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ABSTRACT

In this investigation of potential sources of individual differences in free-recall learning and retention by children, learning ability is defined in terms of performance on a free-recall test with the upper and lower thirds of the distribution typically being defined as fast and slow learners. Variables concerned with short-term memory, presentation rate, study time, distribution of practice, transfer of conceptual schemes, and instruction regarding potential sources of organization in the materials to be learned were investigated. Learning ability was found to be unrelated to short-term memory, although fast learners had a higher probability of recalling a word on the trial immediately following the trial on which it was first recalled, and they recalled more of the words in the pool to be learned than did slow learners; these findings were suggested to be reflections of individual differences in encoding processes. The use of the same or a somewhat different conceptual scheme in the learning of two successive lists appeared to have differential transfer effects for fast and slow learners. Also, pointing out potentially useful bases of organization in the material to be learned seemed to have differential transfer effects for fast and slow learners. (Author/WR)

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INDIVIDUAL DIFFERENCES IN LEARNING AND RETENTION

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U.S. DEPARTMENT OF
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Summary

The purpose of this project has been to investigate some potential sources of individual differences in free-recall learning and retention by children. The approach taken to the problem has been from an experimental point of view rather than from the more traditional psychometric or mental test point of view. Learning ability is defined in terms of performance on a free-recall test with the upper and lower thirds of the distribution typically being defined as "fast" and "slow" learners, respectively. An attempt was then made to isolate variables which, for either theoretical or empirical reasons, were thought to be a potential source of individual differences. With the exception of one study--which involved an attempt to determine whether or not a number of different variables were correlated with free-recall performance in order to determine some potentially fruitful direction for reasearch to go--the studies which were conducted as part of this project involved experimental-type studies which involved attempts to locate variables which interact with learning ability. Variables concerned with short-term memory, presentation rate, study time, distribution of practice, transfer of conceptual schemes, and instructions regarding potential sources of organization in the material to be learned were investigated.

A review of some of the experimental studies which have investigated or been concerned with individual differences in learning and retention was conducted, and these studies are discussed. Some methodological issues concerning the appropriate and most powerful procedures for studying individual differences in learning are raised in the context of some of the data collected as part of this project.

Learning ability was found to be unrelated to short-term memory although "fast" learners had a higher probability of recalling a word on the trial immediately following the trial on which it was first recalled and recall more of the words in the pool to be learned (i.e., the words on the list) than did "slow" learners; these findings were suggested to be reflections of individual differences in encoding processes.

Learning ability does appear to be related in some ways to various factors involving transfer; only suggestions of these relationships, however, were obtained in the present project. The use of the same or somewhat different conceptual scheme in the learning of two successive lists appears to have differential transfer effects for "fast" and "slow" learners. Also, pointing

out potentially useful bases of organization in the material to be learned seems to have differential transfer effects for "fast" and "slow" learners. For example, in two different studies, instructions concerning the categorized nature of the list to be learned facilitated the performance of "slow" learners while having either no effect of a detrimental effect for "fast" learners. However, since a similar effect was not obtained with alphabetic organization, the boundary effects of the instruction and the to-be-learned material are not understood.

Finally, associative and categorical norms for "fast" and "slow" learners were collected.

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T. J. S.

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Chapter 1: INTRODUCTION

Differences among individuals are obvious. However, the actual extent of these differences, the reasons for their existence, the significance of these differences, and how these differences relate to one another in a lawful manner are anything but obvious! While many differences are apparent and influential, the way these differences contribute to our understanding is not always clear. Some differences, such as differences among species, are frequently overlooked and are considered by many to be of little interest in understanding human behavior and of little practical importance. Other easily recognizable differences, such as Women's Liberation and the Black Revolution, are of considerable importance and do add to our understanding of the human situation; however, they sometimes miss differences which may be more fundamental and which in the long run, add considerably more to what we already know about human behavior.

Most psychologists interested in individual differences are concerned, in one way or another, with differences that already exist in behavior among individuals. Those interested in learning, however, are more concerned with changes in behavior and the way individuals differ in the manner that such changes in behavior occur rather than existing behavior. Many things can make one person different from another. The way in which our thinking about individual differences is conceptualized involves or relates to, either implicitly or explicitly, philosophical, theological, political, social, and economic considerations as well as psychological factors. As someone interested primarily in basic research in education, I feel that all of these factors are important. However, the purpose of the present project has been to investigate some of the sources of individual differences in human learning and retention.

My main concern in this area is with why individuals differ, if in fact they do, in the process by which new behaviors or competencies are learned. Therefore, the more specific purpose of this project has been to investigate and try to understand some of the reasons for the substantial differences we observe among individuals in performance on even simple learning tasks. There are several somewhat different perspectives from which this problem can be conceptualized.

First, in talking about individual differences in learning it is useful to keep in mind the nature of the variables with which

we are concerned and how individuals might differ with respect to those variables. For example, if we are interested in the role of reinforcement in operant conditioning, it is one thing to be concerned with whether or not reinforcement is important for learning to occur in different individuals and quite another issue as to the type of reinforcement which is effective for a given individual. If the reinforcement is a necessary condition for learning in some individuals but not for other individuals, we are dealing with an entirely different problem than the situation in which we find that money--but not praise--is an effective reinforcer for some individuals while praise--but not money--is an effective reinforcer for other individuals. Reinforcement may possibly be a necessary condition of learning for all individuals, but individuals may differ, for a variety of reasons, in what will serve as an effective reinforcer.

For purposes of comparison and clarification, it is possible to make an analogy between the learning process and certain biological processes, such as digestion, which are perhaps more conspicuous and which provide a somewhat clearer example of some of the issues involved. Everyone digests food on a regular basis, and we perhaps assume that the process of digestion is the same for everyone. However, most of us are aware that different types of foods are digested in a number of ways. For example, proteins and carbohydrates are digested by the body by quite different processes. There is obviously a fair amount of similarity between this fact and the suggestion that there are various types of learning (Gagné, 1970), each involving somewhat different processes. While perhaps the differences associated with different types of competencies to be learned and different types of foods to be digested are related to task analysis and are quite important for understanding the overall process involved, one might quite legitimately raise the question: What does this have to do with individual differences? The answer has to be that we do not know at present.

While there are surprisingly large differences among individuals in physiological factors related to digestion such as the size and shape of the stomach and the amount of various ameno acids, serine, glycene, etc. present in an individual's saliva (Williams, 1956), we know almost nothing about how these individual differences relate to the process of digestion. In a number of respects, biology is not much better off than psychology! However, there are some obvious individual differences in physiological characteristics which do affect digestion just as there are obvious individual differences in the process which affects learning. Perhaps a good example of a physiological characteristic is diabetes and an example of a learning related characteristic is mental retardation. A detailed consideration of the implications of these

factors, however, is beyond the scope of this monograph. We actually know very little about individual differences in either digestion or learning, especially how these differences relate to the overall, general process.

Second, we can be concerned with the source of the individual differences which are present at any given time and which can affect the learning of an individual at that time. Obviously, some differences are determined by genetic factors (although the specific factors determined by genetics are not so obvious) while others are determined from the past experience of the individual. A consideration of the nature-nurture issue and how it relates to learning is also beyond the scope of this monograph. However, some consideration of these two sources does help to put our problem in perspective. Most, if not all, modern investigators would acknowledge that both factors in varying degrees are involved.

Differences among individuals' past experience can be related to learning in at least two ways. First, the extent to which an individual has already learned some or all of the prerequisites for what he is presently learning will obviously have an influence on how well or how quickly the individual learns the task. Thus, if there is positive transfer between Task A and Task B, and some individuals have learned Task A while others have not, it should be obvious that these differences will show up in the learning of Task B even though none of the individuals may actually differ in their ability to learn Task B if the prerequisites are learned first. Since learning in most real-life and even laboratory situations is probably much more complex than the example just cited, it is perhaps not too surprising that the variety of individual differences in learning a specified task is as great as it is. Second, different individuals may have previously learned different strategies for going about learning a specific type of task. Strategies can be interpreted very broadly here to include things other than just methods of organization. Frequently, methods of learning and previous knowledge are not easily overcome and are often very difficult to specify; yet, these factors have a considerable influence on how an individual goes about learning a new task and even what he learns in that task.

Educational Implications

The educational or practical implications of basic research such as that being conducted as part of this project are not always immediately obvious to some individuals. The potential interaction between basic and applied research is sometimes overlooked by researchers as well as laymen. Just as the study of individual differences can shed insight into the more general process or processes of learning and just as knowledge about general laws should guide our search for individual differences and how they relate to these general laws, the interaction between basic theoretical issues and practical problems can contribute to both concerns. Rohwer (1972) has presented an excellent discussion and example of how basic research can contribute to our understanding and improvement of practical educational issues.

The current concern for individualizing instruction and the growing field of research and interest in Aptitude by Treatment Interaction (ATI) (e.g., Cronbach & Snow, 1969; Bracht, 1970), is another example of the interaction between basic and applied research, although the approach that I am taking in this monograph is somewhat different from the approach taken by most researchers doing work in the area of ATI.

While the short range goal of the research conducted in this project is to better understand the basic nature of individual differences in learning and retention, the long range goals are for this understanding to contribute to the improvement of instructional techniques and environment. The exact way in which the knowledge obtained in this project will affect these long range outcomes, however, is not clear at present. A reasonable analogy that exemplifies both the nature of the research strategy which is being followed and the potential practical implications or relationships of such research is provided by the example of vision and glasses. The fact that individuals differ in visual acuity is so obvious that we almost take it for granted. However, it is not quite so obvious that the source of these differences result from individuals differing in the focal length of the lens and the relationship between this focal length and the distance from the lens to the retina. Once this relationship is realized, it is possible to ask questions about how this focal length might be changed. One way this can be accomplished is by placing glasses ground in specific ways in front of the eyes so that the image will focus on the retina. Thus, the widespread

use of glasses to reduce individual differences in visual acuity is dependent upon an understanding of how these individual differences relate to the visual process.

While it is premature to even speculate on how analogous techniques or procedures may be used to reduce individual differences in ability to learn, such possibilities do exist, although as Bereiter (1969) has pointed out most of the techniques or tools we presently know about tend to amplify rather than equalize the differences among individuals. Hopefully, the type of research conducted as part of this project will contribute to our knowledge of how people learn, so that other more obvious but less important differences, such as race, sex and IQ, will become virtually irrelevant to learning and performance.

Approach to the Problem

The approach to the study of individual differences taken in this project differs from much of the research which has been done on individual differences. Frequently, the research in this area is characterized by the use of mental or paper-and-pencil tests rather than actual measures of performance on a learning task. The scores on these mental tests are usually factor analyzed in the hope of isolating common sources of variance, thereby reducing the number of factors contributing to the variability obtained in the various test scores. Some studies (e.g., Duncanson, 1966; Stake, 1961) have included measures of performance from various learning tasks in their test batteries, however, the typical finding is that there are few meaningful relationships between the tests of mental abilities and the performance on various learning tasks. Unfortunately, this research is too seldom guided by any kind of a theoretical framework, especially a theory concerning the potential relationship between the various mental abilities and learning.

One of the important characteristics of the present research is that it begins with the variability in a learning task and then searches for specific variables that will explain the difference in performance between those who do well on the task and those who do poorly. Thus, the type of research question being asked is concerned with variables that interact with the individual differences obtained on the performance measure; the psychometrician, on the other hand, is usually concerned with determining the

extent to which various mental tests are related to one another and sometimes to scores obtained from various learning tasks. While this project has evolved out of an experimental rather than a psychometric framework, it is becoming increasingly difficult to separate the two different approaches to the problem (Cronbach, 1957; Cronbach & Snow, 1969: Glaser, 1972).

Another characteristic of this research is its concern for intrinsic rather than extrinsic sources of individual differences (Jensen, 1964, 1967). Much of the research on individual differences in learning has investigated individual differences which are obvious, such as sex, race, IQ, and socio-economic status, but which are only indirectly related to the learning processes. In this project, we have been more concerned with variables which are thought to be more directly involved in the learning process such as presentation rate, short term memory, instructions to organize, etc.

In this project, learning ability was operationally defined in terms of performance on a free-recall task consisting of either one or two lists of words presented for a single trial. There were several reasons for selecting the free-recall paradigm. First, the task is simple enough so that it is relatively easy to analyze and investigate the variables and process involved in free-recall learning. Second, the paradigm represents a type of learning/recall that frequently occurs in real-life situations. Third, complex and organizational factors, as well as more simple factors, are involved in free-recall learning. Finally, there is a fairly well developed theory of free-recall learning (e.g., Tulving, 1968). In each study Ss were ranked on the basis of their performance on this pretest, and the upper and lower thirds were operationally defined as "fast" and "slow" learners, respectively. However, all Ss were tested on all tasks, and at times the analyses were not limited to these defined ability groups. While this grouping is somewhat arbitrary, it seems to provide a relatively good balance between those Ss scoring in the upper and lower parts of the distribution and the number of Ss necessary for reasonable statistical analyses. The exact procedures followed in administering the pretest and the exact nature of the pretest is described in detail for each study in the appropriate chapter of this monograph.

After defining learning ability in this manner, the next step of each study involved experimental manipulations of variables

which were felt to be potentially related to learning ability and which would differentially affect the performance of "fast" and "slow" learners. In order for this procedure to be valid, it is necessary for the difference between "fast" and "slow" learners to be significant in the main experimental task. Otherwise, we could not be certain that we were dealing with stable differences among individuals or that the pretest was related in any meaningful way to the main learning task. This replication of the ability factor was obtained in all of the studies conducted for this project.

Methodological Considerations

A number of important methodological issues arise in the context of studying individual differences. One of the most important of these issues involves the appropriate method for analyzing the data. Cronbach and Snow (1969) present a very strong case for the use of regression analysis, especially when one is investigating Aptitude by Treatment Interactions. While the research conducted in the present project is similar to most of the research on ATI's in that statistical interactions, or the lack of them, are the most important source of information for getting at the questions the investigator is most interested in answering, there are a number of noteworthy differences.

Both approaches to the problem involve, or are based on to some extent, a combination of the psychometric and experimental traditions of psychology. However, one difference which probably subsumes a number of other differences is that most of the ATI research has evolved primarily from the psychometric tradition while the present research has evolved primarily from the experimental tradition. Another difference is that ATI research is usually concerned with comparing a measure or measures (usually independent or relatively independent) of performance or achievement under different treatments while the present research is primarily concerned with trial-by-trial performance of subjects with different "ability."

One of the points made by Cronbach and Snow (1969) is that regression analysis is more powerful than the use of analysis of variance with a "blocked" design in which groups of Ss are formed according to their scores on the aptitude variable, the distribution usually being split at the median or into upper,

middle, and lower thirds. The rationale behind their position is that such a split ignores differences in aptitude within the upper and lower blocks and that the use of a regression analysis reduces the error term by taking these differences into account.

However, this is not always the case. A good example is our study on learning ability and instructions to categorize (cf. Chapter 7 of this monograph). A multivariate analysis of variance for repeated measures was used for analyzing the affect of different instructions for the upper and lower thirds of the distribution on an aptitude measure (a pretest of learning ability). In effect, this analysis compares the performance over all six trials of the learning task for the two ability groups. The within-group variance for this total score was 609.85. A regression analysis was also done with the total number of words which a subject recalled on all six trials of the learning task being regressed on the pretest score (measure of aptitude). The pooled, adjusted variance for the total score was 603.73 (652.66 for one treatment group and 541.11 for the other). The reduction in the error variance is negligible, but, more important, the interaction was statistically significant with the multivariate analysis of variance, $F(1,45) = 4.82$, $p = .03$, while it was not significant with the regression analysis, $F(1,69) = 1.90$, $p = .17$.

The above analysis of variance excluded the middle third of the distribution while the regression analysis did not exclude them. Such a procedure throws away some of the data, but I wonder how important this data was to begin with, especially if one is concerned with exploring some of the potential differences between those scoring high and those scoring low on some aptitude measure rather than being concerned with making practical decisions. Perhaps if we could obtain a better understanding of how and why individuals differ on some aptitude we would be able, at some later time, to make better practical decisions.

The selection of the upper and lower thirds of the distribution was, of course, completely arbitrary; any other split could have been used just about as easily. However, in certain types of research such arbitrariness may not be critical. Cronbach and Snow (1969) admit that such procedures may have certain benefits.

> Extreme-groups designs are often advantageous, if one can sample subjects from a larger pool. One way, for

example, choose the highest and lowest fifths of the aptitude distribution, assigning half of each group to each treatment. This is a relatively powerful way of establishing interactions. (p. 21)

This apparent contradiction to their earlier statement that regression analysis is usually more powerful than the use of analysis of variance needs to be explored further.

To my knowledge, there has never been a systematic study comparing the statistical power of regression analysis and analysis of variance. My suspicions are that there would be many situations in which an analysis of variance would be more powerful than a regression analysis, although this would probably depend on the type of design involved, e.g., the extent to which the ability groups represent the extremes of the distribution, as well as the number of Ss involved. The appropriate selection of an analysis would depend, of course, on the purpose of the study and the type of question that the investigator is asking.

One informal indication of the relative power of the two analyses may be the "rule of thumb" used for selecting the number of Ss for a study. Researchers using experimental designs and analysis of variance for analyzing their data usually feel that approximately 15 to 20 Ss are sufficient for detecting worthwhile differences in their data; researchers who use correlational procedures for analyzing their data usually feel that approximately 100 Ss are the minimum number which should be used for a study. The appropriateness and statistical power of various types of experimental designs and procedures for the study of individual differences need to be considered and discussed at more length than they have been at the present time.

Chapter 2: EXPERIMENTAL STUDIES OF INDIVIDUAL DIFFERENCES IN LEARNING AND RETENTION

It is not particularly easy to trace the history of concern for individual differences within psychology--especially as they relate to learning and retention--and it is equally difficult to formulate an adequate perspective for the study of individual differences and the relationship of these differences to general laws of behavior. A number of complicated and interwoven factors are involved in the development of research on individual differences and developing a meaningful perspective or theoretical framework for understanding the role of individual differences in behavior. These factors include a concern for basic vs. applied problems and/or questions within psychology, the correlational vs. experimental methods for gathering and analyzing data, the earlier British and German traditions in psychology, and concern for individual vs. general aspects of behavior (Boring, 1957, e.g., pp. 478-508; Cronbach, 1957; Glaser, 1967, 1972).

Sir Francis Galton was probably the first person to become systematically concerned with the problem of individual differences in humans. His primary interest with resepct to individual differences was with the heritability of mental capacity/ability and with the measurement and description of the range of differences that exist in people. Galton developed both the "mental test" and the correlation coefficient, although it is probably James Cattell, an American who received his Ph.D. from Wilhelm Wundt (the German who is generally considered to be the founder of experimental psychology), who has had the most impact on the study of individual differences. The development and use of mental tests by the armed forces in America during World Wars I and II and the widespread use of intelligence tests in American schools have given considerable impetus to this type of research.

Most of the research on learning has been done within the experimental tradition of psychology. This research has been concerned with the discovery of general laws of behavior that are applicable to all humans. Individual differences have usually been viewed as a nuisance, something that adds to the error variance making it more difficult to isolate the effect of the treatment variables which were of major concern. When individual differences were considered, they were usually viewed as parameters or empirical constants of the general equations of human behavior (Hull, 1945). In contrast, the correlational psychologist has sought to minimize or ignore the effects of

various treatments in order to investigate the variability among individuals within a treatment--in a sense, treatment variance has been a nuisance to the correlational psychologist.

Most psychologists who have been concerned with individual differences have been interested in practical issues and predictions of how different individuals will behave or react in certain situations. Experimental psychologists, on the other hand, have tended to be interested more in explanation and theoretical issues than in practical prediction. Their concern with prediction has been with how the average individual behaves or reacts in a specified situation; of course, the assumption has usually been that all individuals would react the same way if all the variables were known and controlled. Very few researchers have seen how the two are related to one another and how the study of individual differences can add to our understanding of general processes and how our knowledge of general processes can further our understanding of individual differences. While Cronbach's (1957) widely known and cited presidental address to the American Psychological Association called for the correlational and experimental discipline to join forces in the study of individual differences, it is somewhat surprising that little actual research has been done to integrate the two approaches in the 15 years since he addressed the APA. While it did foreshadow the presently increasing interest in research on ATIs (e.g., Bracht, 1970; Cronbach & Snow, 1969), research on individual differences within the experimental framework has been less obvious and systematic. A notable early exception to this, however, is the conference on learning and individual differences held at the Learning Research and Development Center at the University of Pittsburgh in April, 1965 (Gagné, 1967).

While obvious differences, such as sex, I.Q., and race, are important in understanding the complexities of behavior, they usually add little to our knowledge of the basic underlying processes of how people learn. Most differential psychologists are primarily interested in describing and explaining existing differences in behavior. As a learning psychologist, however, my main concern is with changes in behavior, rather than behavior as it exists at any one time.

Jensen (1964, 1967) has suggested a taxomony of individual differences that has had some usefulness in organizing and conceptualizing the issue involved in studying individual differences in learning. One distinction Jensen emphasizes is between

intrinsic and extrinsic individual differences. Intrinsic differences are those which exist in the learning process itself. Extrinsic differences are primarily subject variables which are not directly involved in the learning process but which may influence, or be related to, performance on learning tasks. Another way of looking at it is to think of intrinsic differences as those differences in learning while extrinsic sources of individual differences are those differences which have an effect on learning.

Nearly all of the research on individual differences in learning have focused on extrinsic sources such as chronological age, mental age, sex, race, socio-economic-status, personality characteristics, and similar factors. Without denying the importance of these sources of differences, especially for some practical situations, it is probably fair to say that these studies have contributed very little to our understanding of the learning process itself.

Intrinsic sources of differences, on the other hand, being directly related to the learning process should be able to give us a much better understanding of why individuals differ in the way they learn. Examples of intrinsic differences might include, but are not limited to, susceptibility to interference, reaction time, rate of neural consolidation, transfer (i.e., ability to apply information already learned), etc. Unfortunately, very little research has been done on how these factors affect individual differences in learning.

There have been several symposia and discussion groups at the annual meetings of the American Educational Research Association in recent years directly dealing with intrinsic sources of individual differences. The distinction between intrinsic and extrinsic sources of individual differences has been a heuristic tool to researchers in this area. This tool is now, perhaps, losing some of its impetus because researchers are beginning to realize that individual differences are more complex than implied by this distinction and there is a great deal of difficulty involved in actually classifying research into one of the two classes.

Individual Differences in Learning

The widely known research of Clyde Noble on meaningfulness in verbal learning has included a number of studies which were concerned with individual differences (cf. Noble, 1961). In both his dissertation (Noble, 1952) which used a serial-learning task and a later paired-associate study (Noble & McNeely, 1957), significant interactions were obtained between learning ability and meaningfulness (m) of the words used in the main learning task. In both studies, learning ability was defined in terms of the Ss' performance on a practice list which preceeded the main learning task. The interactions obtained indicate that "slow" learners are more sensitive than "fast" learners to variations in meaningfulness in that the difference in performance between the groups receiving lists of high and low meaningfulness was greater for the "slow" learners than it was for the "fast" learners.

In a later study (Cieutat, Stockwell & Noble, 1958), however, just the opposite results were obtained when CVC trigrams were used; the two earlier studies had both used nouns and paralogs. This finding may have resulted from the fact that the list was extremely difficult. A 10-item list was presented for 20 learning trials; over all 20 learning trials of the low m list, the "slow" learners recalled an average of 5.0 items while the "fast" learners recalled an average of 7.0 items. On the list of medium m, the average correct recall was 24.8 and 38.0 for the "slow" and "fast" learners, respectively--an average of between 1 and 2 items per trial. This excessive difficulty may have produced a basement effect or have influenced the motivation of the learners making the results somewhat equivocal.

Carroll and Burke (1965) defined learning ability in terms of Part V, Paired Associates, of the Modern Language Aptitude Test (MLAT) (Carroll & Sapon, 1958) and failed to obtain a statistically significant interaction between learning ability and meaningfulness on a subsequent paired-associate learning task. However, there was a tendency for "fast" learners to do better than "slow" learners on the list of medium m while very little difference was obtained between the performance of the two ability groups on the lists of low and high m. However; since the correlation obtained between the MLAT scores and performance on a practice list which preceeded the main learning task was only .24, it is not entirely clear how comparable this study is with the studies done by Noble. Thus, while there is some indication

that learning ability interacts with the meaningfulness of the material to be learned, the nature and boundary conditions of this interaction are not clear at present.

Another paired-associate study by Noble (1959) investigated the relationship between learning ability and practice. The Ss were classified into four ability groups on the basis of their performance on the first 8 trials of a 20-trial task. The interaction between ability and performance was significant, but unfortunately, the performance during the first 8 trials was included in the analysis making the results extremely difficult to interpret. A visual inspection of the learning curves after Trial 8 indicates that the curves are very close to being parallel. Noble, Gerrish and Koski (1966), however, did two similar studies using a serial-learning task; learning ability was defined in terms of performance on a practice list preceeding the main list. In both studies there was a significant interaction between ability and performance as a function of practice.

These studies are reminiscent of the many earlier studies (e.g., Kincaid, 1925; Woodrow, 1938) which were done to investigate whether individual differences increase or decrease with practice. One important difference, however, is that most of the earlier studies used tests that look more like tests of mental ability than learning tasks, e.g., substitution, horizontal adding, reproduction of spot-patterns, rearranging letters to make words (i.e., anagram solutions), cancellation of letters with complex instructions, estimating lengths, etc. Woodrow (1938) concluded that the convergence or divergence of the performance of various ability groups depends primarily on the shape of the learning curve and the position of various Ss on that curve as a result of experiences they have had prior to their participation in the study. He also presented evidence that the convergence or divergence of performance depends on the task involved, a consequence which can be explained in terms of the two basic factors involved.

The difficulty in dealing with these factors and the fact that the use of raw scores and standard scores sometimes leads one to exactly opposite conclusions, raises serious question to the fruitfulness of this type of research at the present time. I cannot help but wonder if maybe the question being asked is partly at fault; if we better understood the role of individual differences in the learning process and had better task analyses of the learning tasks being used, we would better understand why

a convergence or divergence of performance among individuals of varying ability might be obtained in different situations, with different types of learning tasks, when different types of measures are used, etc.

A large amount of the research in verbal learning has, in one way or another, centered around the concept of interference. Thus, it might be reasonable to expect that one potential source of individual differences in learning and retention might be differential susceptibility to interference.

Jensen (1964) conducted a rather large scale project to investigate some of the ways interference relates to individual differences in learning. Five hundred and thirty college Ss were given a battery of tests and learning tasks. The scores on these tests were then factor analyzed in an attempt to isolate potential sources of individual differences. The tests in the battery included immediate and delayed digit span, retroactive and proactive inhibition of digit span, forward and backward digit span either pre or post cues, repeated digit span, serial learning involving retroactive inhibition, serial lists that were hypothesized to differ in amount of intralist interference; Raven's Progressive Matrices, neuroticism (anxiety), and extraversion. The results and conclusions of the project are much too lengthy to summarize here; for present purposes, it will probably suffice to mention that some of the factors Jensen identified as underlying individual differences in learning included initial strength of the stimulus trace, speed of consolidation of the stimulus trace, resistance to interference with the consolidation of the trace, and resistance to response competition among already consolidated associations.

Stroud and Carter (1961) investigated the relationship between learning ability and interference factors by varying the length of the list to be learned. Learning ability was defined in terms of performance on a pretest consisting of two different lists of paired-associates; the upper and lower 15% of the distribution were defined as "fast" and "slow" learners, respectively. Long lists generally required a disproportional amount of time to learn relative to short lists, supposedly because of the interference involved. Therefore, it was reasoned that lists of different lengths might differentially affect the performance of fast and slow learners. Two lists of paired adjectives were used in the main part of the study; one list consisted of 12 items, the other consisted of 24 items. During the learning

of the list, each item was removed from the list after it had been correctly recalled two times; this procedure was followed to reduce overlearning of some items--each item was recalled the same number of times--and it reduced the total amount of time required for learning. Each S learned the short and long lists on different days and recalled each list after 24 hours. There was a significant interaction between learning ability and list length indicating that the difference in the number of trials required to learn the short and long lists was greater for "slow" learners than it was for "fast" learners. However, the proportional increase in the number of trials required to learn the two lists was slightly larger for the "fast learners (3.97) than for the "slow" learners (3.19). The authors suggest that their data provides some evidence that "slow" learners are more susceptible than "fast" learners to interlist interference. Schoer (1962) obtained very comparable results with lists of 7 and 14 items learned by the standard, whole-list method of paired-associate learning.

A good example of the way in which the study of individual differences can make a contribution to more general theories of learning are two studies done by Plenderleith and Postman (1956, 1957) which investigated individual differences in incidental and intentional learning. Earlier studies by Postman and his associates provided considerable data on incidental learning, and they were beginning to develop a theory of incidental learning based on this data. Plenderleith and Postman (1956) analyzed this earlier research and concluded that there are two characteristics of Ss which should be related to performance in an incidental learning task. The first of these was the S's ability to discriminate and categorize stimulus-materials along more than one dimension, i.e., the ability to maintain a multiple set. Second, since they concluded that recall in incidental learning depends to a large extent on the degree to which the stimulus items have been differentiated during exposure, it was felt that another factor important to performance was the availability and effectiveness of differential responses to the stimulus items. They then developed tests to measure these two factors and subsequently correlated these measures with performance in both incidental and intentional learning tasks.

The test they developed for measuring the ability to maintain a multiple set consisted of a series of 21 different patterns of 12 symbols each (varying numbers of capital letters, small letters, and digits) which were presented to the Ss one at a time. For the first 8 slides, the Ss had to report only the digits, i.e., he operated under a single set. For the

remaining 13 slides, he was to recall either the digits or the capital letters, but he wasn't told until after each pattern had been presented which type of symbol he was to recall for that particular pattern, i.e., he operated under a double or multiple set. The difference in the number of digits which a S could recall under the single- and double-set instructions was taken as a measure of the S's ability to maintain a multiple set.

In order to measure the availability and effectiveness of differential responses, Ss were asked to solve anagrams formed from very common words. The time allowed for this task was purposely insufficient for solution of all the items, and it was felt that this task provided a measure of the S's ability to differentiate nonsense-stimuli in terms of their similarity to conventional meaningful units. Thus, the number of anagrams correctly solved was used as a measure of differential responses.

The intentional learning task consisted of four alternate study-recall trials of free-recall learning; the stimulus list consisted of 20 low-frequency nonsense syllables. The incidential learning task consisted of 20 nonsense syllables, and the orienting task required the Ss to match each syllable with various geometric designs. After the matching task, the Ss were asked to recall, in any order they wished, as many of the syllables as they could remember. The results were consistent with their original expectations; the correlations obtained among the various scores was higher for incidental learning than they were for intentional learning for both the symbol discrimination decrement (-.42 vs. .16) and performance on the anagram task (.25 vs. .11). The correlations between intentional learning and incidental learning increased progressively as a function of trials of intentional learning. In addition, the correlation between intentional learning and the symbol discrimination decrement and the correlation between intentional learning the anagram task became more nearly like those obtained with incidental learning by Trial 4 of intentional learning, -.18 and .19, respectively. However, the extremely low average performance on the incidental learning task (2.71) and Trial 1 of the intentional learning task (4.55) makes it somewhat difficult to interpret some of the coefficients obtained. They concluded that incidental learning is more sensitive than intentional learning to individual differences in verbal and discriminative skill. With relatively simple learning tasks, the high motivation in intentional learning masks some of the differences in habits and sets. They further reasoned that as the intentional learning task becomes more complex, increasingly

similar patterns of correlations with the measures of discriminative and verbal skills could be expected for the two types of learning. However, the assumption that learning becomes more complex as learning progresses is somewhat moot, and in view of the limited distributions of scores on the incidental learning task and the first trial of the intentional task, this conclusion should probably be viewed with some caution.

In a second study (Plenderleith & Postman, 1957), they further investigated the extent to which the linguistic habits of the Ss influences incidental learning. More specifically, they were concerned with the associative strength of the differential responses made by the Ss during learning. This problem was approached from two directions. First, the strength, or associative potency, of a response was measured by the frequency with which it was given across all of the Ss; the more Ss giving the response, the stronger that response was considered to be. Second, from the perspective of the S, potency was assumed to be reflected in the conventionality of the response; the more a particular S gave popular associative responses to a particular class of stimuli, the more conventional were his responses. The two investigators then argued that the recall of stimulus items should be a joint function of the potency of the item and the conventionality of the subject.

The Ss were presented two lists and asked to make associations to each item. One list consisted of 20 nonsense syllables and another list consisted of 100 common words. On the basis of norms collected earlier, each list was divided into items of high and low potency. Half of the Ss were told to learn the list, but all of the Ss were asked to recall as many of the items as they could remember after they had completed the association task. A significantly larger percentage of words was recalled than syllables, and more items of high potency were recalled than items of low potency, although this effect was statistically significant for only the syllables. The correlation between conventionality scores and recall scores was significant for both low potency words (.36) and low potency syllables (.48) under conditions of incidental learning. Thus, the investigators' hypotheses were again confirmed.

Another example of an attempt to investigate the relationship between general theory and individual differences is a series of studies by Gorfein, Blair and Rowland (1968a, 1968b, 1969). Tulving (1962b, 1968) has developed a theory of free-recall

learning based on subjective organization (SO), i.e., the extent and manner in which Ss organize the material to be learned. Gorfein, Blair and Rowland wanted to investigate the possibility that individual differences in SO could be considered to be a general ability factor. The Ss received seven alternate study-recall trials on each of four lists differing in the type of material to be learned. One list was composed of CCCs of medium Associative Value; another list of CVCs representing the full range of m; another list consisted of 10 words representing each of 4 conceptual categories; and the remaining list was composed of "unrelated" words. Each list consisted of 40 items and was learned according to typical free-recall procedures. Two different measures of SO were used, and low to moderate correlations of SO were obtained among the four different lists. For both measures, moderate correlations were obtained among the CVC, unrelated word list and the categorized word list. The correlation between the CVC and CCC list was moderate for one measure and low for the other; the correlations between the CCC list and the two word lists were very close to zero for both measures. They concluded that there was no evidence in their data for a generalized ability that could be referred to as subjective organization, although it was possible to obtain generalized measures of organizational ability in free-recall studies using similar materials such as words and some CVCs. In addition, they concluded that the number of words which a S recalled in free-recall learning is influenced by his ability to perform in free-recall studies in general as well as his ability to encode and retain specific kinds of materials (Gorfein, Blair & Rowland, 1968b).

A somewhat different approach to the study of individual differences in SO has been taken by Earhard (1967, 1970; Earhard & Endicott, 1969). In these studies, the Ss initially learned a 22-item list of unrelated words which was presented for 16 trials of free-recall learning. Depending on the particular study, those Ss scoring either above or below the median or whose scores were at the extremes of the distribution were designated as either high or low subjective organizers. The Ss then learned a new list presented in either a preferred or nonpreferred order in several different learning paradigms. Both the preferred and non-preferred lists included the same words, but the preferred-order list consisted of sequences of pairs of words most frequently found in the recall records of Ss in an earlier study while the nonpreferred-order list consisted of sequences of pairs of words never recalled in succession on the final trial of the earlier study. In free-recall learning

"high" organizers learned both orders equally well, but "poor" organizers recalled more words when the list was presented in the preferred order (Earhard, 1967). For serial recall (Earhard, 1967) and with a double-function paired-associate list (Earhard & Endicott, 1969), both "high" and "low" organizers did better on the preferred-order list, but "high" SO Ss did better than "low" SO Ss on both orders of the list, i.e., there was no interaction between ability and type of list. In serial-anticipation learning (Earhard & Endicott, 1969), "high" organizers learned the preferred-order list more rapidly than any of the other groups; the performance of these latter three groups did not differ from one another. Earhard suggests that these results support the idea that "high" organizers perform better because they are better able than "low" organizers to form and maintain interitem associations. In a related study (Earhard, 1970), she found that "high" and "low" organizers performed equally well on a short-term memory task (cf. Chapter 3).

A somewhat different example of the way data from individual Ss can be used to clarify general theories is a study done by Mandler (1968b) to verify a model of free-recall learning developed earlier (Mandler, 1967, 1968a). Data from earlier studies (Mandler, 1967) indicated that the number of words which a S recalls from a list of unrelated words is a linear function of the number of categories used by the S in organizing the list. The Ss were first asked to sort a list of 100 words into anywhere from two to seven categories, with the Ss choosing the number of categories which he wanted to use. The sorting procedure was continued until the S sorted the words in the same way on two successive sorts with at least 95% identity. Immediately following the sorting task, the S was asked to recall as many of the words from the list as he could.

All of the data in the earlier studies were based on a between-subject design with different Ss providing the different data points for the function between recall and number of categories used. Even though the likelihood of the relationship being based on the fact that poor learners just use fewer categories was reduced when the Ss were instructed in the number of categories they were to use, Mandler (1968b) reasoned that if the model he proposed was valid that the relationship should still hold when a single S provides all of the data. Therefore, five Ss repeated the sorting-recall procedure with 12 different lists in 12 individual sessions spaced over a period of six weeks. Each time the S was told to use between two and seven

categories; the exact number of categories to be used in a particular session was specified by the experimenter.

The linear relationship between recall and number of categories used in sorting was obtained for all five Ss; the slopes of the function varied from 2.36 to 4.17 with a median of 3.60 which was fairly close to the value of 3.9 which was obtained in the earlier between-subject designs. The intercepts for the five Ss, however, were much more variable, ranging from 8.74 to 25.93. Mandler suggested that of the two sets of values (slope and intercept), that the intercept is probably the more appropriate measure of individual differences since it most likely represents recall based on organization other than that expressed by the categories used during sorting and therefore reflects individual differences in the way material is organized. The slope, on the other hand, Mandler feels represents a basic limitation of human memory and should show little individual variation. However, the finding that there is less variation among individuals in the slope does not necessarily preclude the possibility that there may be stable individual differences in those factors which determine the value obtained for the slope. Also, it is unfortunate that while he acknowledges time as a confounding variable for some of the earlier studies (even though some of the studies controlled for total sorting time), he did not report the times taken by the individual Ss in the present study.

Two recent studies (Jensen, 1971; Levin, Rohwer & Cleary, 1971) have investigated individual differences in mode of presentation. Jensen was concerned with visual and auditory presentation of a digit memory span test with either immediate or 10-second delayed recall of the items. All Ss received series of digits ranging in length from two to nine digits and were tested at both time intervals on each of two days. Each S was tested under one of the four possible combinations of sensory modalities, e.g., visual-auditory, on the two days. Auditory memory was slightly better than visual memory on the immediate test, but on the delayed test there was a fairly substantial difference between the two modalities with performance for the visual group being superior to that for the auditory group. However, correlations between individual differences in auditory and visual memory were not significantly different from unity for either the immediate or delayed intervals. Thus, there does not appear to be individual differences in short-term memory which are related to the sensory modality

of the input. However, there were significant subject by recall-interval interactions for both the visual and auditory modes; some Ss had greater memory decrements after delayed recall than did others even though virtually all Ss had poorer recall on the delayed test than they did on the immediate test.

Levin, Rohwer and Cleary (1971) investigated individual differences in preference or relative performance between paired associates presented verbally and pictorially. The Ss received two trials on each of two 25-item lists separated by 48 hours. Each list consisted of five items presented under each of five different modes of presentation; verbal, pictorial, and three different combinations of verbal and pictorial. The latter three conditions were ignored for purposes of the present analysis. The Ss were grouped in terms of three extrinsic sources of individual differences: SES-race, grade level, and sex. They were further classified in terms of their relative performance on verbal and pictorial items on the first paired-associate list (recall of pictorial items minus recall of verbal items); the investigators were interested in determining whether or not this classification would predict item-type performance on the second list. In general, performance was better on pictorial items than on verbal items--i.e., few Ss recalled more verbal items than pictorial items--although there were rather large differences in the amount of discrepancy between the recall of the two types of items. High P-V Ss (as defined by the first test) had larger differences between the recall of the two types of items in the second test than Low P-V Ss in ten of the 12 reference samples formed by the three extrinsic-difference factors although the difference was statistically significant in only five of the samples. While the authors were aware of several limitations of the post hoc analysis of data originally gathered for another study, the data are consistent with the idea of individual differences in preference for mode. While the data are somewhat inconsistent with the results of Jensen's (1971) study, differences in procedures, tasks, and population makes it difficult to attempt a reconciliation of the two studies.

Individual Differences in Retention

While there are obviously large individual differences in learning ability, it does not necessarily follow that similar

differences are present in memory. On a priori grounds it is possible that "fast" learners forget at the same, at a faster, or at a slower rate than "slow" learners.

An early study by Gillette (1936) indicated that fast learners retain more than slow learners, and for many years this generalization appeared in a variety of textbooks (cf. Underwood, 1954). For example, McGeoch and Irion's (1952) popular book on The Psychology of Learning stated that "By and large, individual differences in learning are reflected in individual differences in retention." (p. 325) However, there are now a number of studies which indicate that fast and slow learners forget at the same rate.

In investigating individual differences in memory, there are several things that should be kept in mind. First, in considering a question of this nature, it is important to recognize the distinction between learning and retention (cf. Underwood, 1963). While it is true that learning is always inferred from a performance measure of retention, it can be somewhat misleading to view learning and retention as a continuous process. A study of learning is concerned with the acquisition of a specific task while a study of retention is concerned with how well the task is retained once it has been acquired.

Second, in order to study potential differences in retention, it is necessary, of course, to equate the Ss on variables known to affect retention. Probably the most important of these variables is degree of original learning (Underwood, 1964). Therefore, in determining whether fast and slow learners differ in rate of forgetting, it is necessary to insure that they have attained the same level of performance before the start of the retention interval. Otherwise, differences, or lack of differences, in the amount remembered may merely reflect differences in the degree of original learning.

There are several ways by which performance can be equated: differential numbers of exposure trials, list of different length, study intervals of different durations, and probability matching. However, it should be mentioned that while these procedures can equate the terminal levels of performance attained by the various groups under investigation, this is accomplished by confounding the equating procedure with the independent variable of interest, e.g., learning ability. Unfortunately, little is known about the consequences of this necessary con-

founding, so that the outcomes of retention studies in which such equating procedures have been employed must be interpreted with some degree of caution. However, if similar results are obtained in studies using different methods of equation, it is probably reasonable to conclude that the results are valid unless there is some reason to suspect that all of the confounded variables have the same affect on performance.

Underwood (1954) made the first attempt to control for degree of original learning. By performing a successive probability analysis on data from five different studies of paired-associated learning, he discovered that the probability of recalling an item correctly on the succeeding trial when that item had been correctly anticipated on previous trials once, twice, three times, etc. was consistently lower for "slow" learners than it was for "fast" learners. Therefore, each correct recall of an item had less of an affect on the associative strength of an item for "slow" learners than it did for "fast" learners, although it was possible to equate the probability of correct recall on the next trial for the two ability groups by allowing the "slow" learners to have more correct anticipations of each item than was allowed the "fast" learner.

After 24 hours, the recall of items which had been correctly anticipated an equal number of times during learning was greater for "fast" learners than it was for "slow" learners. However, when the two ability groups were matched in terms of the probability of correctly recalling an item on the next trial, the probability of correctly recalling the item 24 hours later was virtually equivalent for "fast" and "slow" learners over a wide range of correct anticipation during learning.

Gregory and Bunch (1959) investigated this ame problem with children between 10 and 14. The Ss learned a 10-item list comprised of geometric drawings as stimuli and the number 1 through 10 as the responses. Apparently they did not use a constant rate of presentation since the Ss were allowed tocontinue giving responses until they were correct. The list was learned to a criterion of one perfect recitation. In one study the list was immediately relearned while in a second study the list was relearned after 24 hours. Learning ability was defined in terms of the number of trials required to reach criterion with the upper and lower quartile being defined as "fast" and "slow" learners, respectively. While the two ability groups differ in their rate of learning--by definition as well as statistically--

there was not a significant difference between the two groups in relearning the list even though this measure of retention confounds retention and learning ability.

Stroud and Schoer (1959) had 149 college students learn, recall 24 hours later, and then relearn foud different lists. Two of these lists consisted of 12 pairs of adjectives while the other two lists each consisted of 10 pairs of pictures of male students and fictitious first and last names. Each list was learned to a criterion of one perfect recitation; 24 hours later the Ss were asked to recall the list and then relearn it to the same criterion. The correlations obtained between the number of trials to learn the list and the number of items correct on the recall test were near zero and not significant for the two lists of paired adjectives, but significant correlations were obtained between learning and recall for the two picture-name lists (r = -.23 and -.25). When the Ss were split into fifths on the basis of the number of trials to learn on each of the four lists, the differences obtained among the recall scores of the various fifths were small and not significant for any of the four lists. Relearning scores are confounded with learning ability and therefore are not as critical to the analysis of the relationship between learning ability and memory as are the recall scores. They concluded that the results of their various analyzes "suggest no more than a slight relationship between rate of learning and recall." (p. 291)

Later in his dissertation Schoer (1962) investigated the effect of list length and interpolated learning on recall for fast and slow learners. Learning ability was defined in terms of the Ss' performance on a pretest involving paired-associate learning; this pretest was administered to college students in their classroom. Roughly the upper and lower fourth of the distribution were defined as "fast" and "slow" learners, respectively. Ss learned either a 7-item or 14-item list of paired adjectives to a criterion of two consecutive perfect trials and then returned 24 hours later to recall and then relearn the list. Just prior to recall half of the Ss in each ability group learned a 9-item interpolated list. This interpolated list produced a decrement in recall for both fast and slow learners, and it affected the recall of fast and slow learners to about the same extent, i.e., there was no interaction. Likewise, fast and slow learners recalled an equivalent number of items for both the 7- and 14-item lists.

Shuell and Keppel (1970) used fifth-grade children to investigate the same proble-. However, they used the free-recall rather than the paired-associate paradigm, and they equated performance by using different rates of presentation for the two ability groups. Learning ability was defined in terms of the Ss' performance on a pretest consisting of a single presentation of a list of 30 nouns at a 2-sec. rate to all Ss. Roughly, the upper and lower thirds of the distribution were defined as "fast" and "slow" learners, respectively. In a pilot study they found that both "fast" and "slow" learners recalled the same number of words if they list was presented to the "fast" learners at a 1-sec. rate and to the "slow" learners at a 5-sec. rate. In two separate studies they compared the recall of the two ability groups immediately after receiving a single study-recall trial on a list of nouns and after 24 and 48 hours. In neither experiment was there any indication that the "fast" and "slow" learners forgot at different rates although both groups did forget some of the words.

These studies all indicate that individual differences in learning are not related to individual differences in memory. There may be stable individual differences in retention, but if there are it seems very likely that they are not related to or determined by the substantial individual differences that are obtained in learning. The study reported in Chapter 3 of this monograph suggests that this lack of relationship holds for short-term as well as long-term memory.

Chapter 3: LEARNING ABILITY AND SHORT TERM MEMORY*

While there are obvious differences among individuals in their performance on a simple learning task, it does not necessarily follow that similar differences are also present in memory. For example, previous research (e.g., Shuell & Keppel, 1970) has shown that "fast" and "slow" learners, as defined by performance on a simple learning task, forget at the same rate over relatively long periods of time (e.g., 48 hours) if they are equated for degree of original learning. In recent years a number of researchers and theorists (e.g., Baddeley & Dale, 1966; Waugh & Norman, 1965) have distinguished between long-term and short-term memory. Thus, it is possible that there is a relationship between learning ability and short-term memory without a similar relationship existing between learning ability and long-term memory.

It is reasonable to expect a relationship between learning ability and short-term memory since the retention intervals involved in both intratrial and intertrial retention are rarely longer than 30 sec. Individuals who have poor short-term memory would remember fewer words after a single trial and retain fewer words on successive trials; thus, they would learn the task more slowly than individuals who have better short-term memory. The finding by Underwood and Keppel (1963) that in paired-associate learning "fast" learners are more likely than "slow" learners to recall a word on the trial immediately following the trial on which the word is recalled for the first time is consistent with such an interpretation, and the results of the study on Learning Ability and Alphabetic Organization (cf. Chapter 6 of this monograph) replicates this finding.

However, these data are equivocal since there is no way of knowing whether or not words recalled for the first time by "fast" and "slow" learners are equivalent in strength; we know only that the words were above the threshold for omission. It is possible that the difference between the two groups resulted from differences in the degree to which items were learned above the threshold necessary for the word to be recalled. In order to investigate potential differences in memory, it is necessary

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*This study was done in collaboration with John Giglio and will be published in the Journal of Educational Psychology.

to equate the groups in degree of original learning before the start of the retention interval (Shuell & Keppel, 1970). Otherwise, differences, or lack of differences, in the amount remembered may merely reflect differences in the degree of original learning. When a dichotomous measure is used, the groups should be equated at some level of performance less than 100%.

The purpose of the two studies reported in this chapter is to investigate the relationship between learning ability and short-term memory when "fast" and "slow" learners have been equated in degree of original learning. In the typical short-term memory study, the material to be recalled is usually an individual term which is either recalled or not recalled. Sometimes this item is a trigram, but usually all three letters must be recalled in the correct order for the item to be scored as correctly recalled. In the present studies, the material to be remembered is a string of consonants; the dependent variable is the number of consonants recalled regardless of order. The use of this measure avoids the problems inherent in a dichotomous measure and provides a means of equating performance at some level less than 100%. It also provides a task more similar to the task used to define learning ability--performance on a standard free-recall test.

The first experiment was designed to determine the experimental conditions which could be used to equate the performance of the two ability groups at some level less than 100%. The second experiment investigates the short-term memory of "fast" and "slow" learners when their performance is equivalent immediately following presentation of the stimulus material.

Experiment I

Method

Design. The experimental design was basically a 2x3x3 factorial with two levels of learning ability (as determined by the pretest described below), three lengths of consonant strings to be recalled (3, 5, and 7 consonants), and three presentations rates (0.5, 1.0, and 2.0 sec.).

Materials. A list of 20 nouns was randomly selected from the 1,000 most frequent words in the English language (Thorndike & Lorge, 1944) for use in the pretest. The stimulus materials for the experimental testing consisted of strings of 3, 5, and

7 consonants. Three strings of each length were used. The three trigrams were randomly selected from the 4% and 8% levels of Witmer's (1935) norms. The six longer strings were constructed so that each possible three letter combination in the string was also in the 4% or 8% range according to Witmer.

Procedure. The pretest consisted of a single presentation of a list of 20 simple nouns to all 222 Ss in the study. The words were presented at a 2-sec. rate by means of an automatic slide projector. After all 20 words had been presented, a special slide (++++++) signaled the end of the list. The Ss had been instructed that when this slide appeared they were to write down, in any order they wished, as many of the words as they could remember. Three minutes were allowed for recall. Minor spelling errors were ignored, and the Ss were ranked on the basis of the number of words correctly recalled. Those Ss scoring in the upper and lower thirds of the distribution were classified as "fast" and "slow" learners, respectively.

Experimental testing took place approximately 3 weeks after pretesting. The Ss were shown a string of consonants at one of the three presentation rates on a two-channel tachistoscope which projected the consonants onto a screen. A slide containing three rows of asterisks was shown before and immediately following the consonants, and the Ss were instructed to write down, in any order they wished, as many of the consonants as they could remember as soon as the asterisks reappeared. Ten seconds were allowed for recall. All Ss were tested under all nine combinations of string length and presentation rate in a fully counterbalanced order. The consonants were written on a slip of paper which was turned over after each test; a new slip of paper was used for each test. The order in which the three strings of each length were shown was also counterbalanced.

Subjects. The Ss were 222 fifth-grade students from three elementary schools. The pretesting was conducted in the regular classrooms. The Ss were ranked without regard to school, and Ss in each ability group were randomly assigned to one of the 27 conditions (9 major conditions and 3 orders of testing). Experimental testing was conducted in a separate room in groups of one to five children. All Ss were given the experimental test, although only the data from the Ss in the two ability groups defined above were used in analyzing the results. Subjects from both ability groups were tested at the same time if they were assigned to the same experimental condition. Two Ss from the original sample did not receive the experimental testing.

Results and Discussion

The overall mean number of words recalled by all 222 Ss on the 20-word pretest was 7.51, SD = 1.88. The mean of the "fast" learners on the pretest was 9.51, SD = 0.97, and the mean of the "slow" learners was 5.46, SD = 1.10.

The combined means for the various conditions on the experimental task are presented in Table 1. An inspection of these means reveals a direct relationship between number of consonants recalled and the length of the string, $F(2,142) = 17.8$, $p<.01$, and also a direct relationship between number of consonants recalled and presentation rate, $F(2,142) = 17.9$, $p<.01$. The differences in performance between the two ability groups was small (3.09 vs. 3.06) and not statistically significant, $F(1,145) = .08$. None of the interactions approached statistical significance.

These results indicate that the performance of fast and slow learners is equivalent immediately following presentation of a consonant string under all of the various conditions used in this study. This finding is supported by the non significant correlation of .08 that was obtained between performance on the pretest and the total number of consonants recalled under all nine conditions on the experimental test for all 220 Ss. Thus, it appears as though any of the conditions could be used for investigating potential differences in short-term memory between "fast" and "slow" learners since the performance of the two ability groups should be equivalent at the beginning of the retention interval.

Experiment II

The purpose of the second experiment was to investigate the relationship between learning ability and short-term memory when performance immediately following the presentation of the stimulus materials has been equated at some level less than 100%. The results of Experiment I indicate that any of the conditions used in that study would be appropriate for presenting the stimulus material in the present study. We decided to use a five-consonant string and a 2-sec. presentation rate; these conditions should equate the performance of the two ability groups at approximately 70%, increase the likelihood that the materials are within the memory span of all Ss and maximize the opportunity for the Ss to perceive and process the materials.

Table 1

Mean Number of Consonants Recalled on Experimental Task in Exp. 1

Conditions	Presentation Rate 0.5 sec.	1.0 sec.	2.0 sec.	Row Totals
3 Consonants				2.75
"Fast"	2.68	2.71	2.81	2.73
"Slow"	2.73	2.78	2.81	2.77
5 Consonants				3.10
"Fast"	2.84	3.07	3.48	3.13
"Slow"	2.81	2.91	3.49	3.07
7 Consonants				3.37
"Fast"	3.07	3.32	3.82	3.40
"Slow"	2.95	3.41	3.66	3.34
Column Totals				
Both	2.84	3.03	3.34	3.07
"Fast"	2.86	3.03	3.37	3.09
"Slow"	2.83	3.03	3.32	3.06

Note--n = 73 for the "Fast" learners and 74 for the "Slow" learners.

Method

Design and procedure. The experimental design was a 2x4 factorial with two ability groups (as determined by a pretest) and four retention intervals (0, 10, 20, and 30 sec.). The pretest consisted of a single presentation of a list of 25 simple nouns. The words were presented at a 2-sec. rate by an automatic slide projector. Following the presentation of the list, the Ss were given 3 min. to write down, in any order, as many of the words as they could remember. Minor spelling errors were ignored, and the Ss were ranked on the basis of the number of words recalled. Those Ss scoring in the upper and lower thirds of the distribution were classified as "fast" and "slow" learners, respectively.

Approximately three weeks later the experimental testing was conducted. The Ss were shown a string of five consonants for 2 sec. on a two-channel tachistoscope. The slide containing the consonants was preceeded by a slide containing three rows of asterisks and followed either by the same slide of asterisks (in the 0-sec. delay condition) or by a slide containing a two-digit number (in the other 3 conditions). The Ss had been instructed that if a number appeared they were to begin counting backward by ones on their recall sheet until a bell sounded; when the bell sounded they were to write down as many of the consonants that they had seen as they could remember in any order they wished. For the 0-sec. condition the bell sounded as soon as the asterisks reappeared. Ten seconds were allowed for recall. All of the Ss were tested at each of the four retention intervals in a fully counterbalanced order with a different slip of paper used for each test. Four different five-consonant strings were selected from the same source used for Experiment I. Each string was used equally often at each retention interval in a fully counterbalanced order.

Subjects. The Ss were 213 fifth-grade students from two elementary schools; none of the Ss in this study had participated in Experiment I. The pretesting was conducted in the regular classrooms. The Ss were ranked without regard to school, and Ss in each ability group were randomly assigned to one of the 16 conditions (4 retention intervals and 4 orders of testing). Experimental testing was conducted in a separate room in groups of one to eight children. All Ss were given the experimental test, although only the data from the Ss in the two ability groups defined above were used in analyzing the results. Subjects from

both ability groups were tested at the same time if they were assigned to the same experimental conditions. Eight Ss from the original sample (2, 1, and 5 from the upper, middle, and lower thirds, respectively) did not receive the experimental testing.

Results and Discussion

The overall mean number of words recalled by all 213 Ss on the 25-word pretest was 7.62, SD = 2.47. The mean of the 71 "fast" learners on the pretest was 10.28, SD = 1.26, and the mean of the 71 "slow" learners was 4.85, SD = 1.23.

The combined mean numbers of consonants recalled at each retention interval by the two ability groups are presented in Fig. 1. A multivariate analysis of variance for repeated measures indicated that the overall difference in performance between the two ability groups was significant, $F(1,133) = 11.94$, $p<.01$, and that significant forgetting occurred across the various retention intervals, $F(3,131) = 8.07$, $p<.01$. However, the interaction between learning ability and retention interval was not significant, $F(3,131) = .67$.

Thus, these data suggest that both "fast" and "slow" learners forget at the same rate over short intervals of time. The difference between the two ability groups was essentially the same at each retention interval, and this difference can be attributed to the difference in level of original learning which is apparent at the 0-sec. interval. Unfortunately, a definitive conclusion cannot be drawn from the present study since the performance of the two groups was not equivalent at the beginning of the retention interval (i.e., 0 sec.). The importance of this failure to obtain equivalent performance at the beginning of the retention interval is perhaps moot. Performance of both groups was sufficiently below the 100% ceiling (52% and 40% for the fast and slow learners, respectively), and the failure to obtain an interaction between learning ability and retention interval is consistent with the notion that individual differences in learning ability cannot be explained in terms of corresponding individual differences in short-term memory.

The reasons for not obtaining equivalent performance for fast and slow learners on the 0-sec. test are not obvious. Both

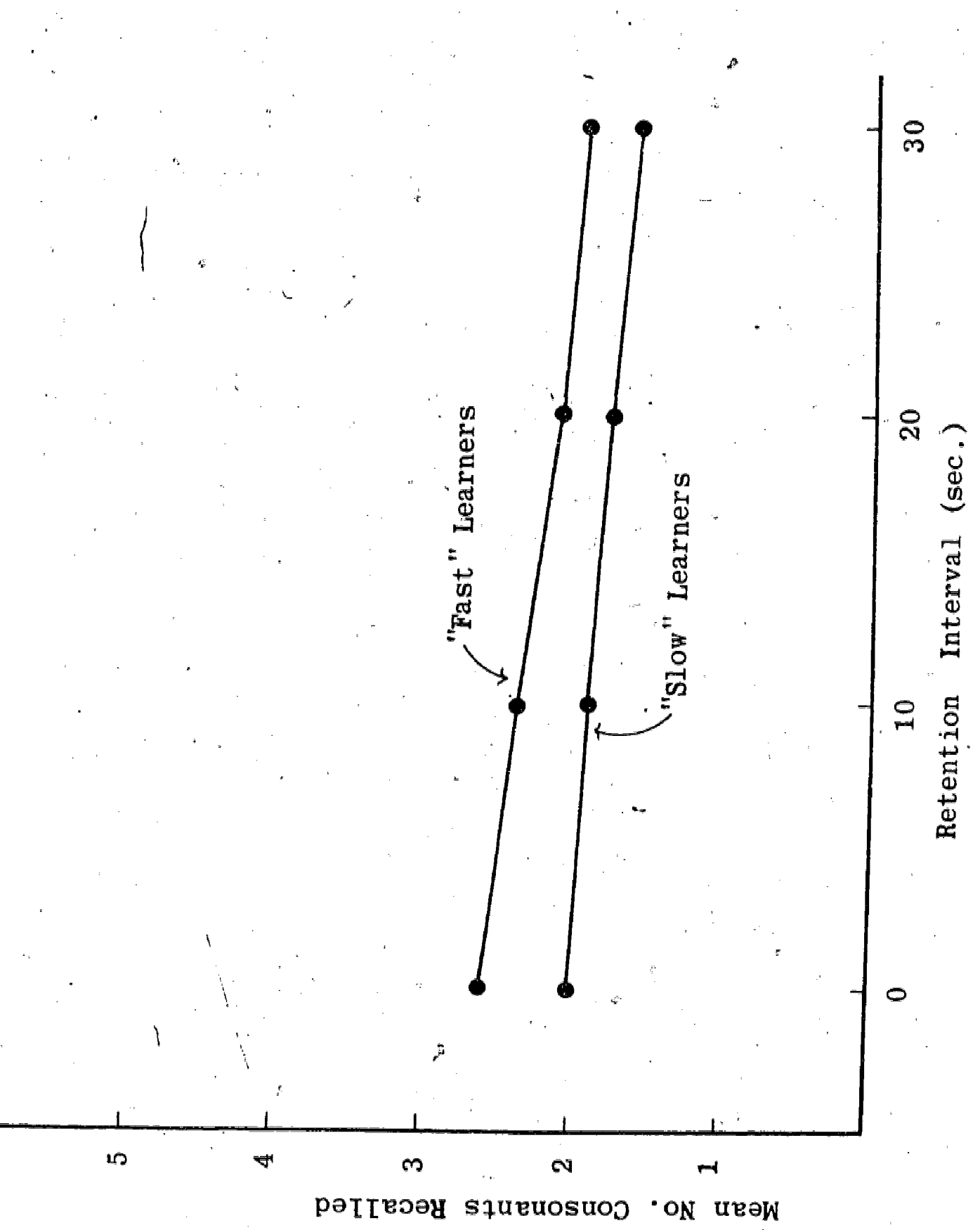

Fig. 1. Mean numbers of consonants recalled at each retention interval.

groups performed more poorly than similar Ss did in Experiment I under near identical conditions. The only major difference between the two studies was the number of different testing conditions which the Ss could expect. In Experiment I the Ss were asked to respond in the same manner immediately following each stimulus presentation. In Experiment II they were required to recall the consonants immediately following presentation on only one of the four tests; on the other three tests a two-digit number appeared and they had to count backwards until they heard the bell ring. The Ss didn't know until after the consonants had been presented (i.e., when either the number appeared or the masking slide reappeared and the bell rang) which set of conditions they would have for that particular test. Thus, the experimental task in Experiment II is somewhat more complex than the task in Experiment I. Perhaps the Ss had not fully understood the instructions or mastered the requirements of the task; if this was the case, it would be expected that the resultant effect would be larger for slow learners than for fast learners. It is also possible that the necessity of being prepared to respond in two different ways affects level of performance and has a larger effect on slow learners than on fast learners.

Results similar to those obtained in the present study have been reported by Earhard (1970) when college Ss were classified in terms of subjective organization rather than performance. A moderate to high correlation is usually obtained between performance and subjective organization, and she reports a correlation of .67 between the two scores for her pretest when it was used in another study (Earhard, 1967). The procedure developed by Peterson and Peterson (1959) was followed, and the retention of consonant trigrams was measured at six intervals up to 18 sec. While no mention is made of how the trigrams were scored, it is probably safe to assume that the standard procedure was used in which a trigram is scored as correctly recalled if all three consonants are recalled in the correct order. Thus, while there are several important differences between the two studies, Earhard's (1970) data are consistent with the present results.

In the introduction we mentioned the difference that is obtained between fast and slow learners in the probability of correctly recalling an item on the trial immediately following the trial on which it is recalled for the first time. The locus of this difference apparently lies in either the effectiveness of encoding or the degree to which an item is learned above the threshold necessary for recall, rather than in short-term memory.

Individual differences in learning ability or performance are apparently not related to individual differences in either short-term memory or long-term memory (Shuell & Keppel, 1970). It seems likely that these differences are associated with individual differences in what the individual has already learned or in his ability to apply previously learned information to the learning task in which he is currently engaged.

Chapter 4: LEARNING ABILITY, STUDY TIME, AND LEARNING-TO-LEARN*

Reasons for obtaining individual differences in performance on a learning task are presently obscure. One possible source of these differences might be related to the amount of study time allowed for learning the task. For example, if a relatively fast presentation rate is used, "fast" learners may be able to make efficient use of the time allowed while "slow" learners may find that the time allowed is not sufficient for processing the material to be learned. If a slower presentation rate is used, it is possible that the slow learners may find the additional time sufficient for processing the material, but the fast learners may be able to make only limited use of the additional time since they are able to process the material in less time. Thus, slow learners may profit more than fast learners from additional study time.

Shuell & Keppel (1970) found that "fast" and "slow" learners profit from additional study to about the same extent when all subjects learn only a single list. However, other research (e.g., Duncan, 1960) suggests that "slow" learners benefit more than "fast" learners from repeated practice on the same type of learning task, i.e., learning-to-learn. Also, the slope of the linear relationship between the number of words recalled and the total time required to present the list obtained by Shuell & Keppel (1970) was not as steep as the slope obtained by Murdock (1960). Shuell and Keppel suggested that this difference might have resulted from the fact that their subjects learned only a single list while Murdock's subjects were tested on a variety of different lists.

The purpose of the present study is to investigate the possibility that with repeated practice on the same type of learning task "fast" and "slow" learners will differ in the extent to which they can make effective use of additional study time.

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*This study was done in collaboration with Linda DeAngelo and was presented at the American Educational Research Association in New York, February, 1971.

Method

Design. The experimental design was basically a 2x3x2 factorial with two ability groups (as determined by the pretest described below), three presentation rates (1, 2, and 5 sec/word), and two levels of practice (0 and 5 previously learned lists). The first two factors consisted of independent groups while the third factor involved repeated measures of the same subjects.

Materials. Seven lists of nouns randomly selected from the 1,000 most frequent words in the English language (Thorndike & Lorge, 1944) were used in the study. The list used for the pretest consisted of 25 nouns, and the six lists used for experimental testing contained 22 nouns each. In the experimental testing each of the six lists was used equally often at each level of practice.

Procedure. The pretest consisted of a single presentation of the 25 words at a 2-second rate. The words were presented by means of an automatic slide projector. After all 25 words had been presented, a special slide (+++++) signaled the end of the list. The Ss had been instructed that when the special slide appeared they were to pick up their pencils and write down, in any order they wished, as many of the words as they could remember. The Ss were told that if they were unsure of a word they could guess and that the correct spelling of the words was not crucial. They were allowed 2 minutes to recall the words. Minor spelling errors were corrected, and Ss were ranked on the basis of the number of words correctly recalled. The upper and lower thirds of the distribution were classified as "fast" and "slow" learners, respectively.

Experimental testing took place approximately 3 weeks after the pretest. All Ss learned a total of six lists during the experimental testing. Each list of 22 words was presented once at the prescribed presentation rate, and 2 minutes were allowed for recalling each list. The procedures for learning the lists were the smae as those used for the pretest. Each S was tested twice at each of the three presentation rates in a counterbalanced order with the restriction that a given rate could not be used a second time until all rates had been used once. Within each ability group Ss were randomly assigned to one of the three presentation rates for the initial test. Each presentation rate and each list was used equally often for each of the six tests.

Subjects. The pretest was administered to 128 fifth-grade students in two elementary schools. Ranking of the Ss was done without regard to the school in which the S was enrolled. Pretesting was conducted in the regular classrooms. For experimental testing Ss from all classrooms in a given school who had been assigned to a particular condition reported to a separate room in groups ranging in size from 1 to 9. All Ss were given the experimental test although only the data from Ss in the two ability groups defined above were used in analyzing the results. Subjects from both ability groups were tested at the same time if they were assigned to the same testing condition.

Results

The overall mean number of words recalled by all Ss on the pretest was 7.45, SD = 2.46. The mean for the "fast" learners was 10.08, SD = 1.51, and the mean for the "slow" learners was 4.88, SD = 1.07. The mean numbers of words recalled by the various conditions on the first and last experimental test are presented in Figure 2. There was a significant difference between the performance of fast and slow learners on both tests, $F(1,73) = 11.41$ and 13.80, $p<.01$, for Test 1 and 6 respectively, indicating that the two ability groups were successfully separated by the pretest. In addition, there was a direct relationship between the number of words recalled and presentation rate, $F(2,73) = 3.24$, $p<.05$, and 7.55, $p<.01$, for Trials 1 and 6 respectively. Neither interaction approached significance.

Murdock's (1960) formula $R_1 = kt + m$ was used for investigating the linear trend across presentation rates for the various groups. In this formula R_1 is the number of words correctly recalled on the first presentation of a list, k is the slope of the linear function, t is the total time required to present the list, and m is a constant. Since in the present study list length was constant for all presentation rates, the total time required to present the list was 22, 44, and 110 seconds for the 1-, 2-, and 5-second rates, respectively. The values of k and m were computed by the least-squares method and are presented in Table 2 along with the values obtained in the two earlier studies. The values of k obtained in the present study are similar to those obtained by Shuell & Keppel (1970), although these values are all considerably lower than the median value obtained by Murdock (1960). The values of m obtained in the present study are somewhat lower than those obtained by Shuell and Keppel.

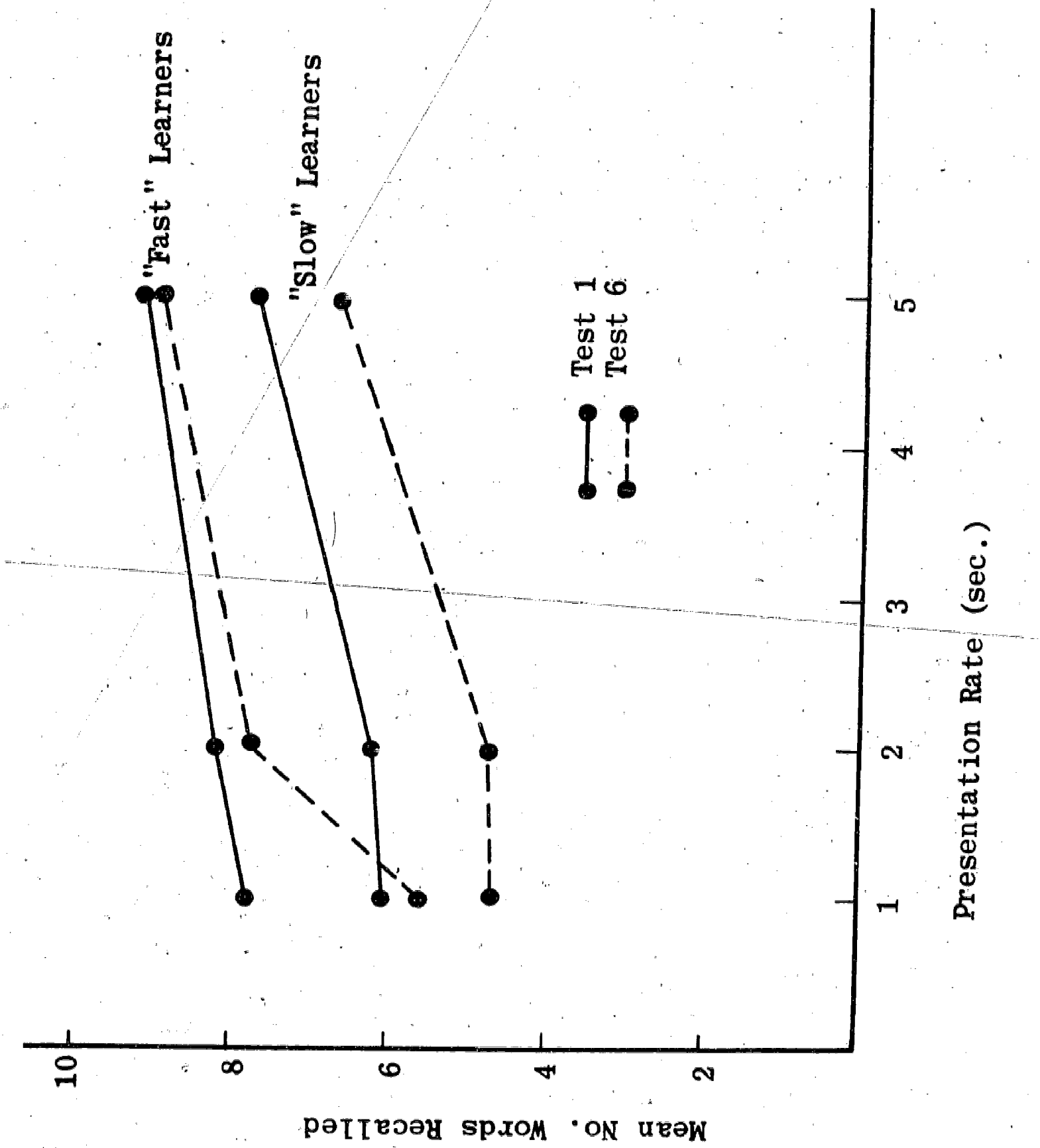

Fig. 2. Mean numbers of words recalled by "fast" and "slow" learners on Tests 1 and 6 as a function of presentation rate.

Table 2

Values of k and m for Number of Words Recalled as a Function of Total Time to Present the List

Study and Group		
Test 1 (Present Study)		
Fast	.015 (.0098)	7.47 (.680)
Slow	.020 (.0094)	5.44 (.646)
Test 6 (Present Study)		
Fast	.033 (.0108)	5.43 (.749)
Slow	.024 (.0103)	3.92 (.708)
Shuell & Keppel (1970)		
Fast	.016 (.0093)	9.74 (.877)
Slow	.029 (.0093)	5.80 (.909)
Murdock (1960)		
Median values	.060	6.1

Note--The standard errors of measurement are presented in parentheses.

An inspection of Figure 2 reveals a decrease in performance from Test 1 to Test 6 for all conditions. Since in the random assignment of presentation rate to test number Ss were tested at the same presentation rate on both Tests 1 and 6, it is possible to test the difference in performance on the two tests. A multivariate analysis of variance for repeated measures indicates that the difference between the tests is significant, $F(1,73) = 13.98$, $p<.01$. None of the interactions were significant, F's<1. The mean numbers of words recalled on each of the six tests by the two ability groups are presented in Table 3. A multivariate analysis of variance indicates that there was a significant decrease in performance as a function of tests, $F(5,73) = 3.70$, $p<.01$. The test by ability interaction was not significant, $F = .29$.

Discussion

The results for Test 1 of the present study are very similar to those obtained by Shuell and Keppel (1970) and serve as a replication of the earlier study. The main difference between the two studies is in the absolute level of performance, and this probably results from the shorter list used in the present study (22 vs. 30 words). In general, the results for Test 6 are the same as those for Test 1. The failure to find an interaction between learning ability and presentation rate for either test suggests that "fast" and "slow" learners profit to the same extent from additional study time and that this finding does not depend on the amount of practice which the subjects have had in learning the particular type of task.

Shuell and Keppel (1970) suggested that one possible explanation for the relatively steeper slope of the linear function obtained by Murdock (1960) may have been that with repeated practice subjects could make more efficient use of additional study time. This hypothesis was not supported by the present results. The reasons for the difference in the slopes obtained in the various studies are not immediately apparent, although one obvious difference is the age of the subjects--Murdock used college students while the other studies used fifth-grade children.

The inverse relationship between the number of prior lists which had been learned and the number of words recalled is an interesting finding. The failure to find an interaction between

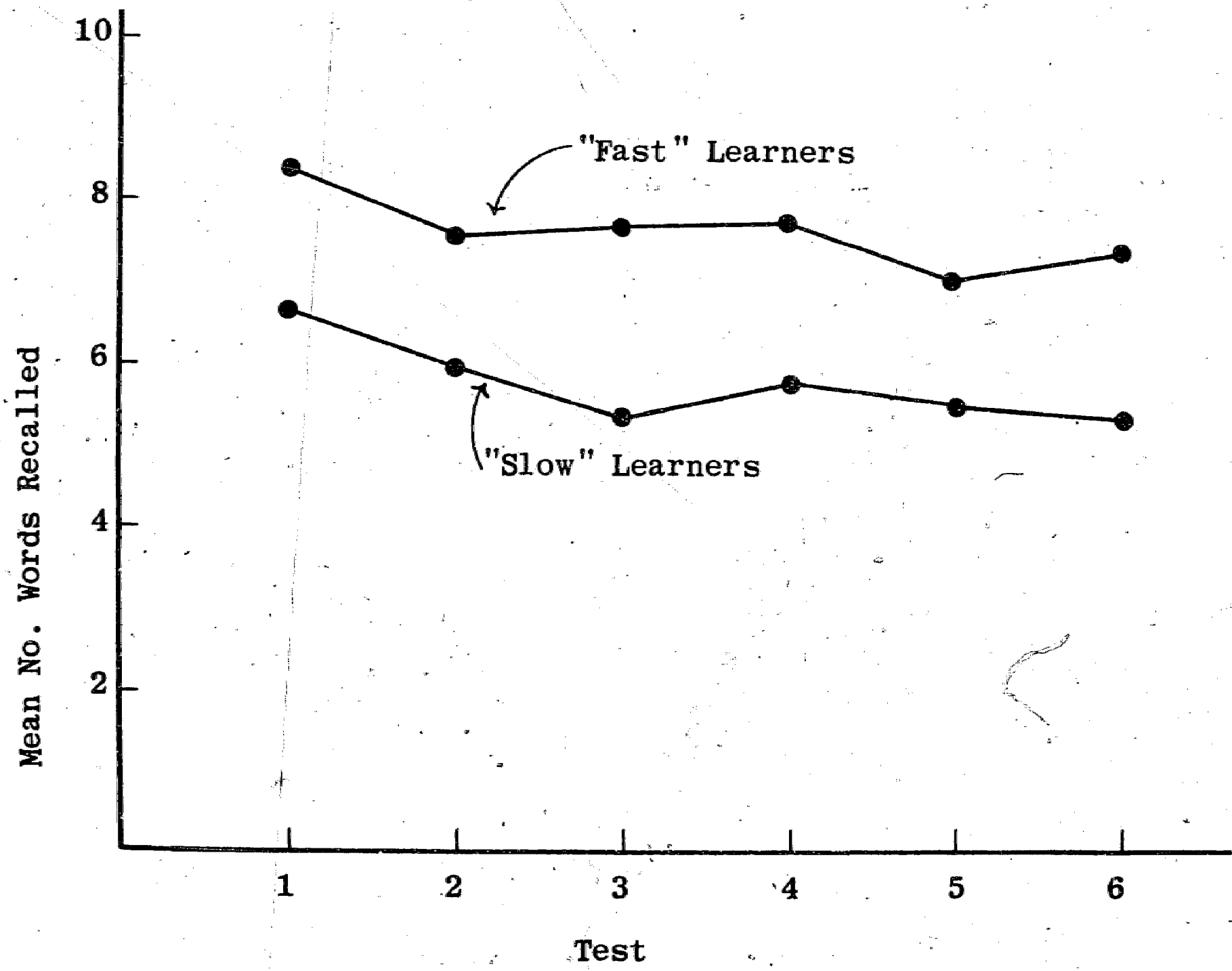

Fig. 3. Mean numbers of words recalled on each test.

learning ability and amount of practice indicates that the decrement is equivalent for both fast and slow learners. While this finding is contrary to other research on learning-to-learn, few studies have investigated learning-to-learn in free-recall learning, and none of these have used children as subjects. It is not clear whether the decrement in performance results from interference or decreased motivation, but the most interesting finding for purposes of the present study is that the decrement is the same for fast and slow learners.

Attempts to isolate the sources of individual differences in performance on a relatively simple learning task such as free recall need to consider factors other than amount of study time available and learning-to-learn. Potential differences in short-term memory, organizational strategies, attention, and/or the past experiences of the individual which could produce differences in such things as meaningfulness of the material may prove worthwhile to consider in future research in this area.

Chapter 5: THE RELATIONSHIP OF FREE-RECALL LEARNING TO OTHER VARIABLES

In this chapter, two attepts to investigate the relationship oflearning ability in free recall to other variables are reported. The first attempt is the reanalysis of data collected for a yet unpublished study by the present writer which investigated the extent to which massed and distributed practice during learning affects retention. The second study correlated free-recall performance in children with a wide variety of measures which were felt might, in one way or another, be related to learning ability. It was hoped that the nature of the obtained correlations might indicate some potential worthwhile directions for future research.

Learning Ability and Distribution of Practice

Hovland (1939) did a study investigating the effect of distributed practice in both serial and paired-associate learning. Each S learned four 9-item paired-associate lists--two lists under conditions of massed practice and two lists under conditions of distributed practice--and four 11-item serial lists--two lists under each condition of practice. The intertrial interval was six seconds with massed practice while with distributed practice the interval was two minutes filled with a color-naming task. For serial learning, the list was learned to a criterion of one perfect recitation more quickly under conditions of distributed practice; however, 22% of the Ss learned the four serial lists more quickly with massed practice while 63% learned more quickly with distributed practice--16% learned equally well with the two conditions of practice. With the paired-associate lists, there was no overall difference between the two conditions of practice, but 44% of the Ss learned the lists more readily with distributed practice while 38% of the Ss learned more readily with massed practice--19% learned equally well with either condition of practice. Unfortunately, he did not make a similar tally with both lists combined. While the data are equivocal, they do suggest the possibility that there may be individual differences in preference for or effectiveness of massed and distributed practice.

The results of another study (Madsen, 1963) suggest that IQ may interact with distribution of practice. Children of high, medium, and low IQ learned a 10-item paired-associate list under conditions of massed (5-second intertrial interval) and distributed (60-second intertrial interval filled with

color naming) practice. For children of low IQ, the list learned by massed practice required almost twice as many trials to reach criterion than was required with the list learned with distributed practice. The high IQ children, on the other hand, learned more readily under conditions of massed practice, although the difference between massed and distributed practice was not statistically significant. There are some difficulties in interpreting the interaction between IQ and condition of practice since the process that would be involved is not completely obvious. Jensen (1964) suggested that perhaps this finding is dependent on the time necessary for a memory trace to be consolidated; with distributed practice sufficient time is allowed for the trace to be consolidated while with massed practice only those Ss who are able to consolidate rapidly (i.e., high IQ) have sufficient time for the consolidation process to be completed. However, it would be interesting if similar data were available on subject variables that are more directly related to the learning process than is IQ.

In an attempt to obtain such data, the results of a study, as yet unpublished, which I had conducted earlier were reanalyzed with this idea in mind. In the study, college Ss spent six alternate study-recall trials learning a list of 24 words by free recall. Half of the Ss received all six trials on a single day (i.e., massed practice), while the remaining Ss received two trials on each of three successive days (i.e., distributed practice). Seventy-two hours later they were asked to recall the list; during this interval, two-thirds of the Ss learned an interpolated list under conditions of either massed or distributed practice while the remaining Ss worked on an unrelated task.

In order to investigate the potential relationship between learning ability and distribution of practice, Ss were ranked on the basis of their performance on the first two trials of learning (before the distribution variable was introduced), and those Ss in the upper and lower thirds of the distribution were defined as "fast" and "slow" learners, respectively. The mean numbers of words recalled on Trial 1 and 2 combined, Trial 6, and the difference between the number of words recalled on Trial 6 and the 72-hour recall on Trial 6 and the 72-hour recall test for Ss in the various conditions are presented in Table 3. For performance on Trial 6, "fast" learners recalled more words than "slow" learners, $F(1, 75) = 46.63$, $p < .01$; while slightly more words were recalled on Trial 6 under conditions of massed practice than under conditions of distributed practice (19.90 vs 18.87). This difference was not statistically significant, $F(1, 75) = 2.40$, $p = .13$. Likewise, the ability-

Table 3

Performance o "Fast" and "Slow" Learners Under Conditions of Massed and Distributed Practice

Condition	n	Trials 1 and 2	Trial 6	Trial 6 Minus Recall
"Fast" Learners				
Massed Practice	19	28.95	21.63	6.79
Distributed Practice	19	30.26	21.58	3.89
"Slow" Learners				
Massed Practice	20	19.25	18.25	9.90
Distributed Practice	21	18.62	16.43	4.48
MSE		8.76	7.73	10.63

by-practice interaction was not significant, $F(1,75) = 1.99$, $p = .16$. Thus, there is no evidence that "fast" and "slow" learners are differentially affected by distribution of practice, although it would have been preferable to have an independent measure of learning ability.

In order to take into consideration the different levels of learning that had been reached by Trial 6, the difference between the number of words recalled on Trial 6 and on the 72-hour retention test was used to measure retention. In testing the differences among the various groups in this measure, the condition of interpolated learning was used in the design in an attempt to increase the precision of the statistical tests. The resulting analysis revealed that "fast" learners forgot fewer words than did "slow" learners (5.34 vs 7.12), $F(1,67) = 6.17$, $p < .05$, although it is possible that this finding could have been influenced by a ceiling effect among some of the "fast" learners. Those Ss who had learned the list under conditions of massed practice forgot almost twice as many words as the Ss who learned the list under conditions of distributed practice (8.39 vs 4.20), $F(1,67) = 32.08$, $p < .01$. However, there was absolutely no indication of an interaction between learning ability and distribution of practice, $F(1,67) = .55$. Thus, while distributed practice during learning resulted in superior retention, this effect was comparable for "fast" and "slow" learners.

Correlations of Learning Ability with Other Variables*

Since we have a very hazy picture of the type of variables which are related to learning ability as it is being defined in this project, it was decided to conduct an exploratory study that hopefully would provide us with information about some of the directions in which research on individual differences in learning might profitably pursue. A variety of different tasks which, for one reason or another, we felt might possibly be related to individual differences in free-recall learning were included. A sample of 47 fifth-grade children in a single elementary school were administered the following tests and simple correlation coefficients were computed among the various measures.

*This study was done in collaboration with Hugh Gash.

Single-Trial Free Recall. The standard measure of learning ability in this project has been performance on a single-trial free recall test. Two lists of 25 simple nouns each were constructed for the present study. Each list was presented separately to the children in their regular classrooms. Each list was presented at a 2-second rate by means of an automatic slide projector; after each complete list had been shown, a special slide indicated the beginning of a three-minute recall period. The number of words correctly recalled from each list and the total number of words recalled from both lists comprised an index of learning ability.

Multi-Trial Free-Recall Learning. While some of the studies conducted as part of this project used multi-trial free-recall learning, none of them continued until a common criterion of performance was attained. Data on the relationship between various measures of learning are limited. It was felt that possible performance in this type of task might differ somewhat from the single-trial tasks we had been using, so it was decided to include this type of task in the study. A list of 10 simple nouns selected from the same source (the 1,000 most frequent words in the English language according to Thorndike & Lorge, 1944) were used for the other free-recall task, although none of the words were the same as those in the previous task. Initially, the list consisted of 12 items, but when the first two Ss were unable to learn the list in a reasonable number of trials, the list was reduced to 10 items (these Ss were subsequently excluded from the analysis since complete data was not available for them). The Ss were tested individually. The words were presented by an automatic slide projector at a 2-second rate; after each presentation, 45 seconds were allowed for written recall. Three different orders of the list were used an equal number of times during learning in a counterbalanced order. The number of words correctly recalled on Trial 1 and the number of trials required to reach a criterion of one perfect recall were used for the study.

Extraversion. There is some evidence that extraversion is related to individual differences in learning and school achievement (e.g., Jensen, 1964; Lynn, 1960; Lynn & Gordon, 1961). In order to obtain a measure of extraversion for the present study, the Junior Eysenck Personality Inventory was administered to the children in their regular classrooms. Six items (#10, 12, 20, 29, 37 and 47) were deleted from the inventory at the request of the Internal Clearance Committee, Bureau of Research, U.S. Office of Education; none of these items were on the Extraversion Scale of

the inventory. The items were deleted by blocking them out with a black felt pen and telling the children not to respond to these items. The inventory was scored with the key provided, and the score obtained for the Extraversion Scale of the inventory was used for the study.

"Meaningfulness" Score for Subjects. A large amount of research (e.g., Noble, 1963) has been conducted on the role of meaningfulness (m) in verbal learning. One standard procedure for obtaining a measure of meaningfulness is to present a group of Ss with a series of stimulus items and ask them to write down as many words as they can that each stimulus item makes them think of; 60 seconds is allowed for the Ss to respond to each item. The total number of responses made by the Ss to each item are divided by the number of Ss responding, and the resulting measure (m) is used as an operational definition of meaningfulness. A number of studies have shown that the m value of the materials to be learned is directly related to the ease in learning the material, and the relationship is well established.

Might there be an analogous measure of individuals that would be related to individual differences in learning ability? Is it possible that Ss who are able to give more responses to stimulus items are also able to learn the items more readily just as high m material is easier to learn than low m material? It was decided to gather data that would be relevant to this possibility in the present study. A booklet of 12 stimulus words preceded by two practice words was given to the Ss in their regular classrooms. These words were all high-frequency nouns selected from the source described earlier. The children were told that this was a test to see how many words they could think of in a short time. Each word was presented on a separate page, and the Ss were asked to write as many things, places, ideas, events, or whatever the key word made them think of, and they were asked to return to the key word after each response. Sixty seconds were allowed for the children to respond to each word.

In order to obtain a score for each individual, the total number of responses which each S generated to the various stimulus words was calculated; the number of responses which each S made to each word was summed across words to get a score for each individual rather than summed across Ss to get a score for each word as is done for the traditional measures of meaningfulness. For half of the Ss, it was necessary to terminate the test after they

had responded to only five of the original 12 stimulus words, although data for all 12 words were available for the remaining Ss. In an attempt to determine if the results would be seriously altered if only the data from the five words responded to by all Ss were used for the analysis, the correlation between the total number of responses made to the first five stimulus words and the total number of responses made to all 12 words was calculated for those Ss who had responded to all of the words. The correlation coefficient obtained was .92. Therefore, it was decided that using the data from the five words would provide us with the same results as using all 12 words, and the five-word data is what is reported.

It is possible, of course, that different Ss respond differently to this task. For example, a S who gives only direct associations to the stimulus word, returning to the stimulus word after making each response as instructed, might generate fewer total associations than another S who generates continuous associations, responding to previously given responses rather than the stimulus word, or who responds in several other different ways. However, these two Ss might obtain comparable scores on the overall meaningfulness rating. Various attempts were made to determine if Ss were in fact responding differently to the task and if these differences in response style might be related to learning ability. For example, one attempt involved searching for superordinate and subordinate associations to the stimulus items. Another attempt involved counting the number of different types of associations generated by the Ss. This latter measure was the only one that seemed feasible to score, and it is included in the analysis.

Average Reaction Time to Say a Word. Another factor which we felt might conceivably be related to learning ability was the effective amount of study or rehearsal time which a S has available for processing each word in the list that he is learning and, therefore, related to his overall performance in learning the list. One possible index of this effective processing time might be the amount of time it takes the S to perceive and react to a word as measured by the reaction time required to say the word. Ten simple words from the same source used previously were projected onto a screen one at a time. The cycling of the projector activated a stop clock which was stopped by a voice-keyed relay when the S said the word. There was a short rest interval between words. The Ss were tested individually, and the average reaction time in milliseconds for all ten words was calculated for each S for use in this study.

Reactive Inhibition. The concept of reactive inhibition (I_R), as an inhibitory potential which builds up as a consequence of making responses, was originally developed by Hull (1943) and incorporated into his well known general theory of behavior. There is some evidence (Eysenck, 1957; Lynn, 1960; Otto, 1965; Otto & Fredricks, 1963) that reactive inhibition is related to both extraversion and the learning of school-like tasks. There are also some similarities between this concept and the notion of individual differences in susceptibility to intralist interference (eg., Stroud & Carter, 1961)

For the present study, an inverted number-printing task (Otto, 1965; Otto & Fredricks, 1963) was used as a means of measuring reactive inhibition. The task was done in the Ss' regular classroom in groups of 25 to 30; three experimenters were present to supervise and insure accurate timing. First, the numbers 1 through 10 were put on the board. The Ss were asked to make their own inversion of each number while one of the experimenters wrote the inversion of each number underneath the numbers already there. As soon as the Ss understood the nature of the task, they were given 12 massed, 30-second trials during which they wrote the inverted numbers on a prepared data sheet consisting of half-inch squares. A verbal signal was given every 30 seconds, and the Ss had been instructed to skip a square when the signal was given. After completing the 12 trials, the Ss were given a five minute rest period, and then they continued the inverted number-printing task for an additional four 30-second trials. The number of inverted numbers recorded during each trial was recorded, and the mean numbers of items written on Trial 1 and 12 of the task prior to the rest period and the four post-rest trials were used for the analysis. The difference between S's performance on the last pre-rest trial (Trial 12) and the first post-rest trial is used as an index of the amount of reactive inhibition which is dissipated by the introduction of the rest period.

Blocking. Blocking refers to those periods of time when an individual engaged in mental activity seems unable to respond and even with effort is unable to continue until a short interval of time has elapsed (Bills, 1931). Obviously, this concept is related to the concept of reactive inhibition, although this relationship has never been developed. Bills (1931) investigated blocking in a variety of tasks and obtained individual differences in speed of response, frequency of blocks, and length of blocks. He found that individuals who respond rapidly tend to have fewer blocks and blocks of shorter length that individuals who respond slowly. The procedure used in the present investigation is a somewhat sophisticated version of one of Bills' original tasks.

The task consisted of presenting a matrix of digits to the S. There were seven rows in the matrix, and each row consisted of 25 digits ranging in value from one to nine. The S's task was to add three to the first number in the row, substract three from the second number in the row, add three to the third number in the row, etc., alternately adding and subtracting three; after the S had responded to all 25 numbers in the first row, he moved to the second row, etc. After working on a pretest string of 25 numbers until the experimenter was convinced that the task was understood, the S was given four minutes to respond to the matrix of digits described previously. He had been told to work as quickly as he could but not to go so fast that he would make mistakes. The Ss were tested individually, and their verbal responses were recorded on a tape recorder.

Later, a visual representation of each S's vocalization was obtained by using a polygraph to make a transcription of the original tape recording. Whenever the S said something, there was a peak in the graphic representation; and to insure that each peak actually represented an appropriate response rather than a cough, static electricity, etc., the experimenter listened to the tape while it was being transcribed and marked each appropriate peak with a pen. A block was operationally defined as a pause greater than two average responses for that S. Unfortunately, the first few responses of each S were lost in the translation. The total number of responses and the number of blocks that occurred during the last three minutes of the task were recorded and used in the analysis.

Results. The means and standard deviations of the various measures are presented in Table 4, and the correlation coefficients among the various measures are presented in Table 5. The most obvious conclusion is that none of the variables considered seem to be related to individual differences in free recall. Moderate correlations were obtained among the various measures of free-recall learning with the exception of Trial-1 performance on the multi-trial task which may have been influenced by the limited range of scores that were obtained on Trial 1 ($\bar{X}$ = 5.38, SD = 1.50)

The only variable that was significantly correlated with performance on any of the free-recall tasks was the number of responses given in the blocking task; those Ss who made fewer responses during the blocking task tended to recall more words on the single-trial free-recall tests. An explanation for this relationship is not immediately obvious. Since very few errors were made on the blocking task by any of the Ss, it is difficult to attribute the relationship to something like concentration or conscientiousness.

Table 4.

Means and Standard Deviations for the Various Measures

Variable	Mean	Standard Deviation
1. First 25-word Free-Recall Test	11.00	2.40
2. Second 25-word Free-Recall Test	10.38	2.68
3. Total Words Recalled From Both Tests	21.38	4.42
4. Trial 1 of Multitrial Free-Recall Test	5.38	1.50
5. Trials to Criterion of One Perfect Recitation on Multitrial Free-Recall Test	7.45	3.64
6. Extraversion Score from the JEPI	11.62	4.62
7. "Meaningfulness" Score for Subjects	39.15	9.63
8. Number of Categories in "Meaningfulness" Score for Subjects	8.72	2.36
9. Average Reaction Time (in milliseconds) to Say a Word	1,582.11	121.34
10. Reactive-Inhibition Task--Trial 1	12.79	5.69
11. Reactive-Inhibition Task--Trial 12	14.38	6.06
12. I_R Task--Post Rest--Trial 1	18.19	7.18
13. I_R Task--Post Rest--Trial 2	15.70	6.27
14. I_R Task--Post Rest--Trial 3	16.11	5.87
15. I_R Task--Post Rest--Trial 4	17.53	6.92
16. Difference Between Trial 12 and First Post-Rest Trial of I_R Task	3.81	5.32
17. Blocking Task--Total Number of Responses	57.47	18.65
18. Blocking Task--Total Number of Blocks	3.51	1.69

Table 5

Intercorrelations (N=47) Among Learning Ability and Other Variables (Decimals omitted)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. First Free-Recall Test																	
2. Second FR Test	51																
3. Total Free Recall	85	88															
4. T 1--Mult. Trial FR	21	04	14														
5. T/C--Mult. Trial FR	-44	-35	-45	-40													
6. Extroversion (JEPI)	04	-03	00	21	-09												
7. Meaningfulness (Total)	-03	-05	-04	23	-23	15											
8. Meaningfulness (Catg.)	-08	-14	-13	12	-21	02	59										
9. Av. Reaction Time	-13	-19	-18	-09	16	02	-08	-16									
10. I_R--Trial 1	17	20	21	07	-21	12	24	-08	04								
11. I_R--Trial 12	-01	16	09	08	02	-08	20	-09	11	66							
12. I_R--Post Rest (T1)	16	19	20	07	-11	-21	19	-05	04	69	69						
13. I_R--Post Rest (T2)	11	11	13	-03	-12	-06	20	-17	-12	70	62	74					
14. I_R--Post Rest (T3)	17	18	20	10	-23	-10	27	01	-12	59	52	76	82				
15. I_R--Post Rest (T4)	-03	02	00	-03	09	-15	05	-25	-04	58	55	69	78	66			
16. I_R--Diff. (T12-PR1)	23	08	17	01	-17	-19	03	03	-06	18	-21	56	28	43	29		
17. Blocking--Responses	-23	-28	-29	-12	18	-18	-16	13	05	-14	-14	02	-01	14	03	19	
18. Blocking--Blocks	09	09	10	-10	15	-22	-01	-25	-22	17	14	14	16	08	27	03	-01

With 47 Ss a value of .29 is required for significance at the .05 level and a value of .43 is required for .01.

The failure to find any kind of a relationship between learning ability and "meaningfulness" scores for the Ss was somewhat of a surprise since meaningfulness of the material to be learned is such a powerful variable. There appear to be substantial individual differences in "meaningfulness" of Ss ($\bar{X}$ = 39.15, SD = 9.63) and these differences appear to be rather stable across the words used in the present study (r's among the 5 words ranged from .36 to .61), but these individual differences certainly do not appear to be related to individual differences in free-recall learning. It is possible that different results would have been obtained if a wider variety of words had been used in the test (all of the words used--Bank, Hill, Pound, Sleep, and Start--are high frequency words), but this seems somewhat unlikely in view of the large individual differences that were obtained.

Chapter 6: LEARNING ABILITY AND TRANSFER OF A CONCEPTUAL SCHEME*

It would seem reasonable to suspect that the efficiency with which one can transfer from one situation to another might be different for learners of varying ability, accounting for at least a portion of observed individual differences. This study investigated the transfer of learning for "fast" and "slow" learners between two successive lists where the organizational structure of the first list was either the same or different from that of the second.

In order to investigate this possibility, the data from an earlier study (Shuell, 1968) were reanalyzed. In this study, college Ss were asked to learn two successive lists, each containing 35 nouns representing seven different conceptual categories. Each list was presented for four alternate study-recall trials of free-recall learning. For half of the Ss, different examples of the same seven categories appeared in the two lists; for the other half, different categories were represented by the words in the two lists.

Since learning ability was not a concern of the earlier study, no pretest was given to define "fast" and "slow" learners. For reanalysis, learning ability, therefore, was defined in terms of performance on the first Trial of the first list. The upper and lower fourths of the distribution were referred to as "fast" and "slow" learners, respectively. A 2 x 2 factorial design was used with two levels of ability ("fast" and "slow") and two conditions of transfer (same and different categories).

Table 6 presents the mean number of words recalled on the last trial of List 1 and on each trial of the Transfer List (i.e., List 2) for each ability-by-transfer group. A multivariate analysis of variance indicated that there was a statistically significant difference between the performance of "fast" and "slow" learners, $F(1, 153) = 59.9$, $p < .01$, and between the two conditions of transfer, $F(1, 153) = 17.53$, $p < .01$. The interaction between learning ability and condition

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This study was done in collaboration with John Giglio who wrote chapter.

Table 6

Mean Numbers of Words Recalled on Trial 4 of List 1 and on the Transfer List by "Fast" and "Slow" learners in each Condition

(Based on data from Shuell, 1968)

Condition	List 1 Trial 4	Transfer List Trial 1	Trial 2	Trial 3	Trial 4
"Fast" Learners					
Same Condition	29.92	17.05	24.61	27.08	28.61
Different Condition	29.63	18.65	26.28	28.16	29.53
"Slow" Learners					
Same Condition	24.14	13.06	18.71	21.06	23.51
Different Condition	25.34	14.12	22.54	25.12	27.73

of transfer was not statistically significant, F (1,153) = 3.29, p = .07. However, there was a significant ability-by-transfer-by-trials interaction, F (3,151) = 3.17, p <.05. One possible interpretation of these results is that after the first trial "slow" learners were affected more by the interference due to the presence of the same categories in each list than were the "fast" learners. The failure to find a difference on Trial 1 could result from Ss needing one trial to learn the nature of the list.

Since learning ability is confounded with the absolute level of learning on List 1, these results must be viewed with caution. Also, there was a possible "ceiling effect" on Trials 3 and 4 of List 2 for the "fast" learners which might have influenced the 3-way interaction. A multivariate analysis of covariance, using Trial 4, List 1 as the covariate was done to statistically control for the absolute level of List 1 learning. The ability-by-transfer-by-trials interaction was still significant, F (3,150) = 2.65, p = .05. In order to investigate this transfer effect further, it was decided to conduct a study with children in which the degree of learning for the original list was equated.

Method

Design. The experimental design was a 2 x 2 factorial with two levels of learning ability ("fast" and "slow") and two conditions of transfer (same and different categories). The upper and lower thirds of the distribution were used in the statistical analysis although all subjects underwent experimental testing.

Materials. Two noncategorized lists of 20 nouns each were randomly selected from 1000 most frequent words in the English language (Thorndike & Lorge, 1944) for use in the pretest. In addition, four lists of 40 words each were constructed for the main part of the experiment using norms reported by Battig and Montague (1969). A total of 16 categories were used; each list consisted of five words from each of eight categories. The same eight categories were represented in each of two lists (A1 and A2) and the remaining eight categories were represented in each of the other two lists (B1 and B2). The 10 most frequent responses for each of the 16 categories were used except where a word appeared in more than one category (eg., orange: color and fruit). The odd-numbered responses were assigned to the

A1 and B1 lists; and the even-numbered responses were assigned to the A2 and B2 lists. Three random orders of each list were then constructed with the following restrictions: (a) no more than two words from each category could be contiguous, (b) the same word could not occupy the same serial position in more than two of the orders, (c) the words could not be adjacent and in the same order in more than one order and finally (d) words with obvious associations whether within the same or different categories could not be contiguous (eg., pot, pan; yellow, canary; table, tennis; train, track; and apartment, house were not allowed). Each word was mounted on a 2 x 2 transparency to be used with an automatic slide projector.

Procedure. Pretesting consisted of a single presentation of each uncategorized 20-noun list at a two-second rate by means of an automatic slide projector. The lists were presented to 144 fifth and sixth grades in their regular classrooms and were counterbalanced across classrooms. After the last word appeared, the next slide consisted of a row of asteriks (*****) which served as a cue for the Ss to begin free recall. The Ss were given three minutes for recall and had been instructed to avoid wild guesses, but to record doubtful responses and not to be concerned with spelling. The Ss were ranked on the basis of the combined pretest scores with the upper half being defined as "fast" learners and the lower half as "slow" learners.

The experimental testing was begun approximately three weeks after pretesting. The Ss were tested in 24 small groups of from 1 to 6 persons depending on their assigned conditions and their availability. One day was used to test Ss who could not attend the testing session for which they were originally scheduled.

All Ss were presented one of the 40-word lists in the same manner as the pretest. The "fast" learners received two trials and the "slow" learners received six trials. Previous work indicated that the different number of trials would effectively equate "fast" and "slow" learners for original degree of learning. The second list was presented for four trials to each S with half of the "fast" and "slow" learners receiving different words but from the same categories as the first list and the other half receiving different words from different categories. Both the order in which the lists were presented and the random orders of each list were counterbalanced to preclude any list or order bias.

For each of the six ("fast" learners) or 10 ("slow" learners) presentations, 2.5 minutes were allowed for recall. At the end of each recall period, enough time was allowed to remind the S that he would see the same list but in a different order than the preceding trial. An exception to this procedure was made for the "slow" learners where a short (approximately 30-seconds) rest break was provided after the fourth trial of the first list. Approximately one minute, in addition to the time needed to read instructions, was allowed between the presentation of the first and second lists.

Subjects. A total of 144 Ss were pretested in three fifth and three sixth grades of one school, and 138 Ss were available for the experimental testing. As a result of failure to obey instructions or an obvious refusal to cooperate, 10 of this number were eliminated from the sample resulting in a final total of 128 Ss. The upper and lower thirds (N = 84) were used for the statistical analysis with 21 Ss in each of the four experimental conditions.

Scoring. The measures used for analyzing the data from this study include the number of words recalled, the number of words recalled per category, the number of categories recalled, and several measures of clustering. Since there is some disagreement in the literature about the appropriateness of the various measures of clustering which are available, it was decided to compare the results obtained with the observed minus expected number of repetitions (O-E--Bousfield & Bousfield, 1966), the Z-score measure (Frankel & Cole, 1971), and the adjusted-ratio of clustering (ARC--Roenker, Thompson, & Brown, 1971).

Results and Discussion

The results of List 1 learning are presented in Table 7. It is apparent that four trials would have been sufficient to adequately equate the "fast" and "slow" learners on the degree of original learning. Although the "slow" learners recalled more words than the "fast" learners on the last trial of the first list (18.71 vs. 16.67), the difference was not statistically significant, $F(1,80) = 2.72$, $p > .10$. Also, neither the transfer condition nor the ability-by-transfer interaction was significant for this trial. Thus, for the purposes of the subsequent analyses, the "fast" and "slow" groups can be considered as having been equated for original learning performance.

Table 7

Mean Numbers of Words, Categories, and

Words per Category Recalled During List-1 Learning

Condition	Trial 1	2	3	4	5	6
"Fast"-Same						
Words	12.24	16.86				
Categories	6.43	7.19				
Words/Cat.	1.93	2.34				
"Fast"-Different						
Words	14.29	16.33				
Categories	6.43	6.62				
Words/Cat.	2.21	2.44				
"Slow"-Same						
Words	9.38	12.71	14.76	16.38	17.14	18.29
Categories	5.00	6.05	6.14	6.48	6.48	6.76
Words/Cat.	1.91	2.04	2.34	2.43	2.53	2.57
"Slow"-Different						
Words	8.62	12.90	14.62	17.14	18.14	18.33
Categories	4.57	6.43	6.16	7.14	7.14	6.95
Words/Cat.	1.85	2.02	2.17	2.40	2.55	2.68

The mean number of words recalled on each trial of the Transfer List (List 2) are displayed in Figure 4. A multivariate analysis of variance indicated a statistically significant difference between ability groups, F (1,80) = 18.49, p <.01. The overall transfer effect was not significant, F (1,80) = 0.26, nor was the ability-by-transfer interaction significant. However, for the "slow" learners, there appeared to be a rather large difference on Trial 1 between the "same" and "different" transfer conditions. In fact, the other trials showed a reversal in the sign of the difference, i.e., only in the first trial was the "same" transfer condition mean greater than the "different" transfer condition mean. Consequently, the ability-by-transfer-by-trials interaction was statistically significant, F (3,78) = 3.48, p <.02.

A univariate analysis of variance on Trial 1, List 2 failed to indicate a significant ability-by-transfer interaction, F (1,80) = 2.78, p = .10. However, using the final trial of List 1 as a covariate, Trial 1 of the transfer list does show a statistically significant ability-by-transfer interaction, F (1,79) = 4.61, p <.05.

Another way of analyzing Trial 1, Transfer List performance is to compare the regression coefficients for the "same" and "different" conditions when Trial 1, Transfer List performance is regressed on pretest scores. These regression coefficients are .2557 for the "same" condition and .5688 for the "different" condition, which is a statistically significant difference t (124) = 2.20, p <.05. This indicates an interaction between learning ability and condition of transfer when the middle third of the data is included in the analysis.

Thus, on Trial 1, List 2 "slow" learners recall more words if the conceptual organization of the lists is the same; the reverse is true for "fast" learners. A word of caution must be interjected here. Another look at Table 7 reveals a difference of approximately two words between the "same" and "different" conditions for the "fast" learners on the first trial only. By the second trial, this idiosyncratic difference has disappeared. The difference is accounted for by the difference in words per category recalled rather than the number of categories. By the second trial, Ss under the "different" condition continue to recall more words per category (2.44 vs. 2.34) but fewer categories (6.62 vs. 7.19). The relative positions of the "fast" learner means on the Transfer List might merely reflect this unexpected List 1 finding, rather than represent the "true" "fast" learner means.

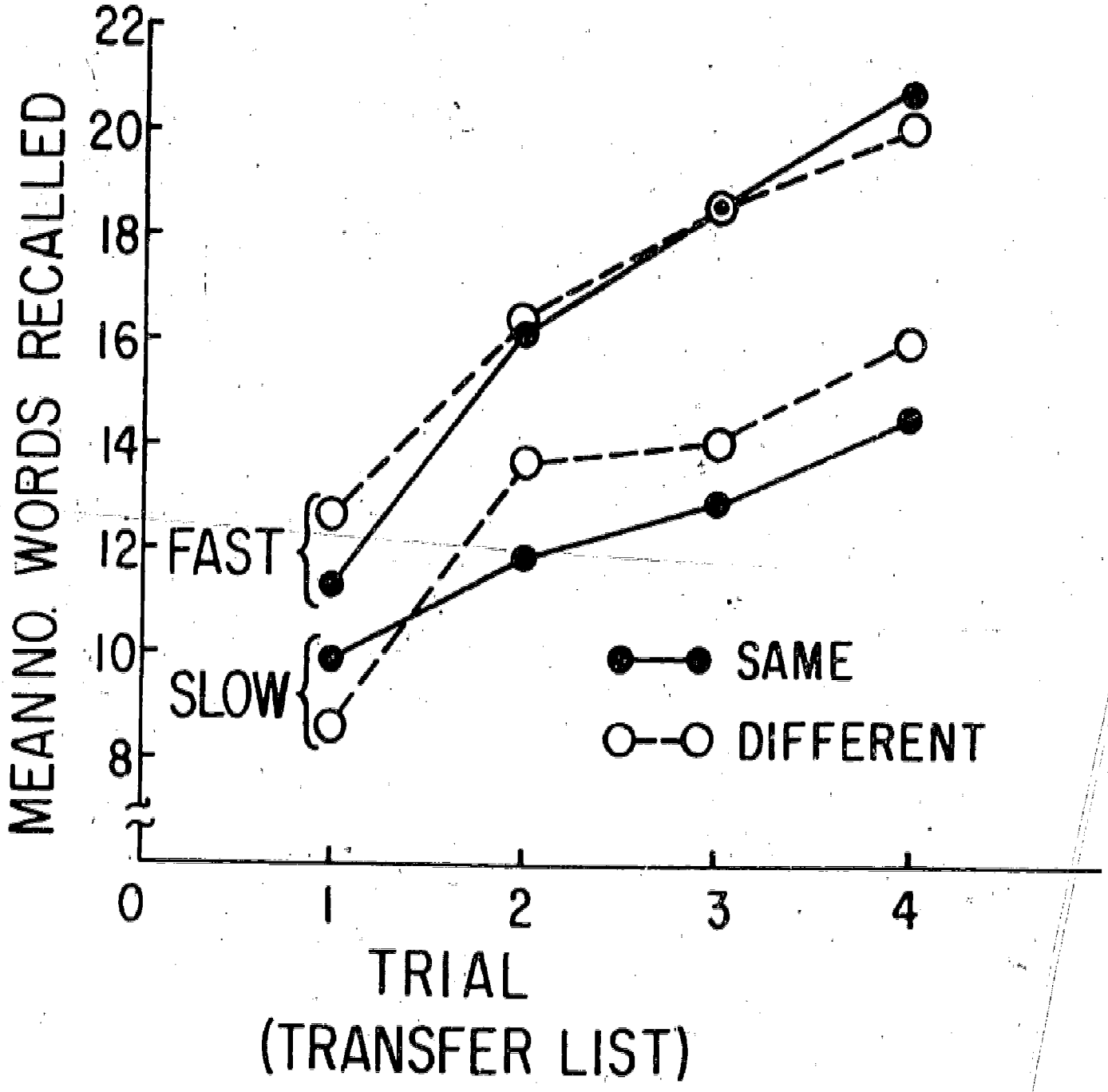

Fig. 4. Mean numbers of words recalled on each trial of the transfer list by "fast" and "slow" learners in each condition of transfer.

Another possible explanation for the Transfer List ability-by-transfer-by-trials interaction is that the presence of the same conceptual categories was interfering to the "fast" learner on the first trial because he was aware of or made use of the list's categorical structure and had to remember which words were on the first list rather than on the second list. The "slow" learner, on the other hand, made less efficient use of the categorical nature of the lists and did not find the same categories as interfering until after the first trial. Once the "slow" learner in the "different" condition made use of the list's organization, his performance improved to the "same" condition since within category interference is not present.

Figure 5 presents the mean number of words-recalled-per-category and the mean number of categories recalled for each trial of the transfer list. It is readily observed that the difference in mean number of words recalled (Figure 4) is accounted for by the number of categories recalled rather than words-per-category.

If the "fast" learner becomes aware of or makes more efficient use of this categorical structure, then he should recall more categories under the "same" transfer condition. An inspection of the lower panel of Figure 5 indicates that this, in fact, occurred for the last three of the four trials on the Transfer List, and it is remembered that the first trial might reflect the "fast" learner group idiosyncracy evident on the first trial, List I. In other words, the "fast" learner should be able to transfer his learning of the categories from the first list to the second list (under the "same" condition) even though the elements (words) of each category might be interfering. If the "slow" learner does not become aware of the categorized structure or does not use it as effectively as the "fast" learner, he would be less likely to be able to transfer his List I learning to the Transfer List.

The means of the three clustering measures for each trial of the transfer list are presented in Table 8. Because of the data needed to calculate the clustering measures, it was necessary to exclude Ss in some cases and thereby reduce the sample size of the group. Clustering refers to the tendency for the S to group words from the same conceptual categories together during recall and, hopefully, provides an index of the extent to which the Ss in the various groups make use of the categorical structure of the list.

A multivariate analysis of variance was performed for the transfer list trials for each of the clustering measures. The

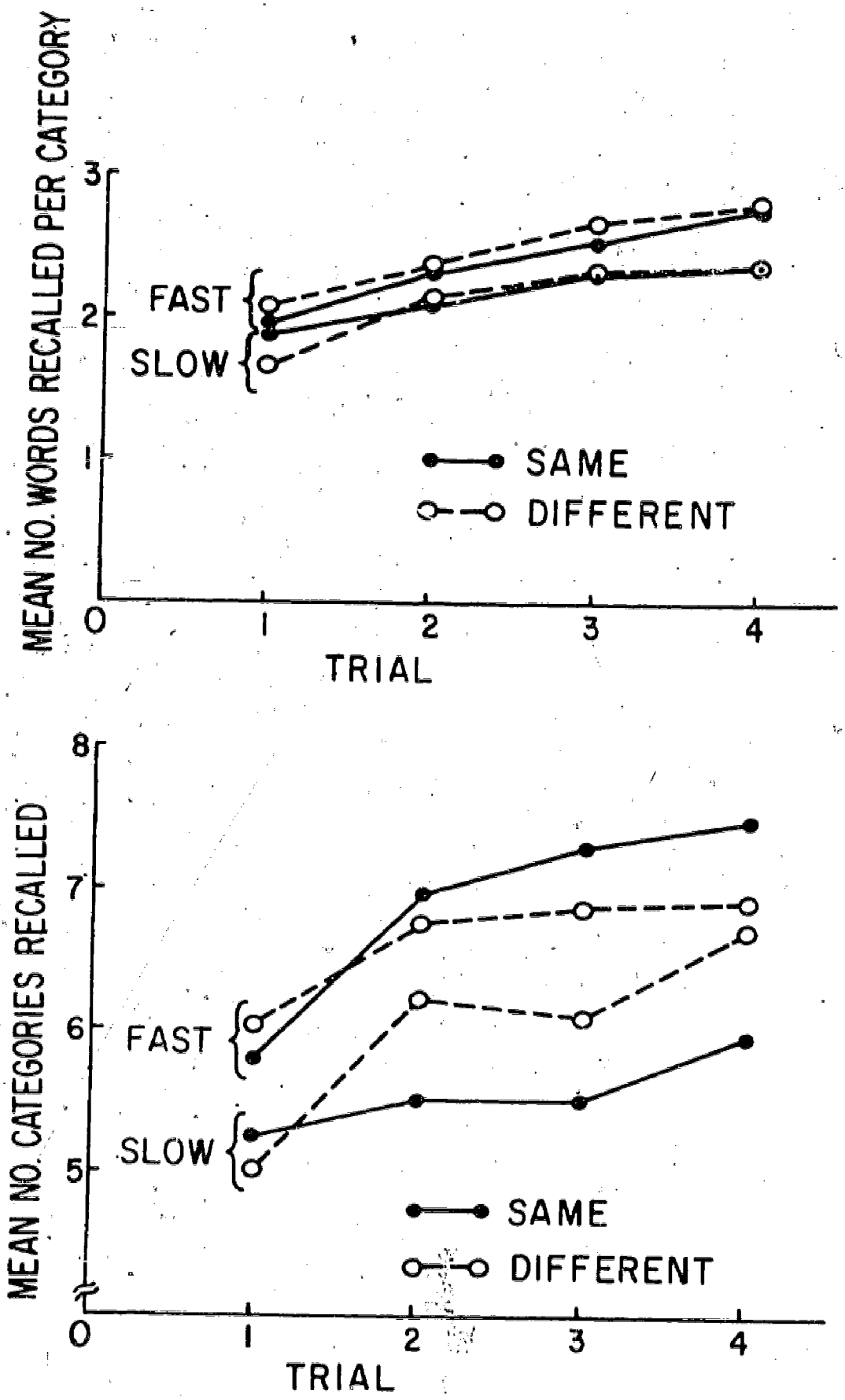

Fig. 5. Mean numbers of words recalled per category and mean numbers of categories recalled on each trial of the transfer list.

Table 8

Clustering Scores on Transfer List

Condition	n	Trial 1	Trial 2	Trial 3	Trial 4
"Fast"-Same	21				
O-E		7.13	10.12	11.44	11.69
Z		1.29	2.03	2.27	3.29
ARC		1.19	1.52	1.34	1.28
"Fast"-Different	20				
O-E		7.03	9.20	9.55	9.95
Z		2.35	2.61	3.51	4.23
ARC		1.76	1.47	1.19	1.29
"Slow"-Same	19				
O-E		6.91	7.71	7.39	8.60
Z		.91	1.46	2.30	2.52
ARC		2.21	1.75	1.30	1.35
"Slow"-Different	18				
O-E		5.86	7.71	6.84	7.89
Z		1.03	2.80	3.06	3.96
ARC		3.51	1.50	1.30	1.20

only statistically significant result was the difference between the two ability groups for the O-E measure, F (1,74) = p <.01, and as expected, the "fast" learners showed a greater degree of clustering than did the "slow" learners. In fact, though not significant, the "fast" learners also showed consistently more clustering for the Z score than did the "slow" learners. The ARC score did not share this consistency but rather seemed to show greater clustering for the "slow" learners, especially for the first trial (1.19 vs. 3.21 for the "same" condition and 1.76 vs. 3.51 for the "different" condition). A univariate analysis of variance for the ARC measure approached statistical significance for the first transfer list trial F (1,74) = 3.47, p <.07. This result would again suggest that the "slow" learner was less affected by interference within and between categories on the first transfer list trial than was the "fast" learner, due to the possibility that he was not using the conceptual organization as efficiently as the "fast" learner. It must be concluded, unfortunately, that the clustering scores do not result in any consistent findings.

Although the evidence is far from overwhelming, there is a suggestion that "fast" and "slow" learners did use the categorical list structure differently. The "fast" learner seemed to be able to transfer his learning of categories to a greater degree than did the "slow" learner.

Chapter 7: LEARNING ABILITY AND ALPHABETIC ORGANIZATION*

One prominent characteristic of free-recall learning is that individuals organize the words in the list to be learned even if there are no apparent or obvious bases for organization (Shuell, 1969; Tulving, 1962b). This tendency or ability to organize the material to be learned plays an important role in theories of free-recall learning, and Tulving (1968) has suggested that the number of words recalled depends directly on the degree of organization imposed on the list by the individual.

Thus, it is possible that differences among individuals in their performance during free-recall learning is the result of individual differences in developing and/or effectively using organizational strategies during learning. Perhaps some subjects are better able than others in either finding or making use of potential bases of organization present in the material to be learned; these subjects would recall more words from the list than those individuals who do not make use of available forms of organization. While moderately large correlations are typically obtained between various measures of organization and the number of words recalled during learning (Shuell, 1969; Tulving, 1962b), it is not possible, of course, to conclude from these data that the differences in performance are being caused by individual differences in ability to organize the material to be learned.

Potentially effective bases of organization which are present in the list are not always utilized by the subjects (Tulving, 1962a). It is possible that pointing out some of these more subtle bases of organization to the subjects may facilitate the performance of "slow" learners more than the performance of "fast" learners since the "slow" learners would be the ones more likely to overlook potentially useful strategies for learning. In investigating such a possibility, it would be desirable to use some form of organization which is inherent in the list, which is familiar to and could be used by all subjects learning the list, but which is not normally used by the subjects in learning the list unless it is pointed out to them. The use of alphabetic organization can be made to fit all of these requirements. Tulving (1962a) has demonstrated that informing subjects that each word in the list begins with a

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*This study was done in collaboration with Timothy Moore.

different letter of the alphabet and that the use of alphabetic cues can improve their performance will increase the number of words they can recall from the list.

Thus, the purpose of the present study is to determine if such instructions have a differential effect for "fast" and "slow" learners. It seems reasonable to expect that the instructions may provide the "slow" learners with an effective method of organizing the words and consequently improve their performance. The "fast" learners, on the other hand, may already be using an effective strategy for learning the list--perhaps even the one suggested--and consequently their performance may not be affected, or affected to a lesser extent, than the performance of the "slow" learners. This interpretation would be supported by an interaction between learning ability and instructions to use alphabetic organization.

Method

Design. The experimental design employed in the study was a 2 x 2 factorial with two ability groups (as defined by the pretest described below) and two conditions of instructions (standard free-recall instructions and these standard instructions plus information concerning the use of the first letter of each word as a basis for organizing the words in the list).

Procedure. The pretest used for defining learning ability consisted of a single presentation of a list of 30 common nouns at a 2-second rate to all 92 Ss in the study. The words were presented one at a time by means of an automatic slide projector. After all 30 words had been shown, a special slide (******) signaled the end of the list. The Ss had been instructed that when this slide appeared they were to write down, in any order, as many words from the list as they could remember, including words about which they were unsure. Three and one-half minutes were allowed for recall. Minor spelling errors were corrected, and the Ss were ranked on the basis of the number of words correctly recalled. The upper and lower thirds of the distribution were classified as "fast" and "slow" learners, respectively.

Approximately two weeks later, all the Ss learned a list of 22 high-frequency two-syllable nouns. The initial letter of each word began with a different letter of the alphabet. This list was presented for six alternate study-recall trials. The words were presented at a 2-second rate with 90 seconds allowed for recall after each presentation. The Ss wrote down the words they could recall on successive pages of a booklet, and

they were told not to look back at words from previous trials. Half of the Ss in each ability group were given standard free-recall instructions prior to learning the list ("Noninstructed" Condition) while the other half were informed of the alphabetic nature of the list ("Instructed" Condition) in addition to the standard instructions. The Instructed Condition were told to look at the first letter of each word and to make an attempt to associate the word with the letter. They were also told that they would probably recall more words if they went through the alphabet one letter at a time while they were recalling the words and tried to remember the word associated with that letter; however, they were not required to recall the words in alphabetic order. Three different orders of the list were used in a counterbalanced order so that each order was used equally often on each trial. The Ss were matched according to pretest scores and then randomly assigned to one of the two conditions of instructions.

Materials. The pretest consisted of 30 nouns randomly selected from the 1,000 most frequent words in the English language (Thorndike & Lorge, 1944). The list used in the main part of the study consisted of 22 two-syllable nouns representing all frequency ranges; each word in the list began with a different letter of the alphabet with the letters E, U, X, and Y not represented.

Subjects. A total of 92 ninth-grade students in a single high school served as Ss for the study. High school students were used to insure that all Ss had overlearned the alphabet. The pretest was administered in a large room to all Ss at the same time. The experimental testing was conducted in groups of 15 or 16 in a separate, small room. All Ss were given the main task, although only the data from the two ability groups defined above were used in analyzing the results. Subjects from all ability groups were run at the same time if they were to receive the same instructions. The data from one S was discarded due to a failure to follow instructions, and a total of 5 Ss from all ability groups were absent when the main learning task was administered.

Results

The overall mean number of words recalled on the pretest by all 92 Ss was 12.96, SD = 3.04. The mean number of words recalled by the "fast" learners was 16.32, SD = 1.58, and the

"slow" learners recalled an average of 9.74, SD = 1.50. The mean numbers of words recalled on each trial of the main learning task are presented in Figure 6. A multivariate analysis of variance indicates that there is a significant difference between the performance of "fast" and "slow" learners, $F(1,54) = 15.90$, $p < .01$. However, the difference between the two conditions of instructions was not statistically significant, $F(1,54) = 2.98$, $p = .09$. The interaction between learning ability and instructions and none of the interactions involving trials approached significance.

While the failure to find a difference between the two conditions of instruction makes it somewhat difficult to interpret the overall results of the study, it should be noted that a multivariate analysis of variance based on all Ss for which we have data (learning ability defined in terms of a median split on the pretest) indicates that instructions regarding the alphabetic nature of the list did improve performance, $F(1,83) = 5.73$, $p < .02$; the values of the F-ratios for the other factors remained virtually the same with no change in the conclusions to be drawn.

Regression analysis. Another way in which these data can be analyzed is to compare the performance of the Ss in the Instructed and Noninstructed conditions on a trial-by-trial basis and to calculate regression coefficients of that performance on pretest scores. It is then possible to test the coefficients obtained for the two groups to determine whether or not the two regression slopes are parallel. If they are not parallel, it can then be concluded that the two types of instructions have differential effects for "fast" and "slow" learners since the predictor variable (pretest) is the basis on which learning ability is defined in this study. The mean numbers of words recalled by each condition on the pretest and each trial of the main learning task are presented in Table 9 along with the regression coefficients of performance on the main task regressed on the pretest. T-tests were conducted on the various measures, and the results of this analysis were consistent with the analysis of variance performed earlier. Thus, on the basis of both analyses, it seems reasonable to conclude that informing Ss of the alphabetic nature of the list increased the number of words recalled and that these additional instructions had a comparable effect for both "fast" and "slow" learners.

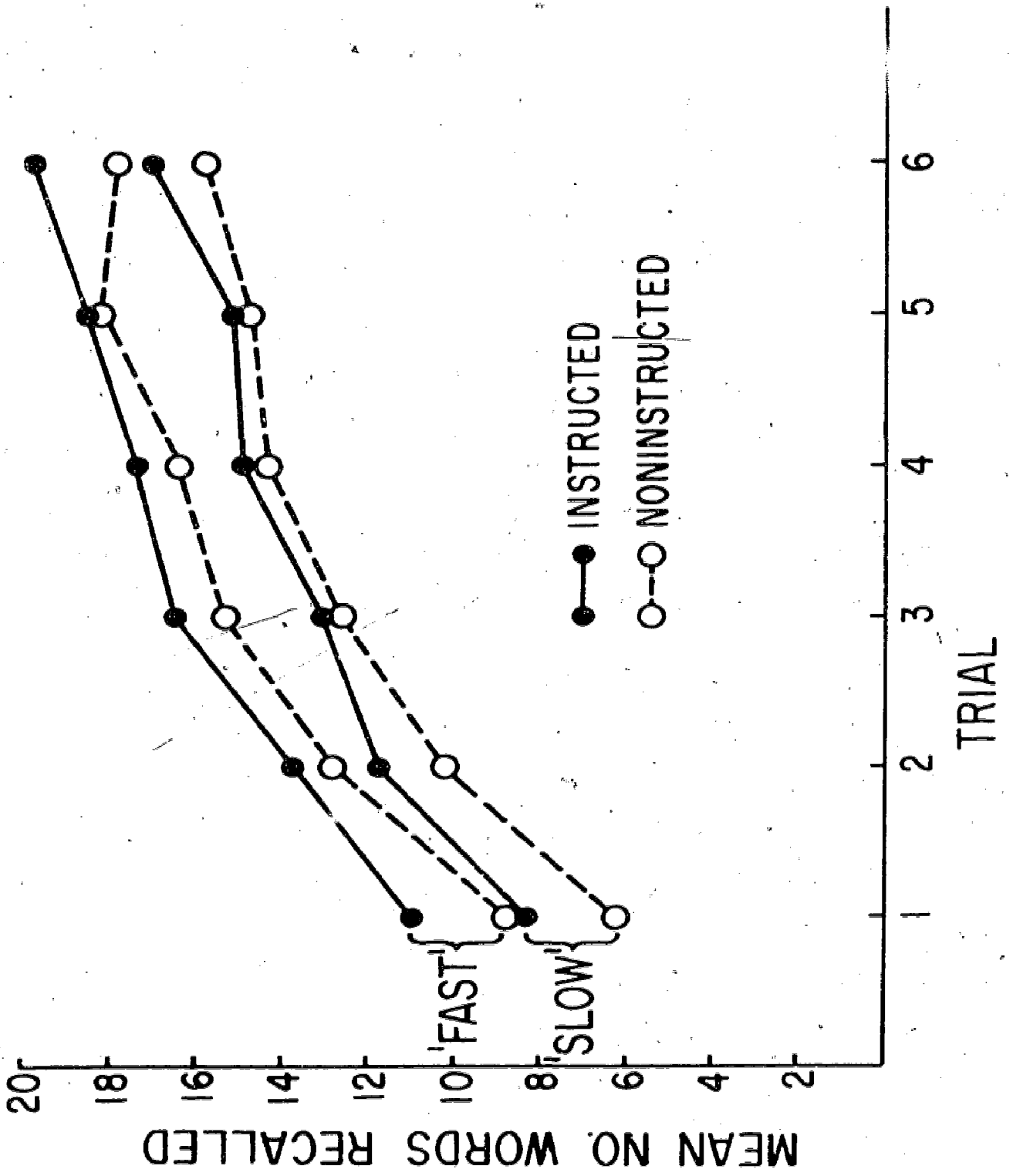


Fig. 6. Mean numbers of words recalled by "fast" and "slow" learners for those informed and not informed of the alphabetic nature of the list.

Table 9

Mean Numbers of Words Recalled for Instructed and Noninstructed Conditions and Regression Coefficients of Learning Scores on Pretest Scores

	Instructed	Noninstructed	Value of *t*-test
n	45	42	
Mean Number Words Recalled			
Pretest	12.96	13.00	- .07
Trial 1	9.31	7.86	2.75 **
Trial 2	12.76	11.79	1.44
Trial 3	14.80	13.71	1.60
Trial 4	16.16	15.17	1.41
Trial 5	17.22	16.29	1.25
Trial 6	18.62	16.90	2.59 *
Total	88.87	81.71	2.13 *
Regression Coefficients			
Trial 1	.4273	.3365	.58
Trial 2	.3706	.3791	- .04
Trial 3	.5837	.3744	1.04
Trial 4	.4471	.2654	.83
Trial 5	.5756	.3981	.78
Trial 6	.3315	.3341	- .01
Total	2.7358	2.0877	.65

Note: * $p < .05$
** $p < .01$

Probability of recall. Several studies (Stroud & Schoer, 1959; Underwood, 1954; Underwood & Keppel, 1963) have obtained substantial differences between "fast" and "slow" learners in the probability of a word being recalled on the trial immediately following the trial on which that word is correctly recalled for the first time. These studies all involved paried-associate learning, and learning ability was defined in terms of performance on the to-be-learned list. Schoer (1962) obtained similar results with a paired-associate list when learning ability was defined in terms of performance on a pretest.

In order to determine if similar results can be obtained with free-recall learning, the conditional probability that a word is recalled given that it was correctly recalled for the first time on the immediately preceding trial was calculated for each S in the present study. In addition, the total number of different words recalled from the pool of 22 words on the list was determined for each S. The means of these two variables for the upper and lower thirds of the distribution of scores on both the pretest and Trial 1 of the main learning task are presented in Table 10. When learning ability is defined in terms of the pretest, the differences in probability of recall between "fast" and "slow" learners, between the two conditions of instruction, as well as the interaction between these two factors, are not statistically significant. However, "fast" learners recalled significantly more of the total number of words in the list than did slow learners, $F(1,54) = 13.65$, $p < .01$; the difference between the two conditions of instruction and the interaction between ability and instruction were not significant, F's < 1.

When learning ability is defined in terms of performance on Trial 1 of the main learning task, a nested design must be used since the Ss have already been given different instructions and learning ability must be defined separately for the instructed and noninstructed conditions. Defined in this manner, "fast" learners had a higher conditional probability of recall than "slow" learners, $F(2,54) = 4.10$, $p < .05$. There was also a significant difference between "fast" and "slow" learners in the total number of different words recalled from the list, $F(2,54) = 21.47$, $p < .01$. The difference between the two conditions of instruction was not significant for either variable.

Another way of looking at these data is to consider the full range of scores on the pretest and Trial 1. The correlation

Table 10

Mean Probabilities of a Word Being Recalled on the Trial Immediately Following the Trial on Which It was Recalled for the First Time and Mean Numbers of Total Different Words Recalled for "Fast" and "Slow" Learners Defined in Terms of Both the Pretest and Trial-1 Performance

	n	p(R)	Words
Pretest			
"Fast" Learners			
Instructed	15	.7341	21.67
Noninstructed	15	.6849	21.80
"Slow" Learners			
Instructed	15	.7118	20.33
Noninstructed	13	.6468	20.69
MSE		.0371	1.59
Trial-1 Performance			
"Fast" Learners			
Instructed	15	.7426	21.87
Noninstructed	14	.7125	21.64
"Slow" Learners			
Instructed	15	.6936	19.80
Noninstructed	14	.5958	20.57
MSE		.0277	1.87

coefficients among the four variables we have been considering are presented separately for the two conditions of instruction in Table 11. The conclusions from this analysis are the same as those reached from the analyses of variances discussed above. Thus, the results of the present study are consistent with the results obtained in the other studies discussed previously (Schoer, 1961; Stroud & Schoer, 1959; Underwood, 1954; Underwood & Keppel, 1963); those Ss who do well on the initial trials of a learning task are more likely to hold onto a word once it has been correctly recalled than those who do poorly.

Discussion

The finding that performance during free-recall learning can be improved by informing the Ss of the alphabetic nature of the list is essentially a replication of Tulving's (1962a) earlier study. The failure to obtain an interaction between learning ability and instructions suggests that both "fast" and "slow" learners benefit equally from information regarding a basis of organization present in the list but which is usually overlooked or not utilized by learners. The present results indicate that both "fast" and "slow" learners are able to make use of an effective strategy for learning once it is pointed out to them. However, there is no evidence that individual differences in free-recall learning are related to either an ability to use an effective strategy if it is pointed out or an ability to organize the material to be learned, at least for the basis of organization investigated in this study. Perhaps more potent forms of organization such as the use of categorized lists would be necessary to obtain differential effects of instructions for "fast" and "slow" learners.

The finding that "fast" learners recall more of the 22 words in the list at least once during the six trials of learning than do "slow" learners could possibly be explained in terms of motivational factors or an organizational strategy which permits the "fast" learners to relate more of the words to each other, although if the latter is the case it certainly is not in terms of the organizational strategy offered in the present study. It is also possible that learners concentrate on a limited number of words and add new words or pay attention to new words only when those they are presently trying to learn have reached a certain probability of being recalled on the next trial.

The correlation between learning ability and the probability of recalling an item on the trial immediately succeeding the trial on which it is first recalled is an extention of earlier findings to free-recall learning by children. The reasons for obtaining this relationship when learning ability is defined in terms of Trial-1 performance but not pretest performance are not clear.

Table 11

Correlation Coefficients for Variables in Table 10 for Instructed and Noninstructed Conditions

	Pretest	Trial 1	p(R)
Instructed (n = 45)			
Trial 1	.450 **	----	
p(R)	.205	.309 *	----
Total Words	.425 **	.616 **	.190
Noninstructed (n = 42)			
Trial 1	.519 **	----	
p(R)	.180	.395 **	----
Total Words	.352 *	.386 *	.003

Note: * $p < .05$
** $p < .01$

While performance on the pretest and Trial 1 of the main learning task are correlated, it appears that individual differences in the probability measure are less stable than some of the other measures, i.e., the context of the learning task is important in some way for determining the probability of recall once an item is correct. The fact that an item has to be recalled before it is entered into the probability analysis insures that the word was processed by the S at least to the extent necessary for recall. Since "fast" and "slow" learners do not differ in short-term memory ability (cf. Chapter 3 of this monograph), this difference in probability is most likely related in some way to individual differences in effectiveness of encoding the word. This encoding process could involve organizational factors, attention, speed of rehearsal, or other similar factors.

Chapter 8: LEARNING ABILITY AND INSTRUCTIONS TO CATEGORIZE

In the preceeding chapter, it was suggested that possibly the use of more potent forms of organization might be required in order to obtain differential effects for "fast" and "slow" learners when they are informed of the organization present in the material to be learned. Three studies investigating this effect for a list of words consisting of examples representing different conceptual categories are reported in this chapter. The first study is very similar in design to the study reported in Chapter 7 except that a categorized word list was used. The second study collected associative and categorical norms for "fast" and "slow" learners to see if differences between the two ability groups in the relationships among the words in the list would compliment the results of the first study. Finally, data from a recently completed study done as a master's thesis provides information on the transferability of instructions to categorize.

Instructions to Categorize

Method

Design. The experimental design of the study was essentially a 2 x 2 factorial with two ability groups and two conditions of instructions. The two ability groups consisted of "fast" and "slow" learners as defined by a pretest described below. One of the two conditions of instructions consisted of standard free-recall instructions that informed the Ss of the nature of the task but included no mention of the categorized nature of the list; the other condition of instruction consisted of the same instructions given to the "noninstructed" group plus additional information concerning the fact that the words in the list represented various conceptual categories. The "instructed" group was further told that they would probably find it easier to learn the list if they concentrated on the groupings of words and tried to write down together the words that fall into each category. As part of these instructions, they were also given examples of categories which were not represented in the list to be learned.

Procedure. The pretest used for defining learning ability consisted of a single presentation of each of two lists. Each list consisted of 25 common, one syllable nouns presented at a 2-second rate by means of an automatic slide projector. After each list had been presented, a speciall slide (*****) signaled the end of the list and the Ss were allowed 2 minutes to write down in any order as many of the words from that list as they

could remember. They had been told to avoid wild guesses but to write down doubtful responses and not to be concerned with spelling. Minor spelling errors were corrected, and the Ss were ranked on the basis of the number of words correctly recalled from both lists. The upper and lower thirds of the distribution were classified as "fast" and "slow" learners, respectively. While all Ss were included in the main part of the experiment, this classification of "fast" and "slow" learners was used for all of the statistical analysis unless otherwise noted.

Approximately three weeks later, the Ss learned a 40-item list consisting of five words representing each of eight conceptual categories. The list was presented for six alternate study-recall trials; the words were presented singly at a 2-second rate with 2 minutes allowed for recall after each presentation. The Ss wrote down the words they were able to recall on successive pages of a booklet; the page was collected after each recall period. Three different orders of the list were used in a counterbalanced order so that each order was used equally often on each trial. The Ss in each ability group were randomly assigned to one of the two conditions of instruction and one of the three orders of testing.

Materials. The pretest consisted of two lists of 25 nouns each; the lists were constructed by randomly selecting from the 1,000 most frequent words in the English language (Thorndike & Lorge, 1944). The list used in the main part of the experiment consisted of five words representing each of eight categories (colors, fruits, insects, kitchen utensils, parts of a building, parts of the human body, and types of vehicles). Three random orderings of the list were constructed and used equally often for each S.

Subjects. A total of 79 fifth-grade students from a single elementary school located in a primarily professional suburb served as Ss for this study. The pretest was administered to groups of approximately 25 Ss in a regular classroom. The main part of the experiment was conducted in a smaller room in groups of approximately 13 Ss. All Ss were given the main learning task, although most of the statistical analyses were conducted using only the upper and lower thirds of the distribution of scores on the pretest. Subjects from all ability groups were run at the same time if they were to receive the same type of instructions. Two Ss from the middle group and two Ss from the "slow" group were absent on the day the main part of the experiment was conducted, and one S in the "slow" group was excluded for failure to follow instructions.

Results

The overall mean number of words recalled on the first pretest by all 79 Ss was 8.97, SD = 2.85, on the second pretest, the mean

was 9.03, SD = 3.13. The correlation between performance on the two lists was .71. For both lists combined, the mean was 17.99, SD = 5.53. The mean number of words recalled by the "fast" learners on both lists combined was 24.12, SD = 3.46, while the "slow" learners recalled an average of 12.19 words, SD = 2.73.

The mean number of words recalled on each trial of the main learning task are presented in Figure 7. A multivariate analysis of variance indicates that there was a significant difference between the performance of "fast" and "slow" learners, F (1,45) = 30.84, p <.01. The main effect of instructions was not significant, F (1,45) = 1.12. However, the interaction between learning ability and instructions was significant, F (1,45) = 4.82, p <.05. None of the other interactions with trials were significant.

Another way of investigating the ability-by-instruction interaction is by means of a regression analysis in which performance on the main learning task is regressed onto pretest performance. The regression lines of Trial-1 performance regressed onto the pretest for both conditions of instruction are presented in the upper panel of Figure 8. The regression coefficients for the two lines are .324 for the instructed condition and .458 for the noninstructed condition, but the difference between the two coefficients was not statistically significant, F(1,69) = 1.00. The regression lines of the total number of words recalled on all six trials of the main learning task regressed onto pretest performance are presented in the lower panel of Figure 8. The regression coefficients are 2.46 and 3.92 for the instructed and noninstructed conditions, respectively, and the difference between the two values is not statistically significant, F(1,69) = 1.90. The implications of the discrepancy between the conclusions reached with the two analyses is not completely clear at present. The relative power of the two statistical procedures with small samples such as that in the present study are not presently known (cf. pp. 7-9 of the present monograph for a more complete discussion of some of the methodological issues involved).

The number of words which a S recalls can be broken down into two components: the number of categories which are represented by the words recalled and the number of words recalled per category. The mean numbers of categories recalled (a category was scored as being recalled if at least one word from that category was recalled) and the mean numbers of words recalled per category on each trial of the main learning task are presented in Figure 9. The "fast" learners recalled significantly more categories and words per category than the "slow" learners, F(1,45) = 12.57 and 27.65, p <.01,

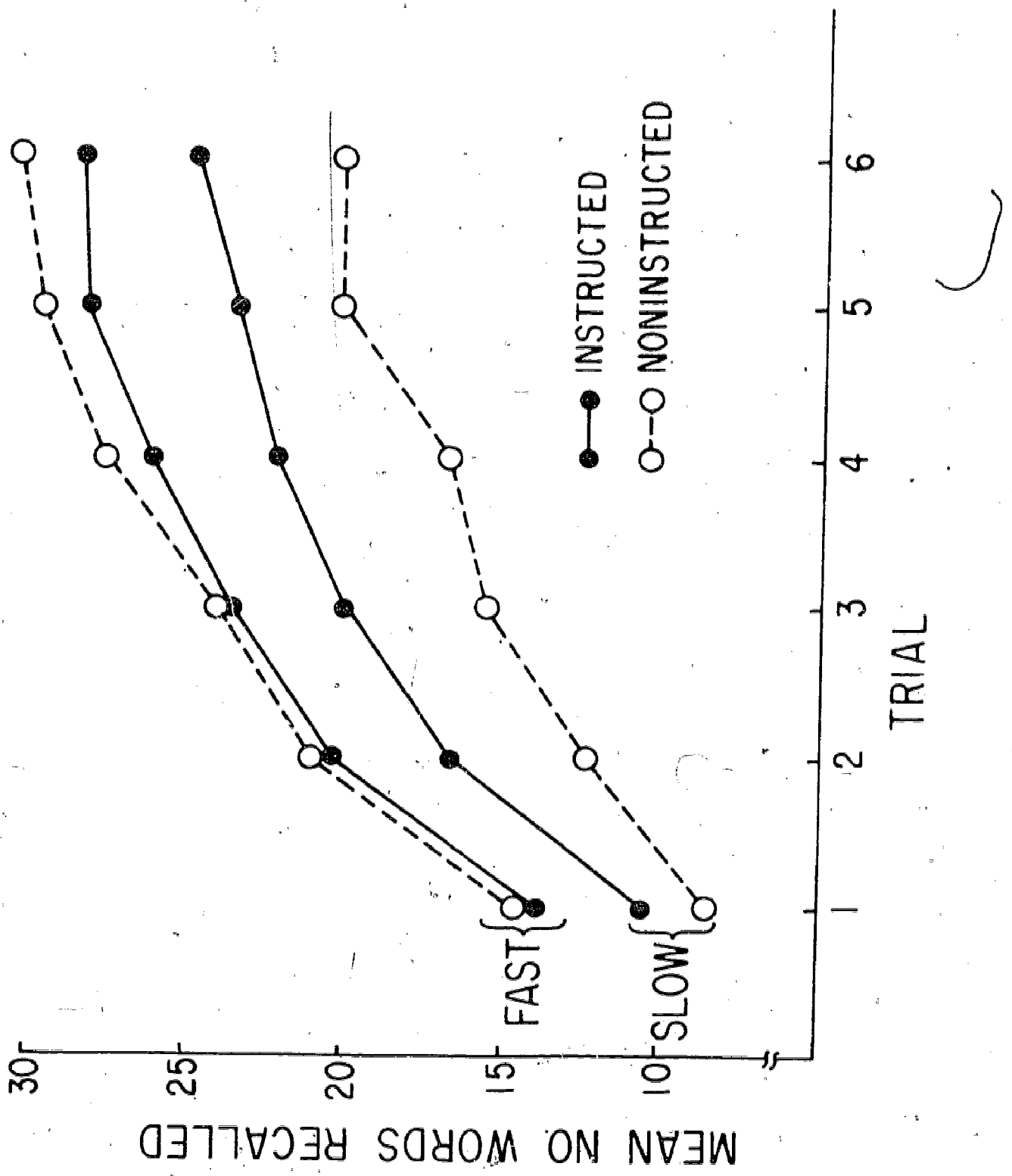


Fig. 7. Mean numbers of words recalled by "fast" and "slow" learners with each type of instructions.

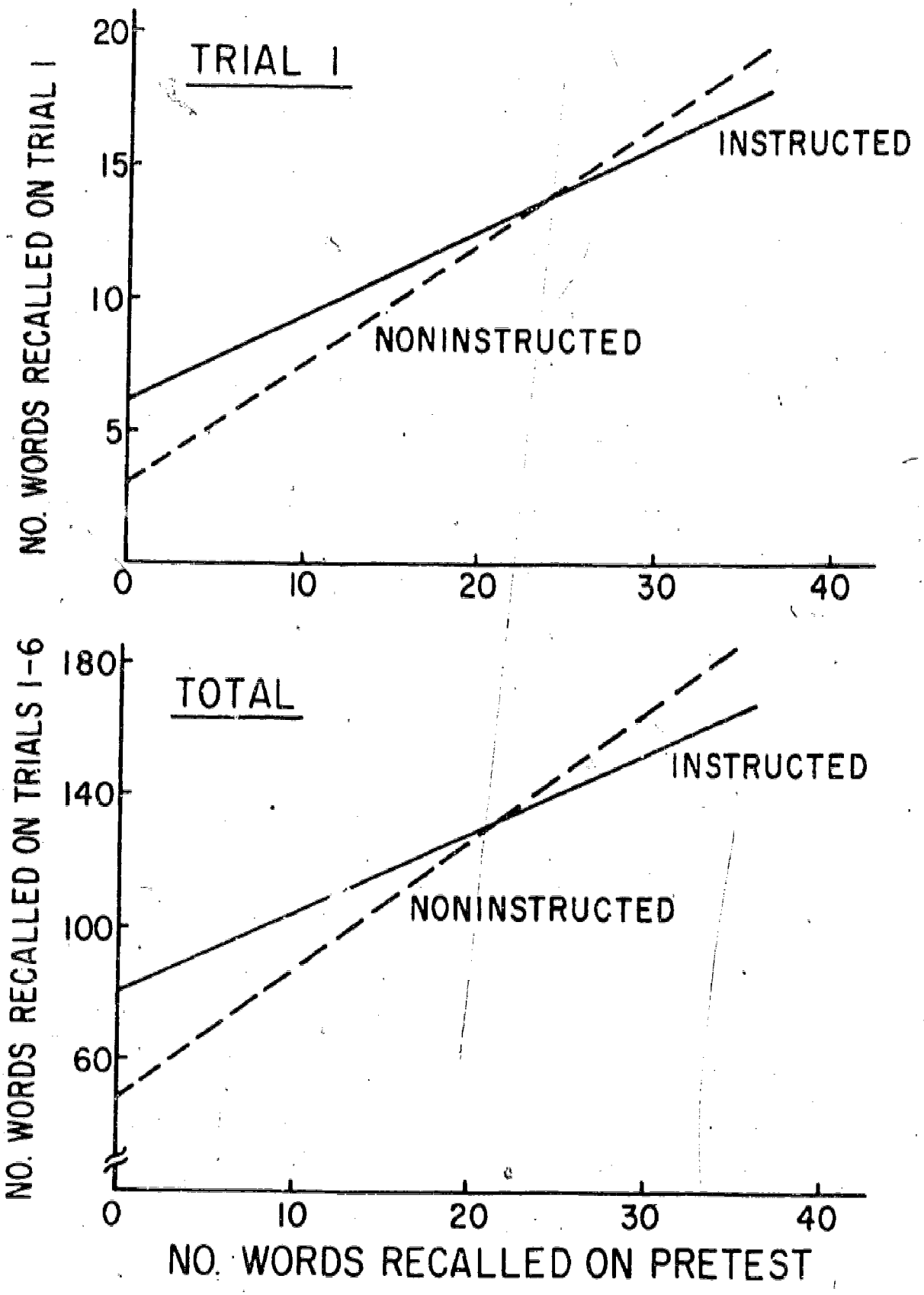
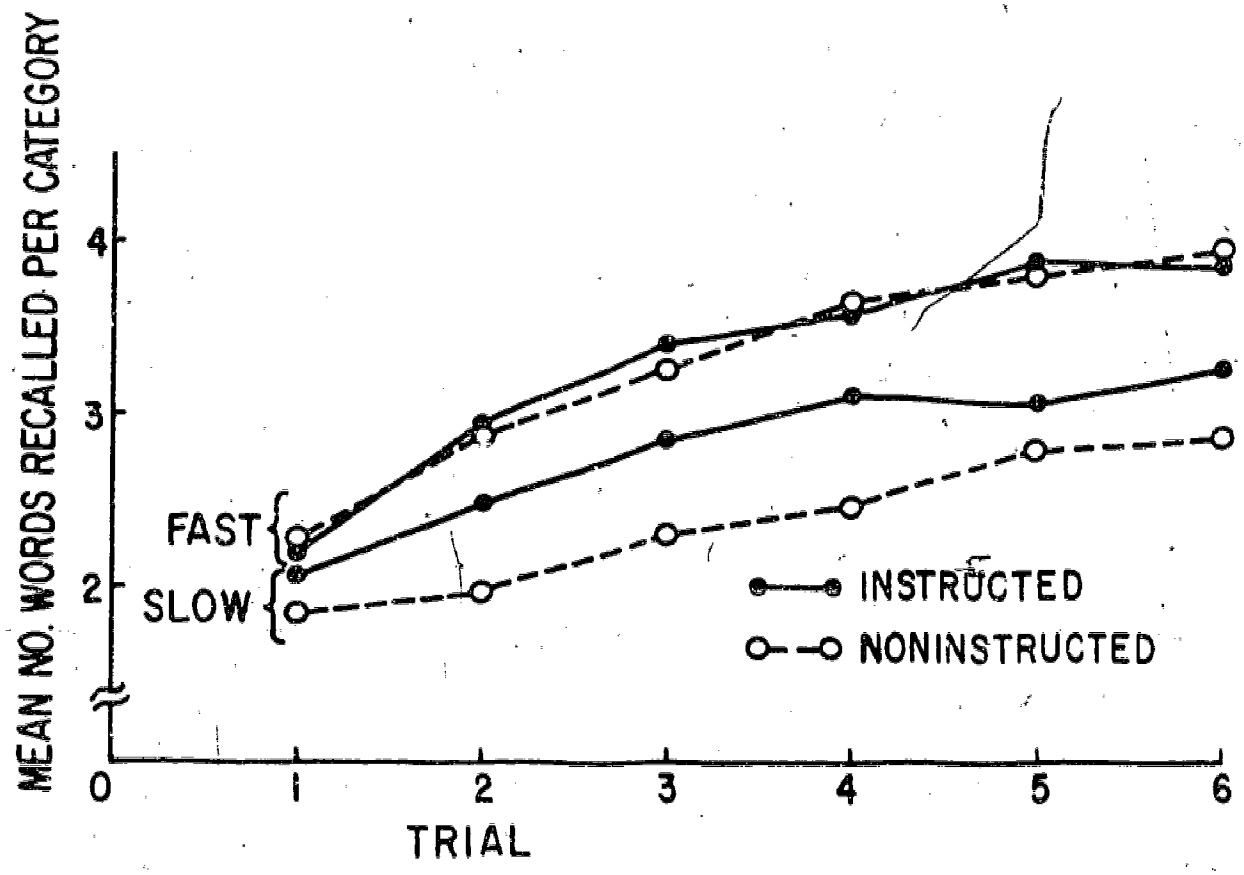


Fig. 8. Regression lines of Trial-1 performance and overall performance regressed on pretest (learning ability) for both types of instructions.



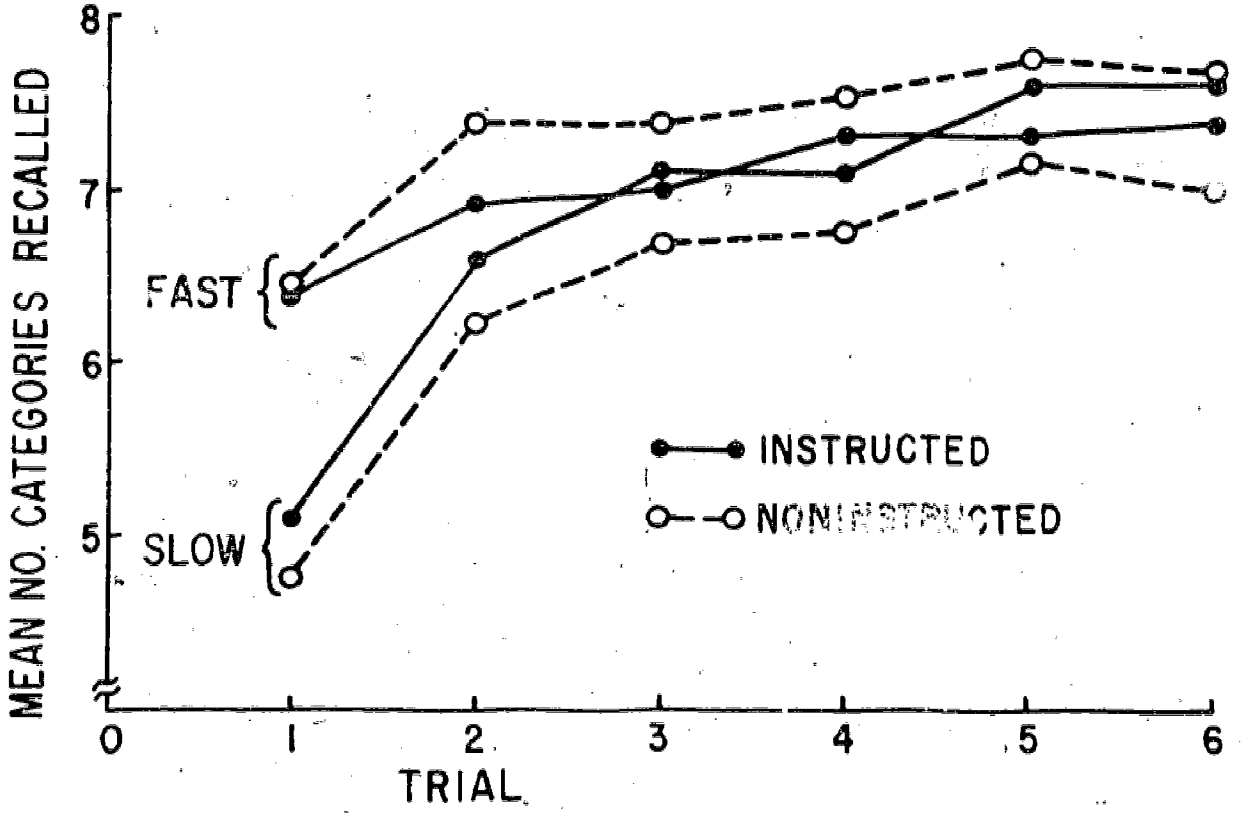


Fig. 9. Mean numbers of words recalled per category and mean numbers of categories recalled by "fast" and "slow" learners with each type of instructions.

respectively. The main effect of instructions was not significant for either variable, F (1,45) = .02 and 2.02 (categories and words per category, respectively). The interaction between learning ability and instructions was significant for categories, F (1,45) = 4.78, p <.05, but it was not significant for words per category, F (1,45) = 2.28, p = .14. In addition, there was a significant interaction between learning ability and trials for both variables: F (5,41), p = .01, for categories and F (5,41) = 2.91, p <.05 for words recalled per category. The differential effect of instruction for "fast" and "slow" learners appeared to have its primary locus in the number of categories recalled rather than the number of words recalled per category. While instructions increased the number of words recalled per category for the "slow" learners, this increase was not statistically significant in the present study. In addition, the difference between "fast" and "slow" learners in the number of words recalled per category increased as learning progressed as indicated by the significant learning ability-by-trials interaction. On the other hand, the instructions concerning the organizational structure of the list increased the number of categories recalled by the "slow" learners and decreased the number of categories recalled by the "fast" learners, and the interaction was statistically significant. While there may have been a ceiling effect for the "fast" learners on the later trials, the effect appeared early enough in learning to suggest that the effect was a real one. In contrast with the results obtained with the number of words recalled per category, the ability-by-trials interaction obtained for the number of categories recalled indicated that the difference between the performance of "fast" and "slow" learners decreased as learning progressed.

There is considerable confusion in the literature as to which is the most appropriate measure of clustering or organization in free-recall learning (eg., Frankel & Cole, 1971; Roenker, Thompson, & Brown, 1971; Shuell, 1969). Therefore, a number of different measures were calculated on the present data. There are basically two different types of measures of clustering, deviation measures and ratio measures. The observed minus expected number of repititions (O-E--Bousfield & Bousfield, 1966) and the Z-score measure developed by Frankel and Cole (1971) are primarily deviation measures. On the other hand, the original ratio of repitition (RR) measure developed by Bousfield (1953) and the more recent adjusted ratio of clustering (ARC--Roenker, Thompson, & Brown, 1971) are representative of what can be referred to as ratio measures.

One measure of each type is represented in Figure 10. The upper panel consists of the mean differences between the observed and expected number of repititions. A multivariate analysis of variance for repeated measures indicates that "fast" learners have significantly higher scores than "slow" learners, $F(1,44) = 11.64$, $p < .01$, and that those Ss who are instructed about the categorized nature of the list and are encouraged to group the words from the same category together during recall exhibit clustering to a greater extent than do the noninstructed Ss, $F(1,44) = 5.94$, $p < .05$. The interaction between learning ability and instruction was not significant, $F(1,44) = 1.40$. The corresponding figure of the Z-score is not presented since the graph and the analysis are almost identical to that obtained with the O-E measure.

The lower panel of Figure 10 presents the values obtained with the ARC measure (Roenker, Thompson, & Brown, 1971); the graph for the RR (Bousfield, 1953) measure is extremely similar to the one presented. For the ARC measure, the main effect of learning ability was close to being statistically significant, $F(1,44) = 3.71$, $p = .06$. However, the main effect of instructions was significant, $F(1,44) = 8.82$, $p < .01$. The value of the F-ratio for the interaction between the two variables is .32. Thus, the conclusions are essentially the same for both measures of clustering. A more complete consideration of the appropriateness of the various type of measures that have been developed for measuring organization in free recall is beyond the scope of the present discussion; suffice it to say that, as far as the present study is concerned, "fast" learners appear to cluster to a greater extent than do "slow" learners, that interactions to organize the material to be learned increases clustering, and there is no interaction between learning ability and instructions which parallels the interaction obtained in the number of words recalled.

Discussion

The results of this study indicate that informing learners of the categorized nature of the list and encouraging Ss to make use of this organization facilitates the performance of "slow" learners but has little effect on the performance of the "fast" learners. Apparently, "slow" learners can make effective use of the conceptual organization present in the list if it is pointed out to them and they are encouraged to use it in learning the list. This implies, of course, that they have previously learned the necessary conceptual framework and/or strategies but are not normally able to make use of the information they have available unless its relevancy is pointed out to them. This

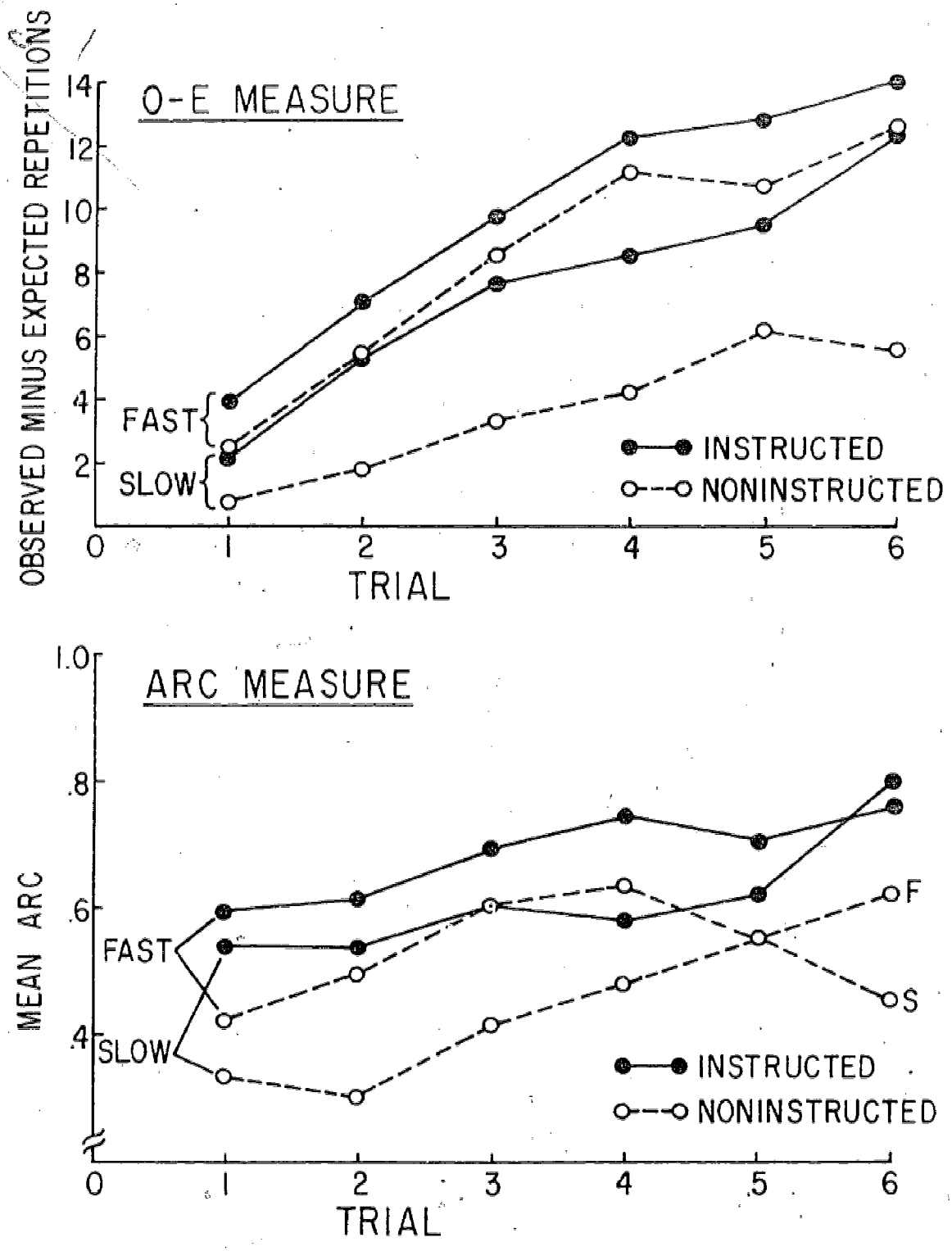


Fig. 10. Measures of clustering for "fast" and "slow" learners with each type of instructions.

implication is somewhat supported by the finding that, with the one exception of the ability-by-trials interaction obtained for number of categories recalled and number of words recalled per category, none of the effects interact with trials for any of the measures used in the present study. The interaction between learning ability and trials for the number of categories recalled suggests that possibly it requires one trial for the "slow" learners to "catch on" to the categorized nature of the list; the fact that there is little difference between the two ability groups after the first trial suggests that the categories are as familiar to the "slow" learners as they are to the "fast" learners, although there is some possibility that there is a ceiling effect for the "fast" learners. The ability-by-trials interaction for the mean number of words recalled per category suggests that perhaps the words within the categories are related to a greater extent for the "fast" learners than they are for the "slow" learners; this possibility is investigated further in the next section of this chapter.

This interpretation is consistent with the results of a completely different type of study which investigated problem solving in college students. Bloom and Broder (1950) found that successful and unsuccessful problem solvers differed not in the amount of information which they possessed that was relevant to the problem to be solved but in the extent to which the two groups could bring the relevant knowledge they already had to bear on the problem.

The results of the present study indicate that "fast" learners are apparently able to make use of the organization present in the list--it could be said equally well that they are able to see the relevance of knowledge they already possess to the learning of the categorized list and are able to utilize this knowledge in the learning of the list--without having it pointed out to them. This slight, and statistically nonsignificant, decrement in performance for "fast" learners who are told to use a particular type of organization in learning the list could mean that "fast" learners utilize somewhat idiosyncratic forms of organization which are more effective for them than the ones suggested in the instructions given in the present study.

The reasons for obtaining an interaction between learning ability and instructions for categorical organization but not for alphabetic organization (Chapter 7) are not entirely clear at present. One possible reason for the different results in the two studies could be that categorical organization is a more potent and obvious form of organization than alphabetic organization

and some Ss, i.e., the "fast" learners, discover the usefulness of the organization for learning the material. Alphabetic organization, on the other hand, is not as obvious and therefore is not normally used during learning even though both "fast" and "slow" learners can make use of it if asked.

Associative and Categorical Norms

Several times in the preceding discussion, it has been suggested that perhaps "fast" and "slow" learners differ in the associative and categorical relationships among the words in the list. One possible reason for the instructions not being more effective than they were might be that the words in the list were more highly associated with one another for the "fast" learners than for the "slow" learners. In order to investigate this possibility, both associative and categorical norms were collected.

Two hundred fifteen fifth-grade children from two elementary schools in a primarily working-class suburb were first given a pretest in order to define learning ability. The pretest consisted of two lists of 25 common nouns each. Each list was presented at a 2-second rate and 3 minutes were allowed for free recall after each list. The Ss were ranked on the basis of the total number of words recalled from both lists, and normative data for both the upper and the lower thirds and the upper and the lower halves are presented in Appendices E and F. None of the words in the pretest were included in the words for which normative data were obtained.

The normative data were collected three days after the pretest. Seven Ss were absent on the day the norms were collected. Both associative and categorical data were obtained on the same day from all 208 Ss in a counterbalanced fashion. Half of the classrooms in each school provided associative data before providing categorical data; for the other half, the order was reversed. Since the order in which the normative data are collected could influence the responses given, the data are presented separately for the two orders. However, the order in which the norms were collected appeared to have very little, if any, influence on the data obtained.

In collecting the associative norms, 55 words, including the 40 words used in the previous study on learning ability and instructions to categorize, were listed in a booklet containing 14 words per page. Beside each word was a blank line, and the Ss were asked to write beside each word the first word they thought of when they

read the stimulus word. Three different, random orders of the words were used to reduce biases resulting from priming and other factors. They were told to work as quickly as possible, and that every 30 seconds a number would be put on the board in front of the room; they were asked to record the number that was on the board when they finished the complete test. In addition, they were asked to circle the word they were working on when the experimenter said "mark" at the end of 30 seconds and 1 minute. These measures were obtained in order to determine whether "fast" and "slow" learners differ in how quickly they can think of words. The complete instructions are presented in Appendix C.

The associative norms are presented in Appendix E. The numbers outside the parentheses are the data for the upper and lower thirds of the distribution on the pretest while the numbers inside the parentheses are the data for the upper and lower halves of the distribution. In an attempt to determine whether or not the list used in the study described earlier in this chapter differs in associative strength for "fast" and "slow" learners, the Index of Total Association (ITA) and the Index of Concept Cohesiveness (ICC) (Marshall & Cofer, 1963) were calculated from the normative data for the upper and lower thirds of Ss since that was the classification used in the earlier study. The measures were calculated separately for each of the eight categories that were in the list; only the data from the 40 items used in the list were used in calculating the measures. The values of both measures for each category are presented for both "fast" and "slow" learners in Table 12. The "fast" Ss appear to have higher scores on the ITA measure while the "slow" learners appear to have higher scores on the ICC measure, although t-tests for paired observations indicate that neither difference was statistically significant, t (7) = 1.92 and 1.03 for the ITA and ICC measures, respectively, with a value of 2.37 required for significance at the .05 level. Thus, there does not appear to be any evidence that the list differs in associative strength for the two ability groups. It would be interesting to see if the values of ITA and ICC would predict either the probability of recalling a category or the number of words recalled per category. Due to the large amount of time required to tally the norms, there was insufficient time to conduct this analysis, however, we plan to do it in the future.

Seventeen different categories were used for the categorical norms which are presented in Appendix F. The same procedures for keeping the data separate for the two orders of testing and for presenting data for the upper and lower thirds and the upper and lower halves that were used for the associative norms were also

Table 12

Indices of Total Association and Indices of Concept Cohesiveness for "Fast" and "Slow" Learners for each Category

	"Fast"	"Slow"
Index of Total Association		
Colors	.7971	.7768
Fruits	.7797	.6870
Insects	.5971	.4957
Kitchen Utensils	.5652	.5507
Musical Instruments	.5304	.3971
Parts of a Building	.4754	.4290
Parts of the Human Body	.5130	.5275
Vehicles	.5478	.6000
Average	.6007	.5580
Index of Concept Cohesiveness		
Colors	.7673	.7351
Fruits	.6097	.6751
Insects	.4612	.5556
Kitchen Utensils	.0000	.1053
Musical Instruments	.1694	.3869
Parts of a Building	.2744	.3716
Parts of the Human Body	.1356	.1648
Vehicles	.2116	.0000
Average	.3287	.3743

used with the categorical norms. The name or description of each category was read aloud twice, and the Ss were given 30 seconds to write down as many items belonging to that category as they could think of. A separate page in a test booklet was used for each category. Three different orders of reading the categories were used--a different one was used in each classroom--in order to reduce any bias that might result from the order in which the categories were presented. The complete instructions that were used are presented in Appendix D. Unfortunately, we have not yet had sufficient time to analyze the results in any systematic manner, but we plan to do some in the near future.

Transfer of Instructions to Categorize

Margaret Barnes Karsick has recently completed a study for her master's thesis that was concerned with the transferability of the effect obtained in the first study on learning ability and instructions to categorize. While the analysis of the data has not been completed, preliminary results are available. The purpose of the Karsick study was to determine whether the effectiveness of instructions to organize the material to be learned is specific to the task for which the instructions are given or whether with practice in using an effective strategy, the effect will transfer to new tasks where the strategy would be effective but where no specific mention is made of the applicability of the strategy.

Method

Design. The experimental design of the study was basically a 2 x 2 x 2 factorial with two ability groups, two conditions of instructions, and two types of transfer lists. The two ability levels consisted of "fast" and "slow" learners as defined by the same pretest used in the earlier study. The two types of instructions involved standard free-recall instructions or these same instructions plus instructions concerning the categorized nature of the list; the instructions were essentially those used in the previous study (cf. Appendix B). These instructions were given prior to the first of the two learning tasks that comprised the main part of the study and were not repeated. The transfer list consisted of a categorized list for half of the Ss while the other half of the Ss received a list of unrelated words. Since it is usually felt that organization is important in the free-recall learning of both categorized and unrelated lists of words (eg., cf. Tulving, 1968), it was decided to include both types of lists in the design to see if there would be differential transfer effects to the two types of lists.

Procedure. The pretest used for defining learning ability was the same one used in the earlier study on learning ability and instructions to categorize; it consisted of a single presentation-recall trial for each of two lists comprised of 25 common nouns. The Ss were ranked on the basis of the number of words correctly recalled on both lists combined, and the upper and lower thirds of the distribution were classified as "fast" and "slow" learners, respectively.

The main part of the study consisted of two learning tasks which the Ss learned approximately four weeks after receiving the pretest. The first list (original learning) was composed of a categorized list of 40 common nouns with five words representing each of eight conceptual categories. Prior to the learning of this first list, half of the Ss received standard free-recall instructions while the remaining half of the Ss received instructions emphasizing the categorized nature of the list and encouraging them to use this categorical organization in learning the list. The words were presented in a different random order on each trial. In an attempt to equate the various groups in degree of original learning, the "fast" learners in both conditions of instruction were given two trials on the first list, the "slow"-instructed group was given three learning trials, and the "slow"-noninstructed group was given four learning trials. The number of trials given to the various groups was based on the data obtained in the earlier study (cf. Figure 7). The words were presented at a 2-second rate with 2 minutes allowed for recall after each presentation.

The second, or transfer, list was also composed of 40 words. Half of the Ss received a categorized list similar to the one they had learned during original learning, although all of the words and the categories represented by the words were different in the two lists. The other half of the Ss learned a comparable list of 40 unrelated words. All Ss received three alternate study-recall trials on the transfer list. The words were presented at a 2-second rate and 2 minutes were allowed for recall following each presentation.

Materials. The two lists used in the pretest were the same as those used in the earlier study. Two categorized lists and two lists of unrelated words were constructed for the main part of the study. None of the words in any of the six lists were the same. In constructing the categorized list, five examples representing each of sixteen conceptual categories which were considered appropriate for use with children were selected. The sixteen categories were randomly assigned to one of the two lists creating two lists of 40 items each (five words representing each of eight categories). Three random orders of each list were constructed

and used equally often in a counterbalanced manner. In addition, the two lists were counterbalanced with respect to the two learning tasks. Three random orders of each unrelated-word list was also constructed. Each of the three orders were used equally often on each trial of the second or transfer list in a counterbalanced manner, and the two lists were counterbalanced with respect to each of the two categorized lists used during original learning.

Subjects. The Ss in this study were 189 fifth-grade children from two elementary schools in a primarily working-class suburb. The Ss were ranked without regard to school on the basis of the number of words recalled from both lists on the pretest. All Ss took part in the main part of the experiment, although only the data from the upper and lower thirds will be presented here. Subjects from all ability groups were run at the same time if they were in the same experimental conditions. The pretest was administered in their regular classrooms, and the experimental testing was done in a smaller room in groups of from one to eight Ss. One S in the "fast" group and two Ss in the "slow" group were absent on the day the main experimental testing was done. Three additional Ss were randomly excluded from three different groups in order to equate the number of Ss in each condition. Thus, there were 15 Ss in each of the eight main conditions of the study.

Results and Discussion

The over all mean number of words recalled by all 189 Ss on the first pretest was 9.25, SD = 2.55. The overall mean number of words recalled by all Ss on the second pretest was 9.24, SD = 2.80. The correlation between performance on the two lists was .53. The overall mean number of words recalled by all Ss on both pretests combined was 18.49, SD = 4.68. The "fast" learners recalled an average of 23.65 words (SD = 3.16) from the two lists combined, and the "slow" learners recalled an average of 13.56 (SD = 1.86) from the two lists combined.

The mean number of words recalled by the four ability-instruction groups on each trial of both the first and second list are presented in Figure 11. On the final trial of original learning, the "fast" learners recalled more words than the "slow" learners (20.07 vs. 17.73), $F(1,112) = 6.57$, $p < .05$. The Ss in the noninstructed condition recalled more words than those in the instructed condition (19.68 vs. 18.12), but this difference was not statistically significant, $F(1,112) = 2.96$, $p = .09$. The interaction between learning ability and instruction was also not significant, $F < 1$.

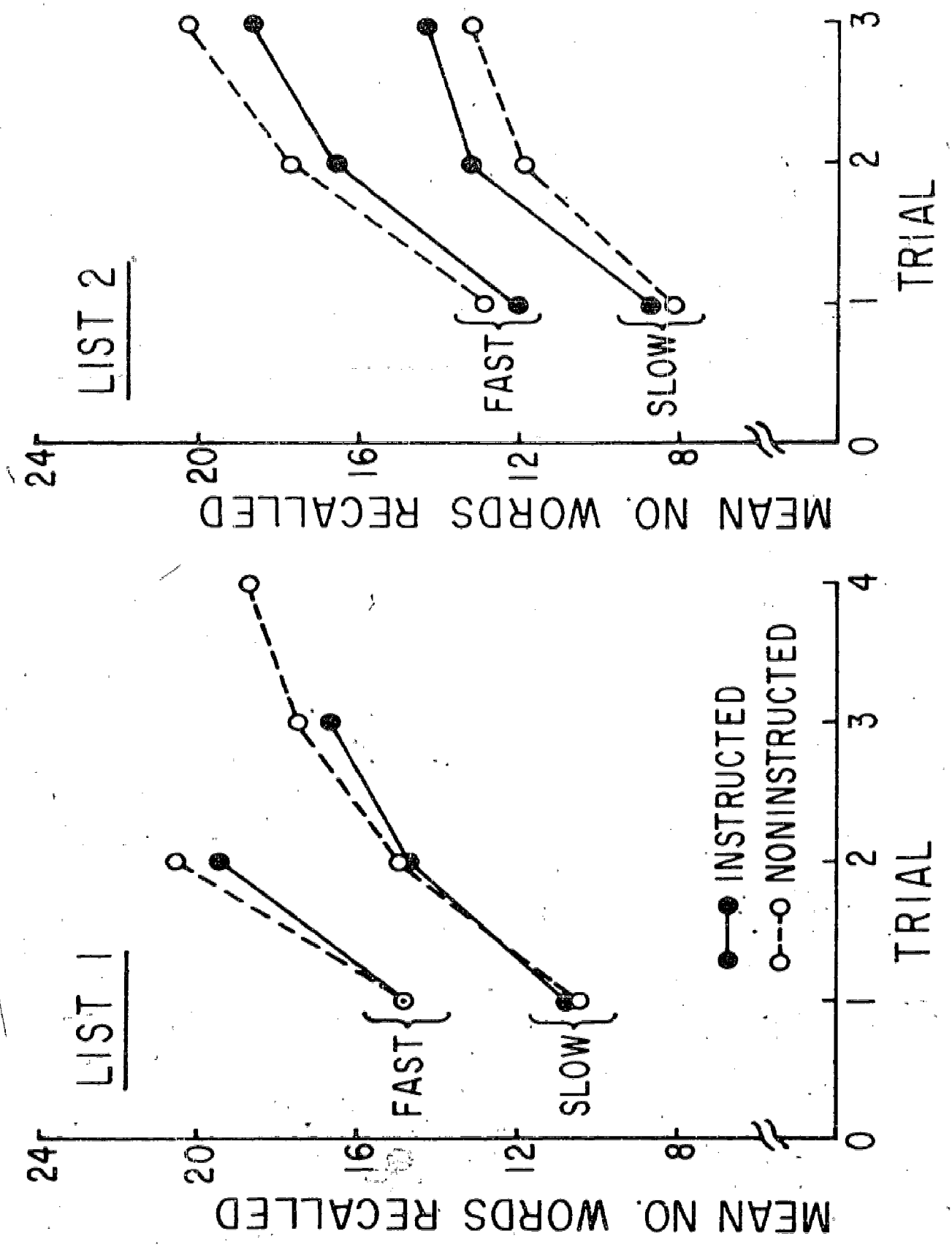


Fig. 11. Mean numbers of words recalled on each trial of Lists 1 and 2 by "fast" and "slow" learners with each type of instructions. (Data from Karsick's thesis).

Thus, the attempt to equate degree of original learning for the various groups was not completely successful; this was partly the result of instructions not being as effective for the "slow" learners as they were in the earlier study. The reasons for this discrepency between the results of the two studies are not clear at present.

A multivariate analysis of variance for repeated measures on performance during learning of the transfer list indicates that "fast" learners recalled significantly more words than "slow" learners, F (1,112) = 40.64, p <.01, and that more words were recalled from the categorized list ($\bar{X}$ = 12.82, 17.92, and 19.52 for Trials 1, 2, and 3, respectively) than from the list of unrelated words ($\bar{X}$ = 8.07, 11.78, and 13.78 for Trials 1, 2, and 3, respectively), F (1,112) = 54.44, p <.01. The main effect of instructions was not significant, F (1,112) = .01, and the interaction between learning ability and instructions which is apparent in Figure 11 is also not statistically significant, F (1,112) = 2.13, p = .15. None of the other interactions were significant.

Since the attempt to equate for degree of original learning was not entirely successful, it was decided to do a multivariate analysis of covariance for repeated measures using performance on the final trial of List-1 learning as the covariate. With this statistical analysis, the conclusions regarding the three main effects remained unchanged. However, the learning ability-by-instructions interaction was significant, F (1,111) = 6.21, p = .01. The conclusions regarding the remaining interactions were unchanged. Thus, when degree of original learning was statistically controlled, instructions concerning the organizational nature of the list given prior to learning the first list facilitated the performance of "slow" learners while reducing the performance of "fast" learners on the transfer list.

This finding is consistent with the results of the earlier study, although the reasons why the instructions were not effective until the second list and why the overall effect was less pronounced than in the previous study are not clear at present. However, the results of both studies do suggest that the performance of "slow" learners can be improved by informing them of the way in which the material to be learned is organized and by encouraging them to make use of effective learning strategies which they already possess. The boundary conditions of this instructional effect requires and deserves further investigation.

Thus if appears that one possible source of individual differences in learning may be the extent to which an individual is

able to see how what he already knows is relevant to subsequent learning tasks. The results of the second study reported in this chapter suggests the possibility that once effective learning strategies are pointed out to "slow" learners and they are given practice in their use, the use of these strategies can transfer to similar learning tasks.

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Appendix A

Standard Instructions for Pretest

Please print your first and last name on the top line of the paper that was just given to you. (Allow time for this) You are going to see a list of 25 very simple words on the screen. You should have no trouble recognizing the words. Each word will appear on the screen by itself for a very short period of time. Pay close attention to each word when it appears for you will see it only once. When the complete list has been shown, you will see a sign like this: (Show slide with ++++++).

When you see this slide, print or write down as many of the words that you have just seen as you can remember. I will not tell you when to start writing. Write the words you remember when you see this slide: (Point to the screen). The words may be written down in any order you wish. Are there any questions?

Alright, let's try it once with a short list of numbers instead of words. You'll see three different numbers followed by this sign: (Point to the screen). When you see this slide, print or write down the numbers that you are about to see. Use a different line for each number. Does everyone understand?.....OK, let's begin.

(Show practice list of three numbers)

Did everyone write down the three numbers?.....Can anyone tell me what one of the numbers were? (Call on children and put the three numbers on the board).....These are the numbers you should have on your paper (Point to the board).....Are there any questions?..... Could everyone read the numbers?

Remember, the next list will be a list of words instead of numbers, and it will be longer. Each word will be shown just once, so pay close attention to it when you see it.. When you see this sign (Point to screen) again, write down all the words you can remember.

Do as well as you can. If you are not sure whether or not a certain word appeared, write it down anyway. If you are not sure how to spell a word, just do the best you can and continue writing down the other words. This is not a spelling test, so don't spend time trying to correctly spell a word you are not sure of.

Before we begin, are there any questions?..... Please put down your pencils and pens. OK, here is the list of words.

(Show list and allow time for recall)

OK, please turn your paper over and pass them in.

WHEN A SECOND TEST IS GIVEN: (After collecting papers for first test, pass out second answer sheet)

Now, we'll do the same thing only with a new list of words. This list will also contain 25 words. Once again, please print your first and last name on the top line of your paper. (Allow time for this) You are to do the same thing as before. Remember, however, that this is a list of 25 new words. None of the words on the first list will appear this time. Once again, when you see this sign (point to ++++++ on screen) write down as many words from the second list as you can remember. If you are not sure whether or not a certain word was on the first list or the second list, write it down anyway. Once again, the words may be written in any order.

Please put down your pencils and pens. Are there any questions? .....OK, here is the second list.

(Show list and allow time for recall)

OK, please turn your papers over and pass them in. That is all for today. Thank you very much for your cooperation.

Appendix B

Instructions Used for

Instructions to Categorize Studies

Hi. My name is Claudia and I'm assisting Dr. Shuell in an experiment similar to the one you did a couple of weeks ago. But before we talk about the details, I'd like you to please put your first and last names on the six pages in front of you. (Allow time for this)

What we are going to do today is an experiment similar to the one you did a couple of weeks ago. This time, however, there will be 40 new words and they will be repeated in a different order in 6 different trials--that is, you will see the list of words 6 times and each time the words will be in a different order. During each trial the word will flash on the screen once for only 2 seconds each, so please pay attention. After the 40 words are shown, a slide with a series of asteriks will appear (show slide with ****** on screen and point to it). As soon as you see this slide, please write down as many words as you can recall on the paper on top--the papers are marked 1 through 6, one for each trial. Please do not pick up your pencils until you see this asterik slide. The words may be written in any order and the correct spelling is not necessary.

INSERT THE FOLLOWING FOR THE "INSTRUCTED" GROUPS--OMIT FOR THE "NONINSTRUCTED" GROUPS: You will notice that the words seem to fall into categories--for example, there could be a group of words that are vegetables (celery, carrots, etc.) or animals (dog, cat, etc.). You will find it easier to recall the words if you concentrate on the groupings of the words and try to write down the words that fall into each category--for example, write down as many vegetables as you can remember--as many animals, etc. Remember the order of words within each grouping is not important--and the correct spelling is not necessary.

ADD FOR ALL GROUPS: You will not be graded on your performance at all; however, please do the best you can because it is important to Dr. Shuell and me. Are there any questions before we begin?

PRIOR TO SHOWING THE WORDS FOR TRIAL 2, ADD THE FOLLOWING: Now we will repeat it. The words will be the same words, but they will appear in a different order. Again you will have 2 minutes to write down as many words as you can remember. The correct order and spelling of the words is not necessary. Begin writing as soon as you see the slide of asteriks. Be sure you are using the paper marked #2.

ADD THE FOLLOWING FOR THE INSTRUCTED GROUP: Again try to concentrate on the groupings of the words and try to write down the words that fall into each category.

FOR BOTH GROUPS, ADD: Are there any questions?

NOTE: After each recall period the experimenter picked up the sheet for that trial.

Appendix C

Instructions for Collecting Free-Association Norms

Please do not open the booklets I am passing out until I tell you to do so. Fill in the first page with the information indicated. (Allow time for this)

The purpose of this experiment is to see how quickly you can think of words. It is not a test, and there are no right or wrong answers. We are just interested in how quickly you can think of words. When I tell you to open your booklets you will find inside a list of words. I would like you to write next to each word the first word that it makes you think of. It does not matter what word you write as long as the word on the paper makes you think of it. There are no right or wrong answers. The purpose of the experiment is just to see how quickly words will come to your mind.

For example (writing on the board), suppose that Coat is the word you see. It will look just like this in the list with a line beside it for you to write the first word that you think of. Your job will be to write down the first word that Coat makes you think of on the line next to Coat. For example, Coat might make you think of Hat or Man or Wear or Brown or Big or Warm or you might think of some other word. Whatever the first word is that you think of write it down on the line next to Coat.

You are to do the same thing for each word in the list. Be sure to write the word clearly, but don't worry if you are not sure how to spell the word. Spell it as best you can. We are not interested in spelling; we are just interested in the word you think of each time.

Speed is important. When I tell you to start, I want you to work straight down the list as fast as you can. When you finish a page, go right on to the next one. There are four pages in all. Write only one word on each line, but do not skip any words and be sure to write clearly since we must be able to read the word you write. I am going to time you and every 30 seconds I am going to write a number on the board. When you finish all of the words on the list write the number that is on the board on the back page of your test. That will tell me how long it took you to finish. In addition, I will say "Mark" twice while you are working. When I say "Mark", draw a circle around the word you are working on at the time.

Are there any questions?

Be sure to write clearly.

Be sure to write the first word that you think of.

Be sure to write just one word for every word on the list.

Be sure to circle the word you are working on when I say "Mark" and to put the number that is on the board when you finish on the last page of your booklet.

OK, Turn the page and begin with the first word.

Appendix D

Instructions for Collecting Category Norms

Please number each page of the booklet on the top, right-hand corner. You should have 18 pages altogether. (Allow time for this) Now, please print your first and last name on page #1.

The reason we are doing this experiment is to find out what things people usually think of as belonging to different categories or groups. Can any of you tell me what a category is? (Make sure they know what a category is) Here is what I would like you to do. First, I will say the name or description of a category, and as soon as I name the category, begin to write down the words in that category that you think of. You will have 30 seconds to write down on one of the pages of your booklet as many things as you can think of that belongs to that category. Write the words down as soon as you think of them.

Spelling is not important, so don't worry about spelling. Just spell the word as best you can; this is not a spelling test. In fact, it's not a test at all. There are no right or wrong answers. We are just interested in what items or things you think belong in each of the categories.

For example, if I said "A Toy", you might think of and write down such things as: doll, top, blocks, jumprope, puzzle, swings, and so forth. Perhaps you thought of something else. Whatever you think of that belongs to the category we are working on, write it down as soon as you think of it. The category might be a description like "Something to Climb On". I'll be giving you 17 different category names or descriptions. Please use a separate page in the booklet for each group of things. When I say, "Stop", put your pencil down and turn to the next page. Then I will say the number of the page you should be on, give you another name of a group or category, and then you will have 30 seconds to write down as many things as you can think of that belong to that category or group.

OK, are there any questions? Remember, there will be 17 different categories, and you are to use a different page of the booklet for each category.

Please turn to page #2, and we will begin.

NOTE: (Allow 30 seconds for each category.--Be sure to say the page number they should be on before giving them a new category name. --Use the appropriate order of reading the categories from the list on the next page. Say each category name TWICE.)

Order*			Category
1	2	3	
2	14	6	Something to Use in the Kitchen
3	3	8	A Four-Footed Animal
4	11	5	A Part of the Human Body
5	12	7	A Fruit
6	7	12	A Name Applied to a Person to Indicate his Occupation or Job
7	16	16	An Article or Piece of Clothing
8	17	4	An Article or Piece of Furniture
9	4	15	A Sport
10	8	14	A Musical Instrument
11	5	18	Something to Travel In or On
12	10	13	A Relative
13	15	17	Some Place a Human Could Live
14	18	2	A Vegtable
15	6	9	A Bird
16	13	11	An Insect
17	2	10	A Color
18	9	3	A Part of a Building

*Numbers range from 2 to 18 to correspond to page number in booklet.

Appendix E

Associative Norms

AIRPLANE

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	fly(ing)	16(25)	11(14)	27(39)	10(15)	10(17)	20(32)
2.	jet	4(6)	7(10)	11(16)	2(2)	3(5)	5(7)
3.	air	3(3)	3(3)	6(6)	2(4)	8(8)	10(12)
4.	car	1(3)	1(3)	2(6)	2(2)	2(2)	4(4)
5.	sky	1(1)	0(1)	1(2)	2(3)	2(4)	4(7)
6.	high	1(2)	0(2)	1(4)	1(2)	0(1)	1(3)
7.	ride	2(2)	0(1)	2(3)	1(1)	0(2)	1(3)
8.	plane	0(1)	0(2)	0(3)	0(1)	1(1)	1(2)
9.	train	0(1)	2(2)	2(3)	0(0)	1(1)	1(1)
10.	transportation	0(0)	2(4)	2(4)	0(0)	0(0)	0(0)
	no response	1(1)	2(2)	3(3)	0(0)	1(1)	1(1)

Three: wing/s (H,ML,L); helicopter (MH,2L); travel (2H, L)

Two: fast (H,ML); pilot (H,MH); glide (MH,L); airport (2ML); go (2L)

One: engine (ML); the (L); land (H); vehicle (L); job (H); nose (L); wheels (L); enjoyment (L); propellers (L); big (ML); animal (L); fast (1); boy (L); her (L); ring (ML); bus (H); white (H); steel (L) can (ML); map (H); zoom (H); ear (ML); cat (L); span (L); box (L); Florida (ML); whale (ML)

ANT

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	insect	8(10)	10(13)	18(23)	7(10)	10(15)	17(25)
2.	bug	4(10)	7(12)	11(19)	3(5)	9(10)	12(15)
3.	small	5(8)	2(2)	7(10)	4(5)	3(4)	7(9)
4.	little	5(6)	1(2)	6(8)	2(2)	1(3)	3(5)
5.	uncle	0(1)	0(2)	0(3)	1(3)	1(1)	2(4)
6.	aunt	1(3)	1(1)	2(4)	0(0)	0(2)	0(2)
7.	black	1(1)	0(1)	1(1)	1(2)	0(2)	1(4)
8.	bee	0(1)	1(2)	1(3)	0(0)	0(1)	0(1)
9.	crawl	2(2)	0(1)	2(3)	0(0)	0(0)	0(0)
	no response	0(0)	0(0)	0(0)	0(0)	2(2)	2(2)

Two: hill (H,ML); watch (2H); fly (H,ML); picnic (H,ML); beetle (2H); desk (H,ML); tiny (2H); food (ML,L); spider (2H); animal (H,L)

One: climb (H); cricket (H); ant (L); moth (H); walk (L); mole (L); pest (MH); ladybug (MH); frog (L); "fraud" (L); roach (L); house (L); egg (ML); relative (MH); thing (L); bad (L); dirt (H); "illegible" (H); six legs (L); "retant" (L); "yak" (L); "deak" (L); pant (ML); ground (ML); ugly (ML); motorcycle (MH); farm (MH); bird (L); foot (L); antenna (L); age (L); pal (L); plate (MH); "ness" (MH); orange (ML); "thoes" (ML); grandmother (ML); tan (L); crumb (H); nat (H); eraser (H); Niagara Falls (ML): anteater (MLO; people (ML)

APPLE

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. fruit	6(12)	9(13)	15(25)	10(14)	7(18)	17(32)
2. red	5(6)	1(2)	6(8)	4(4)	6(8)	10(12)
3. orange	2(2)	1(2)	6(8)	0(2)	5(7)	2(9)
4. eat	3(3)	1(2)	4(5)	4(4)	1(1)	5(5)
5. peach	3(3)	3(3)	6(6)	1(2)	1(1)	2(3)
6. pear	1(3)	1(2)	2(5)	1(1)	2(2)	3(3)
7. good	3(5)	1(1)	4(6)	0(0)	1(1)	1(1)
8. tree	1(2)	2(2)	3(4)	1(3)	0(0)	1(3)
9. banana	0(2)	1(3)	1(5)	0(0)	0(1)	0(1)
10. food	1(1)	1(1)	2(2)	2(2)	1(1)	3(3)
11. core	1(2)	2(2)	3(4)	0(0)	0(0)	0(0)
12. pie	0(1)	0(1)	0(2)	0(1)	1(1)	1(2)
13. grape	1(2)	1(2)	2(4)	0(0)	0(0)	0(0)
no response	0(0)	0(0)	0(0)	1(1)	0(0)	1(1)

Two: chapple/dapple (2ML); juicy (H,ML); round (2L); bite (H,L); delicious (H,ML); teeth (MH,L); sweet (H,MH); cider (M,L); five (2ML); green (2L)

One: first (L); tomatoes (H); cherry (MH): desk (H); I (L); cat (L); little (H) seed (MH); love (L); prune (L); see (H); white (MH); soft (L); airplane (H); candy (MH); paper (L); stem (L); birthday (L); dog (H); chimpanzee (H); skin (H); lunch (ML); leaf (H); small (H); bee (H); worm (ML); juice (ML); snack (ML): face (ML)

ARM

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	leg(s)	7(13)	12(18)	19(31)	3(9)	10(14)	13(23)
2.	hand	6(8)	8(10)	14(18)	8(10)	3(4)	11(14)
3.	body(human body, part of body)	3(6)	4(8)	7(14)	5(7)	7(10)	12(17)
4.	long	2(4)	0(0)	2(4)	2(2)	3(4)	5(6)
5.	move	3(5)	1(1)	4(6)	1(2)	0(0)	1(2)
6.	person	1(1)	0(0)	1(1)	2(3)	1(1)	3(4)
7.	fingers	2(2)	0(0)	2(2)	1(2)	0(0)	1(2)
8.	farm	1(2)	0(0)	1(2)	0(2)	0(0)	0(2)
9.	elbow	0(1)	1(2)	1(3)	0(0)	0(0)	0(0)
10.	write	1(1)	1(1)	2(2)	0(0)	1(1)	1(1)
	no response	1(1)	0(0)	1(1)	0(0)	0(0)	0(0)

Two: reach (H,MH); human (H,MH); throw (H,L); hit (H,ML); bone (L,MH); foot (H,L); work (2L); use (H,L); gun (H,L)

One: arm (L); me (H); week (H); thing (L); "stofe" (L); hat (MH); eat (ML); back (L); fist (ML); knee (ML); funny (ML); men (L); broke (MH); flood (H); black (H); fall (L); bell (L); it (ML); burn (ML); house (L); cow (L); people (L); face (L); light (H); is (H); head (H); green (ML); at (ML); right (L); English (L); able (L); flesh (H); ceiling (ML); war (ML)

BANANA

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	fruit	9(14)	18(24)	27(38)	7(12)	20(30)	27(42)
2.	yellow	6(7)	0(2)	6(9)	4(6)	3(4)	7(10)
3.	eat	2(3)	0(2)	2(5)	4(5)	5(5)	9(10)
4.	apple	2(3)	4(5)	6(8)	1(2)	1(2)	2(4)
5.	food	4(4)	0(1)	4(5)	3(4)	1(1)	4(5)
6.	long	3(4)	1(1)	4(5)	0(0)	0(1)	0(1)
7.	orange	1(1)	3(3)	4(4)	0(0)	0(1)	0(1)
8.	peel	3(4)	1(1)	4(5)	0(0)	0(0)	0(0)
9.	monkey(s)	0(0)	1(2)	1(2)	1(2)	0(0)	1(2)
10.	curve	0(0)	0(1)	0(1)	1(1)	0(1)	1(2)
11.	grape	0(0)	1(2)	1(2)	0(0)	1(1)	1(1)
	no response	0(0)	0(0)	0(0)	0(0)	1(1)	1(1)

Two: pear (2MH); peach (MH,L); door (ML,L); good (H,MH)

One: split (L); Sally (MH); band (MH); truck (ML); and (ML); pil (L); soft (H); lemon (H); desk (H); skin (H); mouth (H); "stofe" (L); chewy (MH); sweat (MH); "sqush" (L); blue (L); banaña bread (L); thing (L); today (L); baseball (L); many (L); Tuesday (L); leg (H); flag (H); chimpanzee (MH); flavor (MH); "chasses" (ML)' yes (ML); cup (L); skipt (H); step (ML); man (L); ice cream (ML); dog (ML)

BEE

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. sting	10(14)	13(16)	23(30)	10(13)	10(13)	20(26)
2. insect	1(3)	4(7)	5(10)	3(4)	8(12)	11(16)
3. fly(ing)	2(5)	7(8)	9(13)	2(2)	1(3)	3(5)
4. bug	3(5)	1(2)	4(7)	3(4)	3(3)	6(7)
5. wasp	1(2)	2(5)	3(7)	4(5)	0(1)	4(6)
6. honey	0(0)	1(3)	1(3)	2(4)	2(5)	4(9)
7. buzz	5(5)	0(0)	5(5)	3(4)	2(2)	5(6)
8. hive	1(1)	1(2)	2(3)	1(3)	0(0)	1(3)
no response	1(1)	0(0)	1(1)	0(0)	0(0)	0(0)

Three: hurt (H,MH,ML); yellow (H,MH,L); me (ML, 2L); ouch (H,ML,L)

Two: flower (2H); hornet (H,MH), bite (MH,ML)

One: animal (L); stinger (ML); dog (L); ditch (L); bus (L); Judy (L); see (L); stake (L); bad (L); pain (H); yellow jacket (MH); thing (L); bird (H); wash (H); "a mess of bees" (L); bit (H); play (L); rat (ML); bumblebee (MH); girl (MH); run (MH); did (H); chair (H); string (H); bare (MH); he (ML); ore (ML); "nise" (ML); eye (L); wing (H); keep (H); sound (H); hand (ML)

BELL

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. ring	24(34)	15(27)	39(61)	18(21)	16(26)	39(47)
2. noise	0(2)	0(1)	0(3)	4(6)	4(5)	8(11)
3. ding	2(3)	0(1)	2(4)	0(2)	0(2)	0(4)
4. church	1(1)	2(4)	3(5)	0(1)	2(2)	2(3)
5. Christmas	1(1)	3(3)	4(4)	0(1)	2(2)	3(3)
6. ding dong	1(2)	1(1)	2(3)	1(2)	1(1)	2(3)
7. instrument	1(1)	1(1)	2(2)	0(0)	1(1)	1(1)
8. jingle	0(0)	1(1)	1(1)	1(1)	1(1)	2(2)
9. music	0(0)	0(0)	0(0)	0(1)	2(2)	2(3)
sound	1(1)	1(1)	2(2)	0(0)	1(1)	1(1)

Two: horn (H,L); door (H,MH); loud (2H); song (H,ML); string (H,ML); ball (ML,L); fell (H,ML); hear (2ML)

One: sell (L); blow (H); let out of school (L); band (L); boy (H); tree (H); box (ML); cat (H); bell (L); here (L); dinner (ML); thing (ML); cow (MH); school (MH); silver (H); steel (MH); rode (L); fly (MH); toad (L); one (L); smell (L); pencil (L); "stell" (L); fat (H); green (H); too (ML); well (ML)

BIKE

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. ride	17(26)	7(13)	24(39)	16(20)	9(15)	25(35)
2. wheel(s)	6(7)	5(5)	11(12)	3(5)	5(8)	8(13)
3. car	0(2)	3(8)	3(10)	3(6)	2(2)	5(8)
4. motor cycle	1(3)	1(1)	2(4)	0(0)	2(2)	2(2)
5. pedal	1(2)	2(2)	3(4)	0(1)	0(0)	0(1)
6. fast	0(0)	1(1)	1(1)	2(2)	2(2)	4(4)
7. trike	0(0)	1(2)	1(2)	1(2)	0(1)	1(3)
8. travel	0(0)	2(3)	2(3)	1(1)	0(0)	1(1)
9. move	2(2)	0(0)	2(2)	1(1)	0(0)	1(1)
10. vehicle	0(0)	2(2)	2(2)	0(0)	1(1)	1(1)
no response	0(0)	0(0)	0(0)	0(0)	2(2)	2(2)

Two: mike (2L); road (H,L); toy (2H); mini bike (MH,L); spoke (MH,ML); light (MH,L); red (MH,L); orange (H,L); bicycle (bike) (H,L)

One: can (H); log (ML); hurt (MH); boy (L); ball (ML); enjoyment (L); "5" (ML); basket (H); flat (L); nice (H); transportation (L); radio (ML); fun (L); scooter (H); handles (H); travel in (H); like (H); fast wheels (ML); two wheels (H); spider (MH); big (ML); square (L); fifth (L); rack (ML); fit (MH); old (L); bell (L); cake (L); sea (H); pink (ML); pot (ML); dog (ML); thing (L); pen (H); eye (H); right (H); "wike" (ML); call (ML); hike (ML)

BLACK

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	color	9(14)	6(9)	15(23)	15(16)	8(16)	23(32)
2.	white	6(14)	6(9)	12(23)	4(10)	5(8)	9(18)
3.	dark	6(7)	2(3)	8(10)	3(5)	5(6)	8(11)
4.	brown	1(2)	2(3)	3(5)	0(2)	5(6)	5(8)
5.	cat	4(5)	1(2)	5(7)	1(1)	2(2)	3(3)
6.	blue	1(1)	4(6)	5(7)	1(1)	1(2)	2(3)
7.	cow	0(0)	0(2)	0(2)	2(2)	1(2)	3(4)
8.	ugly	1(1)	1(1)	2(2)	0(1)	1(1)	1(2)
9.	red	0(0)	2(4)	2(4)	0(0)	0(0)	0(0)
10.	night	0(0)	1(1)	1(1)	1(1)	1(1)	2(2)
11.	hair	1(1)	0(0)	1(1)	1(1)	0(0)	1(1)
12.	dog	0(0)	0(1)	0(1)	0(0)	1(1)	1(1)
	no response	0(0)	1(1)	0(1)	1(1)	1(1)	2(2)

One: gold (ML): black (L); male (H); might (H); sheep (H); trouble (MH); "carer" (L); Beth (H); chimney (L); people (L); hat (L); jet (H); log (L); light (H); paper (MH); yellow (L); Negro (MH); "frigh" (H); "puper" (H); "wile" (ML); lack (ML); dark color (MH); dull (L); window (L); wood (L); green (H); ocean (H); purple (MH); lone (ML); "bra(k)" (ML); stack (ML); belt (L); clear (H); pink (H)

BLUE

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	color	14(18)	14(19)	28(37)	18(20)	19(30)	37(50)
2.	red	1(4)	6(8)	7(12)	4(6)	5(7)	9(13)
3.	sky	3(4)	1(1)	4(5)	3(4)	2(2)	5(6)
4.	green	2(4)	1(3)	3(7)	0(3)	1(1)	1(4)
5.	black	1(2)	3(5)	4(7)	1(1)	1(2)	2(3)
6.	yellow	0(2)	1(1)	1(3)	0(2)	1(1)	1(3)
7.	eye	1(1)	0(1)	1(2)	0(0)	1(2)	1(2)
8.	purple	0(1)	0(1)	0(2)	2(2)	0(0)	2(2)
9.	pink	2(2)	1(1)	3(3)	0(0)	0(0)	0(0)
10.	pretty	2(2)	0(1)	2(3)	0(0)	1(1)	1(1)
	no response	0(0)	0(1)	0(1)	0(0)	0(0)	0(0)

Two: water (MH,L); you (2ML): white (H,L); nice (MH,ML): dark (H,L); silver (2H); flag (2H); call (H,L)

One: house (L); gray (H); me (L); home (L); grape (H): bird (H): cat (ML); room (ML); light (L); hat (L); dress (L); snow (L); man (MH); wall (H); wind (H); bright (MH); violet (ML); white (ML); mine (MH); fire (H); orange (H); glasses (H); cold (H); class (H); word (MH); wow (ML); comics (ML)

BOAT

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. water	9(14)	8(11)	17(25)	6(11)	8(13)	14(24)
2. ship	5(9)	8(12)	13(21)	6(8)	1(2)	7(10)
3. sail	4(8)	1(3)	5(11)	4(4)	4(5)	8(9)
4. float	4(5)	1(1)	5(6)	2(2)	1(2)	3(4)
5. motor	1(1)	1(2)	2(3)	2(3)	3(3)	5(6)
6. car	0(1)	3(3)	3(4)	2(3)	1(2)	3(5)
7. ride	2(2)	2(2)	4(4)	3(3)	1(1)	4(4)
8. sink	0(0)	0(2)	0(2)	0(0)	2(3)	2(3)
9. coat	2(2)	0(0)	2(2)	0(2)	0(1)	0(3)
10. sea	1(1)	1(2)	2(3)	0(1)	0(0)	0(1)
11. row	1(1)	4(4)	5(5)	0(0)	0(0)	0(0)
12. travel	0(0)	0(0)	0(0)	1(1)	2(2)	3(3)
no response	1(1)	1(1)	2(2)	0(0)	0(0)	0(0)

Two: big (H,ML); fast (ML,L); fish (ML,L); wood (MH,L); plane (MH,L)

One: toat (ML); cow (L); long (L); ten (L); oars (ML); vehicle (L); bell (H); flag (L); shoe (L); thing (L); toy (ML); blue (L); tip (MH); bus (ML); "a ried" (L); stream (L); engine (H); drive (ML); log (L); lake (MH); wings (MH); dog (MH); ate (L); door (L); moth (H); air (H); sky (H); cruise (MH); red (ML); it (ML); "larch"(ML); gone (ML); plastic (L); house (L); sunk (L); "wather" (H); anchor (H); paddle (H); pencil (ML)

BROWN

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	color	12(17)	15(19)	27(36)	11(15)	10(19)	21(34)
2.	black	2(6)	8(13)	10(19)	5(11)	4(9)	9(20)
3.	blue	0(1)	1(1)	1(2)	1(1)	3(3)	4(4)
4.	cow	1(1)	1(2)	2(3)	1(1)	1(2)	2(3)
5.	coat	0(0)	3(3)	3(3)	2(2)	0(0)	2(2)
6.	dark	2(2)	0(1)	2(3)	0(0)	2(2)	2(2)
7.	green	1(2)	2(2)	3(4)	0(0)	0(0)	0(0)
8.	hair	2(2)	0(0)	2(2)	1(2)	1(1)	2(3)
	no response	0(0)	0(0)	0(0)	0(1)	0(0)	0(1)

Two: bat (H,L); dull (MH,L); shoe (2H); white (H,L); tree (2H); red (H,MH); ugly (2L); dog (H,MH); boy (H,MH); bear (H,MH); orange (MH,L); yellow (MH,ML);

One: violet (H); nectar (L); tree trunk (L); brown (L); purple (H); name (L); "cari" (L); capricorn (H); herd (L); house (H); fall (H); nice (H); animal (ML); bathroom (ML); Carl (L); street (L); know (L); hours (ML); "dom" (L); down (ML); pink (MH); fight (MH); Negro (L); bird (H); bell (H); gown (H); four (MH); free (MH); dress (MH); horse (ML); tar(r) (ML); bay (ML); fur (L); bag (L); chair (L); mud (H); car (H); mess (H); silver (H); case (ML); me (ML)

BUS

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	car	6(8)	11(17)	17(25)	11(17)	10(14)	21(31)
2.	ride	2(5)	2(3)	4(8)	2(2)	2(6)	4(8)
3.	school	3(6)	2(4)	5(10)	2(3)	1(1)	3(4)
4.	truck	1(3)	3(3)	4(6)	1(1)	2(2)	3(3)
5.	wheel(s)	1(1)	2(2)	3(3)	1(3)	2(3)	3(6)
6.	stop	1(1)	2(4)	3(5)	0(0)	2(3)	2(3)
7.	yellow	1(2)	1(2)	2(4)	1(2)	1(2)	2(4)
8.	travel	1(1)	1(2)	2(3)	1(2)	1(1)	2(3)
9.	big	2(4)	0(0)	2(4)	1(1)	1(1)	2(2)
10.	transportation	1(1)	2(3)	2(4)	0(1)	0(0)	0(1)
11.	children	1(1)	0(0)	1(1)	1(1)	1(2)	2(3)
12.	train	0(1)	0(1)	0(2)	0(1)	1(1)	1(2)
	no response	1(1)	0(0)	1(1)	0(0)	0(0)	0(0)

Three: street (H,ML,L); go(H,ML,L); seat (3H); ride (H,MH,ML)

Two: people (H,ML); fast (H,L); long (H,MH); plane (H,ML); automobile (2L); driver (H,L); vehicle (2L); trip (H,MH); drive (2L)

One: crowded (H); passenger (ML); bee (ML); smelly (H); "hred" (L); street (H); New York (H); take (MH); crash (MH); top (H); move (L); drive (L); "celdre" (L); people (H); high (H); noisy (L); "bro" (L); fuse (L); hard (L); us (ML); bench (L); write (L); story (L); kite (MH); "drune" (L); mouse (L); see (H); run (H); fast (H); wait (ML); cab (ML); auto (ML)

CAR

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	truck	2(2)	5(8)	7(10)	6(9)	4(7)	10(16)
2.	ride	3(4)	3(4)	6(8)	1(2)	4(6)	5(8)
3.	automobile	2(4)	0(3)	2(7)	3(4)	3(3)	6(7)
4.	drive	2(3)	0(0)	2(3)	3(3)	2(4)	5(7)
5.	bus	1(2)	2(2)	3(4)	2(2)	2(3)	4(5)
6.	wheel(s)	4(5)	0(0)	4(5)	3(3)	1(1)	4(4)
7.	bike	0(2)	1(2)	1(4)	1(4)	1(1)	2(5)
8.	fast	1(1)	1(1)	2(2)	1(1)	4(6)	5(7)
9.	go	2(3)	2(2)	4(5)	2(3)	0(0)	2(3)
10.	transportation	1(3)	1(1)	1(4)	0(1)	0(0)	0(1)
11.	train	0(1)	0(2)	0(3)	0(0)	2(2)	2(2)
12.	move	2(2)	0(0)	2(2)	1(2)	0(0)	1(2)
13.	travel(ing)	0(0)	2(2)	2(2)	1(1)	1(1)	2(2)
	no response	1(1)	0(0)	1(1)	0(0)	0(0)	0(0)

Three: boat (H,MH,ML); motor (H,2L); street (H,2L); horn (2H,ML); seat(s) (2MH,ML);

Two: gas (2H); horse (ML,L); vehicle (H,L); door (H,L)

One: saw (ML); big (H); slow (MH); ours (H); smack (L); monkey (H); break (L); thing (MH); dangerous (H); station (H); road (H); red (H); sit (MH); Chevrolet (MH); window (ML); white (MH); wash (H); "reet" (ML); plane (H); blood (MH); highway (MH); steering wheel (ML); wagon (H); motor home (H); car (H); tires (H); race (H); steer (H); purse (H); Ford (H); blue (H); in (L); here (L); star (ML); rubber (ML); cold (L); desk (L); trip (L); dog (H); run (H); wagon (MH); transporting (MH); ship (MH); cat (ML); bar (L); stop (L); driveway (L); "patel" (L); colors (L); far (H); zoom (H); motorcycle (H); war (ML); ran (ML); no (ML)

CAT

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. dog	15(21)	19(27)	34(48)	14(26)	15(21)	29(47)
2. animal	6(11)	6(7)	12(18)	12(13)	8(11)	20(24)
3. pet	2(2)	2(3)	4(5)	0(0)	2(3)	2(3)
4. black	1(2)	0(1)	1(3)	1(1)	3(3)	4(4)
5. fur	0(0)	1(2)	1(2)	1(1)	2(2)	3(3)
6. meow	2(3)	0(0)	2(3)	0(0)	0(1)	0(1)
7. scratch	3(3)	0(0)	3(3)	0(0)	0(0)	0(0)
8. soft	0(0)	0(2)	0(2)	1(1)	0(0)	1(1)

Two: hat (H,ML); pretty (H,ML); kitten (2MH); tiger (H,MH); mouse (ML,L)

One: rat (MH); horse (MH); boat (L); line (L); grandma (L); teeth (H); climb (H); nice (L); legs (H); wild (MH); thing (L); Willie (H); fat (H); lion (MH); heave (ML); food (ML); small (L); mush (L); two (L); tail (H); mule (H); coat (MH); little (ML); car (ML); to (ML); sat (L); blue (H); desk (H); fish (ML); "wat" (ML); love (ML)

CHERRY

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. red	5(13)	5(7)	10(20)	8(10)	7(11)	15(21)
2. fruit	4(5)	6(10)	10(15)	6(8)	13(18)	19(26)
3. eat	4(4)	3(4)	7(8)	5(5)	1(2)	6(7)
4. tree	3(4)	2(4)	5(8)	2(4)	3(3)	5(7)
5. food	2(4)	0(1)	2(5)	4(4)	3(3)	7(7)
6. grape	2(3)	0(0)	2(3)	2(3)	1(1)	3(4)
7. good	2(3)	2(2)	4(5)	0(0)	0(2)	0(2)
8. berry	2(2)	1(3)	3(5)	0(1)	1(1)	1(2)
9. apple	0(1)	1(3)	1(4)	2(2)	0(0)	2(2)
10. orange	1(1)	1(1)	2(2)	0(1)	1(2)	1(3)
11. plum	1(2)	0(0)	1(2)	0(2)	0(0)	0(2)
no response	0(0)	1(1)	1(1)	1(1)	0(0)	1(1)

Three: sweet (3H); pie (H,MH,ML); pit (2H)

Two: cat (ML,L); peach (H,MH); pop (2ML); color (2H); pear (H,L)

One: monster (H); seed (H); bra (H); could (L); be (L); candy (MH); something to eat (L); "bome" (H); nose (ML); flavor (H); nut (H); thing (L); round (L); basket (ML); cherry (ML); fun (ML); rasberry (MH); sweat (L); yum (ML); boat (ML); juicy (H); pick (H); little (H); merry (H); G. Washington (MH); lane (ML)

COW

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	animal	6(11)	2(5)	8(16)	11(14)	10(17)	21(31)
2.	horse(s)	7(11)	10(15)	17(26)	6(8)	3(5)	9(13)
3.	milk	4(7)	7(9)	11(16)	4(6)	7(8)	11(14)
4.	moo	2(2)	5(6)	7(8)	3(6)	2(3)	5(9)
5.	pig	1(3)	1(2)	2(5)	0(1)	1(2)	1(3)
6.	dog	0(1)	0(1)	0(2)	1(1)	2(2)	3(3)
7.	calf	1(1)	1(1)	2(2)	0(0)	3(3)	3(3)
8.	cat	1(1)	0(0)	1(1)	1(2)	0(1)	1(3)
9.	fat	2(2)	0(0)	2(2)	1(1)	1(1)	2(2)
10.	big	0(1)	2(2)	2(3)	0(0)	0(1)	0(1)
	no response	0(0)	0(0)	0(0)	1(1)	0(0)	1(1)

Three: bull (H,MH,L); bell (2H,MH); horn (2H,MH)

Two: meat (H,L); farm (ML,L); mom (H,MH)

One: "buw" (L); plow (H); pasture (H); coat (H); lion (H); farm animal (L); ant (L); bird (L); and (L); bedroom (L); tail (ML); mow (ML); chow (ML); "answ" (H); heavy (H); sound (H); hog (MH); bad (ML); house (H); food (L); white (ML); grass (L); four (L); look (H); head (H); brown (ML); goose (ML); heart (ML); "mamel" (MH)

DOG

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. cat	15(24)	17(27)	32(51)	13(24)	14(21)	27(45)
2. animal	4(5)	4(5)	8(10)	6(6)	8(10)	14(16)
3. bark	4(8)	1(3)	5(11)	6(6)	3(5)	9(11)
4. pet	1(3)	3(4)	4(7)	1(2)	2(3)	3(5)
5. fur	1(1)	1(1)	2(2)	1(1)	0(0)	1(1)
6. big	2(2)	0(0)	2(2)	0(0)	0(1)	0(1)
7. bite	2(2)	0(0)	2(2)	1(1)	0(0)	1(1)
8. brown	0(0)	1(2)	1(2)	0(0)	1(1)	1(1)
9. teeth	0(0)	0(0)	0(0)	1(2)	0(0)	1(2)
10. four	0(0)	1(1)	1(1)	0(0)	0(1)	0(1)
11. bone	0(0)	1(1)	1(1)	0(1)	0(0)	0(1)
12. eat	1(1)	0(1)	1(2)	0(0)	0(0)	0(0)
no response	0(0)	1(1)	1(1)	0(0)	0(0)	0(0)

One: bus (H); neighbor (L); mouse (ML); like (L); love (MH); hog (ML); cow (L); leg (H); "biskow" (L); trainer (L); rough (ML); spotted (H); dead (L); yellow (H); fast (ML); thing (L); eat (L); cute (MH); Sofe (L); die (L); bird (H); watch (H); the (ML); Barre (ML); rat (L); banana (L); black (H); play (H); best (MH); food (ML)

DOOR

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. open	10(13)	6(10)	16(23)	9(14)	7(9)	16(23)
2. house(s)	0(0)	3(4)	3(4)	4(5)	6(8)	10(13)
3. close	4(9)	1(1)	5(10)	3(4)	1(1)	4(5)
4. wall	0(2)	4(7)	4(9)	2(2)	1(1)	3(3)
5. knob	4(6)	1(3)	4(9)	0(1)	1(1)	1(2)
6. window	3(3)	0(2)	3(5)	3(3)	1(1)	4(4)
7. handle	1(1)	2(2)	3(3)	1(2)	1(2)	2(4)
8. bell	2(3)	1(1)	3(4)	1(1)	0(0)	1(1)
9. wood	0(0)	2(2)	2(2)	2(2)	1(1)	3(3)
10. floor	1(1)	2(2)	3(3)	0(0)	1(2)	1(2)
11. room	0(1)	0(0)	0(1)	1(0)	1(2)	2(3)
12. step(s)	0(1)	1(1)	1(2)	0(1)	0(1)	0(2)
no response	0(0)	1(1)	1(1)	0(0)	0(0)	0(0)

Three: brown (2MH,ML); slam (H,ML,L); building (2H,MH); hinge (MH,2L); shut (ML,2L)

Two: door(s) (H,MH); mat (2H); hall (H,MH); walk (ML,L)

One: flat (H); lock (H); color (L); red (L); key (ML); out (MH); "hred" (L); turn (ML); rug (H); big (H); opening (L); next (H); apartment (H); way (H); desk (ML); banana (ML); hand (H); lunch (H); board (L); part (L); or (ML); bee (ML); eat (L); doorknob (L); roof (L); cat (L); "na" (L); know (H); sky (H); table (MH); dog (ML); in (ML); feet (ML); more (L); "hinch" (L); foot (L); see (H); "brow" (H); roar (H); stool (ML); stop (ML); fan (ML); Mom (ML)

DRUM

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. stick	5(11)	3(6)	8(17)	3(5)	5(6)	8(11)
2. beat	8(8)	5(6)	13(14)	4(6)	3(4)	7(10)
3. instrument	1(1)	3(4)	4(5)	2(4)	5(10)	7(14)
4. play	1(3)	1(3)	2(6)	3(3)	1(3)	4(6)
5. hit	2(3)	1(1)	3(4)	2(3)	2(3)	4(6)
6. noise	1(2)	1(5)	2(7)	0(0)	2(3)	2(3)
7. pound	1(1)	0(2)	1(3)	3(4)	1(2)	4(6)
8. music	4(4)	0(0)	4(4)	1(1)	2(3)	3(4)
9. boom	2(3)	1(1)	3(4)	1(2)	1(1)	2(3)
10. bass	0(0)	5(5)	5(5)	1(1)	0(0)	1(1)
11. loud	0(2)	1(2)	1(4)	1(1)	1(1)	2(2)
12. sound	1(1)	2(2)	3(3)	0(0)	2(2)	2(2)
13. flute	0(1)	1(2)	1(3)	0(1)	0(1)	0(2)
no response	0(0)	0(0)	0(0)	0(0)	1(1)	1(1)

Two: violin (2H); big (H,ML); strike (2H); guitar (H,MH); ear (2L); plum (ML,L)

One: "how!" (L); drum (H); "hred" (L); bassdrum (L); racket (L); pat (H); boy (H); lode (L); lass (L); me (L); thing (L); "lade" (L); snaredrum (L); set (L); nice (L); room (L); kettle (MH); peace (MH); tick (MH); sister (L); like (L); cat (L); din (L); thin (H); bell (H); can (H); wood (H); "dum" (ML); one (ML); hall (ML); straw (L); roll (H); sum (H); Saturday (ML); land (ML)

EAR

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. hear	21(29)	14(22)	35(51)	13(17)	14(18)	27(35)
2. head	3(5)	3(3)	6(8)	3(6)	4(4)	7(10)
3. eye	0(3)	4(6)	4(9)	0(0)	2(2)	2(2)
4. nose	2(4)	3(4)	5(8)	1(2)	0(0)	1(2)
5. body	0(0)	1(1)	1(1)	0(1)	2(7)	2(8)
6. face	0(1)	1(1)	1(2)	2(4)	2(2)	4(6)
7. hair	1(2)	0(0)	1(2)	2(2)	0(0)	2(2)
8. sound	0(0)	0(0)	0(0)	0(1)	1(2)	2(3)
no response	0(0)	1(1)	1(1)	0(0)	1(1)	1(1)

Two: mouth (2HO; teeth (2ML); corn (MH,ML); air (2L); human (H,L)

One: earring (H); loud (ML); part (L); skin (L); closet (ML); ear of corn (L); pink (H); phone (H); fat (H); deaf (MH); ache (H); ear (MH); drop (MH); "stofe" (L); little (ML); listen (ML); big (L); helpful (H); Nana (L); heave (L); hen (L); book (MH); ship (L); hockey (L); eardrum (L); horn (L); inch (L); heart (H); clock (H); arm (MH); moth (MH); want (ML); dog (ML); skate (L); drum (L); hose (L); hole (H); white (H); near (H); pocket (ML); foot (ML)

EYE

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. see	15(20	9(16)	24(36)	13(27)	7(10)	20(27)
2. nose	3(5)	5(6)	8(11)	1(5)	2(6)	3(11)
3. head	1(1)	1(2)	2(3)	3(4)	6(7)	9(11)
4. ball	0(3)	4(5)	4(8)	2(3)	1(1)	3(4)
5. face	2(4)	1(1)	3(5)	2(2)	4(4)	6(6)
6. ear	1(3)	0(3)	1(6)	1(1)	2(3)	3(4)
7. body	1(1)	3(3)	4(4)	0(1)	2(4)	2(5)
8. look	0(0)	1(1)	1(1)	0(0)	3(5)	3(5)
9. sight	0(0)	1(2)	1(2)	1(2)	0(0)	1(2)
no response	1(1)	0(0)	1(1)	0(0)	1(1)	1(1)

Three: lid (2H,L); blue (H,2L); classes (H,MH,L); pupils (2H,ML); brown (H,MH,L)

Two: I (H,MH); person (2L); men (2L)

One: stop (L); colorful (L); cheek (H); the (L); leg (H); eyelash (H); yours (H); finger (MH); hand (H); eye (L); boy (H); blir (H); red (ML); drop (MH); lips (H); dog (ML); by (ML); mouth); hair (L); "penice" (L); hall (H); witness (H); moth (MH); pie (ML); apple (ML); people (ML); "hry" (L); wink (L); circle (H); die (H); shirt (ML); my (ML)

FLUTE

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. instrument	5(9)	9(11)	14(20)	14(16)	8(15)	22(31)
2. music	3(5)	3(4)	6(9)	3(6)	5(5)	8(11)
3. play	7(9)	2(4)	9(13)	4(5)	1(2)	5(7)
4. piccolo	0(0)	2(3)	2(3)	1(2)	0(3)	1(5)
5. drum	1(3)	1(2)	2(5)	0(0)	0(2)	0(2)
6. horn	0(1)	2(2)	2(3)	0(1)	2(3)	2(4)
7. noise	1(1)	1(20	2(3)	0(1)	2(2)	2(3)
8. clarinet	2(3)	0(0)	2(3)	2(2)	0(0)	2(2)
no response	1(1)	0(0)	1(1)	0(0)	3(3)	3(3)

Three: fruit (2MH,ML); band (H,ML,L); violin (H,MH,L); wood (2MH,L); air (H,MH,L); trumpet (H,2MH)

Two: oboe (H,MH); guitar (ML,L); whistle (H,L); silver (H,L); harp (2H); note(s) (MH,ML); apple (2L); high (2H); water (H,L); sax(aphone) (H,MH); bus (ML,L)

One: blow (H); nice (L); ear (MH); small (MH); "a rore" (L); long (H); sound (L); woodwind (H); hard (MH); pretty (H); pillowe (L); clear (MH); squeaky (H); sick (L); food (L); "tist" (H); soft (H); car (H); map (H); "etar" (L); "bule" (L); tute (ML); button (ML); "anctement" (L) flute (L); neighbor (L); truck (H); girl (H); song (ML); eye (ML); winter (L); bell (L); fly (H); coat (H); mistake (H); "catle" (H); shoe (H); pout (ML); flood (ML); man (ML)

FOOT

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	toe(s)	9(14)	12(15)	21(29)	8(11)	4(7)	12(18)
2.	leg	6(9)	7(7)	13(16)	3(5)	4(8)	7(13)
3.	feet	3(6)	0(2)	3(8)	1(2)	7(10)	8(12)
4.	walk	6(6)	2(3)	8(9)	3(3)	2(4)	5(7)
5.	body	0(1)	5(9)	5(10)	1(3)	3(3)	4(6)
6.	shoe(s)	3(4)	0(0)	3(4)	4(6)	0(0)	4(6)
7.	arm	0(1)	1(2)	1(3)	0(0)	3(3)	3(3)
8.	hand	0(0)	1(1)	1(1)	2(30	1(1)	3(4)
9.	inch(es)	0(1)	0(0)	0(1)	1(2)	1(2)	2(4)
10.	smell	0(1)	0(0)	0(1)	3(3)	0(0)	3(3)

Three: step (2H,MH); person (H,MH,L)

Two: ball (MH,L); apple (H,MH); heel (MH,ML)

One: nook (ML); back (MH); bottom (H); foot (L); skin (L); "hout" (L); print (H); run (H); map (H); short (H); pot (H); boon (L); men (L); "sofe" (L); orange (L); boat (L); person (ML); stand (L); toenail (H); part (MH); ache (L); "plue" (L); boy (MH); cut (L); people (L); ankle (L); human (H); soft (ML); horse (ML); shore (ML); tan (L); "nishcr" (L); "bood" (L); pace (H); stink (H); write (ML); hurts (ML); moot (ML); air (ML)

FORK

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	spoon	8(14)	12(21)	20(35)	8(15)	10(15)	18(30)
2.	eat	5(8)	3(7)	8(15)	7(8)	8(11)	15(19)
3.	knife	10(16)	6(7)	16(23)	1(3)	4(4)	5(7)
4.	silverware	1(2)	2(2)	3(4)	1(1)	3(4)	4(5)
5.	food	1(1)	2(2)	3(3)	2(3)	1(1)	3(4)
6.	sharp	2(2)	0(0)	2(2)	1(1)	3(3)	4(4)
7.	silver	0(0)	1(1)	1(1)	1(3)	0(0)	1(3)
8.	point	1(1)	0(0)	1(1)	0(0)	0(2)	0(2)
	no response	0(0)	0(0)	0(0)	1(1)	1(1)	2(2)

Two: dig (2H); plate (ML,L); hit (H,L); people (2H); kitchen (ML,L)

One: york (ML); fork (L); "krok" (L); mouth (H); stick (L); table (ML); house (L); meat (L); Joe (H); men (L); steak (ML); ouch (H); disease (L); cow (H); "pome" (L); road (H); herd (L); dull (MH); "muise" (ML); fun (MH); eating tool (MH); test (L); eye (L); chop (L); "humin" (L); prune (H); pitch (MH); meet (MH); children (ML) pork (ML); leg (ML); "invotueof" (ML); supper (L); three (H); stab (H); use (H); "pater" (H); car (ML)

GRAPE

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. fruit	8(10)	12(16)	20(26)	12(16)	15(22)	27(38)
2. purple	9(15)	4(5)	13(20)	4(5)	4(5)	8(10)
3. eat	4(4)	2(3)	6(7)	2(4)	1(1)	3(5)
4. food	1(2)	0(0)	1(2)	3(3)	0(2)	3(5)
5. vine	1(2)	1(1)	2(3)	1(2)	2(2)	3(4)
6. good	0(2)	0(1)	0(3)	2(2)	2(2)	4(4)
7. orange	0(1)	2(2)	2(3)	0(1)	1(2)	1(3)
8. cherry	0(1)	2(3)	2(4)	1(2)	0(0)	1(2)
9. juice	0(0)	2(2)	2(2)	1(3)	0(0)	1(3)
10. green	1(1)	2(2)	3(3)	0(0)	0(1)	0(1)
11. pear	1(1)	0(1)	1(2)	1(1)	0(0)	1(1)
12. color	0(2)	0(0)	0(2)	1(1)	0(0)	1(1)
no response	0(0)	0(0)	0(0)	1(1)	2(2)	3(3)

Two: blue (H,L); apple (2H); nice (2H); wine (H,MH); lemon (H,MH); small (H,MH); peach (H,MH); tree (H,MH); grapes (2L)

One: berry (H); strawberry (ML); graping (L); flavor (H); round (L); grapefruit (H); door (L); prune (L); sour (ML); suck (L); jam (H); "sode" (MH); good (ML); plum (MH); "yeow" (MH); you (L); lime (L); cape (L); flower (H); violet (MH); drum (ML); leave (ML); chear (ML); rape (ML); boy (ML); men (L); bite (L); drink (H); paper (H); happy (ML); raisin (MH); "waip" (ML); yum (ML)

GREEN

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. color	16(26)	17(26)	33(52)	17(22)	20(30)	37(52)
2. blue	2(4)	5(9)	7(13)	2(6)	4(5)	6(11)
3. grass	5(6)	2(2)	7(8)	5(5)	4(4)	9(9)
4. red	5(7)	2(3)	7(10)	2(4)	1(1)	3(5)
5. yellow	4(4)	1(1)	5(5)	0(0)	1(3)	1(3)
6. tree	0(0)	2(2)	2(2)	2(3)	0(1)	2(4)
7. orange	0(0)	1(1)	1(1)	0(1)	0(2)	0(3)
8. black	1(2)	0(0)	1(2)	1(1)	0(0)	1(1)
9. purple	0(1)	1(1)	1(2)	0(0)	0(0)	0(0)
10. bean	0(0)	1(1)	1(1)	0(0)	0(1)	0(1)

One: ugly (ML); "meen" (ML); bird (ML); chalkboard (ML); pink (ML); wall (L); from (L); Mars (L); horn (MH); apple (MH); me (L); Christmas (MH); paint (L); white (H); "peen" (L); dress (L); light (L); bright (H); stem (MH); ground (H); car (H); "caren" (L); "marsham" (L)

GUITAR

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. instrument	2(7)	6(10)	8(17)	6(6)	7(12)	13(18)
2. music	8(8)	5(7)	13(15)	3(7)	11(12)	14(19)
3. string(s)	5(6)	2(6)	7(12)	3(4)	1(1)	4(5)
4. play(ing)	8(9)	4(5)	12(14)	2(3)	2(0)	2(3)
5. banjo	1(1)	2(3)	3(4)	1(1)	1(2)	2(3)
6. song	2(2)	0(0)	2(2)	3(3)	0(0)	3(3)
7. drum	1(2)	1(1)	2(3)	1(1)	1(1)	2(2)
8. pick	0(0)	1(2)	1(2)	1(2)	0(0)	1(2)
9. trumpet	0(1)	0(0)	0(1)	1(2)	0(0)	1(2)
no response	0(0)	0(1)	0(1)	3(3)	3(3)	6(6)

Two: band (H,L); piano (MH,ML); violin(MH,L); sound (MH,ML); football (H,L); house (MH,L); nice (H,L); water (ML,L); good (MH,L)

One: "grap" (L); Jill (L); run (H); milk (ML); loot (ML); happy (ML); key (H); fence (H); place (ML); sing (ML); earth (H); woodwind (L); strong (H); steel (H); "mano" (L); beauty (ML); robot (ML); girl (H); stop (L); tar (ML); "conter" (MH); "beaga" (L); he (L); hose (L); save (MH); roof (L); Carter (H); big (H); leader (H); book (H); cat (L); flute (H); black (L); toughness (MH); ran (MH); garage (L); ball (L); "britar" (L); ant (H); hat (H); singer (MH); "tiey" (MH); wedding (MH); brown (ML); dime (ML); do (ML); chart (ML); see (L); safe (H); machine (H); me(H); button (H); garbage can ML); fast (ML); rain ML); my (ML)

HALL

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. wall	2(4)	4(4)	6(8)	6(9)	4(6)	10(15)
2. walk	5(7)	4(5)	9(12)	2(2)	5(5)	7(7)
3. long	8(10)	0(0)	8(10)	2(4)	1(3)	3(7)
4. way	0(1)	5(6)	5(7)	2(3)	4(6)	6(9)
5. house	2(3)	2(5)	4(8)	1(2)	2(4)	3(6)
6. room	2(2)	2(3)	4(5)	0(1)	3(3)	3(4)
7. corridor	3(3)	2(2)	5(5)	2(2)	0(0)	2(2)
8. run	2(3)	0(2)	1(3)	1(1)	0(1)	1(2)
9. school	1(1)	0(2)	1(3)	1(1)	0(1)	1(2)
no response	1(1)	0(0)	1(1)	0(0)	2(2)	2(2)

Four: stair(s) (2H,2MH); door (2H,MH,ML); dark (2H),2L); run (2ML,2L)

Three: alley (H,MH,L); fall (2ML,L); floor (ML,2L); master(s) (H,MH,ML); small (3L)

Two: big (H,L) tall (H,ML); hall (MH,L); snow (2MH); fire (H,ML); bedroom bedroom (H,MH); ball (MH,L)

One: "hred" (L); stare (H); weding (ML); passageway (MH); stop (H); step (ML); cave (MH); party (L); "sool" (L); narrow (ML); place (MH); take (L); noise (ML); mall (2H); white (H); mirror (H); map (H); "waw" (L); bill (L); jump (L); building (L); call (L); bed (L); football (L); hallway (L); wide (L); Patty (L); class (L); "hunp" (L); justice (H); jail (MH); "ile" (MH); "plaer" (L); fork (L); chip (H); "roch" (H); light (H); flag (ML); path (MH); closet (ML)

HARP

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. instrument	3(6)	6(8)	9(14)	6(8)	6(8)	12(16)
2. string(s)	9(10)	4(6)	13(16)	3(6)	4(6)	7(12)
3. music	4(4)	5(6)	9(10)	6(8)	6(9)	12(17)
4. play	4(4)	4(6)	8(10)	4(5)	0(0)	4(5)
5. violin	1(3)	2(4)	3(7)	0(1)	0(0)	0(1)
6. pretty	0(0)	1(2)	1(2)	0(0)	1(2)	1(2)
7. drum	0(2)	1(1)	1(3)	1(1)	0(0)	1(1)
8. piano	1(1)	0(0)	1(1)	1(1)	0(1)	1(2)
9. noise	0(1)	1(2)	1(3)	0(0)	1(1)	1(1)
10. sound	0(0)	0(1)	0(1)	0(0)	2(2)	2(2)
11. flute	1(1)	1(1)	2(2)	1(1)	0(1)	1(1)
no response	1(1)	1(1)	2(2)	1(1)	3(3)	4(4)

Two: talk (ML,L); carp (H,L); bark (H,MH); clarinet (MH,HL); band (H,L); sharp (MH,ML); pen (H,L); yellow (H,ML); harp (2L)

One: "campan" (L); here (L); heart (L); nice (H); "leat" (H); toy (ML); spoon (H); hum (MH); now (H); bass (L); song (L); big (H); "cong" (MH); "pare" (L); long (H); english horn (H); like (L); "musk" (L); shot (L); bell (MH); don't (MH); remember (L); "fram" (L); rip (L); brag (L); ocean (H); "poon" (H); car (MH); "ovil" (MH); "yab" (MH); hit (ML); around (ML); no (ML); Tom (ML); Pat (ML); leg (ML); man (L); arrow (L); jog (L); "ovn" (L); toe (H); dinner (H); loud (H); prune (H); spare (MH); what (MH); grape (MH); "warp" (ML); orchestra (ML); "tarape" (ML); fat (ML); sing (ML)

HORN

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	blow	11(15)	8(11)	19(26)	3(50	6(10)	9(15)
2.	car	3(4)	2(3)	5(7)	5(5)	2(6)	7(11)
3.	noise	4(5)	0(1)	4(6)	7(10)	2(2)	9(12)
4.	loud	3(6)	2(3)	5(9)	3(3)	3(5)	6(8)
5.	trumpet	2(5)	3(4)	5(9)	0(1)	0(0)	0(1)
6.	instrument	1(2)	1(3)	2(5)	1(2)	3(3)	4(5)
7.	beep	3(3)	2(2)	5(5)	0(0)	3(3)	3(3)
8.	toot	2(2)	0(0)	2(2)	2(3)	1(2)	3(5)
9.	flute	0(1)	1(1)	1(2)	1(2)	1(2)	2(4)
10.	cow	1(2)	1(1)	2(3)	0(0)	1(2)	1(2)
11.	sound	1(1)	2(2)	3(3)	0(0)	1(2)	1(2)
12.	bugle	0(0)	0(2)	0(2)	0(0)	1(1)	1(1)
	no response	0(0)	0(0)	0(0)	1(1)	2(2)	3(3)

Two: whistle (2L); play (H,L); violin (2MH); music (H,ML); honk (H,MH); dog (2L); bull (H,MH); bell (2H); French (H,ML); corn (H,L)

One: "shrap" (L); toy (H); unicorn (H); goat (ML); ear (MH); "rines" (L); english horn (H); dumb (MH); deer (MH); bone (H); wasp (H); "taske" (L); love (L); her (L); hook (L); rap (ML) he (L); bike (L); born (ML); chop (ML); bee (MH); peach (L); peep (L); sharp (L); fat (H); cat (H); curve (ML); eat (ML); number (ML); hoot (L); "rumer" (L); yellow (L); born (H); hear (MH); Mom (ML); brown (ML); "trapit" (ML)

HORSE

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	animal	4(10)	5(11)	9(21)	7(8)	10(12)	17(20)
2.	cow	5(7)	4(8)	9(15)	6(7)	4(8)	10(15)
3.	ride	4(6)	4(4)	8(10)	2(4)	3(6)	5(10)
4.	colt	4(5)	1(1)	5(6)	0(1)	2(3)	2(4)
5.	pony	2(2)	3(4)	5(6)	1(1)	1(1)	2(2)
6.	saddle	2(3)	0(0)	2(3)	1(3)	0(0)	1(3)
7.	big	2(3)	0(0)	2(3)	1(1)	0(1)	1(2)
8.	run	1(1)	0(0)	1(1)	1(2)	2(2)	3(4)
9.	dog	0(2)	2(2)	2(4)	0(1)	0(0)	0(1)
	no response	(1)	0(0)	1(1)	0(0)	0(0)	0(0)

Four: pig (H,MH,2ML); cat (2H,MH,L); brown (H,3ML)

Three: hoof (3H); fast (MH,ML,L); trot (2H,MH)

Two: nose (2L); back (ML,L); mane (H,L); leg (2L); hair (2H); nice (2L)

One: thing (L); farm (H); ranch (H); sled (H); stable (MH); horse (L); foot (ML); travel (ML); bell (L); thoroughbred (L); gate (L); "ost" (L); female (MH); shoe (L); nine (L); strong (L); neigh (H); jump (H); Mike (H); carriage (H); old (H); calf (L); coarse (ML); pet (ML); mule (MH); like (MH); cafe (L); love (L); hose (L); Charlen (H); barn (MH); lunch (ML); boy (ML); 'flry" (L); book (L); mouth (L); tail (H); fly (H); four (H); come (H); plane (ML); chicken (ML); pretty (ML)

KNIFE

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	cut	10(13)	5(10)	15(23)	7(15)	8(11)	15(26)
2.	sharp	11(14)	5(6)	16(20)	5(7)	8(12)	13(19)
3.	fork	2(6)	5(7)	7(13)	3(4)	2(5)	7(9)
4.	spoon	0(0)	9(11)	9(11)	4(5)	1(1)	5(6)
5.	kill	1(2)	3(5)	4(7)	2(3)	1(1)	3(4)
6.	silverware	1(1)	1(1)	2(2)	1(1)	0(1)	1(2)
7.	stab	0(2)	0(0)	0(2)	1(1)	1(1)	2(2)
8.	silver	1(1)	1(1)	1(1)	1(2)	0(0)	1(2)
9.	eat	1(1)	0(1)	1(2)	0(0)	1(1)	1(1)
10.	kitchen	0(0)	0(0)	0(0)	0(0)	2(3)	2(3)
	no response	1(1)	1(1)	2(2)	0(0)	2(2)	2(2)

Two: jab (2H); utensil (H,ML); blood (H,MH)

One: daggar (H); wife (ML); back (ML); "bearter" (L); pocket (L); food (L); tool (L); cub scouts (L); scissors (H); pain (L); blade (L); spear (MH); hit (H); weapon (MH); "stofe" (L); Jack (MH); sad (ML); sap (L); found (L); football (L); cat (MH); kite (MH); hurt (MH); shine (L); knife (L); ear (L); meat (L); table (H); pan (MH); carve (MH); foot (ML); went (ML); cave (ML); kraft (L); be (L); thing (L); light (L); use (H); water (H); stick (H); clock (ML); hand (ML)

LEG

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. arm	5(10)	12(18)	17(28)	1(3)	11(15)	12(18)
2. foot	8(10)	6(9)	14(19)	7(9)	1(2)	8(11)
3. body	2(3)	5(7)	7(10)	4(7)	6(9)	10(16)
4. walk	5(7)	0(3)	5(10)	2(2)	3(5)	5(7)
5. run	2(2)	1(1)	3(3)	1(2)	2(3)	3(5)
6. toe	3(4)	0(0)	3(4)	1(1)	0(0)	1(1)
7. hand	1(1)	1(1)	2(2)	1(3)	0(0)	1(3)
8. knee	0(2)	2(2)	2(4)	1(1)	1(1)	2(2)
9. human	0(0)	1(2)	1(2)	0(0)	1(1)	1(1)
10. feet	1(1)	0(1)	1(20	0(0)	1(1)	1(1)
11. peg	0(1)	0(0)	0(1)	0(1)	0(1)	0(2)
12. long	1(1)	0(0)	1(1)	0(0)	1(2)	1(2)
no response	0(0)	0(0)	0(0)	1(1)	1(1)	2(2)

Two: sock (H,MH); head (H,L); hip (H,L); flesh (H,L); bone (H,L); person (2L); cut (MH,ML)

One: "litten" (L); ankle (H); part of me (L); neck (H); pull (L); "stoff" (L); are (H); hair (H); "moten" (L); log or small (ML); boon (ML); help (MH); line (L); frog (ML); cat (L); "nam" (L); house (ML); part (ML); science (L); hang (L); horse (L); him (L); board (H); chair (MH); "claf" (MH); fork (ML); time (ML); finger (ML); suppertable (L); pencil (L); fat (L); on (H); rock (H); kick (H); broken (ML);knee cap (ML); move (ML)

LEMON

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. sour	12(16)	4(8)	16(24)	7(11)	9(13)	16(24)
2. fruit	2(4)	7(9)	9(13)	8(10)	11(15)	19(25)
3. lime	4(6)	7(10)	11(16)	3(6)	2(2)	5(8)
4. yellow	4(5)	4(5)	8(10)	3(3)	1(3)	4(6)
5. juice	1(3)	1(1)	2(4)	3(5)	1(1)	4(6)
6. orange	0(2)	2(3)	2(5)	0(0)	2(2)	2(2)
7. ade	1(3)	1(3)	2(6)	0(0)	0(1)	0(1)
8. food	2(3)	0(0)	2(3)	2(2)	0(0)	2(2)
9. eat	2(2)	2(2)	4(4)	0(0)	0(0)	0(0)
10. sweet	0(0)	0(0)	0(0)	1(2)	1(1)	2(3)
11. good	0(0)	1(2)	1(2)	0(0)	0(1)	0(1)
no response	0(0)	0(0)	0(0)	0(0)	0(1)	0(1)

Two: squeeze (H,L); apple (H,ML); boy (H,ML)

One: drink (H); teacher (L); soap (L); block (L); horse (L); paper (H); watermelon (MH); bitter (MH); pie (ML); here (L); tree (H); "parpe" (L); citrus (L); soup (MH); "stfe" (L); tasty (ML); two (H); vegetable (H); peach (H); hate (L); dog (H); color (MH); fresh (MH); taste (ML); "Pew" (ML); shot (ML); limit (ML); hat (L); round (H); "pulpve" (H); satisfied (ML); cola (ML); suck (ML)

LION

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. animal	6(11)	3(5)	9(16)	10(10)	11(16)	21(26)
2. tiger	5(5)	11(16)	16(21)	3(7)	5(7)	8(14)
3. roar	7(11)	2(4)	9(15)	3(4)	3(3)	6(7)
4. cat	3(4)	3(5)	6(9)	2(3)	1(2)	3(5)
5. big	2(2)	1(2)	3(4)	1(1)	3(5)	4(6)
6. zoo	0(0)	0(1)	0(1)	1(3)	1(2)	2(5)
7. fur	1(1)	1(1)	2(2)	2(3)	1(1)	3(4)
8. hair	2(3)	1(1)	3(4)	2(2)	0(0)	2(2)
9. meat	2(2)	1(1)	3(3)	0(0)	0(0)	0(0)
10. leopard	0(1)	1(2)	1(3)	0(0)	0(0)	0(0)
no response	0(0)	1(1)	1(1)	1(1)	1(1)	2(2)

Two: cow (2H); brown (2L); dog (2L); cub (H,MH); wild (MH,ML); beast (ML,L); fear(s) (MH,ML); cage (2L); bite (H,L)

One: "strate" (L); loud (H); tough (H); orange (H); thing (L); fierce (H); eat (MH); king (MH); furous (L); rode (L); shot (H); stock (H); scary (ML); hungry (ML); track (L); rough (MH); row (L); bay (ML); restaurant (L); man (L); ant (L); mane (H); glass (H); tamer (H); bear (MH); horse (MH); month (ML); large (ML); cryin (ML); door (ML); "rught" (ML); baby (L); growl (H); come (H); teeth (H); mad (MH); angry (ML); monkey (ML); pet (ML); ger (ML)

MOTH

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. insect	5(7)	6(8)	11(15)	4(5)	5(9)	9(14)
2. butterfly	3(3)	4(8)	7(11)	3(6)	0(0)	3(6)
3. fly	3(5)	4(5)	7(10)	2(3)	2(3)	4(6)
4. bug	3(3)	2(3)	5(6)	2(2)	4(4)	6(6)
5. cloth	1(2)	0(2)	1(4)	0(0)	0(1)	0(1)
6. balls	2(3)	2(2)	4(5)	0(0)	0(0)	0(0)
7. ear	0(1)	0(0)	0(1)	0(0)	1(3)	1(3)
8. nose	0(1)	1(1)	1(2)	1(2)	0(0)	1(2)
9. day(s)	0(0)	0(0)	0(0)	1(1)	3(3)	4(4)
10. eat	1(2)	0(1)	1(3)	1(1)	0(0)	1(1)
11. teeth	0(0)	1(1)	1(1)	1(2)	0(1)	1(3)
no response	0(0)	2(2)	2(2)	1(1)	3(3)	4(4)

Three: flies (2H,L); face (H,ML,L); clothes9ing) (H,MH,L); ugly (H,MH,ML); talk (2H,L); open (MH,2L); mouth (2H,ML); ant (2H,L); tongue (H,2L)

Two: year (H,L); coat (2H); animal (ML,L); big (MH,ML); food (ML,L); lips (MH,ML); bird (2L)

One: closet (H); body (ML); eater (H); "tougn" (H); mother (L); me (H); holes (ML); see (H); month (H); moth balls (L); south (L); "yer" (L); up (L); dog (MH); close (ML); cat (ML); "toge" (L); "thoug" (ML); mink (L); brat (MH); smelly (ML); spider (H); gray (L); "jurly" (L); head (L); pig (H); bite (H); white (H); ate (L); jan (L); water (L); ball (ML); "tose" (ML); wings (MH); food (MH); tong (L); hid (L); letter (L); date (L); summer (L); "perad" (L); hog (H); turtle (MH); smell (MH); house (MH); orange (MH); stink (ML); art (ML); it (L); June (L); color (H); boat (H); people (H); her (MH); bee (MH); "wanth" (ML)

PAN

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. pot	9(12)	15(18)	24(30)	7(11)	15(17)	22(18)
2. cook	2(6)	4(5)	6(11)	2(5)	2(3)	4(8)
3. dish	3(5)	1(3)	4(8)	1(4)	0(0)	1(4)
4. food(s)	3(3)	1(4)	4(7)	2(2)	0(2)	2(4)
5. fry	3(3)	1(3)	4(6)	2(2)	1(1)	3(3)
6. kitchen	1(1)	0(0)	1(1)	0(0)	5(7)	5(7)
7. chimpanzee	2(2)	1(2)	3(4)	2(3)	0(0)	2(3)
8. stove	0(0)	2(3)	2(3)	0(0)	1(2)	1(2)
9. egg(s)	0(0)	3(3)	3(3)	0(0)	0(1)	0(1)
no response	0(0)	0(0)	0(0)	1(1)	0(0)	1(1)

Three: tin (MH,2L); hot (MH,ML,L); can (H,MH,L)

Two: cup (H,L); flat (2H); stick (MH,L); metal (H,MH); plate (H,L); cookware (ML,L); silver (H,MH); meat (H,MH); eat (ML,L); lion (ML,L); horse (H,ML)

One: little (ML); hit (MH); hard (H); pam (H); pancake (L); pact (L); mother (L); "ane" (L); hand (H); coke (L); hog (L); blank (L); card (ML); jan (L); "creac" (ML); a window (L); bang (H); sand (H); holder (H); "pany" (L); push (L); round (L); stan (ML); ran (ML); am (MH); pin (MH); handle (L); "mony" (L); can (L); kitten (L); paper (MH); kettle (MH); blue (MH); Friday (ML); far (ML); red (ML) cold (ML); fork (L); water (H); use (H); grease (H); houseware (MH); pat (ML)

PEACH

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. fruit	5(9)	9(15)	14(24)	12(16)	13(19)	25(35)
2. pear	1(5)	7(9)	8(14)	1(3)	2(4)	3(7)
3. eat	3(4)	2(3)	5(7)	1(2)	3(5)	4(7)
4. plum	3(3)	2(3)	5(6)	1(2)	3(3)	4(5)
5. apple	1(2)	3(3)	4(5)	2(3)	0(0)	2(3)
6. fuzz(y)	3(4)	1(2)	4(6)	1(1)	0(1)	1(2)
7. good	2(3)	0(1)	2(4)	1(3)	0(0)	1(3)
8. prune	1(2)	2(4)	3(6)	0(0)	1(1)	1(1)
9. food	1(2)	0(0)	1(2)	2(2)	1(1)	3(3)
no response	1(1)	0(0)	1(1)	0(0)	1(1)	1(1)

Four: pit (2H,MH,L); yellow (2H,2L); orange (2H,ML,L)

Three: reach (H,ML,L); tree (H,ML,L); round (2H,L)

Two: color (H,MH); pink (H,L); pair (ML,L); fur (H,L)

One: peace (L); face (L); lemon (H); "pome" (H); squeeze (H); sweet (H); thing (L); pumpkin (H); cream (H); sand (L); little (ML); summer (H); soft (L); fun (ML); very (L); shout (L); nectarine (MH); cane (L); "wav" (L); swim (L); aligator (L); taste good (L); "nouse" (L); coat (MH); red (MH); brown (MH); o.k. (ML); in (ML); coil (ML); card (ML); complication (L); seed (H); yum-yum (H); map (ML); weach (ML); print (ML); crane (ML)

PEAR

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. fruit	8(10)	12(16)	20(26)	11(14)	8(18)	19(32)
2. peach	3(4)	5(8)	8(12)	0(2)	1(2)	1(4)
3. apple	2(4)	3(5)	5(9)	2(3)	1(2)	3(5)
4. green	1(3)	2(2)	3(5)	2(2)	1(2)	3(4)
5. eat	1(2)	2(2)	3(4)	2(4)	0(0)	2(4)
6. food	2(2)	0(2)	2(4)	2(2)	1(1)	3(3)
7. orange	1(2)	3(3)	4(5)	0(0)	1(1)	1(1)
8. good	2(3)	0(1)	2(4)	0(0)	2(2)	2(2)
9. plum	0(2)	0(1)	0(3)	2(2)	0(1)	2(3)
10. tree	0(2)	2(2)	2(4)	1(1)	0(0)	1(1)
11. shoes	2(2)	0(0)	2(2)	1(1)	2(2)	3(3)
no response	0(0)	1(1)	1(1)	0(0)	2(2)	2(2)

Three: yellow (H,MH,L); fear (MH,2L); two (H,2MH)

Two: shape (2H); thing (ML,L); banana (2L); socks (ML,L); look (MH,L); pair (MH,L); hair(y) (2L)

One: core (H); round (H); care (L); pain (MH); prune (ML); odd (MH); alike (L); "ovel" (L); seed (ML); right (H); white (H); world (ML); dock (L); boat (L); fall (L); "carring" (L); see (ML); lemon (H); fair (H); pump (L); "bot" (L); speat (L); pot (L); near (ML); good (H); witch (L); desert (L); cat (H); fresh (H); foot (H); color (ML); black (ML); he (ML); bad (ML); hand (L); ear (L); hard (L); earth (H); work (H); "blah" (H); "Icer" (H); spoon (ML)

PIANO

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	play	12(16)	6(10)	18(26)	4(8)	2(6)	6(14)
2.	music	6(8)	5(6)	11(14)	5(7)	5(7)	10(14)
3.	key(s)	6(12)	6(10)	12(22)	2(4)	2(2)	4(6)
4.	instrument	1(2)	5(6)	6(8)	5(5)	7(12)	12(17)
5.	organ	0(2)	5(6)	5(8)	0(0)	0(0)	0(0)
6.	sound	0(0)	0(0)	0(0)	2(2)	3(4)	5(6)
7.	flute	0(2)	1(1)	1(3)	0(0)	1(2)	1(2)
8.	drum	0(0)	0(0)	0(0)	0(1)	2(3)	2(4)
9.	hit	1(1)	1(1)	2(2)	2(2)	0(0)	2(2)
10.	violin	0(0)	0(1)	0(1)	1(2)	0(0)	1(2)
	no response	1(1)	1(1)	2(2)	0(0)	2(2)	2(2)

Two: string (H,L); bell (H,MH); sing (MH,ML); fingers (H,L); big (ML,L); wood (H,L); light (H,ML); band (H,L)

One: brown (H); nice (L); viola (H); thing (L); "gruit" (H); noise (MH); ride (L); percussion (L); in (ML); loud (ML); harp (L); inches (L); miss (L); "Miane" (L); her (L); peg (ML); good (MH); "cees" (ML); did drum (H); Dave (H); fat (H); dog (H); the (L); orange (ML); go (L); trumpet (MH); gym (L); chair (L); "cav" (L); car (L); music class (L); saxiphone (MH); clarinet (MH); boy (ML); star (L); listen (ML)

PLUM

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	fruit	6(9)	10(14)	16(23)	13(16)	11(19)	24(35)
2.	purple	4(4)	2(5)	6(9)	3(3)	4(5)	7(8)
3.	prune	3(4)	6(9)	9(13)	0(1)	0(2)	0(3)
4.	eat	6(7)	2(2)	8(9)	1(2)	2(2)	3(4)
5.	peach	1(2)	3(6)	4(8)	1(3)	1(1)	2(4)
6.	food	2(3)	0(1)	2(4)	2(2)	1(1)	3(3)
7.	good	2(2)	1(1)	3(3)	0(1)	1(2)	1(3)
8.	apple	0(1)	2(2)	2(3)	1(2)	1(1)	1(3)
9.	pear	0(1)	0(1)	0(2)	1(2)	0(0)	1(2)
10.	cherry(ies)	1(1)	1(2)	1(3)	0(0)	0(0)	1(0)
11.	tree	1(1)	0(0)	1(1)	2(2)	0(0)	2(2)
	no response	1(1)	0(0)	1(1)	0(0)	2(2)	2(2)

Two: pink (H,L); raisin (2L); thing (2L); orange (2MH)

One: smooth (H); round (H); bum (L); nice (L); delicious (H); grape (H); green (ML); wet (MH); "ovel" (L); seed (ML); like (L); hard (L); see (L); flower (ML); girl (H); pair (MH); sweat (MH); plumer (H); do (L); nut (ML); fat (ML); banana (H); wash (H); home (L); "fum" (L); hum (ML); little (MH); hate (MH); store (L); "clum" (L); "frot" (L); name (L); wasp (H); table (MH); foot (MH); ate (ML); "dum" (ML); "tor" (ML); fore (ML); slim (L); air (L); battleship (L); violet (L); color (H); sour (H); come (H); peal (H); hall (H); stool (ML); bad (MH); where (ML); face (ML)

POT

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. pan	17(29)	21(28)	38(57)	11(16)	20(23)	31(39)
2. cook	6(9)	2(3)	7(10)	4(6)	3(5)	6(11)
3. food	2(2)	2(4)	4(6)	2(2)	0(0)	2(2)
4. dish	0(0)	1(1)	1(1)	3(4)	1(1)	4(5)
5. hot	0(1)	1(1)	1(2)	1(3)	0(1)	1(4)
6. kitchen	0(0)	2(3)	2(3)	0(0)	1(3)	1(3)
7. stove	2(2)	1(1)	3(3)	0(1)	0(0)	0(1)
no response	0(0)	0(1)	0(1)	0(0)	1(1)	1(1)

Two: bowl (H,ML); stew (2H); flower (H,ML); tin (2L); gold (ML,L); top(s) (H,L); kettle (H,MH)

One: round (L); milk (ML); cup (L); "sot" (H); brown (L); chair (H); tool (H); can (ML); metal (MH); "Hred" (L); handle (L); fry (H); good (ML); heavy (ML); soup (ML); big (ML); luck (MH); "scik" (L); lay (ML); coke (L); thing (L); dron (L); roast (MH); pit (MH); spoon (ML); foot (MH); nick (MH); fast (L); inside (L); desk (L); bellie (L); Mrs. Erbsmehl (ML); grape (ML); smoke (ML); float (L); red (H); utensil (H); plug (ML); girl (ML)

PRUNE

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. fruit	12(19)	15(22)	27(41)	9(12)	9(16)	18(28)
2. food	4(6)	0(2)	4(8)	3(5)	2(2)	5(7)
3. eat	3(5)	2(2)	5(7)	1(2)	1(2)	2(4)
4. plum	0(2)	2(4)	2(6)	1(2)	1(2)	2(4)
5. apple	1(2)	1(1)	2(3)	1(3)	1(1)	2(4)
6. juice	0(0)	2(2)	2(2)	1(4)	1(1)	2(5)
7. grape	2(2)	2(2)	4(4)	0(1)	1(1)	1(2)
8. peach	1(3)	1(3)	2(6)	0(0)	0(0)	0(0)
9. raisin	0(0)	2(2)	2(2)	3(3)	0(0)	3(3)
10. purple	0(1)	1(2)	1(3)	0(0)	0(2)	0(2)
11. pear	0(0)	1(1)	1(1)	2(2)	0(2)	2(4)
no response	1(1)	1(1)	2(2)	1(1)	5(5)	6(6)

Three: wrinkle (H,ML,L)

Two: good (H,L); ball (2L); color (MH,L); the (ML,L); prune (MH,L); hate (H,L)

One: tomato (H); shrivled (H); terrible (H); fat (H); "carer" (L); "yuck" (ML); rotten (H); cake (MH); "eeren" (L); clear (L); sweet (L); ugly (L); dried (L); pit (ML); map (H); run (L); and (L); see (L); "pash" (L); sour (H); round (H); "cand" (L); June (ML); tasteless (MH); four (L); chow (L); "riccle" (L); orange (L); hand (H); "ick" (ML); "skegelly" (L); "brcime" (L); box (L); blue (L); word (H); light (H); "chac" (H); "boone" (ML); hat (ML)

ROACH

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. bug	9(11)	9(12)	18(23)	4(8)	5(9)	9(17)
2. insect	2(4)	7(10)	9(14)	5(5)	4(7)	9(12)
3. ant	1(4)	1(1)	2(5)	4(4)	1(1)	5(5)
4. coach	4(4)	0(1)	4(5)	1(1)	0(1)	1(2)
5. animal	1(1)	1(1)	2(2)	2(2)	0(2)	2(4)
6. ranch	0(0)	2(2)	2(2)	0(1)	2(2)	2(3)
7. horse	0(1)	1(2)	1(3)	0(0)	0(1)	0(1)
8. rat	0(0)	2(3)	2(3)	0(1)	0(0)	0(1)
9. bee	0(0)	0(1)	0(1)	0(0)	2(2)	2(2)
10. car	0(0)	0(0)	0(0)	0(1)	2(2)	2(3)
11. poach	0(0)	1(2)	1(2)	0(1)	0(0)	0(1)
no response	1(2)	1(2)	2(4)	1(1)	4(5)	5(6)

Two: beetle (H,L); house (MH,ML); rode (H,L); mouse (2MH); pan (H,ML); thing (2L); spray (2L); spider (H,MH); hurt (MH,H); more (2L); porch (2L)

One: flea (L); fast (L); tree (H); sleigh (H); grasshopper (H); bite (H); fly (L); skin (ML); nice (MH); high (MH); wood (ML); "maw" (H); disease (H); green (H); money (L); ill (L); hand (L); "pepel" (L); boy (ML); see (H); lion (H); "poack" (H); he (L); "larn" (L); my baby (ML); word (H); "cobert" (L); itch (MH); miss (ML); "cuol" (L); human (MH); rodent (H); star (H); munch (H); cat (L); "hery" (L); rope (L); height (L); reach (MH); rich (ML); mine (MH); movies (L); beach (L); man (L); crow (L); lake (H); Mrs. (H); name (MH); cock (MH); "yuk" (ML); "vincent" (ML); "bot" (ML); sat (ML); "fram" (L); "roup" (L); boat (H); fence (H); know (MH); 3rd grade teacher (ML); proach (ML); me (ML)

ROOF

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	house	9(18)	14(22)	23(40)	14(19)	17(26)	31(45)
2.	top	8(11)	7(11)	15(22)	6(10)	9(11)	15(21)
3.	floor	0(1)	4(4)	4(5)	0(1)	1(1)	1(2)
4.	ceiling	2(2)	2(3)	4(5)	0(1)	0(0)	0(1)
5.	wall	0(1)	2(2)	2(3)	0(0)	0(1)	0(1)
6.	leak	3(3)	0(0)	3(3)	0(0)	0(0)	0(0)
7.	black	1(1)	1(1)	2(2)	0(0)	1(1)	1(1)
8.	cover	1(1)	1(1)	2(2)	1(1)	0(0)	1(1)
9.	high	0(2)	0(0)	0(2)	1(1)	0(0)	1(1)
10.	door	1(1)	0(0)	1(1)	1(1)	1(1)	2(2)
	no response	0(0)	0(0)	0(0)	2(2)	0(0)	2(2)

Two: flat (H,ML); hard (ML,L); dog (H,MH); Santa Claus (ML,L); shingle (H,MH); room (2L); shelter (MH,ML);

One: roof (H); over (H); window (H); slant (H); "brand" (H); car (L); "hird" (L); big (H); happy (ML); tar (ML); dark (L); home (MH); wood (H); "hed" (L); see (H); he (L); "seahl" (L); poof (ML); brick (ML); ground (L); tip (L); animal (L); plane (L); building (MH); hot (ML); sign (ML); torch (ML); up (L); under (H); "hore" (H); "protet" (MH); garage (ML)

SHIP

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. boat	11(18)	14(21)	25(39)	14(18)	14(20)	28(38)
2. sail	6(9)	4(7)	10(16)	6(11)	2(3)	8(14)
3. water	5(5)	0(2)	5(7)	2(4)	6(11)	8(15)
4. big	2(2)	2(3)	4(5)	2(2)	2(2)	4(4)
5. sink, sank, sunk	2(2)	2(3)	4(5)	0(0)	2(2)	2(2)
6. ride	1(3)	1(1)	2(4)	0(0)	(1)	1(1)
7. sea	1(1)	1(2)	2(3)	0(1)	0(0)	0(1)
8. wreck	0(2)	0(0)	0(2)	0(1)	0(0)	0(1)
9. float	1(1)	1(1)	2(2)	1(1)	0(0)	1(1)
10. cargo	0(1)	0(0)	0(1)	1(1)	0(1)	1(2)
no response	0(0)	0(0)	0(0)	1(1)	2(2)	3(3)

Two: airplane (ML,L); anchor (2H); go (2H); car (2MH)

One: wind (ML); yard (L); "ment" (L); mud (L); cat (L); truck (ML); war (L); cruise (L); vehicle (L); me (H); fast (MH); steam (H); travel (L); Mayflower (H); flat (L); summer (H); deck (H); Mr. (ML); battle (ML); window (ML); shoe (L); ill (L); ate (H); ocean (H); pumpkin (H); land (MH); meat (ML); use (ML); liner (L); hip (H); tie (H); lip (H); large (MH); slow (ML)

SPOON

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. fork	12(20)	14(19)	26(39)	9(16)	9(11)	18(27)
2. eat	9(14)	5(11)	14(25)	8(10)	8(11)	16(21)
3. silverware	1(1)	2(2)	3(3)	3(3)	2(4)	5(7)
4. knife	1(2)	2(4)	3(6)	0(1)	1(2)	1(3)
5. silver	1(1)	2(3)	3(4)	1(3)	2(2)	3(5)
6. soup	2(2)	0(1)	2(3)	1(2)	2(2)	3(4)
7. kitchen	0(0)	1(1)	1(1)	0(0)	2(4)	2(4)
8. round	2(2)	1(1)	3(3)	0(0)	0(1)	0(1)
9. dish(es)	0(0)	1(1)	1(1)	0(1)	1(1)	1(2)

Two: bowl (H,ML); food (H,L); cup (2L); cook (2ML); thing (2L)

One: cereal (L); little (H); house (L); big (H); mouth (H); home (H); yarn (MH); pick (L); "hred" (L); sterling silver (MH); good (ML); steel (H); jar (L); wood (MH); "toon" (H); Japan (H); disease (L); "madel" (ML); drink (L); buy (L); are (L); moon (ML); lie (MH); eating tool (MH); pan (MH); chair (L); clock (L); "chalck" (L); soon (H); November (ML); tone (ML); "fock" (ML); man (L); lick (L); sip (L); ladle (H); sup (H); oval (H); snow (ML)

STAIR

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	step(s)	7(13)	10(11)	17(21)	5(7)	2(5)	7(12)
2.	walk	3(6)	4(7)	7(13)	4(6)	4(5)	8(11)
3.	look	3(5)	1(5)	4(10)	2(3)	2(4)	4(17)
4.	case	4(5)	2(5)	6(10)	2(4)	1(3)	3(7)
5.	climb	2(3)	0(1)	2(4)	4(5)	2(2)	6(7)
6.	chair	1(1)	2(3)	3(4)	0(0)	2(3)	2(3)
7.	fall	3(3)	0(1)	3(4)	0(1)	0(2)	0(3)
8.	way	0(2)	4(4)	4(6)	0(0)	0(0)	0(0)
9.	house	0(2)	1(1)	1(3)	1(1)	2(2)	3(3)
10.	eye	0(0)	2(2)	2(2)	1(1)	1(1)	2(2)
11.	up	0(0)	0(0)	0(0)	1(1)	1(2)	1(3)
12.	far	0(0)	0(0)	0(0)	1(2)	1(1)	1(3)
13.	high(height)	1(1)	0(0)	1(1)	2(2)	0(0)	2(2)

Two: door (H,ML); wood (MH,L); stairs (2L); bedroom(s) (2L); big (H,ML); thing (2L); watch (2H); steep (H,L); rail (ML,L); gaze (2L)

One: porch (H); run (H); cellar (ML); box (H); hard (L); rail (ML); carpet (MH); sky (L); "clwidor" (H); "skey" (L); men (L); in the air (ML); balance (ML); "eges" (ML); feed (H); gliter (ML); car (L); spoon (H); head (H); block (L); dog (L); glance (L); go (L); square (L); bar (ML); see (MH); rip (L); "rench" (L); flights (L); board (L); room (L); couch (L); handle (H); eat (H); air (H); Judy (ML); coat (ML); bright (ML); "ber" (L); moon (L); gray (H); drive (H); foot (H); tired (ML); "wair" (ML)

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. track	1(5)	4(7)	5(12)	3(5)	3(4)	6(9)
2. car(s)	2(2)	5(7)	7(9)	5(5)	7(7)	12(12)
3. fast	3(3)	2(5)	5(8)	2(2)	4(5)	6(7)
4. bus	1(3)	0(4)	1(7)	2(2)	3(4)	5(6)
5. truck	3(4)	1(3)	4(7)	0(2)	1(3)	1(5)
6. ride	3(4)	1(1)	4(5)	2(2)	2(4)	4(6)
7. choo-choo	4(5)	1(1)	5(6)	0(1)	0(0)	0(1)
8. locomotive	0(1)	3(3)	3(4)	2(3)	0(0)	2(3)
9. plane (airplane	2(4)	2(2)	4(6)	0(0)	1(1)	1(1)
10. transportation	1(1)	1(1)	2(2)	2(3)	0(1)	2(4)
11. go	1(1)	0(0)	1(1)	1(2)	1(2)	2(4)
no response	0(0)	1(1)	1(1)	0(0)	0(0)	0(0)

Four: engine (2H,2L); caboose (H,MH,2L); long (2H,MH,L); wheels (2ML,2L)

Three: smoke (H,2L); big (H,2ML); toot (=toot) (H,2L); rain (3H); railroad (train tracks (2H,ML)

Two: train (2L); railroad (2L); horn (H,L); box(es) (H,MH); ran (run) (2L); noise (H,L)

One: subway (H); Boston(MH); whistle (MH); map (H); powerful (H); carload (L); lover (L); slow (MH); bat (L); steam (H); squash (MH); boxcar (L); cart (ML); speed (H); "tacnilu" (ML); football (H); boat (ML); cable car (ML); Christmas (H); sister (H); vehicle (L); brain (ML); fun (MH); mother (L); Attica (L); thin (H); set (H); roll (MH); moth (ML); vain (ML); "lun" (ML); travel (L); board (L); rail (H); zoo (ML); move (ML); main (ML); animal (ML)

TRUCK

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. car	6(13)	13(20)	19(33)	16(21)	13(19)	29(40)
2. big	5(6)	1(5)	6(11)	3(3)	2(4)	5(7)
3. wheel(s)	3(4)	3(4)	6(8)	1(1)	1(1)	2(2)
4. drive	3(4)	1(2)	4(6)	1(2)	1(2)	2(4)
5. ride	2(2)	4(5)	6(7)	0(1)	0(1)	0(2)
6. bus	2(2)	2(3)	4(5)	1(1)	1(1)	2(2)
7. dirt(y)	1(2)	0(0)	1(2)	1(1)	0(2)	1(3)
8. move	2(2)	2(2)	4(4)	0(0)	1(1)	1(1)
9. automobile	0(1)	1(1)	1(2)	2(4)	1(1)	3(5)
no response	0(0)	0(0)	0(0)	0(0)	1(1)	1(1)

Three: transportation (H,MH,L); go (H,2L); toy (H,2L); dump (3H)

Two: red (2H); horn (H,L); play (H,ML); fast (2L); stuck (2ML); motor (MH,ML); bike (H,MH)

One: logs (L); vehicle (L); the (L); nose (L); "hred" (L); "duraty" (L); hugh (L); smells (H); street (MH); banging (H); shipping (ML); locomotive (MH); high (H); heavy (MH); farm (H); load (L); movie (ML); heave (MH); work (L); trunk (L); train (L); furniture (L); boy (H); carrier (MH); driver (MH); flute (ML); puppet (ML); had (ML); nothing (ML); mink (L); elephant (L); inch (L); "truk" (H); buck (H); purse (ML); whale (ML); highway (ML); hunt (ML)

VIOLIN

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. instrument	6(13)	8(13)	14(26)	9(12)	9(17)	18(29)
2. music	8(9)	5(6)	13(15)	4(5)	10(10)	14(15)
3. string(s)	5(5)	3(3)	8(8)	2(3)	2(3)	4(6)
4. play	3(4)	2(2)	5(6)	3(4)	2(2)	5(6)
5. harp	1(2)	1(1)	2(3)	1(2)	0(1)	1(3)
6. drum	1(2)	0(0)	1(2)	0(0)	1(3)	1(3)
7. cello	1(1)	1(2)	2(3)	1(1)	0(0)	1(1)
8. viola	0(0)	2(4)	2(4)	0(0)	0(0)	0(0)
no response	0(0)	1(1)	1(1)	1(1)	2(2)	3(3)

Three: flute (2H,MH); bow (H,MH,L); piano (MH,ML,L); squeak(y) (H,MH,ML); guitar (2MH,L)

Two: violin (H,L); orchestra (2ML); noise (MH,L); screen (H,MH); pretty (MH,L); stick (2MH)

One: head (H); bass violin (H); number (H); thing (L); wood (H); strum (L); "stofe" (L); little (L); small (ML); sing (L); horn (H); cow (ML); meat (MH); "wineing" (H); brown (H); "trpit" (L); soak (H); purple (H); band (L); worn (L); white (L); nice (L); trumpet (ML); Lynn (ML); blue (MH); circle (MH); book (L); horse (L); banana (H); "oeoe" (H); sound (H); grass (H); loud (MH); smell (ML); Kenny (ML) know (ML); sat (L); bag (L); "viddle" (L); skill (H); time (H); picture (ML); my (ML); Tina (ML); my violin teacher (ML)

WALL

	"Fast" Learners			"Slow" Learners		
	Assoc.	Categ.	Total	Assoc.	Categ.	Total
1. house	4(8)	5(9)	9(17)	4(5)	4(5)	8(10)
2. tall	2(4)	2(3)	4(7)	0(2)	0(3)	0(5)
3. hall	0(1)	2(2)	2(3)	3(4)	4(5)	7(9)
4. ceiling	2(4)	2(3)	4(7)	1(1)	2(2)	3(3)
5. hard	0(1)	2(2)	2(3)	0(1)	4(6)	4(7)
6. paint	1(1)	4(6)	5(7)	1(1)	1(2)	2(3)
7. floor	1(1)	3(3)	4(4)	0(1)	2(3)	2(4)
8. paper	2(2)	0(1)	2(3)	1(1)	2(3)	3(4)
9. brick	1(1)	1(1)	2(2)	1(1)	4(4)	5(5)
10. door	0(1)	1(3)	1(4)	1(2)	0(0)	1(2)
11. picture	1(2)	0(0)	1(2)	1(2)	0(1)	1(3)
12. high	2(3)	1(1)	3(4)	1(1)	0(0)	1(1)
no response	0(0)	0(0)	0(0)	1(1)	0(0)	1(1)

Four: room (2H,ML,L); roof (H,MH,2L); fall (MH,2ML,L); green (H,ML,2L)

Three: block (H,MH,L); flat (3H): stone (H,ML,L)

Two: blue (H,ML); black (2L); plaster (2H); straight (H,L); hit (H,MH); fall (H,ML); stall (2ML); white (2H)

One: hollow (MH); cave (MH); far (L); solid (H); hall (L); crash (ML); colors (ML); hill (H); run (H); lord (H); all (H); over (MH); yellow (L); see (L); "plask" (ML); cement (L); big (L); building (ML); sink (H); clock (H); up (L); ball (L); go (L); start (L); skull (MH); dog (L); long (L); bedroom (L); pop (L); face (L); tree (H); sock (H); climb (MH); still (L); wall (L); "rodd" (L); chip (H); light (ML); stop (ML); divide (ML)

WASP

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	bee	7(12)	7(13)	14(25)	6(11)	6(9)	12(20)
2.	sting	7(8)	3(6)	10(14)	2(6)	3(7)	5(13)
3.	insect	5(6)	4(5)	9(11)	3(4)	5(6)	8(10)
4.	bug	2(5)	3(4)	5(9)	2(2)	0(0)	?(2)
5.	hurt	1(2)	2(3)	3(5)	0(0)	1(2)	1(2)
6.	hit	2(3)	0(0)	2(3)	1(2)	2(2)	3(4)
7.	fly	0(1)	2(3)	2(4)	0(1)	0(0)	0(1)
8.	hornet	0(0)	2(3)	2(3)	0(0)	1(1)	1(1)
9.	black	0(0)	1(0)	1(0)	1(2)	0(1)	1(3)
10.	nest	1(1)	0(1)	1(2)	0(1)	0(0)	0(1)
	no response	1(1)	1(2)	2(3)	2(2)	4(4)	6(6)

Two: two (ML); air (H,L); wing(s) (H,ML); bit (H,L); wash (H,L); talk (H,L); fast (MH,L); wipe (H,ML); house (ML,L)

One: pig (H); people (H); dragonfly (H); "stofe" (L); look (ML); was (H); ugly (L); clean (H); scared (H); skin (L); "flte" (L); blue (L); see (H); wasp (L); take (L); "coit" (L); sound (H); waste (L); "wasp" paper basket (L); the (L); put (L); paper (MH); knot (ML); cool (MH); stinger (MH); done (MH); took (L); corner (L); dug (L); me (L); up (ML); garage (ML); kill (L); big (L); animal (L); garbage (L); crawl (H): talk (H); leaf (ML); little (ML)

WHITE

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	color	14(22)	13(22)	27(44)	17(19)	21(29)	38(48)
2.	black	7(13)	7(11)	14(24)	7(11)	7(10)	14(21)
3.	blue	1(1)	4(5)	5(6)	1(2)	2(2)	3(4)
4.	snow	1(1)	1(1)	2(2)	1(3)	0(0)	1(3)
5.	house	1(1)	2(2)	3(3)	0(0)	0(1)	0(1)
6.	light	1(1)	1(1)	2(2)	0(1)	1(1)	1(2)
7.	coat	1(1)	0(0)	1(1)	1(1)	0(1)	1(2)
8.	bright	2(2)	1(1)	3(3)	0(0)	0(0)	0(0)
9.	red	1(1)	1(1)	2(2)	0(0)	0(1)	0(1)
10.	brown	0(1)	0(0)	0(1)	0(0)	1(2)	1(2)
	no response	0(0)	0(0)	0(0)	0(0)	1(1)	1(1)

Two: pink (2MH); paint (H,ML); yellow (MH,ML); green (MH,L); clean (H,L); clear (H,ML); paper (MH,L)

One: toe (H); bite (L); blouse (ML); people (ML); gold (H); chalk (H); bread (H); man (H); orange (MH); arm (H); amber (ML); car (L); night (ML); pale (L); song (ML); dark (H); draw (L); hit (L); fight (ML); box (ML); right (ML)

Appendix F

Categorical Norms

BIRD

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	robin	22(32)	31(47)	53(79)	32(44)	22(37)	54(81)
2.	bluebird	16(25)	16(22)	32(47)	16(23)	7(14)	23(37)
3.	blue jay	9(11)	16(26)	25(37)	13(18)	8(12)	21(30)
4.	sparrow	10(12)	10(15)	20(27)	8(9)	7(12)	15(21)
5.	eagle	12(19)	7(13)	19(32)	5(11)	2(4)	7(15)
6.	canary	6(8)	9(9)	15(17)	8(15)	6(13)	14(28)
7.	cardinal	9(10)	6(10)	15(20)	9(10)	5(9)	14(19)
8.	blackbird	8(12)	6(8)	14(20)	6(7)	6(8)	12(15)
9.	crow	3(9)	10(11)	13(20)	2(3)	4(6)	6(9)
10.	parrot	2(4)	7(9)	9(13)	4(7)	3(8)	7(15)
11.	hawk	5(9)	3(4)	8(13)	3(4)	3(3)	6(7)
12.	pheasant	2(4)	3(3)	5(7)	4(8)	3(4)	7(12)
13.	parakeet	1(5)	3(5)	4(10)	0(2)	4(4)	4(6)
14.	huming bird	3(3)	1(2)	4(5)	2(4)	3(3)	5(7)
15.	turkey	4(6)	0(1)	4(7)	0(1)	1(3)	1(4)
16.	ostrich	2(3)	3(5)	5(8)	0(2)	0(1)	0(3)
17.	woodpecker	1(3)	1(2)	2(5)	1(2)	3(3)	4(5)
18.	red wing b.b.	2(2)	3(3)	5(5)	3(3)	0(1)	3(4)
19.	duck	3(3)	3(3)	6(6)	0(2)	0(1)	0(3)
20.	gull	1(2)	2(3)	3(5)	2(4)	0(0)	2(4)
21.	chicken	3(5)	1(2)	4(7)	0(0)	0(1)	0(1)
22.	swan	2(2)	2(3)	4(5)	0(1)	0(1)	0(2)
23.	oriole	1(2)	2(3)	3(5)	1(1)	0(1)	1(2)
24.	owl	3(4)	0(0)	3(4)	1(1)	0(1)	1(2)
25.	penguin	3(4)	1(1)	4(5)	1(1)	0(0)	1(1)
.	pigeon	2(2)	1(2)	3(4)	1(2)	0(0)	1(2)
.	mockingbird	2(2)	1(2)	3(4)	1(1)	1(1)	2(2)
28.	goose	2(3)	1(1)	3(4)	0(0)	0(1)	0(1)
29.	chickadee	1(1)	2(2)	3(3)	0(0)	1(2)	1(2)
30.	killdeer	2(2)	0(1)	2(3)	0(0)	1(2)	1(2)
31.	raven	1(1)	0(2)	1(3)	1(1)	0(0)	1(1)
32.	falcon	2(2)	0(1)	2(3)	1(1)	0(0)	1(1)
33.	finch	0(1)	1(1)	1(2)	2(2)	0(0)	2(2)
	no response	7(8)	2(3)	9(11)	7(9)	7(9)	14(18)

Three: peacock (H,2ML); red bird (2H,MH); roadrunner (2H,L); swallow (3H); wren (H,2L); jay (H,ML,L)

Two: baby bird (2L); mother bird (2L); jay (H,L); hen (H,MH); pelican (MH,ML); yellow bird (MH,L); king fisher (H,MH); gold finch (H,L)

One: mina bird (L); cacato (L); yellow breast (H); bat (MH); cow bird (MH); tweety bird (MH); love bird (H); red belly (H); red jacket (MH); jackbird (H); color (H); pretty (H); yellow tail (L); egg (ML); nest (ML); food (ML); blue breast (L); nightingale (L); puffin (H); junko (H); dove (M L); animal (L); rooster (H); stork (ML); cow (MH)

COLOR

"Fast" Learners

		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	blue	29(42)	35(52)	64(94)	38(53)	26(44)	64(97)
2.	red	29(43)	33(50)	62(93)	31(44)	26(42)	57(86)
3.	black	26(37)	28(43)	54(80)	28(41)	21(34)	49(75)
4.	green	30(41)	30(46)	60(87)	28(37)	14(27)	42(64)
5.	purple	23(33)	21(35)	44(68)	24(36)	15(31)	39(67)
6.	yellow	20(28)	28(40)	48(68)	17(26)	13(25)	30(51)
7.	orange	18(29)	23(30)	41(59)	15(26)	20(31)	35(57)
8.	white	16(27)	17(27)	33(54)	16(25)	18(27)	34(52)
9.	brown	16(23)	17(30)	33(53)	15(24)	9(20)	25(44)
10.	pink	15(22)	17(27)	32(49)	14(21)	9(15)	23(36)
11.	gray	3(7)	9(14)	12(21)	3(5)	1(7)	4(12)
12.	gold	6(8)	4(9)	10(17)	5(6)	3(4)	8(10)
13.	silver	4(6)	4(8)	8(14)	4(5)	3(5)	7(10)
14.	violet	4(5)	4(6)	8(11)	5(7)	2(6)	7(13)
15.	tan	2(4)	2(3)	4(7)	2(5)	1(1)	3(6)
16.	blue-green	2(3)	0(1)	2(4)	1(2)	0(1)	1(3)
17.	peach	3(3)	1(1)	4(4)	2(2)	0(0)	2(2)
18.	turquois	1(2)	0(0)	1(2)	2(2)	1(2)	3(4)
19.	copper	2(2)	0(1)	2(3)	0(0)	1(2)	1(2)
20.	aqua	0(2)	1(1)	1(3)	0(1)	0(0)	0(1)
	no response	4(4)	2(4)	6(8)	11(12)	0(0)	11(12)

Two: pretty(2H); grape (2L); flesh (H,L); lavender (H,L); maroon (2L); orchid (2L)

One: lilac (ML); beige (ML); brick red (L); blond (L); indian red (H); bright (H); beauty (H); pear (H); crimson (L); skirt (H); shirt (H); magenta (H); sky blue (H); shoes (H); socks (H); clothes (H);

CLOTHING

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	pants	23(37)	27(43)	50(80)	26(40)	14(30)	40(70)
2.	shirt	19(32)	23(38)	42(70)	25(34)	14(27)	39(61)
3.	socks	15(26)	24(36)	39(62)	15(26)	11(22)	26(48)
4.	dress	16(24)	17(23)	33(47)	15(18)	11(20)	26(38)
5.	shoes	8(18)	14(22)	22(40)	18(27)	7(14)	25(41)
6.	coat	9(15)	6(9)	15(24)	8(15)	5(10)	13(25)
7.	blouse	9(13)	8(11)	17(24)	5(7)	5(10)	10(17)
8.	hat	8(11)	8(13)	17(24)	5(7)	5(10)	10(17)
9.	skirt	13(14)	9(12)	22(26)	3(6)	3(5)	6(11)
10.	underwear	7(8)	5(9)	12(17)	8(13)	3(7)	11(20)
11.	tie	5(7)	5(9)	10(16)	5(7)	2(6)	7(13)
12.	sweater	6(10)	3(5)	9(15)	5(8)	1(4)	6(12)
13.	jacket	4(7)	1(4)	5(11)	3(3)	0(2)	3(5)
14.	gloves	2(4)	3(6)	5(10)	0(4)	2(2)	2(6)
15.	undershirt	1(2)	2(5)	3(7)	5(7)	1(2)	6(9)
16.	t-shirt	2(4)	2(3)	4(7)	3(6)	1(2)	4(8)
17.	cotton	4(4)	1(1)	5(5)	3(4)	4(5)	7(9)
18.	wool	5(5)	0(1)	5(6)	4(4)	2(3)	6(7)
19.	vest	1(4)	5(6)	6(10)	0(3)	0(0)	0(3)
20.	belt	1(2)	6(7)	7(9)	0(1)	1(2)	1(3)
21.	top	1(2)	2(4)	3(6)	2(3)	1(3)	3(6)
22.	slip	5(5)	2(4)	7(9)	0(1)	1(1)	1(2)
23.	suit	2(5)	4(4)	6(9)	0(0)	1(2)	1(2)
24.	shorts	0(0)	3(5)	3(5)	3(3)	0(2)	3(5)
25.	scarf	1(1)	3(7)	4(8)	0(0)	0(0)	0(0)
26.	cloth	3(3)	1(1)	4(4)	1(1)	2(3)	3(4)
27.	boot	2(2)	0(2)	2(4)	0(2)	2(2)	2(4)
28.	bra	2(2)	2(2)	4(4)	1(2)	0(1)	1(3)
29.	silk	1(1)	2(2)	3(3)	2(2)	1(1)	3(3)
30.	ribbon	0(0)	1(1)	1(1)	1(1)	1(3)	2(4)
31.	mitten	1(2)	2(2)	3(4)	0(0)	0(1)	0(1)
32.	slack	1(1)	1(2)	2(3)	0(1)	1(1)	1(2)
33.	nylon	1(1)	0(0)	1(1)	1(1)	2(2)	3(3)
34.	thread	0(0)	0(0)	0(0)	2(2)	1(2)	3(4)
35.	material	1(1)	1(1)	2(2)	0(1)	1(1)	1(2)
36.	girdle	1(1)	0(1)	1(2)	1(1)	0(1)	1(2)
37.	stocking	0(2)	0(1)	0(3)	1(1)	0(0)	1(1)
38.	leather	1(1)	1(1)	2(2)	1(1)	1(1)	2(2)
	no response	3(4)	3(3)	6(7)	16(18)	11(11)	27(29)

Three: wig (H,2ML); cap (H,2MH); sweatshirt (2ML,L): bow (2H,ML); felt (3H); yarn (2ML,L); jeans 2H,MH)

Two: necklace (H,MH); sleeve (H,L); fur (ML,L); newspaper (2L); pajamas (H,L); velvet (H,L); underpants (MH,ML); linen (H,L); zipper (2H); watch (H,L): pant suit (H,L); paper (2L); jumper (2H); sneaker (H,ML)

One: cape (H); rag (H); bracelet (MH); earrings (MH); choaker (MH); glasses (L); bathing suit (ML); ash tray (MH); button (H); flower (H); color (H); big (H); small (H); slipper (H); hot pants (H); rubber (H); corduroy (H); soak (L); panty hose (H); jewelry (L); ring (L); plain (MH); purse (H); robe (ML); hair band (L); pan (ML); tan (ML); "choucker" (L); fabric (L); bell bottoms (L); collar (L); blazer (ML); shell (H); mask (ML); tights (MH); unmentionables (H); band (H)

FOUR-FOOTED ANIMAL

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	dog	31(45)	32(46)	63(91)	34(48)	21(35)	55(83)
2.	cat	29(42)	31(44)	60(86)	32(45)	17(31)	49(66)
3.	horse	15(25)	16(25)	31(50)	16(24)	13(22)	29(46)
4.	cow	8(16)	10(15)	18(31)	14(16)	11(16)	25(32)
5.	lion	15(21)	13(14)	28(35)	9(11)	7(13)	16(24)
6.	elephant	10(13)	10(12)	20(25)	6(8)	5(14)	11(22)
7.	mouse	7(10)	6(11)	13(21)	9(12)	9(13)	18(25)
8.	pig	5(5)	8(11)	13(16)	8(13)	9(14)	17(27)
9.	bear	5(7)	9(15)	14(22)	7(11)	5(8)	12(19)
10.	tiger	11(15)	7(7)	18(22)	8(10)	0(4)	8(14)
11.	deer	3(5)	5(8)	8(13)	9(12)	5(10)	14(22)
12.	rabbit	5(6)	3(6)	8(12)	4(5)	6(6)	10(11)
13.	rat	5(7)	3(4)	8(11)	4(7)	4(5)	8(12)
14.	giraffe	2(5)	6(6)	8(11)	3(4)	1(5)	4(9)
15.	monkey	0(1)	5(8)	5(9)	0(1)	5(6)	5(7)
16.	sheep	2(4)	2(3)	4(7)	3(4)	3(4)	6(8)
17.	turtle	3(5)	2(3)	5(8)	1(1)	1(4)	2(5)
18.	goat	4(4)	3(3)	7(7)	1(1)	2(3)	3(4)
19.	fox	2(3)	0(2)	2(5)	4(4)	0(0)	4(4)
20.	wolf	1(1)	0(2)	1(3)	4(4)	1(1)	5(5)
21.	bull	1(2)	1(1)	2(3)	2(3)	1(2)	3(5)
22.	squirrel	1(1)	1(4)	2(5)	1(1)	1(2)	2(3)
23.	racoon	1(1)	3(4)	4(5)	2(2)	0(0)	2(2)
24.	hippo	2(3)	1(2)	3(5)	0(0)	1(2)	1(2)
25.	buffalo	3(4)	0(0)	3(4)	3(3)	0(0)	3(3)
26.	leopard	3(5)	1(1)	4(6)	1(1)	0(0)	1(1)
27.	lamb	0(1)	2(2)	2(3)	1(1)	2(2)	3(3)
28.	donkey	0(1)	2(3)	2(4)	1(1)	1(1)	2(2)
29.	aligator	0(0)	1(2)	1(2)	1(1)	1(2)	2(3)
30.	hamster	2(2)	0(0)	2(2)	2(2)	0(1)	2(3)
31.	camel	2(2)	1(1)	3(3)	1(2)	0(0)	1(2)
32.	mule	0(2)	1(1)	1(3)	0(0)	1(2)	1(2)
33.	zebra	2(2)	2(2)	4(4)	0(0)	0(1)	0(1)
34.	beaver	1(1)	1(1)	2(2)	0(0)	1(2)	1(2)
35.	hog	1(1)	0(0)	1(1)	1(2)	1(1)	2(3)
36.	gerbil	2(2)	0(1)	2(3)	1(2)	1(1)	2(3)
	no response	0(0)	3(3)	3(3)	4(5)	0(0)	4(5)

Three: chimpanzee (MH,2ML); great dane (MH,ML,L); kangaroo (H,2ML); pony (MH,ML,L); bob cat (H,2L); calf (H,MH,L)

Two: guinea pig (2L); ant (H,L); frog (MH,L); rhino (2L); people (H,ML);

One: moose (ML); chipmunk (2MH); bird (MH); dinosaur (ML); ant eater (ML); panther (ML); boy (L); girl (L); kitten (L); woodchuck (MH); elk (L); chicken (H); gezelle (H); legs (H); big (H); small (H); animal (H); fat (H); little (H); snake (H); seal (L); dolphin (L); ox (L); wilderbeast (L); fly (L); llama (H); ostrich (MH); ape (MH); cheeta (H); colt (L); skunk (H); hyena (H);

FRUIT

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	apple	34(48)	35(54)	69(102)	38(54)	24(42)	62(96)
2.	orange	29(42)	26(42)	55(84)	29(42)	18(33)	47(75)
3.	pear	22(34)	24(38)	46(72)	24(36)	17(27)	41(63)
4.	banana	20(31)	20(33)	40(64)	24(33)	16(28)	40(61)
5.	grape	17(24)	18(26)	35(50)	19(26)	14(23)	33(49)
6.	peach	17(26)	23(29)	40(55)	13(21)	11(17)	24(38)
7.	plum	14(21)	11(18)	25(39)	11(17)	4(8)	15(25)
8.	cherry	7(11)	4(5)	11(16)	5(6)	5(9)	10(15)
9.	prune	3(5)	6(10)	9(15)	7(9)	0(2)	7(11)
10.	lemon	6(7)	9(10)	15(17)	4(4)	0(2)	4(6)
11.	pineapple	5(6)	2(5)	7(11)	4(5)	3(4)	7(9)
12.	grapefruit	5(5)	4(7)	9(12)	2(2)	1(2)	3(4)
13.	tangerine	4(5)	5(6)	9(11)	1(1)	0(0)	1(1)
14.	apricot	2(3)	2(4)	4(7)	3(5)	0(0)	3(5)
15.	tomato	1(2)	3(4)	3(6)	2(3)	0(2)	2(5)
16.	lime	3(3)	5(6)	8(9)	1(1)	0(0)	1(1)
17.	berry	3(3)	1(2)	4(5)	0(0)	0(2)	0(2)
18.	strawberry	1(2)	0(1)	1(3)	0(1)	0(1)	0(2)
19.	nectarine	1(4)	1(1)	2(5)	0(0)	0(0)	0(0)
20.	blueberry	0(0)	1(2)	1(2)	0(0)	1(2)	1(2)
21.	coconut	0(0)	1(1)	1(1)	1(2)	1(1)	2(3)
22.	cantaloupe	1(1)	0(1)	1(2)	0(0)	0(2)	0(2)
	no response	1(1)	3(4)	4(5)	4(4)	5(5)	9(9)

Three: pumpkin (2H,MH)

Two: cranberry (MH,L); carrot (2ML)

One: onion (ML); blackberry (H); potato (L); fig (H); cocotail (H); nuts (L)l fish (L); ugly (H)

FURNITURE

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	chair	33(48)	33(52)	66(100)	36(50)	23(40)	59(90)
2.	table	29(43)	25(39)	54(82)	28(39)	15(29)	43(68)
3.	couch	21(32)	23(38)	44(70)	26(36)	24(38)	50(74)
4.	desk	15(25)	14(22)	29(47)	11(17)	3(7)	14(24)
5.	bed	15(20)	13(19)	28(39)	8(12)	6(8)	14(20)
6.	lamp	12(17)	8(16)	20(33)	4(8)	7(16)	11(24)
7.	television	7(12)	7(16)	14(28)	6(6)	6(11)	12(17)
8.	sofa	7(10)	8(10)	15(20)	4(7)	3(6)	7(13)
9.	dresser	6(7)	5(7)	11(14)	3(5)	2(3)	5(8)
10.	stool	4(6)	6(7)	10(13)	2(3)	3(6)	5(9)
11.	rug	3(5)	3(6)	6(11)	4(5)	2(3)	6(8)
12.	coffee table	1(1)	2(3)	3(4)	1(3)	0(1)	1(4)
13.	rocker	3(3)	3(3)	6(6)	4(4)	3(3)	7(7)
14.	wood	0(1)	1(1)	1(2)	2(4)	0(1)	2(5)
15.	radio	2(2)	1(3)	3(5)	0(0)	1(1)	1(1)
16.	end table	1(1)	0(0)	1(1)	0(2)	1(1)	1(3)
17.	stereo	1(1)	1(2)	2(3)	1(1)	1(1)	2(2)
18.	bench	0(0)	1(2)	1(2)	0(0)	2(3)	2(3)
19.	shelf	2(2)	0(0)	2(2)	1(1)	0(1)	1(2)
20.	cabinet	1(1)	1(2)	2(3)	0(1)	0(0)	0(1)
	no response	3(4)	0(1)	3(5)	6(7)	3(3)	9(10)

Three: bookcase (2MH,ML); record player (ML,2L); paper (ML,2L); leg(MH,2L); arm (3L); refrigerator (ML,2H); light (2H,L); piano (H,MH,ML); cushion (2H,L); cot (H,2L);

Two: nightstand (2H); rocking chair (MH,ML); bar (H,L); floor (2L); counter (2H); tray (2H); mirror (2H); stove (H,ML) pillow (H,ML); chest (2H); cloth (ML,L); spring (ML,L); bookshelf (H,MH); seat (2L); footrest (2H);

One: fireplace (L); picture (H); secretary (H); bedroom (ML); stuffing (ML); magazine (L); wheel (L); body (L); dry sink (MH); lounge (H); sewing (H); material (H); lazy chair (H); dining table (ML); divider (H); candle (L); dishwasher (ML); board (H); clock (L); car seat (L); love seat (MH); dog (L); ball (L); bat (L); hutch (L); rock ML); metal (MH); foot (L); tea table (MH); booth (H); stand (MH); newspaper (MH); closet (H); handle (L); cotton (L); string (L); floor (L); door (ML); house (ML); soft (ML); steel (ML)

INSECT

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	fly	26(40)	25(37)	51(77)	30(41)	20(33)	50(74)
2.	ant	24(31)	22(38)	46(69)	32(44)	17(27)	49(71)
3.	bee	14(26)	20(31)	34(57)	15(26)	16(29)	31(55)
4.	wasp	8(13)	16(23)	24(36)	6(14)	7(14)	13(28)
5.	spider	8(12)	16(23)	24(35)	12(15)	8(12)	20(27)
6.	mosquito	7(14)	12(20)	19(34)	9(12)	3(9)	12(21)
7.	beetle	10(11)	13(18)	23(29)	3(5)	8(16)	11(21)
8.	butterfly	5(7)	5(7)	10(14)	5(7)	5(9)	10(16)
9.	grasshopper	6(8)	6(7)	12(15)	3(7)	6(7)	9(14)
10.	bug	3(5)	4(5)	7(10)	6(9)	5(10)	11(19)
11.	lady bug	4(7)	5(6)	9(13)	5(7)	5(6)	10(13)
12.	worm	5(5)	2(4)	7(9)	8(10)	3(4)	11(14)
13.	hornet	4(8)	7(7)	11(15)	1(1)	0(2)	1(3)
14.	roach	3(5)	3(7)	6(12)	3(5)	0(1)	3(6)
15.	caterpillar	2(4)	1(2)	3(6)	1(3)	3(3)	4(6)
16.	cricket	2(3)	1(3)	3(6)	1(1)	2(4)	3(5)
17.	moth	1(3)	2(3)	3(6)	3(3)	1(1)	4(4)
18.	dragon fly	0(2)	2(2)	2(4)	2(2)	1(3)	3(5)
19.	praying mantis	2(2)	2(3)	4(5)	0(0)	0(1)	0(1)
20.	yellow jacket	2(2)	0(0)	2(2)	1(1)	1(3)	2(4)
21.	june bug	1(2)	2(2)	3(4)	0(0)	0(1)	0(1)
22.	horse fly	1(2)	0(0)	1(2)	1(1)	1(2)	2(3)
23.	termite	0(0)	0(0)	0(0)	2(5)	0(0)	2(5)
24.	flea	2(3)	0(0)	2(3)	0(0)	1(1)	1(1)
	no response	4(5)	1(3)	5(8)	8(9)	0(0)	8(9)

Two: frog (H,MH); tarantula (MH,L); snake (H,L); fruit fly (H,MH); potato bug (H,ML);

One: brother (MH); black widow (H); fruit bug (L); turtle (H); inchworm (ML); chair (H); plug (H); roof (H); little red bug (H); maggot (MH); insect(ML); garbage bug (ML); water bug (H); gnat (H); bumble bee (ML); centipede (H)

MUSICAL INSTRUMENT

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	drum (bass, snare, kettle)	21(34)	27(44)	48(78)	34(46)	19(35)	53(81)
2.	flute	24(38)	25(35)	49(73)	18(31)	13(23)	31(54)
3.	violin(fiddle, bass)	16(26)	20(29)	36(55)	22(31)	16(30)	38(61)
4.	trumpet	16(24)	15(27)	31(51)	11(17)	12(21)	23(38)
5.	clarinet (bass)	16(27)	19(29)	34(56)	11(15)	5(18)	16(33)
6.	piano	11(16)	14(21)	25(37)	15(22)	10(20)	25(42)
7.	guitar (bass)	15(20)	14(21)	29(41)	11(21)	11(16)	22(37)
8.	saxaphone	6(11)	8(15)	14(26)	4(8)	2(5)	6(13)
9.	horn (french, english)	5(10)	7(9)	12(19)	7(8)	4(9)	11(17)
10.	trombone	3(6)	4(7)	7(13)	7(11)	6(6)	13(17)
11.	harp	(9)	5(5)	12(14)	6(8)	6(7)	12(15)
12.	piccolo	8(9)	4(5)	12(14)	3(6)	3(3)	6(9)
13.	cello	4(6)	3(5)	7(11)	4(7)	3(5)	7(12)
14.	oboe	5(8)	8(9)	13(17)	1(1)	0(3)	1(4)
15.	organ	6(10)	3(7)	9(17)	2(2)	1(1)	3(3)
16.	tuba	2(3)	4(6)	6(9)	2(2)	4(4)	6(6)
17	bells	1(2)	5(6)	6(8)	2(2)	1(2)	3(4)
18.	banjo	4(6)	2(2)	6(8)	1(2)	0(1)	1(3)
19.	bass	1(1)	0(0)	1(1)	5(6)	0(2)	5(8)
20.	gong	0(0)	1(2)	1(2)	1(1)	5(6)	6(7)
21.	tamborine	1(1)	0(0)	1(1)	5(5)	1(2)	6(7)
22.	baritone	2(2)	0(0)	2(2)	3(4)	0(1)	3(5)
23.	bassoon	2(2)	1(2)	3(4)	0(1)	0(1)	0(2)
24.	viola	2(4)	1(1)	3(5)	0(0)	0(0)	0(0)
25.	bugle	1(1)	2(2)	3(3)	1(1)	1(1)	2(2)
26.	triangle	0(0)	1(2)	1(2)	1(1)	0(1)	1(2)
27.	double bass	0(0)	2(2)	2(2)	0(0)	0(2)	0(2)
	no response	6(6)	1(1)	7(7)	13(16)	5(6)	18(22)

Two: sousaphone (2H); coronet (2H); harmonica (H,ML); wood blocks (ML,L); morracas (ML,L)

One: accordian (L); zylaphone (L); record player (H); radio (H); stereo (H); juke box (H); recorder (H); harpsichord (H)

OCCUPATION

		"Fast" Learners			"Slow" Learners"		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	teacher	20(29)	12(15)	32(44)	14(21)	3(9)	17(30)
2.	doctor	7(8)	6(11)	13(19)	9(14)	2(5)	11(19)
3.	police	3(5)	4(6)	7(11)	6(8)	2(3)	8(11)
4.	salesman	7(9)	3(4)	10(13)	4(5)	0(3)	4(8)
5.	steel worker	5(7)	5(6)	10(13)	5(5)	2(2)	7(7)
6.	nurse	4(5)	2(4)	6(9)	3(6)	2(5)	5(11)
7.	carpenter	3(5)	1(4)	4(9)	2(3)	4(5)	6(8)
8.	mailman	3(4)	4(6)	7(10)	0(3)	0(2)	0(5)
9.	engineer	4(5)	4(7)	8(12)	0(0)	0(2)	0(2)
10.	builder	0(2)	1(4)	1(6)	2(2)	6(7)	8(9)
11.	milkman	1(2)	4(7)	5(9)	1(3)	0(2)	1(5)
12.	truck driver	4(5)	2(4)	6(9)	3(3)	1(2)	3(5)
13.	dentist	5(7)	1(2)	6(9)	2(2)	1(2)	3(4)
14.	fireman	4(4)	1(2)	5(6)	2(4)	2(3)	4(7)
15.	storekeeper	4(4)	0(4)	4(8)	2(3)	1(2)	3(5)
16.	manager	2(4)	1(3)	3(7)	1(2)	0(1)	1(3)
17.	bus driver	2(2)	4(5)	6(7)	1(1)	1(2)	2(3)
18.	principal	1(1)	2(2)	3(3)	2(3)	0(4)	2(7)
19.	farmer	1(2)	1(2)	1(4)	3(3)	1(2)	4(5)
20.	plumber	0(1)	0(3)	0(4)	1(1)	2(3)	3(4)
21.	electrican	1(1)	0(0)	1(1)	4(4)	0(3)	4(7)
22.	worker/workman	0(0)	2(3)	2(3)	2(4)	0(0)	2(4)
23.	taxi driver	1(2)	0(1)	1(3)	3(4)	0(0)	3(4)
24.	pilot	1(2)	0(2)	1(4)	2(3)	0(0)	2(3)
25.	business man	1(2)	3(3)	4(5)	1(1)	0(1)	1(2)
26.	librarian	2(4)	0(1)	2(5)	0(2)	0(0)	0(2)
27.	baker	3(3)	3(3)	6(6)	1(1)	0(0)	1(1)
28.	banker	2(2)	1(1)	3(3)	0(1)	2(3)	2(4)
29.	lawyer	3(4)	1(1)	4(5)	0(1)	0(0)	0(1)
30.	artist	4(4)	1(1)	5(5)	0(0)	1(1)	1(1)
31.	secretary	3(3)	1(2)	4(5)	1(1)	0(0)	1(1)
32.	mechanic	1(2)	2(3)	3(5)	0(0)	1(1)	1(1)
33.	janitor	1(1)	0(1)	1(2)	2(3)	0(0)	2(3)
34.	clerk	4(4)	0(0)	4(4)	0(0)	0(1)	0(1)
35.	football(player)	1(1)	0(1)	1(2)	2(3)	0(0)	2(3)
36.	construction	3(3)	1(1)	4(4)	0(0)	0(0)	0(0)
37.	works	0(0)	0(1)	0(1)	0(0)	3(3)	3(3)
38.	garbage man	0(2)	1(1)	1(3)	0(0)	0(1)	0(1)
39.	supervisor	0(1)	0(0)	0(1)	0(0)	1(3)	1(3)
40.	boss	1(1)	1(3)	2(4)	0(0)	0(0)	0(0)
	no response	4(4)	1(4)	5(8)	16(19)	7(10)	23(37)

Three: grocer (2H,MH); fisherman (H,2L); stewardess (2H,L); scientist (H,MH,L); architect (H,MH,L); judge (2H,MH); druggist (2H,L); jockey (ML,2L) waitress (2H,L); barber (2H,L); hunter (3L); car salesman (2ML,L); cook (2H,ML); T.V.repair (MH,2L); painter (H,MH,L)

Two: miller (2MH); butcher (H,ML); gas man (ML,L); manufacture (ML,L); writer (H,L); reporter (2H); slave (H,ML); actor (H,L); sargent (MH,ML); astronaut (MH,L); cashier (2H); T.V. man (2H); welder (2H); tailor (H,L); waiter (H,L); gas station (MH,L); veterinarian (H,MH); baseball (player) (ML,L); basketball (player) (ML,L)

One: comedian (H); movie star (H); machinist (MH); instruction (L); newscaster (L); industries (H); McDonald (H); pressman (MH); Tom (ML); John (ML); Tim (ML); Jerry (ML); Grey (ML); designer (ML); horse racing (H); horse trainer (L); grills (L); make houses (L); medicine (L); coal mining (ML); publisher (L); direct (L); personnel (L); maid (ML); toys (L); paint (H); plow (L); clean (L); wash (L); driver (L); make things (L); stock broker (MH); canner (L); F.B.I. (L); telephone operator (H); welder (L); craftsman (L); printer (L); printer (L); newspaperman (MH); operating engineer (MH); sailor (MH); makes books (H); train master (H); sheet metal (H); stock boy (H); general (H); paper boy (H); priest (MH); insurance (MH); watch maker (H); composer (H); executive (H); Johnson (H); bridge (H); cloth maker (H); contractor (H); railroad worker (MH); food co. (H); candy co. (H); cloth co. (H); thruway (H); metal cutter (L); administrator (L); pediatrician (L); law maker (H); manufacturing (H); Westinghouse (L); politician (H); actress (H); tax (L); steal (L); roofer (H); tile (L); plumber (L); towing car (H); pizzeria (L); shoppingman (L); gas man (L); train driver (L); candy maker (ML); brick layer (H); maid (MH); specialist (H); butler (MH); bowler (H); meat buyer (ML); employer (MH); tool and dye (H); dog catcher (ML); job (L); railroad (H); psychologist (ML); physicist (ML); corporal (ML); phone man (H); custodian (H); bookeeper (ML); bell (ML); bell (ML); top (ML); never work (ML); utica club (L); geologist (MH); mill wright (ML); car sales (ML); wash dishes (MH); model (MH); dancer (MH); cleaner (H); shoe maker (MH); toy maker (MH); fighter (L); football coach (L); baseball coach (L); chef (L); law man (L); dock (L); contractor (H); installer (H); cement finisher (H); typist (L); book (L); magazine (L); draftsman (L); T.V. repair (L); sheet metal (L); operator (L); disc jockey (ML); instructor (ML); moving man (ML); hospital (MH); store (MH); milk store (MH); drug store (MH); dealer (MH); make cars (MH); make money (MH); make machine (MH); book (MH); taxi driver (MH); telephone (MH); popman (H); ice cream man (H); insurance agent (H); officer (H); bartender (L); home repair (L); whip (L); stamper (L); shepherd (L); dog raiser (L); helper (ML); player (ML); washer (ML); railroad worker (MH);

PART OF A BUILDING

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	window	16(24)	23(34)	29(58)	16(28)	12(22)	28(50)
2.	brick	10(18)	14(28)	24(46)	11(21)	13(21)	24(42)
3.	door	11(17)	12(18)	23(35)	16(23)	10(16)	26(39)
4.	wood	5(12)	8(13)	13(25)	8(12)	3(10)	11(22)
5.	floor	12(14)	9(13)	21(27)	4(7)	6(12)	10(19)
6.	wall	6(7)	8(12)	14(19)	5(8)	4(8)	9(16)
7.	roof	3(6)	10(14)	13(20)	4(5)	5(9)	9(14)
8.	room	8(12)	6(10)	14(22)	7(7)	1(4)	8(11)
9.	steel	3(9)	1(3)	4(12)	8(13)	3(6)	11(19)
10.	cement	4(4)	7(9)	11(13)	4(5)	1(4)	5(9)
11.	ceiling	4(6)	4(6)	8(12)	4(6)	0(1)	4(7)
12.	office	3(4)	2(3)	5(7)	3(4)	3(6)	6(10)
13.	stairs	2(4)	3(7)	5(11)	2(3)	0(3)	2(6)
14.	bathroom	3(3)	3(7)	6(10)	4(5)	1(2)	5(7)
15.	hall	4(5)	2(2)	6(7)	4(5)	1(3)	5(8)
16.	elevator	0(0)	3(4)	3(4)	5(6)	2(3)	7(9)
17.	desk	5(6)	0(3)	5(9)	2(2)	3(3)	5(5)
18.	metal	1(3)	2(2)	3(5)	4(5)	0(2)	4(7)
19.	glass	1(1)	1(3)	2(4)	3(5)	2(3)	5(8)
20.	bedroom	4(4)	1(2)	5(6)	3(3)	3(3)	6(6)
21.	chair	2(3)	2(3)	4(6)	3(4)	1(1)	4(5)
22.	kitchen	5(5)	1(2)	6(7)	0(0)	2(2)	2(2)
23.	frame	2(3)	2(3)	4(6)	1(1)	1(2)	2(3)
24.	lights	2(3)	0(0)	2(3)	4(4)	0(1)	4(5)
25.	top	2(2)	1(1)	3(3)	3(3)	2(2)	5(5)
26.	basement	3(3)	1(2)	4(5)	2(2)	1(1)	3(3)
27.	stone	2(3)	2(2)	4(5)	1(1)	1(2)	2(3)
28.	living room	4(4)	1(2)	5(6)	0(0)	1(1)	1(1)
29.	cellar	0(0)	2(3)	2(3)	1(1)	3(3)	4(4)
30.	iron	2(4)	0(0)	2(2)	0(2)	0(1)	0(3)
31.	blocks	0(0)	1(2)	1(2)	2(2)	2(2)	4(4)
32.	chimney	0(1)	0(0)	0(1)	1(3)	1(2)	2(5)
33.	pipe	1(1)	1(2)	2(3)	0(1)	0(1)	0(2)
34.	bottom	1(1)	2(2)	3(3)	2(2)	0(0)	2(2)
35.	side	0(2)	2(2)	2(4)	0(0)	1(1)	1(1)
36.	tile	1(3)	1(1)	2(4)	0(0)	0(0)	0(0)
37.	steel bars	0(0)	0(1)	0(1)	1(1)	1(2)	2(3)
	no response	2(2)	3(4)	5(6)	10(11)	2(3)	12(14)

Three: table (2H,L); upstairs (2H,MH); sideing (H,MH,ML); people(3H); paper (H,MH,L); concrete (2H,MH); store (2H,L); front (2H,L); pen (2MH,L) shingles (H,2MH); dining room (3H); aluminum (H,ML,L); middle (2H,MH);

Two: bottom (H,L); attic (H,MH); plaster (H,ML); parlor (MH,L); hinges (MH,ML); family room (2H); downstairs (H,MH); wing (MH,L); hammer (2L); pen (2MH); wire (MH,L); copper (ML,L); panneling (H,L); lunch room (MH,L); hard (H,L); store room (2L); steps (2ML); inside (H,L); outside (H,L);

One: shade (MH); seal (L); porch (H); classroom (L); picture (L); flag (L); closet (L); bookshelf (L); rim (L); machine (ML); name (MH); step (MH); chalk board (MH); nuts (H); rug (H); nail (H); carpet (H); color (H); playroom (L); hospital (MH); doctor's office(MH); part (H); work (H); easy (H); seats (L); corridor (L); section (L); corner (H); developing room (ML); walk (L); bar room (L); powder room (L); meal (L); smoke stack (L); melt (MH); flag pole (L); story (ML); ward (L); escalator (H); office (L); apartments (H); house (H); saw (L); cover (L); board (L); insulation (H); rock (ML); door handle (L); windowsill (L); main (H); rear (H); ledge (H); coffee (H); copy machine (H); book (MH); adding machine (H); plaster board (L); wine (L); palster (H); tower (H); beams (L); car dealer (ML); men (MH); women (MH); class (MH); log (MH)

PART OF THE HUMAN BODY

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	leg	25(34)	26(37)	51(71)	23(33)	14(25)	37(58)
2.	arm	26(34	21(32)	47(66)	22(30)	10(20)	32(50)
3.	eye	21(30)	23(34)	44(64)	15(24)	10(19)	25(43)
4.	foot	22(28)	20(27)	42(55)	15(22)	13(20)	28(42)
5.	head	10(19)	23(30)	33(49)	18(26)	12(16)	30(42)
6.	heart	13(20)	9(16)	22(36)	21(28)	15(26)	36(54)
7.	hand	11(18)	20(28)	31(46)	15(20)	9(15)	24(35)
8.	ear	16(22)	14(22)	30(44)	14(21)	6(9)	20(30)
9.	nose	16(21)	20(28)	36(49)	5(10)	7(11)	12(21)
10.	finger	15(22)	14(19)	29(41)	9(14)	6(13)	15(27)
11.	mouth	13(18)	15(21)	28(39)	8(12)	9(13)	17(25)
12.	toe	14(21)	10(14)	24(35)	5(8)	2(5)	7(13)
13.	brain	8(11)	4(7)	12(18)	8(12)	9(13)	17(25)
14.	bones	2(5)	7(12)	9(17)	8(9)	4(12)	12(21)
15.	hair	6(6)	6(10)	12(16)	10(13)	3(6)	13(19)
16.	blood	3(4)	2(7)	5(11)	3(7)	5(9)	8(16)
17.	stomach	3(6)	6(10)	9(16)	5(6)	2(2)	7(8)
18.	vein	2(2)	4(8)	6(10)	1(2)	5(8)	6(10)
19.	neck	2(3)	6(8)	8(11)	6(7)	1(1)	7(8)
20.	lung	3(3)	1(1)	4(4)	6(7)	3(6)	9(13)
21.	kidney	0(1)	0(1)	0(2)	4(6)	2(4)	6(10)
22.	skin	1(2)	3(4)	4(6)	2(4)	2(2)	4(6)
23.	liver	1(1)	1(1)	2(2)	1(3)	5(6)	6(9)
24.	knee	3(5)	0(1)	3(6)	1(2)	2(3)	3(5)
25.	teeth	3(3)	4(4)	7(7)	1(2)	0(2)	1(4)
26.	chest	2(2)	2(3)	4(5)	3(4)	1(1)	4(5)
27.	face	4(4)	1(2)	5(6)	1(1)	1(1)	2(2)
28.	skull	1(2)	1(1)	2(3)	2(4)	1(1)	3(5)
29.	lip	1(1)	3(4)	4(5)	2(2)	0(0)	2(2)
30.	ankle	1(1)	4(4)	5(5)	0(1)	0(0)	0(1)

PART OF THE HUMAN BODY (continued)

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
31.	cells	0(0)	1(2)	1(2)	1(3)	0(1)	1(4)
32.	back	2(3)	0(1)	2(4)	2(2)	0(0)	2(2)
33.	rib	0(3)	0(0)	0(3)	0(1)	0(1)	0(2)
34.	muscle	1(1)	1(2)	2(3)	3(3)	0(0)	3(3)
35.	tongue	1(1)	0(1)	1(2)	2(3)	0(1)	2(4)
36.	elbow	0(2)	1(1)	1(3)	1(1)	1(1)	2(2)
37.	shoulder	1(1)	2(2)	3(3)	1(1)	0(0)	1(1)
38.	nail	1(1)	0(0)	1(1)	0(0)	1(3)	1(3)
39.	rear (end)	2(2)	0(0	2(0)	2(2)	0(0)	2(2)
	no response	2(2)	0(1)	2(3)	9(14)	2(4)	11(18)

Three: skeleton (ML,2L); throat (H,ML,L)

Two: eyelid (MH,L); vessel (MH,ML); spine (MH,L)

One: body (middle) (MH); freckles (L); wrist (L); eyelash (L); heel (MH); knee cap (MH); cow bone (MH); nerve (MH); gall bladder (MH); eyebrow (H); intestine (H); cheek (H); appendix (ML); vessel (MH); nude (L); jaw bone (L); hip (L); tubes (ML); bladder (L); fat (H); elbow (MH); finger nails (H); skull (H); fanny (ML); side (L); artery (ML); butt (ML); thing (H); flesh (H); belly (H); talk (H)

RELATIVE

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	aunt	29(44)	31(47)	60(91)	29(43)	19(36)	48(79)
2.	uncle	30(44)	27(42)	47(86)	24(38)	16(32)	40(70)
3.	grandma	22(34)	24(38)	46(72)	26(36)	15(28)	41(64)
4.	grandpa	21(32)	22(33)	43(65)	27(36)	13(24)	40(60)
5.	cousin	19(28)	26(38)	45(66)	12(18)	11(21)	23(39)
6.	mother	14(18)	8(13)	22(31)	8(12)	2(7)	10(19)
7.	father	13(15)	8(14)	21(29)	9(13)	2(7)	11(20)
8.	sister	13(17)	10(11)	23(28)	4(10)	2(6)	6(16)
9.	brother	12(16)	11(11)	23(27)	3(8)	0(4)	3(12)
10.	niece	6(9)	0(2)	6(11)	2(4)	0(2)	2(6)
11.	god mother	0(0)	3(4)	3(4)	4(7)	0(0)	4(7)
12.	god father	0(0)	2(3)	2(3)	2(4)	0(0)	2(4)
13.	great grandma	2(2)	2(4)	4(6)	1(1)	3(4)	4(5)
14.	friend	4(5)	2(2)	6(7)	3(3)	1(1)	4(4)
15.	nephew	2(2)	1(4)	3(6)	0(1)	0(1)	0(2)
16.	great grandpa	0(0)	2(3)	2(3)	2(2)	0(1)	2(3)
17.	great aunt	2(3)	0(0)	2(3)	1(1)	0(1)	1(2)
	great uncle	2(3)	1(1)	3(4)	1(1)	0(0)	1(1)

Three: ma-in-law (H,MH,L); daughter (2MH,L); second cousin (MH,2ML)

Two: son (MH,L); neighbor (2H); boy (H,ML); girl (H,ML); god parent (H,L); sister-in-law (H,MH); Criss (H,L)

One: pa-in-law (MH); David (ML); Mike (ML); Pat (ML); Anthony (ML); Kather (H); Tom (H); Kenny (H); Scott (H); Johnny (H); Nana (H); Jim (L); Joe (L); Rich (L); Deb (L); Henry (L); Sue (L); Mark (L); man (H); woman (H); daughter-in-law (H); brother-in-law (H); dog (H); nice (L); kind (L); love (L); care (L); looks (L); person (H); man (L); parent (L); teacher (L); worker (L); Bette (ML); Joe (ML); John (ML); Denise (H); Marty (H); Dona (L); grand parents (L); step father (ML); step mother (ML); wife (ML)

SOME PLACE A HUMAN COULD LIVE

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	house	28(42)	30(48)	58(90)	34(51)	24(38)	58(89)
2.	apartment	16(22)	10(16)	26(38)	13(15)	7(10)	20(25)
3.	trailer	7(11)	8(12)	15(23)	7(10)	5(10)	12(20)
4.	city	3(6)	8(14)	11(20)	1(2)	0(14)	10(16)
5.	hotel	6(9)	5(9)	11(18)	8(10)	1(3)	9(13)
6.	cave	3(7)	6(7)	9(14)	7(9)	6(8)	13(17)
7.	cabin	2(5)	3(7)	5(12)	8(11)	1(3)	9(14)
8.	country	2(3)	7(10)	9(13)	2(3)	6(9)	8(12)
9.	cottage	1(2)	2(6)	3(8)	4(8)	1(6)	5(14)
10.	motel	3(6)	2(5)	5(11)	3(5)	2(4)	5(9)
11.	home	6(7)	1(1)	7(8)	5(7)	1(2)	6(9)
12.	tent	4(6)	2(3)	6(9)	4(5)	2(3)	6(8)
13.	school	2(3)	2(3)	4(6)	4(4)	2(5)	6(9)
14.	building	0(2)	5(5)	5(7)	4(6)	1(2)	5(8)
15.	state	1(3)	0(4)	1(7)	0(0)	3(7)	3(7)
16.	fort	2(4)	1(2)	3(6)	2(4)	1(2)	3(6)
17.	town	0(2)	2(6)	2(8)	0(1)	0(3)	0(4)
18.	barn	3(3)	1(3)	4(6)	1(4)	2(2)	3(6)
19.	hut	3(5)	1(2)	4(7)	2(2)	0(1)	2(3)
20.	houseboat	1(1)	3(4)	4(5)	1(2)	1(2)	2(4)
21.	mansion	0(1)	2(4)	2(5)	0(2)	2(2)	2(4)
22.	castle	0(1)	2(3)	2(4)	0(2)	2(2)	2(4)
23.	farm	2(2)	2(2)	4(4)	4(4)	0(0)	4(4)
24.	shack	1(1)	2(4)	3(5)	0(2)	0(1)	0(3)
25.	car	1(2)	2(2)	3(4)	1(2)	2(2)	3(4)
26.	garage	2(2)	1(2)	3(4)	1(1)	0(2)	1(3)
27.	room	0(3)	1(3)	1(6)	0(0)	0(1)	0(1)
28.	shed	1(2)	1(2)	2(4)	2(3)	0(0)	2(3)
29.	igloo	2(3)	1(2)	3(5)	1(1)	0(0)	1(1)
30.	store	4(4)	1(1)	5(5)	1(1)	0(0)	1(1)

SOME PLACE A HUMAN COULD LIVE (continued)

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
31.	New York	1(1)	0(0)	1(1)	1(2)	1(2)	2(4)
32.	village	1(1)	1(2)	2(3)	1(2)	0(0)	1(2)
33.	boat	1(1)	1(1)	2(2)	2(2)	1(1)	3(3)
34.	jungle	2(2)	1(1)	3(3)	1(2)	0(0)	1(2)
35.	jail	2(3)	0(1)	2(4)	1(1)	0(0)	1(1)
36.	desert	1(1)	0(1)	1(2)	1(3)	0(0)	1(3)
37.	woods	1(2)	1(1)	2(3)	0(1)	0(0)	0(1)
38.	tree	1(1)	0(0)	1(1)	1(2)	1(1)	2(3)
39.	Florida	0(0)	3(3)	3(3)	0(0)	0(1)	0(1)
40.	palace	0(0)	1(1)	1(1)	0(1)	2(2)	2(3)
41.	truck	0(0)	0(0)	0(0)	0(1)	2(3)	2(4)
42.	college	1(1)	1(1)	2(2)	0(0)	1(2)	1(2)
43.	earth	1(1)	0(0)	1(1)	1(1)	0(2)	1(3)
44.	camper	1(2)	1(1)	2(3)	0(0)	0(0	0(0)
	no response	2(3)	3(5)	5(8)	9(9)	5(8)	14(17)

Three: bedroom (3MH); alley (H,M,L); moon (2H,ML); slum (2H,L); alley (H,ML,L)

Two: cage (MH,L); dome (ML,L); hole (ML,L); mountain (2H); wilderness (2L); Massachusetts (H,L); outside (MH,ML); upstairs (H,MH); train (2H); Mexico (H,L); Italy (2H); France (2H); U.S. (2H); Alaska (H,L); Asia (2H); Buffalo (2H); forest (H,MH); Boston (2H); Canada (ML,L); dungeon (MH,L); space rocket ship (MH,ML); basement (H,L); bus (ML,L); outdoor (2H)

One: train car (L); Europe (ML); Antarctica (ML); environment (H); Russia (H); orphanage (ML); grass (H); old folks home (H); Alabama (L); Hawaii (L); Illinois (L); valley (L); tree fort (L); trolly car (L); box car (L); airplane (L); sun (L); gas station (ML); beach (MH); yacht (H); ghetto (H); neighborhood (H); church (H); Spain (H); cart (L); church (L); firehall (L); ocean (H); canvass (ML); South America (H); Mars (H); inn (H); ball house (H); Japan (H); dump (L); England (H); hall (L); red cross (L); anywhere (ML); summer house (ML); ranch (H); space (H); private school (L); Arizona (H); Washington (H); underwater (H); cell (H); storehouse (L); van (H); White House (L); hostel (MH); Depew (H); Williamsport (H); North Pole (H); pyramid (H); world (MH); mudhouse (H); India (H); Lancaster (H); island (ML); suburbs (H); Oregon (H); Tennessee (H); Texas (H); New Jersey (H); bed (L); man (ML); garbage can (ML); park (ML); stairs (MH)

SOMETHING TO TRAVEL IN

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	car	34(49)	35(54)	69(103)	41(57)	26(45)	67(102)
2.	plane	26(39)	28(42)	54(81)	26(38)	21(36)	47(74)
3.	bus	27(37)	24(38)	51(75)	23(35)	12(25)	35(60)
4.	train	26(35)	25(38)	51(73)	22(34)	13(26)	35(60)
5.	truck	20(31)	21(31)	41(62)	23(31)	15(24)	38(55)
6.	boat	13(18)	11(16)	24(34)	8(12)	6(12)	14(24)
7.	bike	11(13)	9(15)	20(28)	11(13)	7(12)	18(25)
8.	jet	6(10)	9(11)	15(21)	5(6)	1(6)	6(12)
9.	trailer	4(8)	2(5)	6(13)	9(12)	4(7)	13(19)
10.	motorcycle	5(7)	7(10)	12(17)	7(8)	4(6)	11(14)
11.	subway	4(9)	5(7)	9(16)	2(3)	1(4)	3(7)
12.	helicopter	1(1)	5(6)	6(7)	1(2)	3(5)	4(7)
13.	ship	4(6)	1(1)	5(7)	2(4)	1(2)	3(6)
14.	trolly car (street car)	2(3)	2(3)	4(6)	4(5)	1(2)	5(7)
15.	taxi (cab)	3(4)	1(2)	4(6)	3(4)	2(2)	5(6)
16.	horse	2(2)	1(1)	3(3)	4(5)	2(3)	6(8)
17.	wagon	1(3)	2(4)	3(7)	0(1)	1(1)	1(2)
18.	mini bike	4(4)	0(0)	4(4)	2(2)	1(2)	3(4)
19.	snowmobile	0(1)	2(3)	2(4)	0(1)	1(1)	1(2)
20.	dune buggy	1(1)	1(2)	2(3)	0(1)	2(2)	2(3)
21.	rocket	0(1)	0(0)	0(1)	2(3)	0(1)	2(4)
22.	jeep	0(0)	1(2)	1(2)	1(2)	1(1)	2(3)
23.	submarine	1(1)	1(1)	2(2)	1(2)	1(1)	2(3)
24.	feet	1(1)	1(2)	2(3)	0(1)	0(1)	0(2)
	no response	3(3)	1(1)	4(4)	8(10)	2(2)	10(12)

Three: scooter (MH,ML,L)

Two: tractor (2L); trike (MH,L); go cart (H,ML)

One: suitcase (H); trunk (H); house (L); motor home (H); limozene (H); buggy (H); carriage (H); van (L); canoe (H); skateboard (H); cart (H); locomotive (H); blimp (L); cable car (L); roller skate (L); cycle (H); rail (MH); horse and buggy (ML); camel (L); expressway (L); unicycle (ML); cho-cho (L); canal (L); wheel barrow (L); dog (ML); tiger (ML); roller coaster (ML); barge (MH); ocean liner (H); street (H); sand (H)

SOMETHING TO USE IN THE KITCHEN

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	pan	23(33)	23(32)	46(65)	27(36)	18(31)	35(67)
2.	stove	20(27)	21(36)	41(63)	18(27)	15(26)	33(53)
3	spoon	19(29)	21(30)	40(59)	20(29)	12(22)	32(51)
4.	fork	19(28)	19(25)	38(53)	19(28)	13(24)	32(52)
5.	knife	17(25)	14(20)	31(45)	12(22)	14(23)	26(45)
6.	pot	18(20)	15(24)	33(44)	14(17)	10(17)	24(34)
7.	sink	9(12)	13(21)	22(33)	8(10)	7(14)	15(24)
8.	refrigerator	9(13)	9(19)	18(32)	11(14)	5)10)	16(24)
9.	table	8(11)	10(16)	18(27)	7(11)	6(12)	13(23)
10.	dish	2(6)	8(14)	10(20)	3(5)	6(10)	9(15)
11.	oven	2(4)	6(9)	8(13)	3(9)	4(8)	7(17)
12.	chair	4(4)	6(10)	10(14)	6(8)	3(3)	9(11)
13.	plate	6(9)	3(4)	9(13)	3(8)	1(3)	4(11)
14.	food	2(3)	4(7)	6(10)	2(4)	2(3)	4(7)
15.	cup	0(2)	1(2)	1(4)	5(8)	3(5)	8(13)
16.	dishwasher	1(2)	2(3)	3(5)	5(9)	1(2)	6(11)
17.	toaster	2(3)	3(5)	5(8)	2(3)	2(2)	4(5)
18.	bowl	3(5)	3(3)	6(8)	1(3)	0(1)	1(4)
19.	water	2(3)	1(4)	3(7)	0(1)	1(2)	1(3)
20.	spatula	1(1)	4(4)	5(5)	1(2)	1(2)	2(4)
21.	cupboard	0(0)	2(4)	2(4)	2(2)	1(1)	3(3)
22.	silverware	4(4)	0(1)	4(5)	0(0)	0(2)	0(2)
23.	can opener	2(3)	0(1)	2(4)	1(2)	0(0)	1(2)
24.	mixer	1(2)	0(1)	1(3)	1(2)	0(1)	1(3)
25.	potholder	1(1)	2(2)	3(3)	1(2)	0(1)	1(3)
26.	salt	2(2)	2(2)	4(4)	1(1)	0(1)	1(2)
27.	pepper	2(2)	2(2)	4(4)	1(1)	0(1)	1(2)
28.	blender	1(3)	1(2)	2(5)	0(0)	0(1)	0(1)
29.	fry pan	2(3)	0(2)	2(5)	0(0)	0(0)	0(0)
30.	beater	1(1)	2(2)	3(3)	1(1)	1(1)	2(2)
31.	glass	0(1)	1(2)	1(3)	0(0)	2(2)	2(2)
32.	kettel	1(2)	1(2)	2(4)	0(0)	0(0)	0(0)
33.	napkin	1(1)	0(1)	1(2)	0(1)	1(1)	1(2)
34.	freezer	0(0)	0(0)	0(0)	1(1)	1(3)	2(4)
	no response	2(3)	0(0)	2(3)	10(11)	1(1)	11(12)

Three: apron (2H,ML); cabinet (H,ML,L); towel (MH,ML,L)

Two: mother (H,L); grease (2H); soap (MH,L); flour (MH,L); oil (2H); washer (MH,L); batter (ML,L); wash cloth (2H); platter (H,ML)

One: baking soda (H); baking powder (H); dish cloth (MH); handiwipe (L); rag (L); egg beater (H); spice (H); plant (L); burner (H); light (H); saucer (L); cinnamon (ML); counter (MH); tea pot (MH); strainer (H); cookie (H); soup(H); hot pan (H); gas (H); meat (H); sponge (MH); pad (MH); supplies (H); heat (L); cooking utensil (H); jar (L); cake mix (L); shelf (MH); cover (H); measuring spoon (L); tablespoon (H); frier (L); sugar (ML); fan (MH); can (L); cookware (ML); glass (L); towel rack (ML); suck (H);

One: clock (L); broom (H); bread (L); measuring cup (ML); fun (ML); hands (ML); rag (MH); cookbook (ML); ice box (MH); counter top (L); was (L); head (L); strainer (H); butter (ML); pen (ML); tin (MH); fat (H); potato peeler (H); can opener

SPORT

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	football	33(46)	31(46)	64(92)	40(54)	25(42)	65(96)
2.	baseball	33(47)	28(42)	61(89)	29(40)	20(34)	49(74)
3.	basketball	25(35)	28(38)	53(73)	29(42)	20(35)	49(77)
4.	hockey	23(34)	23(35)	46(69)	24(31)	13(27)	37(58)
5.	soccer	14(19)	15(20)	29(39)	13(18)	12(20)	25(38)
6.	tennis	14(17)	10(12)	24(29)	10(14)	6(9)	16(23)
7.	swimming	8(12)	6(12)	14(24)	9(14)	1(5)	10(19)
8.	volleyball	1(4)	6(10)	7(14)	3(5)	4(5)	7(10)
9.	kickball	2(5)	4(5)	7(10)	6(6)	3(3)	9(9)
10.	golf	3(3)	3(4)	6(7)	3(6)	2(3)	5(9)
11.	skiing	2(2)	2(4)	4(6)	1(2)	1(3)	2(5)
12.	badmitten	4(6)	0(0)	4(6)	1(3)	1(1)	2(4)
13.	racing	0(0)	2(4)	2(4)	0(0)	2(4)	2(4)
14.	softball	0(1)	0(1)	0(2)	3(4)	1(2)	4(6)
15.	ice skate	4(5)	1(3)	5(8)	0(1)	1(1)	1(2)
16.	fishing	2(3)	0(1)	2(4)	1(2)	0(0)	1(2)
17.	bowling	2(2)	1(2)	3(4)	2(2)	0(0)	2(2)
18.	dodgeball	1(1)	2(2)	3(3)	0(3)	0(0)	0(3)
19.	roller skate	1(2)	1(2)	2(4)	0(0)	1(1)	1(1)
20.	wrestling	3(3)	0(0)	3(3)	1(1)	0(0)	1(1)
21.	boxing	0(1)	0(0)	0(1)	1(3)	0(0)	1(3)
22.	jump(ing)	0(0)	0(0)	0(0)	2(3)	0(1)	2(4)
23.	ball	0(0)	1(1)	1(1)	0(0)	3(3)	3(3)
	no response	2(2)	2(2)	4(4)	6(8)	0(0)	6(8)

Three: skating (3H); pool (H,2L); ping,pong (MH,2L); jump rope (2H,MH); handball(H,MH,L

Two: boating (MH,ML); horse ride (H,L); running (MH,L); track (H,L); handball (H,L); gym (ML,L); hunting (H,MH); high jump (H,ML)

One: hopping (ML); crab soccer (H); rope (L); hopscotch (L); game (L); cricket (H); squash (H); rugby (MH); mini bike (MH); score (H); lacrosse (H); car racing (MH); javelin throw (L); drums (H); stickball (L); jogging (MH); surfing (H); roller derby (ML); gun (L); bat (L); swing (L); Irish football (ML); fights (ML); climbing (MH); kickball (H); race (H); speedway (H); field hockey (ML); dancing (L)

VEGETABLE

		"Fast" Learners			"Slow" Learners		
		Assoc.	Categ.	Total	Assoc.	Categ.	Total
1.	carrot	27(40)	29(44)	56(84)	31(43)	18(36)	49(79)
2.	pea	12(19)	13(19)	25(38)	19(32)	12(23)	31(55)
3.	corn	15(24)	11(18)	26(42)	13(19)	10(21)	23(40)
4.	bean	18(22)	15(20)	33(42)	9(15)	8(16)	17(31)
5.	tomato	18(22)	18(24)	36(46)	11(15)	8(12)	19(27)
6.	potato	11(17)	11(16)	22(33)	5(10)	9(15)	14(25)
7.	lettuce	10(15)	9(17)	19(32)	3(6)	4(6)	7(12)
8.	beets	10(11)	3(5)	13(16)	6(6)	5(8)	11(14)
9.	spinach	7(9)	5(8)	12(17)	7(8)	2(2)	9(10)
10.	cabbage	10(13)	3(6)	13(19)	4(5)	2(4)	6(9)
11.	celery	5(7)	5(8)	10(15)	6(6)	6(6)	12(12)
12.	squash	2(3)	5(7)	7(10)	1(2)	4(7)	5(9)
13.	cucumber	2(2)	3(4)	5(6)	2(3)	1(1)	3(4)
14.	brocoli	2(3)	2(4)	4(7)	1(2)	0(0)	1(2)
15.	radish	2(3)	0(1)	2(4)	1(1)	1(2)	2(3)
16.	lima bean	2(2)	1(1)	3(3)	2(2)	1(2)	3(4)
17.	onion	0(1)	2(3)	2(4)	1(1)	0(1)	1(2)
18.	cauliflower	1(1)	2(2)	3(3)	2(2)	0(0)	2(2)
19.	apple	0(0)	0(0)	0(0)	3(4)	1(1)	4(5)
21.	turnip	0(0)	2(3)	2(3)	0(1)	0(0)	0(1)
	no response	3(6)	1(1)	4(7)	9(12)	6(6)	15(18)

Two: pear (MH,ML); watermelon (H,MH); cranberry (ML,L); green pepper (H,ML); banana (H,L); plant (MH,ML); asparagus (2H); applesauce (H,ML); grape (H,MH);

One: peach (ML); sourkraut (MH); mushroom (H); cheese (MH); salad (L); mixed vegetables (L); relish (L); brussel sprout (ML); pepper (MH); sugar (H); parsley (H); red pepper (ML); jam (H); olive (L); cherry (ML); vegetable (L); bell (L); cat (L); prune (L); pumpkin (L); sprout (ML); hot pepper (ML)