938	.0865	.2381	.1267	.1426	.1263	.2771	57. R-109 60
.3296	.1726	.2212	.2480	.2867	.3030	.1294	.1302	.0674	.0866	.1053	.2308	58. R-110 60
.2767	.1535	.2021	.2207	.3032	.2965	.0832	.1806	.0918	.0816	.0698	.1464	59. R-111 60
.3976	.2304	.2902	.2686	.3598	.3212	.0959	.1964	.1240	.0856	.1213	.1769	60. R-112 60
.3862	.2767	.3309	.3803	.4482	.4169	.0742	.2816	.1354	.1406	.1460	.2118	61. R-113 60
.3662	.2426	.2918	.3351	.4226	.4007	.0866	.2640	.1248	.1153	.1495	.2428	62. R-114 60
.3110	.2203	.2354	.3120	.3689	.4002	.1260	.2561	.1424	.1504	.1430	.3299	63. R-115 60
.3830	.2664	.3079	.4116	.4511	.4576	.1043	.2833	.1538	.1595	.1631	.3874	64. R-131 60
.2993	.1977	.2112	.2931	.3890	.3487	.0845	.1989	.0822	.1400	.0801	.2504	65. R-132 60
.3305	.2412	.2492	.3564	.4207	.4166	.0780	.3211	.1885	.1800	.1562	.2988	66. R-133 60
.3179	.2121	.2458	.2601	.3191	.3202	.0877	.2040	.1170	.0994	.1308	.1981	67. R-134 60
.2391	.1653	.2169	.2438	.2906	.3040	.0768	.1874	.0852	.1262	.0988	.2287	68. R-135 60
.2120	.1272	.1562	.1827	.2195	.2267	.0958	.1252	.0203	.0711	.0613	.1820	69. R-138 60
.3114	.1989	.2689	.3303	.4607	.4142	.1004	.2661	.1204	.1562	.1378	.3102	70. R-139 60
.2746	.2312	.2152	.3126	.3424	.3332	.0798	.2867	.1788	.1646	.1474	.2681	71. R-140 60
.2910	.1982	.2228	.3192	.4107	.4127	.0909	.2221	.1296	.1325	.0826	.1769	72. R-142 60
.0824	.0409	.0363	.0401	.0758	.0445	.0291	.0106	.0515	.0296	.0205	-.0005	73. R-145 60
.0517	.0142	.0238	.0352	.0295	.0453	.0273	.0486	.0099	.0473	.0242	-.0004	74. R-146 60
.3865	.2883	.2890	.3620	.4185	.4210	.0817	.2697	.1706	.1648	.1776	.3758	75. R-147 60
.3265	.2309	.2343	.3498	.4277	.4414	.0995	.2783	.1539	.1881	.1546	.3693	76. R-150 60
.3942	.2550	.3107	.4120	.5258	.4852	.0886	.3226	.1650	.1735	.1571	.3439	77. R-162 60
.2937	.2106	.2626	.3366	.4018	.4133	.0918	.2778	.1214	.1960	.1586	.2376	78. R-212 60
.3724	.3173	.2796	.4260	.4357	.4404	.0961	.3324	.2307	.3498	.2412	.3065	79. R-220 60
.2147	.1915	.2006	.3189	.4425	.4837	.1073	.3537	.1608	.2662	.1059	.2198	80. R-231 60
.2345	.2097	.2188	.3372	.3845	.3881	.0743	.3131	.1948	.1843	.1751	.2147	81. R-232 60
.4102	.3120	.3588	.5043	.5850	.6169	.1210	.4026	.2028	.2544	.1838	.2916	82. R-233 60
.3161	.2336	.2278	.3632	.4353	.4341	.0712	.3343	.1820	.1991	.1335	.2449	83. R-234 60
.3183	.2246	.2499	.3672	.4493	.4014	.0746	.2741	.1300	.1392	.1206	.2395	84. R-235 60
.4135	.2935	.3717	.4845	.5712	.5780	.0862	.3384	.1978	.2416	.2080	.2887	85. R-240 60
.4841	.3445	.4103	.5574	.6310	.5901	.0914	.3873	.2175	.2528	.2153	.3671	86. R-250 60
.4419	.3096	.3703	.4475	.4732	.4559	.1096	.2812	.1567	.1830	.1949	.2944	87. R-260 60
	.4236	.5246	.5058	.4691	.4432	.1068	.2048	.1653	.1506	.2587	.2737	88. R-270 60
.4236		.4231	.3929	.3214	.3412	.0611	.2075	.2270	.2147	.2808	.1817	89. R-281 60
.5246	.4231		.4983	.4104	.4027	.1008	.1985	.1844	.1430	.2540	.2244	90. R-282 60
.5058	.3929	.4983		.5132	.4957	.0946	.3269	.2127	.2078	.2918	.3267	91. R-290 60
.4691	.3214	.4104	.5132		.6175	.1155	.3668	.1687	.1853	.1463	.2893	92. R-311 60
.4432	.3412	.4027	.4957	.6175		.1802	.3946	.1927	.2137	.1714	.3407	93. R-312 60
.1068	.0611	.1008	.0946	.1155	.1802		.0429	.0129	.0327	.0218	.0710	94. R-333 60
.2048	.2075	.1985	.3269	.3668	.3946	.0429		.2529	.2178	.1940	.1682	95. F-410 60
.1653	.2270	.1844	.2127	.1687	.1927	.0129	.2529		.3142	.3347	.1018	96. F-420 60
.1506	.2147	.1430	.2078	.1853	.2137	.0327	.2178	.3142		.3322	.1414	97. F-430 60
.2587	.2808	.2540	.2918	.1463	.1714	.0218	.1940	.3347	.3322		.1452	98. F-440 60
.2737	.1817	.2244	.3267	.2893	.3407	.0710	.1682	.1018	.1414	.1452		99. P*801 60

---

[a] Each correlation in this table is based on all cases having valid scores for both of the variables correlated.

[b] The unweighted numbers of cases on which each correlation coefficient is based may be determined from Table 2-5.

APPENDIX J

SIX MATRICES OF INTERCORRELATIONS AMONG TEST SCORE VARIABLES (GRADES 9 AND 12), SOCIOECONOMIC INDEX, NUMBER OF COURSES TAKEN IN SELECTED AREAS, AND TWO SIB ITEMS (COLLEGE PLANS AND AMOUNT OF COUNSELING).

TABLE J-1. Correlation Matrix AM (Retest Battery A, males)

N = 419^{a}

Variable No.^{b}		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
OR102	1	1.000	.631	.572	.717	.670	.668	.674	.494	.653	.604	.597	.499	.454	.556	.571	.546	.552	.450
OR103	2	.631	1.000	.643	.661	.613	.549	.562	.409	.559	.469	.387	.396	.371	.533	.606	.527	.541	.311
OR104	3	.572	.643	1.000	.605	.571	.533	.503	.324	.480	.492	.368	.397	.350	.509	.507	.420	.495	.373
OR105	4	.717	.661	.605	1.000	.665	.674	.589	.450	.585	.538	.496	.485	.465	.599	.618	.605	.601	.473
OR106	5	.670	.613	.571	.665	1.000	.630	.538	.471	.557	.562	.478	.437	.393	.531	.488	.538	.523	.403
OR107	6	.668	.549	.533	.674	.630	1.000	.579	.384	.600	.637	.430	.468	.392	.459	.527	.509	.542	.374
OR108	7	.674	.562	.503	.589	.538	.579	1.000	.411	.608	.506	.510	.526	.462	.410	.469	.415	.478	.388
OR109	8	.494	.409	.324	.450	.471	.384	.411	1.000	.364	.335	.390	.335	.254	.395	.383	.393	.352	.296
OR110	9	.653	.559	.480	.585	.557	.600	.608	.364	1.000	.595	.588	.453	.365	.401	.523	.506	.474	.445
OR111	10	.604	.469	.492	.538	.582	.637	.506	.335	.595	1.000	.560	.438	.412	.367	.433	.479	.411	.436
OR112	11	.597	.387	.368	.496	.478	.430	.510	.390	.588	.560	1.000	.496	.422	.372	.429	.433	.406	.478
OR113	12	.499	.396	.397	.485	.437	.468	.526	.335	.453	.438	.496	1.000	.360	.330	.302	.400	.400	.307
OR114	13	.454	.371	.350	.465	.393	.392	.462	.254	.365	.412	.422	.360	1.000	.354	.377	.353	.287	.293
OR115	14	.556	.533	.509	.599	.531	.459	.410	.395	.401	.367	.372	.330	.354	1.000	.407	.468	.446	.287
OR131	15	.571	.606	.507	.618	.488	.527	.469	.383	.523	.433	.429	.302	.377	.407	1.000	.491	.560	.386
OR132	16	.546	.527	.420	.605	.538	.509	.415	.393	.506	.479	.433	.400	.353	.468	.491	1.000	.490	.326
OR133	17	.552	.541	.495	.601	.523	.542	.478	.352	.474	.411	.406	.400	.287	.446	.560	.490	1.000	.460
OR134	18	.450	.311	.373	.473	.403	.374	.386	.296	.445	.436	.478	.307	.293	.287	.386	.326	.460	1.000
OR135	19	.442	.421	.343	.395	.431	.323	.367	.247	.384	.315	.273	.270	.252	.270	.416	.306	.340	.247
OR139	20	.546	.446	.403	.586	.484	.423	.453	.316	.491	.458	.473	.344	.349	.419	.521	.502	.518	.384
OR142	21	.581	.537	.482	.560	.546	.548	.432	.374	.416	.384	.313	.398	.272	.391	.473	.490	.523	.294
OR290	22	.436	.420	.350	.471	.528	.456	.411	.411	.400	.363	.389	.316	.295	.340	.378	.291	.373	.298
3R102	23	.770	.636	.541	.732	.647	.634	.657	.481	.617	.562	.584	.534	.451	.536	.580	.568	.577	.458
3R103	24	.675	.679	.582	.728	.601	.574	.568	.408	.535	.437	.431	.395	.375	.545	.618	.554	.606	.369
3R104	25	.605	.625	.723	.612	.551	.545	.500	.375	.486	.431	.419	.379	.376	.520	.559	.443	.546	.352
3R105	26	.563	.548	.493	.762	.595	.614	.588	.428	.546	.461	.436	.442	.439	.526	.538	.531	.536	.404
3R106	27	.656	.546	.531	.671	.716	.639	.583	.394	.540	.525	.483	.419	.387	.510	.482	.498	.568	.388
3R107	28	.706	.549	.529	.716	.678	.753	.620	.403	.620	.591	.495	.464	.415	.483	.527	.541	.574	.412
3R108	29	.601	.520	.430	.601	.508	.597	.675	.383	.559	.505	.483	.461	.412	.386	.459	.492	.499	.353
3R109	30	.512	.451	.352	.504	.470	.478	.456	.579	.445	.461	.384	.342	.295	.339	.437	.432	.391	.282
3R110	31	.648	.571	.474	.623	.590	.562	.587	.376	.713	.572	.605	.471	.377	.466	.526	.503	.524	.459
3R111	32	.589	.415	.422	.537	.540	.615	.513	.354	.619	.673	.643	.454	.412	.308	.446	.474	.468	.439
3R112	33	.499	.272	.275	.440	.363	.387	.500	.333	.526	.501	.706	.424	.375	.290	.345	.377	.345	.418
3R113	34	.442	.283	.268	.386	.313	.358	.440	.294	.344	.340	.435	.645	.311	.230	.245	.305	.292	.287
3R114	35	.441	.376	.312	.440	.374	.356	.434	.330	.393	.351	.425	.346	.576	.262	.365	.363	.360	.292
3R115	36	.514	.451	.467	.562	.464	.434	.424	.347	.386	.261	.307	.305	.347	.700	.431	.400	.401	.287
3R131	37	.565	.571	.484	.598	.509	.518	.484	.364	.491	.411	.440	.299	.418	.385	.635	.459	.490	.386
3R132	38	.544	.469	.431	.572	.474	.476	.464	.380	.448	.397	.427	.348	.335	.376	.464	.522	.468	.324
3R133	39	.538	.440	.426	.543	.426	.437	.437	.383	.425	.385	.423	.398	.388	.372	.427	.413	.509	.371
3R134	40	.492	.291	.316	.445	.393	.424	.402	.300	.408	.386	.437	.363	.372	.265	.392	.333	.367	.440
3R135	41	.525	.431	.413	.494	.474	.449	.436	.340	.458	.420	.382	.321	.336	.377	.487	.376	.357	.310
3R139	42	.492	.414	.397	.528	.460	.440	.400	.355	.462	.453	.447	.357	.356	.332	.436	.462	.474	.411
3R142	43	.587	.540	.454	.577	.531	.564	.434	.403	.419	.404	.309	.373	.310	.374	.444	.496	.507	.287
3R290	44	.462	.409	.362	.465	.468	.482	.407	.344	.415	.354	.380	.292	.295	.340	.406	.353	.385	.275
X891'	45	.435	.360	.321	.438	.516	.434	.382	.221	.356	.346	.272	.232	.250	.376	.341	.309	.388	.272
X892'	46	.525	.426	.418	.526	.531	.553	.452	.323	.403	.362	.292	.272	.266	.433	.403	.365	.441	.321
X893'	47	.265	.223	.242	.284	.293	.351	.294	.154	.195	.251	.126	.167	.183	.215	.238	.229	.265	.144
X894'	48	.341	.396	.370	.390	.385	.322	.308	.236	.252	.212	.201	.099	.264	.378	.354	.239	.393	.254
SIB 59	49	-.425	-.360	-.348	-.428	-.382	-.382	-.320	-.308	-.297	-.246	-.219	-.209	-.244	-.405	-.353	-.366	-.393	-.201
SIB156	50	.269	.284	.320	.327	.339	.224	.254	.165	.252	.197	.141	.134	.158	.237	.275	.186	.274	.157
P*801	51	.405	.463	.451	.434	.428	.347	.378	.283	.363	.313	.307	.190	.220	.421	.411	.334	.381	.219

TABLE J-I (continued)

Variable No.^b		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
OR102	1	.442	.546	.581	.436	.770	.675	.605	.663	.656	.706	.601	.512	.648	.589	.499	.442	.441	.514
OR103	2	.421	.446	.537	.420	.636	.699	.625	.548	.546	.549	.520	.451	.521	.415	.272	.283	.376	.451
OR104	3	.343	.403	.492	.350	.541	.582	.723	.493	.531	.529	.430	.352	.474	.422	.275	.268	.312	.467
OR105	4	.395	.586	.560	.471	.732	.728	.612	.782	.671	.716	.601	.504	.623	.539	.440	.386	.440	.562
OR106	5	.431	.484	.546	.528	.647	.601	.551	.595	.716	.678	.508	.470	.590	.545	.363	.313	.374	.464
OR107	6	.323	.423	.548	.456	.634	.574	.545	.614	.639	.753	.597	.478	.562	.615	.387	.358	.356	.434
OR108	7	.367	.453	.432	.411	.657	.568	.500	.588	.583	.620	.675	.456	.587	.513	.500	.440	.434	.424
OR109	8	.247	.316	.374	.411	.461	.408	.375	.428	.394	.403	.383	.579	.376	.354	.333	.294	.330	.347
OR110	9	.384	.491	.416	.400	.617	.535	.486	.546	.540	.620	.559	.445	.713	.619	.526	.344	.393	.386
OR111	10	.315	.458	.384	.363	.582	.437	.431	.461	.525	.591	.505	.401	.572	.673	.501	.340	.351	.261
OR112	11	.273	.473	.313	.389	.584	.431	.419	.436	.483	.495	.483	.384	.605	.643	.706	.435	.425	.307
OR113	12	.270	.344	.398	.316	.534	.395	.379	.442	.419	.464	.481	.342	.471	.454	.424	.645	.346	.305
OR114	13	.252	.349	.272	.295	.451	.375	.376	.439	.387	.415	.412	.295	.377	.412	.375	.311	.576	.347
OR115	14	.270	.419	.391	.340	.536	.545	.520	.526	.510	.483	.386	.339	.466	.306	.290	.230	.260	.700
OR131	15	.416	.521	.473	.378	.580	.618	.559	.538	.482	.527	.459	.437	.526	.446	.345	.245	.365	.431
OR132	16	.306	.502	.490	.291	.568	.554	.443	.531	.498	.541	.492	.432	.503	.474	.377	.305	.363	.400
OR133	17	.340	.518	.523	.373	.577	.606	.546	.536	.568	.574	.499	.391	.524	.468	.345	.292	.360	.401
OR134	18	.247	.384	.294	.298	.458	.369	.352	.404	.388	.412	.353	.282	.459	.437	.418	.287	.292	.287
OR135	19	1.000	.366	.373	.300	.361	.374	.276	.338	.356	.337	.315	.288	.285	.272	.178	.200	.212	.216
OR139	20	.366	1.000	.447	.339	.507	.516	.474	.496	.479	.472	.399	.381	.467	.398	.372	.258	.372	.358
OR142	21	.373	.447	1.000	.373	.519	.554	.474	.526	.545	.548	.461	.391	.427	.417	.276	.351	.296	.356
OR290	22	.300	.339	.373	1.000	.487	.431	.357	.441	.546	.512	.406	.376	.407	.441	.328	.337	.263	.271
3R102	23	.361	.507	.519	.487	1.000	.745	.595	.754	.712	.748	.678	.559	.708	.649	.584	.506	.503	.581
3R103	24	.374	.516	.554	.431	.745	1.000	.670	.729	.689	.696	.613	.521	.597	.485	.368	.329	.461	.593
3R104	25	.276	.474	.494	.357	.595	.670	1.000	.602	.578	.588	.509	.463	.501	.492	.353	.336	.396	.527
3R105	26	.338	.496	.526	.441	.754	.729	.602	1.000	.679	.744	.627	.554	.636	.534	.436	.429	.451	.620
3R106	27	.356	.479	.545	.546	.712	.689	.578	.679	1.000	.773	.587	.489	.615	.594	.384	.342	.392	.506
3R107	28	.337	.472	.548	.512	.748	.696	.588	.744	.773	1.000	.694	.548	.698	.706	.518	.436	.463	.507
3R108	29	.315	.399	.461	.406	.678	.613	.509	.627	.587	.694	1.000	.499	.598	.596	.495	.461	.447	.433
3R109	30	.288	.381	.391	.376	.559	.521	.463	.554	.489	.548	.499	1.000	.502	.407	.370	.304	.377	.390
3R110	31	.285	.467	.427	.407	.708	.597	.501	.636	.615	.696	.598	.502	1.000	.619	.594	.411	.472	.485
3R111	32	.272	.398	.417	.441	.640	.485	.492	.534	.594	.708	.596	.407	.619	1.000	.648	.427	.433	.281
3R112	33	.178	.372	.276	.328	.584	.388	.353	.436	.384	.518	.495	.370	.594	.648	1.000	.471	.402	.298
3R113	34	.200	.258	.351	.337	.506	.329	.336	.429	.342	.436	.461	.304	.411	.427	.471	1.000	.337	.291
3R114	35	.212	.372	.296	.263	.503	.461	.396	.451	.392	.463	.447	.377	.472	.433	.402	.337	1.000	.313
3R115	36	.216	.358	.356	.271	.581	.593	.527	.620	.506	.507	.433	.390	.465	.281	.298	.291	.313	1.000
3R131	37	.323	.473	.447	.378	.592	.662	.621	.587	.533	.558	.543	.468	.545	.447	.350	.306	.442	.466
3R132	38	.228	.448	.429	.323	.614	.611	.516	.660	.519	.551	.528	.456	.540	.446	.402	.346	.386	.478
3R133	39	.223	.366	.406	.318	.627	.570	.500	.596	.511	.568	.545	.452	.498	.463	.383	.401	.448	.449
3R134	40	.244	.349	.345	.306	.476	.431	.355	.452	.381	.504	.422	.322	.482	.463	.470	.397	.407	.327
3R135	41	.388	.421	.389	.363	.551	.544	.479	.518	.472	.480	.437	.360	.483	.433	.371	.293	.377	.400
3R139	42	.276	.495	.409	.359	.606	.511	.474	.553	.504	.498	.445	.464	.521	.452	.418	.318	.419	.388
3R142	43	.270	.424	.767	.376	.595	.629	.534	.593	.545	.610	.534	.423	.478	.417	.265	.355	.366	.399
3R290	44	.297	.297	.373	.622	.489	.493	.408	.485	.591	.553	.430	.383	.448	.459	.339	.314	.277	.311
X891'	45	.269	.357	.382	.408	.436	.472	.360	.442	.693	.511	.396	.277	.392	.362	.194	.139	.242	.356
X892'	46	.276	.353	.467	.448	.516	.532	.464	.528	.708	.660	.521	.327	.401	.453	.244	.261	.246	.427
X893'	47	.135	.217	.278	.246	.237	.300	.271	.240	.403	.377	.351	.163	.226	.226	.117	.162	.132	.241
X894'	48	.277	.29[illegible]	.313	.285	.329	.416	.454	.355	.464	.364	.290	.242	.251	.221	.051	.083	.229	.359
SIB 59	49	-.254	-.3[illegible]4	-.353	-.245	-.431	-.523	-.430	-.405	-.557	-.455	-.343	-.328	-.293	-.255	-.093	-.132	-.210	-.419
SIB156	50	.258	.277	.218	.207	.285	.320	.314	.288	.378	.298	.153	.204	.276	.165	.076	.074	.231	.241
P*801	51	.278	.374	.215	.315	.442	.481	.453	.391	.454	.374	.271	.330	.367	.282	.247	.122	.264	.390

TABLE J-I (continued)

Variable No.[b]		37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	MEANS,	STD.DEV.
OR102	1	.565	.544	.538	.492	.525	.492	.587	.462	.435	.525	.265	.341	-.425	.269	.405	12.40	3.56
OR103	2	.571	.469	.440	.291	.481	.414	.540	.409	.360	.428	.223	.396	-.360	.284	.463	11.04	3.96
OR104	3	.484	.401	.426	.316	.413	.397	.454	.362	.321	.418	.242	.370	-.348	.320	.451	5.65	2.92
OR105	4	.598	.572	.543	.445	.494	.528	.577	.465	.438	.526	.284	.390	-.428	.327	.434	14.77	5.06
OR106	5	.509	.474	.426	.393	.474	.460	.531	.488	.516	.531	.293	.385	-.382	.339	.428	7.95	4.01
OR107	6	.518	.476	.497	.424	.449	.440	.564	.482	.434	.553	.351	.322	-.382	.224	.347	10.08	3.61
OR108	7	.484	.464	.437	.402	.436	.400	.434	.407	.382	.452	.294	.308	-.320	.254	.378	6.03	2.27
OR109	8	.364	.380	.383	.300	.340	.355	.403	.344	.221	.323	.154	.236	-.308	.165	.283	5.57	1.92
OR110	9	.491	.448	.425	.408	.458	.462	.419	.415	.356	.403	.195	.252	-.297	.252	.363	4.79	2.33
OR111	10	.411	.397	.385	.386	.420	.453	.404	.354	.346	.362	.251	.212	-.246	.197	.313	8.88	3.80
OR112	11	.440	.427	.423	.437	.382	.447	.309	.380	.272	.292	.126	.201	-.219	.141	.307	11.22	3.21
OR113	12	.299	.348	.398	.363	.321	.357	.373	.292	.232	.272	.167	.099	-.209	.134	.190	7.77	2.21
OR114	13	.418	.335	.388	.372	.336	.356	.310	.295	.250	.266	.183	.264	-.244	.158	.220	7.77	2.63
OR115	14	.385	.376	.372	.265	.377	.332	.374	.340	.376	.433	.215	.378	-.405	.237	.421	7.93	2.89
OR131	15	.635	.484	.427	.392	.487	.436	.444	.406	.341	.403	.238	.354	-.353	.275	.411	5.72	2.37
OR132	16	.459	.522	.413	.333	.376	.462	.496	.353	.309	.365	.229	.239	-.366	.186	.334	4.53	1.84
OR133	17	.490	.466	.509	.367	.357	.474	.507	.385	.388	.441	.265	.393	-.393	.274	.381	5.37	1.95
OR134	18	.386	.324	.371	.440	.310	.411	.287	.275	.272	.321	.144	.254	-.201	.157	.219	3.08	1.21
OR135	19	.323	.228	.223	.244	.388	.276	.270	.297	.289	.276	.135	.277	-.254	.258	.278	2.32	1.29
OR139	20	.473	.448	.366	.349	.421	.495	.424	.297	.357	.353	.217	.299	-.324	.277	.374	4.13	1.89
OR142	21	.447	.429	.406	.345	.389	.405	.767	.373	.382	.467	.278	.313	-.353	.218	.215	6.92	3.28
OR290	22	.378	.323	.318	.306	.363	.359	.376	.622	.408	.448	.246	.285	-.245	.207	.315	8.63	3.01
3R102	23	.592	.614	.627	.476	.551	.606	.595	.489	.436	.516	.237	.329	-.431	.285	.442	14.98	3.54
3R103	24	.662	.611	.570	.431	.544	.511	.629	.493	.472	.532	.300	.416	-.523	.320	.481	15.81	4.69
3R104	25	.621	.516	.500	.355	.479	.474	.534	.408	.360	.464	.271	.454	-.430	.314	.453	6.74	3.05
3R105	26	.587	.660	.596	.452	.518	.553	.593	.485	.442	.528	.240	.355	-.405	.285	.391	17.95	4.68
3R106	27	.533	.519	.511	.381	.472	.504	.545	.591	.693	.708	.403	.464	-.557	.378	.454	12.73	6.45
3R107	28	.558	.551	.568	.504	.480	.498	.610	.553	.511	.660	.377	.364	-.455	.298	.374	11.70	4.12
3R108	29	.543	.528	.545	.422	.437	.445	.534	.430	.396	.521	.351	.290	-.343	.153	.271	7.32	2.10
3R109	30	.468	.456	.452	.322	.360	.464	.423	.383	.277	.327	.163	.242	-.328	.204	.330	6.87	1.86
3R110	31	.545	.540	.496	.482	.483	.521	.478	.448	.392	.401	.226	.251	-.293	.276	.367	6.22	2.34
3R111	32	.447	.446	.463	.463	.433	.452	.417	.459	.362	.453	.226	.221	-.255	.165	.282	11.53	4.46
3R112	33	.350	.402	.383	.470	.371	.418	.265	.339	.194	.244	.117	.051	-.093	.076	.247	13.76	3.04
3R113	34	.306	.346	.401	.397	.293	.318	.355	.314	.139	.261	.162	.083	-.132	.074	.122	8.88	1.95
3R114	35	.442	.386	.448	.407	.377	.419	.366	.277	.242	.246	.132	.229	-.210	.231	.264	9.36	2.85
3R115	36	.466	.476	.449	.327	.400	.388	.399	.311	.356	.427	.241	.359	-.419	.241	.390	9.55	2.67
3R131	37	1.000	.571	.527	.467	.525	.493	.507	.440	.353	.434	.272	.352	-.364	.279	.364	7.21	2.52
3R132	38	.571	1.000	.513	.390	.369	.567	.510	.386	.313	.331	.157	.244	-.250	.193	.313	6.17	1.76
3R133	39	.527	.513	1.000	.421	.363	.485	.510	.378	.276	.412	.219	.217	-.286	.148	.254	6.42	1.83
3R134	40	.467	.390	.421	1.000	.382	.402	.392	.313	.293	.335	.156	.151	-.216	.112	.243	3.65	1.13
3R135	41	.525	.369	.363	.382	1.000	.417	.418	.348	.330	.368	.205	.272	-.330	.259	.318	3.02	1.50
3R139	42	.493	.567	.485	.402	.417	1.000	.448	.322	.262	.266	.148	.204	-.268	.187	.293	5.77	1.96
3R142	43	.507	.510	.510	.392	.418	.448	1.000	.401	.373	.471	.302	.267	-.417	.178	.218	8.28	3.58
3R290	44	.440	.386	.378	.313	.348	.322	.401	1.000	.408	.427	.190	.293	-.292	.241	.317	10.35	2.80
X891'	45	.353	.313	.276	.293	.330	.262	.373	.408	1.000	.610	.419	.393	-.479	.283	.341	6.49	3.39
X892'	46	.434	.331	.412	.335	.388	.266	.471	.427	.610	1.000	.616	.478	-.570	.300	.381	1.93	1.77
X893'	47	.272	.157	.219	.156	.205	.148	.302	.190	.419	.616	1.000	.302	-.408	.146	.164	6.35	2.11
X894'	48	.352	.244	.217	.151	.272	.204	.267	.293	.393	.478	.302	1.000	-.453	.317	.400	2.33	2.59
SIB 59	49	-.364	-.250	-.286	-.216	-.330	-.268	-.417	-.292	-.479	-.570	-.408	-.453	1.000	-.298	-.447	2.50	1.63
SIB156'	50	.279	.193	.148	.112	.259	.187	.178	.241	.283	.300	.146	.317	-.298	1.000	.332	3.22	1.86
P*801'	51	.364	.313	.254	.243	.318	.293	.218	.317	.341	.381	.164	.400	-.447	.332	1.000	98.34	10.20

[a,b] See page J-18 for explanatory notes.

TABLE J-2. Correlation Matrix AF(Retest Battery A, females)

N = 493[a]

Variable No.[b]		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0RI02	1	1.000	.612	.634	.663	.603	.617	.554	.471	.473	.374	.461	.510	.467	.600	.592	.470	.583	.382
0RI03	2	.612	1.000	.560	.632	.525	.506	.434	.363	.500	.307	.345	.418	.401	.491	.549	.436	.476	.274
0RI04	3	.634	.560	1.000	.604	.572	.506	.474	.414	.450	.323	.369	.487	.346	.512	.570	.365	.514	.324
0RI05	4	.663	.632	.604	1.000	.600	.601	.546	.424	.504	.325	.383	.520	.452	.592	.548	.435	.561	.339
0RI06	5	.603	.525	.572	.600	1.000	.530	.461	.427	.438	.360	.379	.419	.422	.526	.484	.380	.423	.300
0RI07	6	.617	.506	.506	.601	.530	1.000	.470	.357	.488	.455	.318	.382	.329	.460	.460	.371	.470	.275
0RI08	7	.554	.434	.474	.546	.461	.470	1.000	.409	.381	.258	.367	.505	.454	.458	.414	.327	.429	.333
0RI09	8	.471	.363	.414	.424	.427	.357	.409	1.000	.279	.274	.334	.417	.354	.358	.421	.343	.417	.294
0RI10	9	.473	.500	.450	.504	.438	.488	.381	.279	1.000	.267	.322	.331	.326	.402	.369	.328	.375	.208
0RI11	10	.374	.307	.323	.325	.360	.455	.258	.274	.267	1.000	.244	.306	.313	.253	.270	.234	.298	.280
0RI12	11	.461	.345	.369	.383	.379	.318	.367	.334	.322	.244	1.000	.452	.380	.354	.399	.323	.378	.336
0RI13	12	.510	.418	.487	.520	.419	.382	.505	.417	.331	.306	.452	1.000	.513	.390	.465	.349	.430	.359
0RI14	13	.467	.401	.346	.452	.422	.329	.454	.354	.326	.313	.380	.513	1.000	.378	.382	.284	.401	.335
0RI15	14	.600	.491	.512	.592	.526	.460	.458	.358	.402	.253	.354	.390	.378	1.000	.473	.379	.397	.284
0RI31	15	.592	.549	.570	.548	.484	.460	.414	.421	.389	.270	.399	.465	.382	.473	1.000	.418	.545	.409
0RI32	16	.470	.436	.365	.435	.380	.371	.327	.343	.328	.234	.323	.349	.284	.379	.418	1.000	.396	.275
0RI33	17	.583	.476	.514	.561	.423	.470	.429	.417	.375	.298	.378	.430	.401	.397	.545	.396	1.000	.360
0RI34	18	.382	.274	.324	.339	.300	.275	.333	.294	.208	.280	.336	.359	.335	.284	.409	.275	.360	1.000
0RI35	19	.383	.396	.331	.358	.291	.270	.226	.162	.243	.184	.234	.257	.213	.256	.320	.260	.267	.146
0RI39	20	.546	.436	.480	.518	.457	.409	.350	.361	.322	.279	.349	.366	.266	.401	.504	.382	.416	.270
0RI42	21	.474	.449	.413	.481	.360	.372	.318	.357	.316	.268	.264	.393	.281	.342	.449	.319	.404	.289
0R290	22	.437	.395	.432	.477	.444	.432	.349	.449	.319	.250	.278	.400	.293	.347	.481	.334	.415	.274
3RI02	23	.754	.627	.629	.699	.627	.552	.558	.525	.466	.355	.423	.520	.439	.539	.643	.465	.585	.375
3RI03	24	.664	.701	.587	.687	.564	.473	.474	.448	.423	.247	.361	.440	.361	.507	.622	.440	.540	.326
3RI04	25	.665	.565	.749	.610	.537	.468	.502	.417	.399	.275	.393	.468	.369	.515	.578	.390	.536	.360
3RI05	26	.642	.578	.585	.784	.552	.548	.556	.413	.430	.328	.347	.515	.414	.548	.540	.419	.491	.303
3RI06	27	.609	.544	.544	.616	.692	.545	.484	.408	.418	.336	.332	.394	.352	.553	.505	.384	.463	.309
3RI07	28	.659	.527	.556	.612	.571	.665	.555	.451	.437	.388	.420	.524	.400	.501	.494	.396	.477	.343
3RI08	29	.570	.444	.476	.571	.485	.477	.613	.386	.403	.262	.335	.482	.381	.415	.443	.374	.512	.356
3RI09	30	.464	.368	.356	.401	.408	.354	.372	.511	.272	.247	.253	.397	.354	.319	.398	.363	.374	.302
3RI10	31	.534	.424	.431	.456	.429	.402	.422	.343	.462	.203	.349	.402	.336	.400	.420	.344	.365	.240
3RI11	32	.436	.259	.335	.356	.305	.394	.401	.291	.253	.412	.355	.430	.305	.326	.304	.239	.246	.311
3RI12	33	.541	.350	.416	.430	.374	.415	.495	.393	.292	.314	.567	.586	.454	.410	.432	.328	.407	.403
3RI13	34	.512	.358	.433	.482	.407	.377	.481	.405	.308	.284	.433	.699	.478	.377	.446	.315	.398	.373
3RI14	35	.473	.354	.409	.438	.343	.345	.476	.407	.285	.278	.380	.524	.639	.367	.401	.282	.425	.336
3RI15	36	.578	.470	.516	.573	.476	.464	.474	.358	.349	.221	.299	.413	.366	.661	.453	.348	.384	.278
3RI31	37	.565	.555	.530	.582	.426	.442	.399	.408	.372	.223	.356	.436	.374	.424	.677	.380	.509	.295
3RI32	38	.552	.401	.443	.539	.434	.357	.406	.366	.313	.210	.321	.435	.380	.431	.469	.404	.373	.258
3RI33	39	.551	.428	.442	.515	.368	.430	.427	.384	.352	.257	.300	.465	.409	.409	.472	.361	.576	.274
3RI34	40	.415	.259	.345	.360	.314	.347	.337	.288	.249	.295	.331	.453	.327	.302	.339	.269	.339	.446
3RI35	41	.418	.422	.374	.403	.337	.333	.313	.281	.304	.238	.236	.359	.275	.295	.405	.217	.317	.242
3RI39	42	.582	.435	.522	.572	.465	.399	.369	.400	.347	.217	.368	.469	.392	.433	.510	.382	.440	.341
3RI42	43	.498	.426	.387	.452	.351	.369	.336	.370	.290	.249	.288	.392	.278	.333	.374	.325	.384	.257
3R290	44	.471	.406	.432	.485	.468	.373	.382	.409	.281	.238	.318	.431	.338	.397	.465	.332	.429	.300
X891'	45	.318	.301	.258	.359	.421	.318	.246	.212	.262	.156	.124	.170	.135	.301	.251	.250	.197	.171
X892'	46	.440	.309	.388	.394	.415	.412	.330	.292	.241	.311	.266	.309	.195	.364	.297	.216	.282	.261
X893'	47	.180	.062	.139	.097	.111	.235	.160	.127	.105	.190	.091	.079	-.002	.111	.079	-.014	.089	.080
X894'	48	.385	.427	.400	.407	.441	.341	.286	.232	.302	.069	.120	.129	.125	.332	.371	.249	.320	.152
SIB 59	49	-.324	-.330	-.326	-.332	-.346	-.266	-.240	-.179	-.219	-.105	-.119	-.153	-.178	-.292	-.291	-.188	-.287	-.206
SIB156	50	.192	.252	.229	.272	.286	.186	.242	.156	.168	.169	.131	.129	.280	.235	.180	.152	.199	.137
P*801	51	.384	.370	.409	.372	.365	.302	.267	.229	.260	.074	.146	.130	.143	.339	.386	.240	.332	.158

TABLE J-2 (continued)

Variable No.[†]		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
ORI0.	1	.383	.546	.474	.437	.754	.664	.665	.642	.609	.659	.570	.464	.534	.436	.541	.512	.473	.578
ORI03	2	.396	.436	.449	.395	.627	.701	.565	.578	.544	.527	.444	.368	.424	.259	.350	.358	.354	.470
ORI04	3	.331	.480	.413	.432	.629	.587	.749	.585	.544	.556	.476	.356	.431	.335	.416	.433	.409	.516
ORI05	4	.358	.518	.481	.477	.699	.687	.610	.784	.616	.612	.571	.401	.456	.356	.430	.482	.438	.573
ORI06	5	.291	.457	.360	.444	.627	.564	.537	.552	.692	.571	.485	.408	.429	.305	.374	.407	.343	.476
ORI07	6	.270	.409	.372	.432	.552	.473	.468	.548	.545	.665	.477	.354	.402	.394	.415	.377	.345	.464
ORI08	7	.226	.350	.318	.349	.558	.474	.502	.556	.484	.555	.613	.372	.422	.401	.495	.481	.476	.474
ORI09	8	.162	.361	.357	.449	.525	.448	.417	.413	.408	.451	.386	.511	.343	.291	.393	.405	.407	.358
ORI10	9	.243	.322	.316	.319	.466	.423	.399	.430	.418	.437	.403	.272	.462	.253	.292	.308	.285	.349
ORI11	10	.184	.279	.268	.250	.355	.247	.275	.328	.336	.388	.262	.247	.203	.412	.314	.284	.278	.221
ORI12	11	.234	.349	.264	.278	.423	.361	.393	.347	.332	.420	.335	.253	.349	.355	.567	.433	.380	.299
ORI13	12	.257	.366	.393	.400	.520	.440	.468	.515	.394	.524	.482	.397	.402	.430	.586	.699	.524	.413
ORI14	13	.213	.266	.281	.293	.439	.361	.369	.414	.352	.400	.381	.354	.336	.305	.454	.478	.639	.366
ORI15	14	.256	.401	.342	.347	.539	.507	.515	.548	.553	.501	.415	.319	.400	.326	.410	.377	.367	.661
ORI31	15	.320	.504	.449	.481	.643	.622	.578	.540	.505	.494	.443	.398	.420	.304	.432	.446	.401	.453
ORI32	16	.260	.382	.319	.334	.465	.440	.390	.419	.384	.396	.374	.363	.344	.239	.328	.315	.282	.348
ORI33	17	.267	.416	.404	.415	.585	.540	.536	.491	.463	.477	.512	.374	.365	.246	.407	.398	.425	.384
ORI34	18	.146	.270	.289	.274	.375	.326	.360	.303	.309	.343	.356	.302	.240	.311	.403	.373	.336	.278
ORI35	19	1.000	.235	.255	.163	.335	.334	.269	.308	.286	.239	.212	.099	.174	.168	.208	.226	.199	.229
ORI39	20	.235	1.000	.420	.326	.569	.522	.475	.503	.486	.447	.376	.370	.360	.232	.318	.386	.325	.376
ORI42	21	.255	.420	1.000	.347	.495	.476	.446	.506	.366	.414	.371	.321	.306	.306	.336	.360	.352	.288
OR290	22	.163	.326	.347	1.000	.540	.456	.426	.472	.510	.485	.394	.391	.334	.274	.387	.349	.366	.363
3RI02	23	.335	.569	.495	.540	1.000	.761	.683	.716	.687	.680	.574	.516	.517	.410	.526	.564	.498	.560
3RI03	24	.334	.522	.476	.456	.761	1.000	.663	.698	.670	.633	.569	.457	.433	.336	.396	.474	.384	.529
3RI04	25	.269	.475	.446	.426	.683	.663	1.000	.621	.581	.602	.540	.424	.430	.381	.444	.462	.422	.532
3RI05	26	.308	.503	.506	.472	.716	.698	.621	1.000	.628	.669	.570	.451	.488	.400	.411	.509	.457	.579
3RI06	27	.286	.486	.366	.510	.687	.670	.581	.628	1.000	.695	.532	.431	.441	.382	.402	.421	.363	.547
3RI07	28	.239	.447	.414	.485	.680	.633	.602	.669	.695	1.000	.610	.460	.539	.568	.554	.540	.441	.543
3RI08	29	.212	.376	.371	.394	.574	.569	.540	.570	.532	.610	1.000	.380	.432	.433	.454	.495	.441	.448
3RI09	30	.099	.370	.321	.391	.516	.457	.424	.451	.431	.460	.380	1.000	.357	.277	.383	.378	.351	.342
3RI10	31	.174	.360	.306	.334	.517	.433	.430	.488	.441	.539	.432	.357	1.000	.390	.457	.383	.374	.420
3RI11	32	.168	.232	.306	.274	.410	.336	.381	.400	.382	.568	.433	.277	.390	1.000	.543	.423	.329	.361
3RI12	33	.208	.318	.336	.387	.526	.396	.444	.411	.402	.554	.454	.383	.457	.543	1.000	.564	.494	.407
3RI13	34	.226	.386	.360	.349	.564	.474	.462	.509	.421	.540	.495	.378	.383	.423	.564	1.000	.541	.424
3RI14	35	.199	.325	.352	.366	.498	.384	.422	.457	.363	.441	.441	.351	.374	.329	.494	.541	1.000	.368
3RI15	36	.229	.376	.288	.363	.560	.529	.532	.579	.547	.543	.448	.342	.420	.361	.407	.424	.368	1.000
3RI31	37	.268	.414	.390	.460	.642	.610	.570	.534	.452	.493	.469	.421	.417	.262	.445	.452	.411	.442
3RI32	38	.290	.380	.373	.393	.579	.554	.522	.572	.425	.469	.431	.423	.435	.341	.431	.453	.379	.468
3RI33	39	.235	.347	.373	.415	.558	.509	.506	.498	.423	.468	.460	.391	.346	.287	.402	.466	.427	.397
3RI34	40	.127	.237	.302	.296	.440	.380	.418	.369	.357	.417	.374	.337	.303	.346	.460	.447	.396	.296
3RI35	41	.297	.265	.303	.370	.417	.427	.426	.410	.368	.416	.381	.284	.303	.331	.325	.300	.284	.344
3RI39	42	.266	.538	.345	.429	.601	.538	.552	.598	.460	.468	.367	.427	.396	.258	.398	.453	.456	.444
3RI42	43	.213	.375	.776	.371	.525	.547	.485	.531	.405	.496	.428	.372	.321	.345	.373	.414	.322	.306
3R290	44	.207	.349	.348	.666	.574	.505	.478	.494	.501	.505	.408	.414	.329	.298	.407	.398	.399	.428
X891'	45	.155	.294	.197	.340	.364	.383	.318	.341	.639	.359	.294	.224	.221	.167	.180	.174	.142	.290
X892'	46	.162	.310	.276	.334	.419	.406	.390	.420	.624	.624	.425	.277	.250	.463	.394	.334	.268	.387
X893'	47	.044	.060	.085	.055	.128	.117	.102	.143	.254	.360	.224	.065	.088	.318	.177	.115	.055	.115
X894'	48	.173	.256	.166	.337	.465	.533	.432	.376	.568	.360	.346	.231	.182	.035	.125	.132	.090	.296
SIB 59	49	-.164	-.254	-.259	-.266	-.396	-.461	-.396	-.331	-.562	-.390	-.314	-.209	-.178	-.178	-.147	-.127	-.129	-.317
SIBI56	50	.078	.151	.119	.240	.254	.227	.251	.234	.354	.260	.198	.140	.125	.120	.159	.118	.186	.242
P*801	51	.237	.280	.145	.317	.432	.476	.437	.357	.462	.344	.322	.274	.232	.113	.161	.113	.147	.343

TABLE J-2 (continued)

Variable No.^{b}		37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	MEANS	STD.DEV.
ORI02	1	.565	.552	.551	.415	.418	.582	.498	.471	.318	.440	.180	.385	-.324	.192	.384	11.02	3.70
ORI03	2	.555	.401	.428	.259	.422	.435	.426	.406	.301	.309	.062	.427	-.330	.252	.370	10.73	3.52
ORI04	3	.530	.443	.442	.345	.374	.522	.387	.432	.258	.388	.139	.400	-.326	.229	.409	6.20	2.70
ORI05	4	.582	.539	.515	.360	.403	.572	.452	.485	.359	.394	.097	.407	-.332	.272	.372	12.95	4.64
ORI06	5	.426	.434	.368	.314	.337	.465	.351	.468	.421	.415	.111	.441	-.346	.286	.365	7.51	3.51
ORI07	6	.442	.357	.430	.347	.333	.399	.369	.373	.318	. 12	.235	.341	-.266	.186	.302	8.32	3.41
ORI08	7	.399	.406	.427	.337	.313	.369	.336	.382	.246	.330	.160	.286	-.240	.242	.267	4.96	2.16
ORI09	8	.408	.366	.384	.288	.281	.400	.370	.409	.212	.292	.127	.232	-.179	.156	.229	5.60	1.80
ORI10	9	.372	.313	.352	.249	.304	.347	.290	.281	.262	.241	.105	.302	-.219	.168	.260	3.03	1.73
ORI11	10	.223	.210	.257	.295	.238	.217	.249	.238	.156	.311	.190	.069	-.105	.169	.074	5.79	2.48
ORI12	11	.356	.321	.300	.331	.236	.368	.286	.318	.124	.266	.091	.120	-.119	.131	.146	7.21	2.66
ORI13	12	.436	.435	.465	.453	.359	.469	.392	.431	.170	.309	.079	.129	-.153	.129	.130	7.11	2.45
ORI14	13	.374	.380	.409	.327	.275	.392	.278	.338	.135	.195	-.002	.125	-.178	.280	.143	11.72	3.23
ORI15	14	.424	.431	.409	.302	.295	.433	.333	.399	.301	.364	.111	.332	-.292	.235	.339	5.37	2.42
ORI31	15	.677	.469	.472	.339	.405	.510	.374	.465	.251	.297	.079	.371	-.291	.180	.386	5.95	2.47
ORI32	16	.380	.404	.361	.269	.217	.382	.325	.332	.250	.216	-.014	.249	-.188	.152	.240	4.05	1.63
ORI33	17	.509	.373	.576	.339	.317	.440	.384	.429	.197	.282	.089	.320	-.287	.199	.332	5.69	1.90
ORI34	18	.295	.258	.274	.446	.242	.341	.257	.300	.171	.261	.080	.152	-.206	.137	.158	2.54	1.25
ORI35	19	.268	.290	.235	.127	.297	.266	.213	.207	.155	.162	.044	.173	-.164	.078	.237	2.34	1.16
ORI39	20	.414	.380	.347	.237	.265	.538	.375	.349	.294	.310	.060	.256	-.254	.151	.280	4.13	1.85
ORI42	21	.390	.373	.373	.302	.303	.345	.776	.348	.197	.276	.085	.166	-.259	.119	.145	7.13	3.17
OR290	22	.460	.393	.415	.296	.370	.429	.371	.666	.340	.334	.055	.337	-.266	.240	.317	8.67	2.88
3RI02	23	.642	.579	.558	.440	.417	.601	.525	.574	.364	.419	.128	.465	-.396	.254	.432	14.00	4.04
3RI03	24	.610	.554	.509	.380	.427	.538	.547	.505	.383	.406	.117	.533	-.461	.227	.476	16.02	4.61
3RI04	25	.570	.522	.506	.418	.426	.552	.485	.478	.318	.390	.102	.432	-.396	.251	.437	7.19	2.86
3RI05	26	.534	.572	.498	.369	.410	.598	.531	.494	.341	.420	.143	.376	-.331	.234	.357	16.19	4.57
3RI06	27	.452	.425	.423	.357	.368	.460	.405	.501	.639	.624	.254	.568	-.562	.354	.462	10.68	6.49
3RI07	28	.493	.469	.468	.417	.416	.468	.496	.505	.399	.624	.360	.360	-.390	.267	.344	9.20	3.98
3RI08	29	.469	.431	.460	.374	.381	.367	.428	.408	.294	.425	.224	.346	-.314	.198	.322	6.13	2.20
3RI09	30	.421	.423	.391	.337	.284	.427	.372	.414	.224	.277	.065	.231	-.209	.140	.274	7.02	1.81
3RI10	31	.417	.435	.346	.303	.303	.396	.321	.329	.221	.250	.088	.182	-.178	.125	.232	3.94	1.95
3RI11	32	.262	.341	.287	.346	.331	.258	.345	.298	.167	.463	.318	.035	-.178	.120	.113	6.47	3.11
3RI12	33	.445	.431	.402	.460	.325	.398	.373	.407	.180	.394	.177	.125	-.147	.159	.161	8.87	2.94
3RI13	34	.452	.453	.466	.447	.300	.453	.414	.398	.174	.334	.115	.132	-.127	.118	.113	8.24	2.19
3RI14	35	.411	.379	.427	.396	.284	.456	.322	.399	.142	.268	.055	.090	-.129	.186	.147	13.83	3.16
3RI15	36	.442	.468	.397	.296	.344	.444	.306	.428	.290	.387	.115	.296	-.317	.242	.343	6.58	2.63
3RI31	37	1.000	.487	.482	.339	.436	.484	.418	.495	.228	.271	.034	.401	-.288	.206	.391	7.55	2.44
3RI32	38	.487	1.000	.456	.320	.295	.504	.433	.446	.199	.271	.026	.268	-.223	.116	.285	5.49	1.73
3RI33	39	.482	.456	1.000	.335	.330	.435	.404	.435	.174	.287	.082	.284	-.175	.165	.302	6.79	1.62
3RI34	40	.338	.320	.335	1.000	.273	.346	.346	.350	.160	.272	.117	.130	-.107	.062	.137	3.06	1.24
3RI35	41	.436	.295	.330	.273	1.000	.300	.330	.337	.207	.299	.148	.259	-.182	.130	.267	3.01	1.30
3RI39	42	.484	.504	.435	.346	.300	1.000	.351	.442	.186	.211	-.050	.264	-.222	.168	.321	5.87	1.98
3RI42	43	.418	.433	.404	.346	.330	.351	1.000	.415	.200	.325	.128	.199	-.261	.049	.119	8.41	3.41
3R290	44	.495	.446	.435	.350	.337	.442	.415	1.000	.289	.360	.018	.284	-.270	.244	.297	10.10	2.91
X891'	45	.228	.199	.174	.160	.207	.186	.200	.289	1.000	.456	.258	.461	-.493	.213	.341	5.51	3.08
X892'	46	.271	.271	.287	.272	.299	.211	.325	.360	.456	1.000	.584	.303	-.441	.291	.286	1.12	1.41
X893'	47	.034	.026	.082	.117	.148	-.050	.128	.018	.258	.584	1.000	.130	-.201	.071	.120	5.43	1.96
X894'	48	.401	.268	.284	.130	.259	.264	.199	.284	.461	.303	.130	1.000	-.475	.249	.546	3.16	3.44
SIB 59	49	-.288	-.223	-.175	-.107	-.182	-.222	-.261	-.270	-.493	-.441	-.201	-.475	1.000	-.347	-.452	2.95	1.94
SIBI56	50	.206	.116	.165	.062	.130	.168	.049	.244	.213	.291	.071	.249	-.347	1.000	.209	3.25	1.82
P*801	51	.391	.285	.302	.137	.267	.321	.119	.297	.341	.286	.120	.546	-.452	.209	1.000	99.16	10.08

[a,b] See page J-18 for explanatory notes.

TABLE J-3. Correlation Matrix DM(Retest Battery D, males)

N = 411^a

Variable No.^{b}		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
OR131	1	1.000	.529	.551	.451	.370	.490	.437	.297	.344	.292	.354	.324	.284	.266	.427	.399	.068	.626
OR132	2	.529	1.000	.404	.387	.270	.479	.437	.233	.311	.234	.311	.270	.249	.233	.377	.332	.064	.452
OR133	3	.551	.404	1.000	.387	.238	.452	.375	.264	.340	.336	.323	.344	.267	.159	.342	.363	.066	.480
OR134	4	.451	.387	.387	1.000	.277	.392	.329	.205	.222	.229	.249	.227	.216	.203	.388	.315	.074	.370
OR135	5	.370	.270	.238	.277	1.000	.235	.294	.207	.166	.124	.203	.218	.172	.105	.228	.242	.053	.386
OR139	6	.490	.479	.452	.392	.235	1.000	.421	.216	.249	.245	.341	.364	.242	.259	.478	.395	.106	.412
OR142	7	.437	.437	.375	.329	.294	.421	1.000	.335	.280	.281	.282	.316	.286	.155	.337	.282	-.035	.392
OR212	8	.297	.233	.264	.205	.207	.216	.335	1.000	.327	.267	.260	.273	.216	.188	.364	.286	.204	.250
OR231	9	.344	.311	.340	.222	.166	.249	.280	.327	1.000	.406	.486	.414	.330	.201	.363	.444	.094	.376
OR232	10	.292	.234	.336	.229	.124	.245	.281	.267	.406	1.000	.510	.471	.342	.201	.386	.433	.110	.357
OR233	11	.354	.311	.323	.249	.203	.341	.282	.260	.486	.510	1.000	.489	.365	.405	.538	.617	.176	.352
OR234	12	.324	.270	.344	.227	.218	.364	.316	.273	.414	.471	.489	1.000	.367	.242	.380	.410	.148	.375
OR235	13	.284	.249	.267	.216	.172	.242	.286	.216	.330	.342	.365	.367	1.000	.261	.315	.308	.053	.345
OR290	14	.266	.233	.159	.203	.105	.259	.155	.188	.201	.201	.405	.242	.261	1.000	.395	.447	.178	.235
OR311	15	.427	.377	.342	.388	.228	.478	.337	.364	.363	.386	.538	.380	.315	.395	1.000	.628	.173	.389
OR312	16	.399	.332	.363	.315	.242	.395	.282	.286	.444	.433	.617	.410	.308	.447	.628	1.000	.226	.420
OR333	17	.068	.064	.066	.074	.053	.106	-.035	.204	.094	.110	.176	.148	.053	.178	.173	.226	1.000	.061
3R131	18	.626	.452	.480	.370	.386	.412	.392	.250	.376	.357	.352	.375	.345	.235	.389	.420	.061	1.000
3R132	19	.444	.506	.437	.332	.243	.471	.356	.297	.283	.315	.330	.371	.293	.242	.466	.389	.069	.543
3R133	20	.464	.396	.486	.293	.275	.336	.274	.191	.328	.288	.335	.340	.236	.180	.306	.322	.000	.558
3R134	21	.398	.341	.306	.354	.219	.343	.263	.135	.177	.269	.276	.265	.220	.198	.301	.307	.026	.406
3R135	22	.396	.326	.285	.269	.406	.338	.281	.222	.206	.209	.259	.303	.235	.147	.285	.315	.107	.425
3R139	23	.466	.423	.376	.335	.271	.490	.375	.213	.224	.284	.326	.308	.225	.197	.458	.390	.043	.472
3R142	24	.417	.417	.352	.281	.269	.393	.794	.303	.315	.288	.329	.338	.301	.221	.326	.306	-.068	.440
3R212	25	.308	.244	.212	.108	.160	.196	.321	.504	.253	.276	.304	.193	.257	.270	.300	.265	.058	.294
3R231	26	.341	.293	.321	.203	.162	.249	.283	.243	.630	.318	.468	.308	.279	.195	.315	.436	.021	.402
3R232	27	.143	.147	.173	.100	.011	.144	.116	.129	.247	.302	.296	.182	.131	.206	.166	.237	-.061	.195
3R233	28	.411	.339	.376	.256	.229	.303	.362	.258	.467	.433	.656	.435	.386	.407	.528	.532	.094	.433
3R234	29	.424	.341	.375	.176	.282	.307	.311	.211	.378	.269	.462	.424	.303	.245	.359	.390	.035	.422
3R235	30	.339	.267	.217	.251	.198	.255	.336	.199	.332	.304	.358	.354	.414	.183	.321	.333	-.060	.360
3R290	31	.313	.246	.169	.182	.140	.270	.316	.178	.240	.292	.392	.254	.205	.545	.377	.388	.052	.309
3R311	32	.426	.347	.306	.344	.245	.403	.347	.303	.298	.334	.526	.375	.299	.387	.668	.535	.119	.405
3R312	33	.367	.365	.310	.298	.252	.326	.268	.347	.434	.356	.554	.356	.333	.397	.603	.636	.151	.438
3R333	34	.333	.294	.298	.294	.238	.348	.256	.256	.398	.266	.512	.317	.300	.328	.519	.561	.182	.382
X891'	35	.236	.264	.223	.252	.152	.248	.164	.203	.360	.259	.426	.210	.252	.268	.345	.434	.090	.317
X892'	36	.287	.310	.339	.309	.239	.325	.259	.301	.355	.273	.423	.330	.262	.295	.370	.437	.090	.289
X893'	37	.165	.197	.137	.169	.148	.186	.167	.152	.160	.090	.205	.111	.215	.082	.174	.178	.010	.204
X894'	38	.385	.313	.329	.279	.314	.265	.331	.301	.364	.262	.383	.308	.284	.304	.341	.423	.120	.393
SIB 59	39	-.338	-.330	-.293	-.230	-.232	-.281	-.342	-.187	-.288	-.215	-.366	-.239	-.266	-.168	-.329	-.339	-.008	-.379
SIB156	40	.200	.122	.123	.120	.130	.216	.131	.155	.189	.112	.216	.121	.073	.132	.265	.241	.032	.211
P*801	41	.301	.256	.227	.310	.229	.286	.191	.159	.085	.160	.231	.216	.194	.178	.292	.239	.027	.323

TABLE J-3 (continued)

Variable No.[b]		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
OR131	1	.444	.464	.398	.396	.466	.417	.308	.341	.143	.411	.424	.339	.313	.426	.367	.333	.236	.287
OR132	2	.506	.396	.341	.326	.423	.417	.244	.293	.147	.339	.341	.267	.246	.347	.365	.294	.264	.310
OR133	3	.437	.486	.306	.285	.376	.352	.212	.321	.173	.376	.375	.217	.169	.306	.310	.298	.223	.339
OR134	4	.332	.293	.354	.269	.335	.281	.108	.203	.100	.256	.176	.251	.182	.344	.298	.294	.252	.309
OR135	5	.243	.275	.219	.406	.271	.269	.160	.162	.011	.229	.282	.198	.140	.245	.252	.238	.152	.239
OR139	6	.471	.336	.343	.338	.490	.393	.196	.249	.144	.303	.307	.255	.270	.403	.326	.348	.248	.325
OR142	7	.356	.274	.263	.281	.375	.794	.321	.283	.116	.362	.311	.336	.316	.347	.268	.256	.164	.259
OR212	8	.297	.191	.135	.222	.213	.303	.504	.243	.129	.258	.211	.199	.178	.303	.347	.256	.203	.301
OR231	9	.283	.328	.177	.206	.224	.315	.253	.630	.247	.467	.378	.332	.240	.298	.434	.398	.360	.355
OR232	10	.315	.288	.289	.209	.284	.288	.276	.318	.302	.433	.269	.304	.292	.334	.356	.266	.209	.273
OR233	11	.330	.335	.276	.259	.326	.329	.304	.468	.296	.656	.462	.358	.392	.526	.554	.512	.426	.423
OR234	12	.371	.340	.265	.303	.308	.338	.193	.308	.182	.435	.424	.354	.254	.375	.356	.337	.210	.330
OR235	13	.293	.236	.220	.235	.225	.301	.257	.279	.131	.386	.303	.414	.205	.299	.333	.300	.252	.262
OR290	14	.242	.180	.198	.147	.197	.221	.270	.195	.206	.407	.245	.183	.540	.387	.397	.328	.268	.295
OR311	15	.466	.306	.301	.285	.458	.326	.300	.315	.166	.528	.359	.321	.377	.668	.603	.519	.345	.370
OR312	16	.389	.322	.307	.315	.390	.306	.265	.436	.237	.532	.390	.333	.388	.535	.636	.561	.434	.437
OR333	17	.069	.000	.026	.107	.043	-.068	.058	.021	-.061	.094	.035	-.060	.052	.119	.151	.182	.090	.090
3R131	18	.543	.558	.406	.425	.472	.440	.294	.402	.195	.433	.422	.360	.309	.405	.438	.382	.317	.289
3R132	19	1.000	.484	.359	.423	.481	.427	.294	.313	.250	.439	.380	.335	.325	.462	.444	.384	.280	.294
3R133	20	.484	1.000	.337	.329	.401	.350	.231	.316	.173	.430	.361	.311	.276	.352	.369	.277	.217	.264
3R134	21	.359	.337	1.000	.276	.308	.276	.159	.179	.118	.280	.175	.237	.259	.310	.270	.297	.164	.236
3R135	22	.423	.329	.276	1.000	.287	.360	.205	.204	.073	.287	.281	.220	.240	.285	.323	.367	.276	.273
3R139	23	.481	.401	.308	.287	1.000	.361	.226	.317	.184	.412	.340	.279	.281	.462	.384	.335	.160	.266
3R142	24	.427	.350	.276	.360	.361	1.000	.312	.329	.193	.423	.359	.356	.321	.354	.339	.295	.226	.258
3R212	25	.294	.231	.159	.205	.226	.312	1.000	.309	.194	.349	.310	.255	.320	.303	.333	.230	.251	.232
3R231	26	.313	.316	.179	.204	.317	.329	.309	1.000	.367	.540	.468	.382	.264	.353	.457	.426	.372	.341
3R232	27	.250	.173	.118	.073	.184	.193	.194	.367	1.000	.372	.237	.208	.292	.250	.202	.202	.175	.187
3R233	28	.439	.430	.280	.287	.412	.423	.349	.540	.372	1.000	.599	.462	.489	.597	.632	.531	.401	.400
3R234	29	.380	.361	.175	.281	.340	.359	.310	.468	.237	.599	1.000	.430	.316	.404	.455	.395	.332	.349
3R235	30	.335	.311	.237	.220	.279	.356	.255	.382	.208	.462	.430	1.000	.323	.438	.351	.324	.285	.327
3R290	31	.325	.276	.259	.240	.281	.321	.320	.264	.292	.489	.316	.323	1.000	.539	.426	.324	.314	.247
3R311	32	.462	.352	.310	.285	.462	.354	.303	.353	.250	.597	.404	.438	.539	1.000	.631	.554	.320	.377
3R312	33	.444	.369	.270	.323	.384	.339	.333	.457	.202	.632	.455	.351	.426	.631	1.000	.731	.587	.557
3R333	34	.384	.277	.297	.367	.335	.295	.230	.426	.202	.531	.395	.324	.324	.554	.731	1.000	.550	.553
X891'	35	.280	.217	.164	.276	.160	.226	.251	.372	.175	.401	.332	.285	.314	.320	.587	.550	1.000	.513
X892'	36	.294	.264	.236	.273	.266	.258	.232	.341	.187	.400	.349	.327	.247	.377	.557	.553	.513	1.000
X893'	37	.119	.201	.137	.120	.100	.162	.117	.190	.104	.159	.186	.209	.107	.118	.265	.273	.300	.576
X894'	38	.263	.342	.205	.378	.227	.344	.294	.339	.172	.382	.327	.259	.238	.311	.458	.439	.329	.470
SIB 59	39	-.309	-.288	-.145	-.283	-.295	-.362	-.227	-.353	-.162	-.419	-.385	-.325	-.227	-.373	-.492	-.469	-.440	-.411
SIB156	40	.257	.162	.114	.173	.236	.175	.096	.179	.061	.134	.175	.095	.146	.208	.276	.223	.234	.279
P*801	41	.291	.330	.231	.232	.329	.172	.126	.175	.133	.283	.213	.223	.243	.317	.302	.293	.216	.244

TABLE J-3 (continued)

Variable No.[b]		37	38	39	40	41	MEANS,	STD.DEV.
OR131	1	.165	.385	-.338	.200	.301	5.79	2.42
OR132	2	.197	.313	-.330	.122	.256	4.77	1.74
OR133	3	.137	.329	-.293	.123	.227	5.50	1.99
OR134	4	.169	.279	-.230	.120	.310	3.15	1.17
OR135	5	.148	.314	-.232	.130	.229	2.25	1.26
OR139	6	.186	.265	-.281	.216	.286	4.16	1.75
OR142	7	.167	.331	-.342	.131	.191	6.99	3.19
OR212	8	.152	.301	-.187	.155	.159	10.81	5.11
OR231	9	.160	.364	-.288	.189	.085	8.34	2.91
OR232	10	.090	.262	-.215	.112	.160	29.27	3.18
OR233	11	.205	.383	-.366	.216	.231	16.99	4.12
OR234	12	.111	.308	-.239	.121	.216	15.97	2.96
OR235	13	.215	.284	-.266	.073	.194	8.00	2.40
OR290	14	.082	.304	-.168	.132	.178	9.00	2.70
OR311	15	.174	.341	-.329	.265	.292	8.48	3.28
OR312	16	.178	.423	-.339	.241	.239	10.67	4.01
OR333	17	.010	.120	-.008	.032	.027	2.40	1.52
3R131	18	.204	.393	-.379	.211	.323	7.24	2.40
3R132	19	.119	.263	-.309	.257	.291	6.24	1.73
3R133	20	.201	.342	-.288	.162	.330	6.62	1.66
3R134	21	.137	.205	-.145	.114	.231	3.72	1.03
3R135	22	.120	.378	-.283	.173	.232	2.89	1.39
3R139	23	.100	.227	-.295	.236	.329	5.85	1.90
3R142	24	.162	.344	-.362	.175	.172	8.23	3.30
3R212	25	.117	.294	-.227	.096	.126	13.47	6.16
3R231	26	.190	.339	-.353	.179	.175	10.33	2.93
3R232	27	.104	.172	-.162	.061	.133	29.99	3.99
3R233	28	.159	.382	-.419	.134	.283	19.51	4.12
3R234	29	.186	.327	-.385	.175	.213	17.80	3.09
3R235	30	.209	.259	-.325	.095	.223	9.48	2.06
3R290	31	.107	.238	-.227	.146	.243	10.39	2.50
3R311	32	.118	.311	-.370	.208	.317	10.96	3.24
3R312	33	.265	.458	-.492	.276	.302	13.67	5.27
3R333	34	.273	.439	-.469	.223	.293	4.92	3.10
X891'	35	.300	.329	-.440	.234	.216	6.29	2.97
X892'	36	.576	.470	-.411	.279	.244	1.82	1.62
X893'	37	1.000	.222	-.296	.162	.176	6.32	2.07
X894'	38	.222	1.000	-.457	.308	.388	2.40	2.60
SIB 59	39	-.296	-.457	1.000	-.274	-.443	2.50	1.60
SIB156	40	.162	.308	-.274	1.000	.149	3.41	1.78
P*801	41	.176	.388	-.443	.149	1.000	97.92	9.62

[a,b] See page J-18 for explanatory notes.

TABLE J-4. Correlation Matrix DF(Retest Battery D, females)

N = 493^{a}

Variable No.^{b}		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
OR131	1	1.000	.428	.484	.384	.351	.384	.418	.368	.378	.360	.428	.404	.319	.339	.383	.394	.023	.688
OR132	2	.428	1.000	.342	.276	.303	.385	.345	.227	.208	.230	.297	.245	.144	.297	.382	.292	.044	.434
OR133	3	.484	.342	1.000	.388	.272	.369	.378	.306	.421	.254	.446	.391	.276	.278	.426	.410	.031	.434
OR134	4	.384	.276	.388	1.000	.193	.275	.282	.249	.253	.166	.276	.262	.222	.243	.319	.269	.045	.335
OR135	5	.351	.303	.272	.193	1.000	.277	.271	.345	.269	.194	.320	.326	.127	.254	.274	.311	.114	.347
OR139	6	.384	.385	.369	.275	.277	1.000	.274	.288	.212	.212	.297	.284	.227	.261	.407	.358	.080	.402
OR142	7	.418	.345	.378	.282	.271	.274	1.000	.259	.291	.253	.362	.314	.248	.300	.375	.325	.069	.416
OR212	8	.368	.227	.306	.249	.345	.288	.259	1.000	.326	.323	.414	.343	.233	.305	.362	.387	.085	.341
OR231	9	.378	.208	.421	.253	.269	.212	.291	.326	1.000	.399	.497	.416	.357	.215	.366	.457	.113	.311
OR232	10	.360	.230	.254	.166	.194	.212	.253	.323	.399	1.000	.567	.459	.388	.317	.411	.421	.051	.297
OR233	11	.428	.297	.446	.276	.320	.297	.362	.414	.497	.567	1.000	.549	.425	.436	.524	.587	.121	.399
OR234	12	.404	.245	.391	.262	.326	.284	.314	.343	.416	.459	.549	1.000	.408	.287	.409	.406	.025	.413
OR235	13	.319	.144	.276	.222	.127	.227	.248	.233	.357	.388	.425	.408	1.000	.265	.448	.375	.053	.280
OR290	14	.339	.297	.278	.243	.254	.261	.300	.305	.215	.317	.436	.287	.265	1.000	.455	.474	.081	.364
OR311	15	.363	.382	.426	.319	.274	.407	.375	.362	.366	.411	.524	.409	.448	.455	1.000	.578	.150	.341
OR312	16	.394	.292	.410	.269	.311	.358	.325	.387	.457	.421	.587	.406	.375	.474	.578	1.000	.142	.408
OR333	17	.023	.044	.031	.045	.114	.080	.069	.085	.113	.051	.121	.025	.053	.081	.150	.142	1.000	.060
3R131	18	.688	.434	.434	.335	.347	.402	.416	.341	.311	.297	.399	.413	.280	.364	.341	.408	.060	1.000
3R132	19	.434	.455	.457	.391	.263	.346	.363	.273	.242	.262	.369	.346	.200	.303	.413	.362	.060	.494
3R133	20	.484	.343	.484	.304	.276	.284	.407	.354	.285	.266	.367	.309	.203	.272	.346	.359	.021	.467
3R134	21	.323	.232	.313	.402	.179	.165	.204	.224	.164	.190	.234	.205	.173	.221	.285	.214	.046	.343
3R135	22	.407	.341	.380	.245	.377	.329	.290	.257	.290	.241	.369	.338	.203	.278	.345	.367	.107	.487
3R139	23	.395	.369	.387	.318	.259	.455	.273	.270	.278	.290	.352	.311	.272	.315	.435	.385	.111	.432
3R142	24	.394	.332	.351	.232	.273	.274	.789	.239	.261	.224	.364	.272	.249	.299	.332	.324	.073	.450
3R212	25	.361	.302	.354	.292	.321	.279	.400	.540	.349	.301	.438	.386	.258	.312	.357	.408	.115	.405
3R231	26	.404	.245	.424	.341	.228	.269	.328	.317	.691	.338	.483	.398	.363	.236	.362	.415	.018	.373
3R232	27	.335	.257	.344	.223	.223	.236	.289	.273	.315	.420	.474	.343	.305	.239	.303	.375	-.000	.344
3R233	28	.429	.315	.444	.333	.297	.235	.351	.359	.445	.441	.698	.469	.416	.472	.517	.551	.081	.386
3R234	29	.397	.211	.397	.288	.259	.244	.408	.389	.389	.393	.547	.542	.361	.372	.435	.491	.021	.392
3R235	30	.376	.254	.324	.216	.231	.266	.324	.269	.325	.261	.456	.379	.392	.313	.359	.389	.066	.379
3R290	31	.384	.311	.316	.325	.219	.272	.294	.315	.233	.361	.437	.334	.308	.587	.446	.454	.041	.432
3R311	32	.401	.410	.405	.333	.247	.403	.399	.352	.287	.397	.552	.362	.365	.471	.643	.558	.107	.421
3R312	33	.395	.361	.425	.298	.282	.381	.393	.428	.382	.411	.569	.372	.326	.468	.565	.636	.139	.410
3R333	34	.369	.291	.338	.239	.305	.306	.291	.364	.261	.275	.466	.318	.240	.370	.460	.501	.160	.390
X891'	35	.262	.233	.254	.141	.226	.270	.273	.300	.243	.220	.391	.203	.211	.36[illegible]	.359	.489	.141	.295
X892'	36	.265	.147	.305	.192	.195	.280	.251	.288	.246	.196	.336	.225	.210	.266	.316	.399	.097	.257
X893'	37	.101	.037	.059	.035	.126	.064	.163	.056	.107	.012	.069	.032	.048	.036	.065	.100	.072	.078
X894'	38	.407	.157	.342	.263	.312	.344	.301	.362	.360	.310	.439	.346	.304	.342	.379	.488	.098	.415
SIB 59	39	-.295	-.190	-.256	-.137	-.177	-.255	-.274	-.318	-.188	-.229	-.325	-.234	-.164	-.304	-.314	-.421	-.057	-.315
SIB156	40	.177	.130	.190	.114	.151	.192	.188	.175	.174	.171	.198	.118	.049	.146	.249	.289	.140	.198
P*801	41	.381	.243	.288	.207	.264	.331	.153	.359	.141	.275	.244	.225	.150	.290	.272	.331	.052	.407

TABLE J-4 (continued)

Variable No.[b]		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
OR131	1	.434	.484	.323	.407	.395	.394	.361	.404	.335	.429	.397	.376	.384	.401	.395	.369	.262	.265
OR132	2	.455	.343	.232	.341	.369	.332	.302	.245	.257	.315	.291	.254	.311	.410	.361	.291	.233	.147
OR133	3	.457	.434	.313	.380	.387	.351	.354	.424	.344	.444	.397	.324	.316	.405	.425	.338	.254	.305
OR134	4	.391	.304	.402	.245	.318	.232	.292	.341	.223	.333	.288	.216	.325	.333	.298	.239	.141	.192
OR135	5	.263	.276	.179	.377	.259	.273	.321	.228	.223	.297	.259	.231	.219	.247	.282	.305	.226	.195
OR139	6	.346	.284	.165	.329	.455	.274	.279	.269	.236	.295	.244	.266	.272	.403	.381	.306	.270	.280
OR142	7	.363	.407	.204	.290	.273	.789	.400	.328	.289	.351	.408	.324	.294	.394	.393	.291	.278	.251
OR212	8	.273	.354	.224	.257	.270	.239	.540	.317	.273	.359	.389	.269	.315	.352	.428	.364	.300	.288
OR231	9	.242	.285	.164	.290	.278	.261	.349	.601	.315	.445	.389	.325	.233	.287	.382	.261	.243	.246
OR232	10	.262	.266	.190	.241	.290	.224	.391	.338	.420	.441	.393	.261	.361	.397	.411	.275	.220	.196
OR233	11	.369	.367	.234	.369	.352	.364	.438	.483	.474	.698	.547	.456	.437	.552	.569	.466	.391	.336
OR234	12	.346	.309	.205	.338	.311	.272	.386	.398	.343	.469	.542	.379	.334	.362	.372	.318	.203	.225
OR235	13	.200	.263	.173	.203	.272	.249	.258	.363	.305	.416	.361	.392	.308	.365	.326	.240	.211	.210
OR290	14	.303	.272	.221	.278	.315	.299	.312	.236	.239	.472	.372	.313	.587	.471	.468	.370	.360	.266
OR311	15	.413	.346	.265	.345	.435	.332	.367	.362	.303	.517	.435	.359	.446	.643	.565	.460	.359	.316
OR312	16	.362	.359	.214	.367	.385	.324	.408	.415	.375	.551	.491	.389	.454	.558	.636	.501	.489	.399
OR333	17	.060	.021	.046	.107	.111	.073	.115	.018	-.000	.081	.021	.066	.041	.107	.139	.160	.141	.097
3R131	18	.494	.467	.343	.487	.432	.450	.405	.373	.344	.386	.392	.379	.432	.421	.410	.390	.295	.257
3R132	19	1.000	.378	.383	.382	.434	.412	.418	.311	.303	.400	.340	.332	.397	.468	.410	.365	.255	.286
3R133	20	.378	1.000	.256	.324	.325	.446	.313	.335	.327	.372	.398	.278	.274	.365	.389	.339	.267	.220
3R134	21	.383	.256	1.000	.231	.306	.250	.209	.217	.195	.254	.227	.205	.266	.292	.227	.238	.159	.212
3R135	22	.382	.324	.231	1.000	.317	.307	.333	.323	.221	.343	.319	.298	.277	.341	.385	.401	.251	.251
3R139	23	.434	.325	.306	.317	1.000	.308	.306	.293	.258	.394	.296	.316	.400	.506	.412	.295	.239	.230
3R142	24	.412	.446	.250	.307	.308	1.000	.420	.320	.283	.381	.385	.343	.291	.417	.394	.322	.263	.253
3R212	25	.418	.313	.209	.333	.306	.420	1.000	.365	.366	.489	.421	.388	.437	.430	.407	.365	.268	.279
3R231	26	.311	.335	.217	.323	.293	.320	.365	1.000	.324	.510	.500	.364	.324	.357	.408	.232	.185	.190
3R232	27	.303	.327	.195	.221	.258	.283	.366	.324	1.000	.468	.378	.300	.303	.370	.375	.299	.231	.204
3R233	28	.400	.372	.254	.343	.394	.381	.489	.510	.468	1.000	.590	.490	.495	.574	.604	.481	.407	.287
3R234	29	.340	.398	.227	.319	.296	.385	.421	.500	.378	.590	1.000	.443	.362	.447	.482	.426	.324	.278
3R235	30	.332	.278	.205	.298	.316	.343	.388	.364	.300	.490	.443	1.000	.341	.412	.386	.286	.281	.225
3R290	31	.397	.274	.266	.277	.400	.291	.437	.324	.303	.495	.362	.341	1.000	.560	.515	.355	.298	.235
3R311	32	.468	.365	.292	.341	.506	.417	.430	.357	.370	.574	.447	.412	.560	1.000	.630	.489	.375	.317
3R312	33	.410	.389	.227	.385	.412	.394	.407	.408	.375	.604	.482	.386	.515	.630	1.000	.663	.669	.544
3R333	34	.365	.339	.238	.401	.295	.322	.365	.232	.299	.481	.426	.286	.355	.489	.663	1.000	.559	.491
X891'	35	.255	.267	.159	.251	.239	.263	.268	.185	.231	.407	.324	.281	.298	.375	.669	.559	1.000	.583
X892'	36	.286	.220	.212	.251	.230	.253	.279	.190	.204	.287	.278	.225	.235	.317	.544	.491	.583	1.000
X893'	37	.069	.153	.044	.079	.058	.133	.079	.013	.082	.056	.043	.037	.019	.063	.212	.211	.320	.579
X894'	38	.365	.311	.190	.359	.283	.277	.369	.360	.312	.435	.379	.317	.304	.399	.514	.454	.500	.516
SIB 59	39	-.289	-.250	-.197	-.309	-.217	-.285	-.266	-.242	-.233	-.354	-.295	-.329	-.237	-.314	-.548	-.466	-.522	-.494
SIB156	40	.263	.098	.162	.213	.199	.164	.203	.132	.138	.197	.158	.123	.167	.233	.369	.273	.320	.407
P*801	41	.342	.261	.221	.368	.326	.157	.246	.230	.236	.255	.194	.229	.305	.372	.409	.349	.354	.326

TABLE J-4 (continued)

Variable No.[b]		37	38	39	40	41	MEANS	STD.DEV.
OR131	1	.101	.407	-.295	.177	.381	6.04	2.41
OR132	2	.037	.157	-.190	.130	.243	4.20	1.60
OR133	3	.059	.342	-.256	.190	.288	5.74	1.85
OR134	4	.035	.263	-.107	.114	.207	2.55	1.23
OR135	5	.126	.312	-.177	.151	.264	2.35	1.20
OR139	6	.064	.344	-.265	.192	.331	4.07	1.69
OR142	7	.163	.301	-.274	.188	.153	7.03	3.11
OR212	8	.056	.362	-.318	.175	.309	12.25	5.35
OR231	9	.107	.360	-.188	.174	.141	9.60	2.68
OR232	10	.012	.310	-.229	.171	.275	30.12	2.63
OR233	11	.069	.439	-.325	.198	.244	18.82	3.92
OR234	12	.032	.346	-.234	.118	.225	17.00	2.95
OR235	13	.048	.304	-.164	.049	.150	9.61	2.08
OR290	14	.036	.342	-.304	.146	.290	8.78	2.88
OR311	15	.065	.379	-.314	.249	.272	8.26	3.20
OR312	16	.100	.488	-.421	.289	.331	10.96	3.80
OR333	17	.072	.098	-.057	.140	.052	2.28	1.49
3R131	18	.078	.415	-.315	.198	.407	7.63	2.48
3R132	19	.069	.365	-.289	.263	.342	5.63	1.75
3R133	20	.153	.311	-.250	.098	.261	7.02	1.47
3R134	21	.044	.190	-.197	.162	.221	3.12	1.18
3R135	22	.079	.359	-.309	.213	.368	2.85	1.36
3R139	23	.058	.283	-.217	.199	.326	5.83	1.78
3R142	24	.133	.277	-.285	.164	.157	8.32	3.49
3R212	25	.079	.369	-.266	.203	.266	15.80	5.91
3R231	26	.013	.360	-.242	.132	.230	11.59	2.33
3R232	27	.082	.312	-.233	.138	.236	31.17	1.79
3R233	28	.056	.435	-.354	.197	.255	21.34	3.38
3R234	29	.043	.379	-.295	.158	.194	18.52	2.68
3R235	30	.037	.317	-.329	.123	.229	9.90	1.77
3R290	31	.019	.304	-.237	.167	.305	10.14	2.66
3R311	32	.069	.399	-.314	.233	.372	10.18	3.28
3R312	33	.212	.514	-.548	.369	.409	12.42	4.92
3R333	34	.211	.454	-.466	.273	.349	3.99	2.71
X891'	35	.320	.500	-.522	.320	.354	5.03	2.88
X892'	36	.579	.516	-.494	.407	.326	1.09	1.29
X893'	37	1.000	.195	-.224	.201	.067	5.19	2.22
X894'	38	.195	1.000	-.519	.348	.507	3.09	3.01
SIB 59	39	-.224	-.519	1.000	-.377	-.474	3.09	1.90
SIB156	40	.201	.348	-.377	1.000	.329	3.31	1.81
P*801	41	.067	.507	-.474	.329	1.000	98.94	9.96

[a,b] See page J-18 for explanatory notes.

TABLE J-5. Correlation Matrix EM(Retest Battery E, males)

N = 333^a

Variable No.^{b}		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
OR131	1	1.000	.468	.488	.427	.247	.407	.445	.309	.342	.566	.399	.288	.279	.292	.370	.597	.436	.337
OR132	2	.468	1.000	.363	.346	.214	.375	.389	.264	.319	.503	.292	.294	.217	.298	.284	.477	.527	.297
OR133	3	.488	.363	1.000	.421	.259	.455	.416	.354	.341	.525	.387	.300	.133	.238	.318	.436	.383	.453
OR134	4	.427	.346	.421	1.000	.228	.347	.286	.334	.327	.437	.336	.362	.187	.246	.314	.345	.298	.286
OR135	5	.247	.214	.259	.228	1.000	.236	.324	.283	.228	.279	.160	.172	.064	.110	.194	.250	.180	.192
OR139	6	.407	.375	.455	.347	.236	1.000	.280	.270	.279	.453	.348	.259	.175	.215	.230	.279	.362	.300
OR142	7	.445	.389	.416	.286	.324	.280	1.000	.254	.363	.449	.262	.261	.144	.222	.261	.435	.384	.210
OR220	8	.309	.264	.354	.334	.283	.270	.254	1.000	.346	.434	.345	.320	.256	.123	.242	.359	.295	.289
OR240	9	.342	.319	.341	.327	.228	.279	.363	.346	1.000	.562	.428	.428	.302	.397	.466	.317	.330	.290
OR250	10	.566	.503	.525	.437	.279	.453	.449	.434	.562	1.000	.504	.495	.291	.376	.532	.513	.447	.372
OR260	11	.399	.292	.387	.336	.160	.348	.262	.345	.428	.504	1.000	.433	.321	.377	.401	.340	.311	.273
OR270	12	.288	.294	.300	.362	.172	.259	.261	.320	.428	.495	.433	1.000	.476	.510	.513	.314	.266	.279
OR281	13	.279	.217	.133	.187	.064	.175	.144	.256	.302	.291	.321	.476	1.000	.428	.297	.221	.172	.175
OR282	14	.292	.298	.238	.246	.110	.215	.222	.123	.397	.376	.377	.510	.428	1.000	.435	.257	.178	.169
OR290	15	.370	.284	.318	.314	.194	.230	.261	.242	.466	.532	.401	.513	.297	.435	1.000	.344	.265	.207
3R131	16	.597	.477	.436	.345	.250	.279	.435	.359	.317	.513	.340	.314	.221	.257	.344	1.000	.532	.545
3R132	17	.436	.527	.383	.298	.180	.362	.384	.295	.330	.447	.311	.266	.172	.178	.265	.532	1.000	.384
3R133	18	.337	.297	.453	.286	.192	.300	.210	.289	.290	.372	.273	.279	.175	.169	.207	.545	.384	1.000
3R134	19	.239	.222	.182	.240	.112	.166	.149	.164	.103	.196	.189	.237	.127	.092	.152	.343	.360	.389
3R135	20	.389	.369	.377	.241	.361	.291	.347	.268	.284	.478	.237	.252	.141	.205	.291	.459	.407	.351
3R139	21	.244	.238	.286	.121	.172	.320	.185	.275	.188	.239	.240	.159	.089	.111	.102	.392	.469	.414
3R142	22	.357	.326	.352	.215	.244	.225	.639	.324	.378	.465	.245	.268	.103	.206	.277	.473	.538	.383
3R220	23	.379	.173	.234	.225	.154	.094	.168	.405	.351	.397	.241	.273	.195	.147	.231	.355	.258	.203
3R240	24	.417	.343	.401	.248	.286	.366	.361	.333	.637	.563	.421	.367	.203	.358	.404	.355	.336	.325
3R250	25	.486	.444	.460	.278	.220	.350	.367	.391	.506	.667	.387	.437	.216	.348	.462	.479	.434	.435
3R260	26	.409	.360	.366	.364	.220	.276	.302	.315	.373	.500	.443	.419	.323	.371	.418	.372	.286	.280
3R270	27	.327	.330	.295	.328	.136	.245	.172	.294	.355	.435	.373	.625	.424	.432	.435	.320	.255	.279
3R281	28	.311	.190	.090	.155	.037	.156	.125	.177	.307	.260	.230	.380	.457	.341	.359	.181	.120	.061
3R282	29	.299	.260	.248	.191	.176	.272	.196	.152	.376	.346	.301	.445	.362	.525	.431	.287	.188	.268
3R290	30	.325	.281	.339	.271	.162	.278	.250	.293	.408	.481	.387	.442	.327	.357	.486	.252	.264	.180
X891'	31	.394	.309	.334	.215	.179	.229	.348	.225	.455	.450	.311	.267	.165	.287	.417	.322	.279	.291
X892'	32	.388	.285	.319	.226	.180	.271	.330	.283	.491	.501	.360	.319	.204	.264	.365	.294	.236	.264
X893'	33	.184	.173	.186	.132	.066	.133	.157	.127	.290	.290	.196	.158	.076	.197	.211	.191	.131	.191
X894'	34	.435	.346	.406	.201	.253	.261	.369	.318	.547	.520	.349	.315	.154	.263	.402	.407	.380	.292
SIB 59	35	-.389	-.238	-.354	-.168	-.129	-.272	-.323	-.250	-.405	-.454	-.265	-.284	-.131	-.208	-.395	-.294	-.339	-.292
SIB156	36	.182	.166	.113	.161	.078	.192	.203	.193	.285	.216	.229	.137	.026	.113	.210	.158	.101	.151
P*801	37	.264	.251	.262	.217	.196	.205	.186	.252	.333	.353	.244	.248	.130	.228	.314	.278	.244	.205

TABLE J-5 (continued)

Variable No.[b]		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	MEANS,	STD.DEV.
OR131	1	.239	.389	.244	.357	.379	.417	.486	.409	.327	.311	.299	.325	.394	.388	.184	.435	-.389	.182	.264	5.99	2.31
OR132	2	.222	.369	.238	.326	.173	.343	.444	.360	.330	.190	.260	.281	.309	.285	.173	.346	-.238	.106	.251	4.12	1.63
OR133	3	.182	.377	.286	.352	.234	.401	.460	.368	.295	.090	.248	.339	.334	.313	.186	.406	-.354	.113	.262	5.09	2.01
OR134	4	.240	.241	.121	.215	.225	.248	.276	.364	.328	.155	.191	.271	.215	.226	.132	.201	-.168	.161	.217	3.17	1.17
OR135	5	.112	.361	.172	.244	.154	.286	.220	.220	.136	.037	.176	.162	.179	.180	.066	.253	-.129	.078	.198	2.45	1.15
OR139	6	.166	.291	.320	.225	.094	.366	.350	.276	.245	.156	.272	.278	.229	.271	.133	.261	-.272	.192	.205	4.19	1.62
OR142	7	.149	.347	.185	.639	.168	.361	.367	.302	.172	.125	.196	.250	.348	.330	.157	.369	-.323	.203	.186	6.66	3.13
OR220	8	.164	.268	.275	.324	.405	.333	.391	.315	.294	.177	.152	.293	.225	.283	.127	.318	-.250	.193	.252	12.89	5.95
OR240	9	.103	.284	.188	.378	.351	.637	.506	.373	.355	.307	.376	.408	.455	.491	.290	.547	-.405	.285	.333	8.98	5.09
OR250	10	.196	.478	.239	.465	.397	.563	.667	.500	.435	.260	.346	.481	.450	.501	.290	.520	-.454	.216	.353	27.25	9.77
OR260	11	.189	.237	.240	.245	.241	.421	.387	.443	.373	.230	.301	.387	.311	.360	.196	.349	-.265	.229	.244	8.53	3.65
OR270	12	.237	.252	.159	.268	.273	.367	.437	.419	.625	.380	.445	.442	.267	.319	.158	.315	-.284	.137	.248	12.26	3.67
OR281	13	.127	.141	.089	.103	.195	.203	.216	.323	.424	.457	.362	.327	.165	.204	.076	.154	-.131	.026	.130	13.13	5.01
OR282	14	.092	.205	.111	.206	.147	.358	.348	.371	.432	.341	.525	.357	.287	.264	.199	.263	-.208	.113	.228	8.65	3.06
OR290	15	.152	.291	.102	.277	.231	.404	.462	.418	.435	.359	.431	.486	.417	.365	.211	.402	-.395	.210	.314	9.09	2.94
3R131	16	.343	.459	.392	.473	.355	.355	.479	.372	.320	.181	.287	.252	.322	.294	.191	.407	-.294	.158	.278	7.07	2.36
3R132	17	.360	.407	.469	.538	.258	.336	.434	.286	.255	.120	.188	.264	.279	.236	.131	.380	-.339	.101	.244	5.64	1.71
3R133	18	.389	.351	.414	.383	.203	.325	.435	.280	.279	.061	.268	.180	.291	.264	.191	.292	-.292	.151	.205	6.45	1.68
3R134	19	1.000	.257	.313	.284	.123	.069	.185	.140	.147	.004	.109	.095	.186	.211	.053	.178	-.127	.066	.017	3.47	1.06
3R135	20	.257	1.000	.277	.417	.131	.341	.443	.312	.245	.111	.248	.289	.285	.325	.134	.376	-.277	.071	.268	2.94	1.34
3R139	21	.313	.277	1.000	.313	.190	.244	.272	.174	.195	.034	.196	.138	.145	.124	.031	.256	-.237	.054	.191	5.60	1.63
3R142	22	.284	.417	.313	1.000	.251	.373	.430	.301	.244	.087	.180	.244	.355	.315	.140	.402	-.338	.161	.199	7.97	3.16
3R220	23	.123	.131	.190	.251	1.000	.383	.399	.369	.289	.333	.244	.283	.158	.267	.201	.355	-.271	.081	.289	17.47	7.97
3R240	24	.089	.341	.244	.373	.383	1.000	.670	.494	.409	.289	.464	.438	.446	.515	.328	.607	-.585	.298	.386	12.11	5.45
3R250	25	.185	.443	.272	.430	.399	.670	1.000	.529	.430	.286	.458	.503	.455	.441	.297	.529	-.534	.203	.397	33.62	9.40
3R260	26	.140	.312	.174	.301	.369	.494	.529	1.000	.508	.392	.420	.406	.301	.348	.168	.361	-.330	.164	.366	12.56	4.25
3R270	27	.147	.245	.195	.244	.289	.409	.430	.508	1.000	.449	.472	.513	.236	.327	.178	.278	-.311	.158	.275	14.93	3.35
3R281	28	.004	.111	.034	.087	.333	.289	.286	.392	.449	1.000	.429	.375	.165	.184	.099	.218	-.227	.101	.188	17.01	5.89
3R282	29	.109	.248	.196	.160	.244	.464	.458	.420	.472	.429	1.000	.447	.342	.294	.233	.318	-.305	.206	.339	10.94	3.17
3R290	30	.095	.289	.138	.244	.283	.438	.503	.406	.513	.375	.447	1.000	.364	.349	.163	.379	-.388	.194	.371	10.59	2.81
X891'	31	.186	.285	.145	.355	.158	.446	.455	.301	.236	.165	.342	.364	1.000	.659	.458	.602	-.455	.326	.310	5.82	3.32
X892'	32	.211	.325	.124	.315	.267	.515	.441	.348	.327	.184	.294	.349	.659	1.000	.580	.607	-.541	.297	.309	1.95	1.76
X893'	33	.053	.134	.031	.140	.201	.328	.297	.168	.178	.099	.233	.183	.458	.580	1.000	.326	-.308	.243	.188	6.64	2.19
X894'	34	.178	.376	.256	.402	.355	.607	.529	.361	.278	.218	.318	.379	.602	.607	.326	1.000	-.584	.303	.471	3.22	3.35
SIB 59	35	-.127	-.277	-.237	-.338	-.271	-.585	-.534	-.330	-.311	-.227	-.305	-.388	-.455	-.541	-.308	-.584	1.000	-.363	-.387	2.87	1.73
SIB156	36	.066	.071	.054	.161	.081	.298	.203	.164	.158	.101	.206	.194	.326	.297	.243	.303	-.363	1.000	.189	3.07	1.78
P*801	37	.017	.268	.191	.199	.289	.386	.397	.366	.275	.188	.339	.371	.310	.309	.188	.471	-.387	.189	1.000	98.50	9.36

[a,b] See page J-18 for explanatory notes.

TABLE J-6. Correlation Matrix EF(Retest Battery E, females)

N = 374^a

Variable No.^{b}		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0RI31	1	1.000	.443	.455	.375	.344	.426	.442	.326	.444	.567	.366	.348	.170	.255	.324	.593	.435	.295
0RI32	2	.443	1.000	.319	.252	.235	.394	.365	.120	.245	.421	.245	.177	.048	.105	.176	.372	.419	.246
0RI33	3	.455	.319	1.000	.379	.259	.394	.331	.340	.323	.468	.304	.250	.164	.256	.300	.373	.312	.503
0RI34	4	.375	.252	.379	1.000	.269	.299	.240	.316	.305	.337	.274	.255	.183	.247	.263	.316	.277	.319
0RI35	5	.344	.235	.259	.269	1.000	.292	.353	.192	.389	.334	.231	.234	.190	.273	.243	.276	.284	.177
0RI39	6	.426	.394	.394	.299	.292	1.000	.379	.287	.389	.468	.328	.272	.140	.233	.208	.407	.401	.260
0RI42	7	.442	.365	.331	.240	.353	.379	1.000	.246	.382	.489	.222	.249	.141	.171	.240	.432	.351	.300
0R220	8	.326	.120	.340	.316	.192	.287	.246	1.000	.473	.510	.334	.339	.343	.312	.391	.357	.271	.339
0R240	9	.444	.245	.323	.305	.389	.389	.382	.473	1.000	.635	.440	.490	.284	.427	.469	.423	.360	.313
0R250	10	.567	.421	.468	.337	.334	.468	.489	.510	.635	1.000	.557	.480	.332	.452	.572	.542	.519	.413
0R260	11	.366	.245	.304	.274	.231	.328	.222	.334	.440	.557	1.000	.435	.307	.429	.428	.303	.273	.208
0R270	12	.348	.177	.250	.255	.234	.272	.249	.339	.490	.480	.435	1.000	.409	.561	.520	.340	.255	.217
0R281	13	.170	.048	.164	.183	.190	.140	.141	.343	.284	.332	.307	.409	1.000	.471	.395	.211	.078	.108
0R282	14	.255	.105	.256	.247	.273	.233	.171	.312	.427	.452	.429	.561	.471	1.000	.527	.277	.297	.207
0R290	15	.324	.176	.300	.263	.243	.208	.240	.391	.469	.572	.428	.520	.395	.527	1.000	.337	.357	.293
3RI31	16	.593	.372	.373	.316	.276	.407	.432	.357	.423	.542	.303	.340	.211	.277	.337	1.000	.550	.436
3RI32	17	.435	.419	.312	.277	.284	.401	.351	.271	.360	.519	.273	.255	.078	.297	.357	.550	1.000	.394
3RI33	18	.295	.246	.503	.319	.177	.260	.300	.339	.313	.413	.208	.217	.108	.207	.293	.436	.394	1.000
3RI34	19	.257	.110	.302	.371	.159	.183	.211	.179	.236	.284	.162	.206	.180	.224	.221	.323	.213	.313
3RI35	20	.398	.353	.351	.316	.360	.389	.400	.265	.380	.421	.182	.194	.024	.205	.216	.407	.412	.282
3RI39	21	.390	.359	.369	.300	.230	.485	.307	.349	.364	.473	.313	.264	.169	.234	.301	.469	.498	.416
3RI42	22	.398	.352	.333	.230	.268	.352	.720	.290	.409	.499	.235	.280	.112	.267	.262	.513	.486	.406
3R220	23	.377	.137	.195	.198	.194	.203	.279	.458	.427	.387	.207	.204	.250	.215	.253	.373	.238	.195
3R240	24	.420	.245	.400	.313	.373	.374	.406	.395	.690	.573	.382	.418	.259	.374	.483	.386	.454	.356
3R250	25	.560	.360	.466	.377	.375	.426	.515	.423	.574	.717	.424	.401	.250	.357	.457	.609	.543	.471
3R260	26	.419	.249	.318	.312	.257	.383	.280	.358	.419	.434	.413	.311	.249	.357	.410	.360	.348	.229
3R270	27	.282	.101	.144	.265	.211	.251	.173	.198	.372	.323	.274	.578	.378	.424	.422	.279	.232	.140
3R281	28	.197	.079	.139	.236	.136	.130	.122	.271	.271	.275	.244	.375	.595	.442	.367	.130	.075	.101
3R282	29	.278	.152	.275	.311	.278	.276	.259	.273	.366	.388	.323	.466	.373	.594	.440	.267	.256	.252
3R290	30	.260	.158	.278	.239	.228	.233	.233	.227	.397	.410	.320	.384	.302	.435	.550	.277	.277	.270
X891'	31	.285	.131	.199	.173	.209	.218	.270	.157	.386	.311	.224	.253	.127	.251	.323	.239	.224	.213
X892'	32	.316	.192	.236	.197	.211	.300	.310	.175	.386	.326	.189	.142	.079	.182	.274	.287	.253	.266
X893'	33	.128	.038	.039	.084	.082	.116	.138	.056	.152	.131	.021	.048	-.009	.084	.097	.130	.084	.129
X894'	34	.476	.236	.279	.197	.330	.318	.416	.271	.532	.452	.250	.255	.119	.217	.333	.439	.395	.286
SIB 59	35	-.332	-.263	-.287	-.166	-.257	-.302	-.413	-.167	-.372	-.359	-.238	-.227	-.040	-.154	-.282	-.372	-.307	-.329
SIB156	36	.190	.096	.162	.095	.156	.077	.221	.058	.208	.138	.090	.156	-.037	.096	.187	.238	.147	.129
P*801	37	.315	.176	.190	.200	.241	.174	.190	.199	.249	.301	.181	.175	.114	.189	.277	.285	.274	.122

TABLE J-6 (continued)

Variable No.^{b}		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	MEANS,STD.DEV.	
OR131	1	.257	.398	.390	.398	.377	.420	.560	.429	.282	.197	.278	.260	.285	.316	.128	.476	-.332	.190	.315	6.31	2.30
OR132	2	.110	.353	.359	.352	.137	.245	.360	.249	.101	.079	.152	.158	.131	.182	.038	.236	-.263	.096	.176	3.86	1.55
OR133	3	.362	.351	.369	.333	.195	.400	.466	.318	.144	.139	.275	.278	.199	.236	.039	.279	-.287	.162	.190	5.75	1.92
OR134	4	.371	.316	.300	.230	.198	.313	.377	.312	.265	.236	.311	.239	.173	.197	.084	.197	-.166	.095	.200	2.61	1.27
OR135	5	.159	.360	.230	.268	.194	.373	.375	.257	.211	.136	.278	.228	.209	.211	.082	.330	-.257	.156	.241	2.51	1.19
OR139	6	.163	.389	.485	.352	.203	.374	.426	.383	.251	.130	.276	.233	.218	.300	.116	.318	-.302	.077	.174	4.21	1.65
OR142	7	.211	.400	.307	.720	.279	.406	.515	.280	.173	.122	.259	.233	.270	.310	.138	.416	-.413	.221	.190	6.87	3.03
OR220	8	.179	.265	.349	.290	.458	.395	.423	.358	.198	.271	.273	.227	.157	.175	.056	.271	-.167	.058	.199	14.27	6.05
OR240	9	.236	.380	.364	.409	.427	.690	.574	.419	.372	.271	.366	.397	.386	.386	.152	.532	-.372	.208	.249	10.47	5.64
OR250	10	.264	.421	.473	.499	.387	.573	.717	.434	.323	.275	.388	.410	.311	.326	.131	.452	-.359	.138	.301	28.78	9.78
OR260	11	.162	.182	.313	.235	.207	.382	.424	.413	.274	.244	.323	.320	.224	.189	.021	.250	-.238	.090	.181	8.05	3.27
OR270	12	.206	.194	.264	.280	.204	.418	.401	.311	.578	.375	.466	.384	.253	.192	.048	.258	-.227	.158	.175	8.32	3.39
OR281	13	.180	.024	.169	.112	.250	.259	.250	.249	.378	.595	.373	.302	.127	.099	-.009	.119	-.040	-.037	.114	11.02	5.64
OR282	14	.224	.205	.234	.267	.215	.374	.387	.357	.424	.442	.594	.430	.251	.182	.084	.217	-.154	.098	.180	7.84	3.05
OR290	15	.221	.216	.301	.262	.253	.483	.457	.410	.422	.367	.440	.550	.323	.274	.097	.333	-.282	.187	.277	6.77	2.94
3R131	16	.323	.407	.469	.513	.373	.386	.609	.360	.279	.130	.267	.277	.239	.287	.130	.439	-.372	.238	.285	7.53	2.35
3R132	17	.213	.412	.498	.486	.238	.454	.543	.348	.232	.075	.256	.277	.224	.253	.084	.395	-.307	.147	.274	5.17	1.77
3R133	18	.313	.282	.416	.406	.195	.356	.471	.229	.140	.101	.252	.270	.213	.266	.129	.286	-.329	.129	.122	6.95	1.47
3R134	19	1.000	.154	.226	.299	.037	.218	.284	.149	.165	.182	.213	.157	.156	.187	.076	.188	-.159	.154	.163	3.08	1.22
3R135	20	.154	1.000	.331	.388	.251	.364	.434	.270	.168	.065	.250	.246	.298	.271	.124	.392	-.278	.122	.189	2.93	1.27
3R139	21	.226	.331	1.000	.321	.270	.409	.502	.354	.253	.186	.282	.328	.133	.102	-.020	.212	-.233	.030	.169	5.65	1.93
3R142	22	.299	.388	.321	1.000	.236	.427	.549	.264	.175	.127	.319	.243	.264	.331	.170	.411	-.377	.260	.177	9.01	3.22
3R220	23	.037	.251	.270	.236	1.000	.363	.368	.367	.220	.325	.291	.245	.146	.148	.036	.361	-.164	.007	.208	18.74	8.42
3R240	24	.218	.364	.409	.427	.363	1.000	.670	.489	.432	.283	.475	.494	.445	.415	.196	.543	-.436	.189	.248	13.57	5.27
3R250	25	.284	.434	.502	.549	.368	.670	1.000	.482	.430	.251	.454	.457	.362	.398	.252	.531	-.428	.206	.330	35.08	8.79
3R260	26	.149	.270	.354	.264	.367	.489	.482	1.000	.365	.357	.396	.416	.277	.232	.088	.329	-.264	.206	.258	10.96	3.67
3R270	27	.165	.168	.253	.175	.220	.432	.430	.365	1.000	.453	.522	.486	.315	.251	.138	.291	-.264	.125	.261	10.40	3.68
3R281	28	.182	.065	.186	.127	.325	.283	.251	.357	.453	1.000	.428	.361	.110	.057	.002	.101	-.058	.001	.116	14.11	6.05
3R282	29	.213	.250	.282	.319	.291	.475	.454	.396	.522	.428	1.000	.489	.320	.218	.102	.287	-.234	.111	.208	9.55	2.85
3R290	30	.157	.246	.328	.243	.245	.494	.457	.416	.486	.361	.489	1.000	.331	.256	.165	.309	-.316	.180	.259	10.03	2.84
X891'	31	.156	.298	.133	.264	.146	.445	.362	.277	.315	.110	.320	.331	1.000	.705	.463	.627	-.515	.346	.301	4.43	3.20
X892'	32	.167	.271	.102	.331	.148	.415	.398	.232	.251	.057	.218	.256	.705	1.000	.638	.692	-.544	.456	.299	1.14	1.42
X893'	33	.076	.124	-.020	.170	.036	.196	.252	.088	.138	.002	.102	.165	.463	.638	1.000	.406	-.278	.280	.148	5.45	2.10
X894'	34	.188	.392	.212	.411	.361	.543	.531	.329	.291	.101	.287	.309	.627	.692	.406	1.000	-.561	.382	.415	3.64	3.66
SIB 59	35	-.159	-.278	-.233	-.377	-.104	-.436	-.428	-.264	-.264	-.058	-.234	-.316	-.515	-.544	-.278	-.561	1.000	-.450	-.381	3.65	1.95
SIBI56	36	.154	.122	.030	.260	.007	.189	.206	.206	.125	.001	.111	.180	.346	.456	.280	.382	-.450	1.000	.276	2.38	1.80
P*801	37	.163	.189	.169	.177	.208	.248	.330	.258	.261	.116	.208	.259	.301	.299	.148	.415	-.381	.276	1.000	98.58	9.11

[a,b] See page J-18 for explanatory notes.

[a] These six matrices are based on cases that were in grade 9 in 1960 and grade 12 in 1963 and who have retest classification code 0, and valid scores on all variables that are included in the matrix.

[b] In the variable # code column in these tables, the designations of test score variables are preceded by the digit 0 or 3, representing 1960 (Grade 9) and 1963 (Grade 12) scores respectively. Thus OR250 and 3R250 represent the 1960 and 1963 Reading Comprehension scores (R-250) respectively.

APPENDIX K

NOTATION USED IN THIS REPORT

APPENDIX K. Notation Used in This Report

Except where otherwise indicated, the following notation is used in this report.

N = number of cases

This is the unweighted number of cases entering into the computation of the statistic, except where it is explicitly indicated to mean weighted number of cases.

n = number of items (in test)

Variables

X is any variable (usually, but not necessarily in raw score form).

z is a variable in standard score form, with a mean of 0 and a standard deviation of 1.

X_9 = grade 9 raw score

X_{12} = grade 12 raw score

z_9 = grade 9 standard score

z_{12} = grade 12 standard score

$$\left.\begin{array}{ll} D & = \text{raw score difference} = X_{12} - X_9 \\ d & = \text{standard score difference} = z_{12} - z_9 \\ \delta & = \text{residual score} = X_{12 \cdot 9} \end{array}\right\} \text{where } X_{12} \text{ and } X_9 \text{ are for the same test}$$

M = mean

M_x or $\overline{X}$ sample mean on variable X (= estimate of population mean)

s_x = standard deviation of sample, on variable X.

$$s_x = \sqrt{\frac{\sum_{i=1}^{N} \left(X_i - \overline{X}\right)^2}{N}}$$

Note: S.D. is sometimes used instead of s, as a row or column heading in tables.

σ_x = estimate of population standard deviation on variable X.

$$\sigma_x = s_x \sqrt{\frac{N}{N-1}} = \sqrt{\frac{\sum_{i=1}^{N} \left(X_i - \overline{X}\right)^2}{N-1}}$$

r_{xx} = reliability coefficient of variable X

σ_{meas_x} = standard error of measurement of variable X

$$\sigma_{meas_x} = \sigma_x \sqrt{1 - r_{xx}}$$

$r_{a_\infty b_\infty}$ = r_{ab} corrected for attenuation $= \dfrac{r_{ab}}{\sqrt{r_{aa}}\sqrt{r_{bb}}}$

df = number of degrees of freedom

In factor analysis:

F_k represents $k^{\underline{th}}$ common factor.

Three kinds of common factors--V-factor, S-factor, and T-factor--are identified in this research. They have the following meanings:

<u>V-factor</u>
A factor retained from the varimax solution.

<u>S-factor</u>
A factor rotated subjectively after varimax.

<u>T-factor</u>
A test-specific factor.

T-factors are designated by the letter T, followed by the three-digit variable number corresponding to the test. For instance T-250 is the test-specific factor corresponding to R-250 (Reading Comprehension).

Factor loadings

a_{ij} = factor loading of variable i on principal factor j

b_{ij} = factor loading of variable i on common factor j (for any kind of common factor)

b_i = factor loading of test i on test-specific factor for that test

Communality (computed)

h_i^2 = communality of variable i = $\sum_j b_{ij}^2$

$$h_i^2 = \sum_j a_{ij}^2 + b_i^2$$

= communality of variable i which has a test-specific factor

For other notation used in this report, see Appendix A, which describes the system of TALENT variable-number designations.

Copies of this report may be ordered from the American Institutes for Research. The price is $5.00 per copy, postpaid. Orders should be addressed as follows:

Until July 31, 1967:

Project TALENT
American Institutes for Research
135 North Bellefield Avenue
Pittsburgh, Pennsylvania 15213

After July 31, 1967:

Project TALENT
American Institutes for Research
Post Office Box 1113
Palo Alto, California 94302