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ABSTRACT

One hundred fifty-seven trainable children (aged 7 to 14 years) in 24 classes were given language stimulation based on the Illinois Test of Psycholinguitic Abilities (ITPA) four or eight times a week for a 1 year period. Also examined were the effects of high and low IQ. Measures used were the ITPA, the Peabody Picture Vocabulary Test, and the Mecham Verbal Language Development Scale. Only one of the 15 analyses showed a significant improvement, and it was concluded that specific, prolonged language training based upon the ITPA is ineffective at both intensities of application. The specific language training actually impeded the language performance of the high-IQ groups. (The major portion of the document consists of statistical data obtained form the analyses.) (DB)

LANGUAGE TRAINING FOR TRAINABLE MENTALLY RETARDED

ANNUAL PROJECT REPORT: FIRST YEAR

PROJECT NUMBER F1-72020H-46-I.U.-01-13-C

TITLE III OF THE ELEMENTARY AND SECONDARY EDUCATION ACT OF 1965

JUNE 15, 1972, TO JUNE 30, 1973 ($49,977.00)

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Gentlemen:

We are enclosing two (2) copies of a research report entitled, "Language Training for Trainable Mentally Retarded." We hope the document can be made available through Research in Education (RIE) and ERIC microfiche, since we have no immediate plans to disseminate it otherwise. The report contains a complete description of a large-scale, tightly controlled research project on the efficacy of different types of language training. There are many findings in this report that are of both practical and theoretical Significance.

There is no copyrighted material in the report. Thus, you are free to disseminate it through regular ERIC channels if you deem it appropriate. Our County Public School System simply cannot afford to make copies of the document available even if we were allowed to charge a fee. Thus, ERIC seems appropriate.

In terms of mechanical details, the date of publication is September, 1973, and the authors are Robert H. Leiss and Barton B. Proger. The core of an abstract could be built around the first page of the Preface (p. i i i). While we do not have an ERIC Thesaurus before us, I would suggest descriptors as follows: Mentally Retarded, Trainable Mentally Retarded, Language, Language Training, Aptitude-Treatment Interactions, Program Evaluation, Peabody Picture Vocabulary Test, Illinois Test of Psycholinguistic Abilities, Mecham Verbal Language Development Scale, Psycholinguistics, Psycholinguistic Training, Socioeconomic Status, and Minnesota Scale for Paternal Occupations.

Please notify me of your decision to include or reject the enclosed report for your ERIC system. Thank you for your attention to this matter.

Sincerely,

Barton B. Proger

Barton B. Proger, Ed. D.
Coordinator of Evaluation Services

BP/jr

Enclosures

Marianne- Please write a note & estimate RIE issue. Thx

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Preface

This report contains the results from the first year's operation of the "Language Training for Trainable Mentally Retarded" Project. The topic of this research project has many important implications for applied school functioning. Further, the results become all the more important because of the dearth of comparative research in this area.

Basically, the Project compared (a) groups which received no special language stimulation with (b) groups which received such stimulation four times a week and with (c) groups which received such stimulation eight times a week. The bulk of stimulation activities were patterned around information on the child's problems gotten from the Illinois Test of Psycholinguistic Abilities. Many experimental controls were built into the study. Besides dealing with the comparisons among the three types of groups, the study also examined the effects of high and low IQ, boys versus girls, and time of testing. All effects were gauged in terms of raw scores from three instruments: (a) Peabody Picture Vocabulary Test (PPVT), (b) Illinois Test of Psycholinguistic Abilities (ITPA), and (c) the Mecham Verbal Language Development Scale. Because of these three tests, 15 analyses were possible. Further, two descriptive studies of the effect of socioeconomic status on total scores for the PPVT and ITPA were undertaken.

The results are presented in conjunction with a series of 15 tables on descriptive statistics and 15 tables on inferential statistics. The results are discussed in light of their implications for both applied school practice and educational theory. Finally, a description of the Project's proposed activities for the second and third years of operation

 iven.

As with any project, many people contributed to the Language Training Program's success. The classroom training activities were ably carried out by four Montgomery County Intermediate Unit speech clinicians: John Busedu, Diane Maurer, Ralph Sholly, and Marilyn Stanford. Testing of the children was done by the above four clinicians with the aid of two other Intermediate Unit clinicians: Linda Bekemeier and Jean Kern. Without the perfection and experimental control that these six staff members strived for, little faith could have been placed in the results. Further, the superintendents, teachers, and directors of special pupil services of the public school systems within the Intermediate Unit offered valuable cooperation: Abington, Cheltenham, Colonial, Hatboro-Horsham, Jenkintown, Lower Merion, Lower Moreland, Methacton, Norristown Area, North Penn, Perkiomen Valley, Pottsgrove, Pottstown, Souderton Area, Springfield Township, Spring-Ford Area, Upper Dublin Township, Upper Merion Area, Upper Moreland Township, Upper Perkiomen, and Wissahickon. The Western Montgomery County Special Education Center also participated in this study. The Ken-Crest Center for Exceptional Persons and St. Katherine's Day School in Overbrook also aided greatly in the conduct of this study; in the latter case, special thanks are due Sister Mary Lawrence, Principal, and Father John Neill, Assistant Superintendent of Schools for the Archdiocese of Philadelphia. The involvement and cooperation of the Montgomery County Association for Retarded Children (Mr. Peter P. Polloni, Executive Director) was also deeply appreciated. Finally, several central office Intermediate Unit staff aided in the conduct of the project: Dr. Allen C. Harman, Executive Director; Dr. Lester Mann, Director of Special Education; Mrs. Martha Marcho, Secretary.

Section 1

Project Purpose and Importance

This research project was designed to investigate the efficacy of providing intensified language stimulation programs to the trainable mentally retarded. Since there is a frequently reported and often observable deficiency in the language skills of this particular population of children, it would appear to be of significance to determine what effect, if any, a concerted program of language stimulation will have. The outcomes of this experiment have a direct bearing upon the caseload composition of speech and language clinicians in the public schools, have implications for the types of testing and assessment procedures utilized with the trainable mentally retarded, and may definitely influence the degree and manner in which language services are provided to these children. In effect, the findings of the study can suggest whether the trainable mentally retarded can benefit from intensified language stimulation, and the amount of language stimulation required to achieve a significant degree of improvement.

Improvements in language were assessed on sensitive instruments and a sub-population of the subjects in this project provided information concerning specific amounts of improvement in language abilities as a result of therapy sessions. This information is of value in providing for the evidence of the effectiveness of intensified language programs with this type of children. Such information is of value to other researchers and experimenters and allows for the development of further important research hypotheses.

Section 2

Identified Needs

1. The large percentage of the trainable mentally retarded children enrolled in special classes within the public schools.
2. The existence of 24 elementary classes of trainable mentally retarded with a population of 157 children who exhibit a chronological age range of seven to fourteen years of age.
3. The paucity of important research with respect to the efficacy of speech and language programs with the trainable mentally retarded.
5. The estimates of the incidence of speech and language problems for the mentally retarded of ten to eighty percent.
6. The estimates of the incidence of speech and language problems among the trainable mentally retarded of about 57 percent.
7. The persistent urging by parents, educators, administrators, and others to provide speech and language services to the trainable mentally retarded.
8. The observable speech and language deficiencies of the trainable mentally retarded children.
9. The necessity for having research available to substantiate the methods utilized for the selection of the trainable mentally retarded children for therapy.

Section I

Review of Literature

Despite the fact that a large percentage of the trainable mentally retarded children are enrolled in special classes in the schools and in spite of the research evidence which has consistently reported such children to have speech and language problems (Bangs, 1961; Brandfon, 1951; Daum, 1953; Donovan, 1957; Everhart, 1953; Gens, 1950, 1951; Goodwin, 1955; Gottsleben, 1955; Harrison, 1958; Irvin, 1942; Karlin and Kennedy, 1936; Karlin and Strazzula, 1952; Kennedy, 1930; Kolstoe, 1958; Lewald, 1932; Lubman, 1950; Lyle, 1960; Masket, 1958; Mathews, 1957; Meader, 1940; Sachs, 1955; Schiefelbusch, 1963; Schlanger, 1953b, 1953c; Schlanger and Gottsleben, 1957; Schneider and Vallon, 1954; Sheridan, 1948; Sirkin and Lyons, 1941; Tarjarn, et. al., 1961; Town, 1913; Wood, 1957; Wolfensberger, et. al., 1963) there exists a paucity of important research with regards to the efficacy of speech and language programs with the trainable mentally retarded.

Among children in special classes, Mathews (1957) estimated an incidence of speech problems of 79 percent. Lubman (1950) studied subjects with IQs below 50 and noted that 95 percent had speech defects. Johnson et. al., (1960) reported an incidence of about 57 percent in a study of trainable mentally retarded children. Wood (1957) noted about 21 percent of a sample studied at a speech and hearing center to have language deficiencies associated with mental retardation. This does not, however, indicate any estimate of the number of mentally retarded who have language problems.

The estimates of the incidence of language deficiencies among the mentally retarded varies from less than 10 percent to almost 80 percent. This variance is primarily due to the differences in the groups studied and the definitions of what constitutes a language problem.

One of the major theoretical questions is whether lack of language development among mentally retarded children is an inevitable consequence of mental retardation or whether intensive training can improve the rate of language development. The studies of language training programs for the retarded are few. Since 1955 therapy with the mentally retarded has emphasized more than articulatory proficiency; it has demonstrated the necessity for providing appropriate language development programs.

Schneider and Vallon (1954) emphasize the necessity for therapy with the severely retarded and challenge the view of West, Kennedy, and Carr (1947), who thought that therapy with the severely retarded was useless, as being too pessimistic. They state that the simple ability to express the wants or needs of oneself in a socially approved manner, along with the ability to merely express one's wants or needs, is an undeniable asset to the child intellectually, emotionally, and socially.

In 1955, Schneider and Vallon reported on a therapy program for trainable retarded children in a day school class. The children were categorized into three groups: (1) Delayed language development, (2) Insufficient language development, and (3) Disturbances of articulation. Appropriate therapy activities were presented to each group for one year. The resultant data revealed gains for all groups. These judgments were, however, subjective, and no control group had been used.

Johnson and Capobianco (1957) studied a group of severely retarded children following a year of language training; they reported no significant improvement. This study was noteworthy as one of the first experimental assessments of a language program for the retarded in which the results were contradictory to preceding reports.

Kolstoe (1958) observed the effect of a language training program with a small group of mongoloid children. On five subtests of the Illinois Language Scale, the experimental group gained significantly over the controls during a

five and one-half months period. Rittmanic (1958) set up a pilot program in group oral language with institutionalized retardates. Despite the lack of statistical evidence, he claimed that the program was successful.

Smith (1962) conducted a language program for sixteen educable retarded children; he assessed the progress by using the ITPA. The experimental group showed a 6.75 month gain in Language Age during a three-months period; the controls declined .4 months in Language Age. Smith did not attempt to remediate any specific disabilities. Improvement was, however, noted on all the language abilities as measured by the ITPA. Blue (1963) supervised a language program for trainable retardates similar to the previously described program by Smith. The program was conducted for an eleven-week period and utilized the ITPA for pre- and post- measurement. The experimental group showed a Language Age gain of 5.67 months as compared to the control group's 3.67 months. The difference was not statistically significant. This is considered one of the more prominent studies on the efficacy of language therapy for trainable retardates.

Blessing (1964) reported on an experimental program which was designed to improve the vocal encoding of mentally retarded children. After a period of three-months training the ITPA was used to note progress. The results revealed only a tendency toward improvement by the experimental group.

Harvey, Yep, and Sellin (1966) reported on a two-year program for trainable mentally retarded children. Their program emphasized the areas of: (1) Self-concept development, (2) Social competence, (3) Motor coordination, and (4) Language development. Their results indicated highly significant improvements in the four areas. All scores, with the exception of social competence, declined over the summer of the first year. This was interpreted to mean: (1) that there are differences between home and school environments, and (2) it is essential to maintain minimal programs during the summer for these children. The second year revealed significant increases in all areas. They concluded that evaluation

of programs should be allowed to occur over longer periods of time, particularly with individuals with low IQs.

Richardson (1967) describes a language training program for retarded children at the University of Oklahoma Child Study Center. It indicates that early sensory-motor training, beginning at the pre-verbal experience level is of utmost importance to the language development of these children. Methods used in the program are related to research evidence on the development of language and thinking which indicates that: (1) Early exposure to a variety of looking and listening experiences is important in language development, (2) Primary learning requires perceptual and pre-verbal experiences, (3) There is a close relationship between motor movements and perceptual development, (4) Language development requires the development of both motor and perceptual patterns, (5) The major source of internal mediators is the orienting response, (6) Linguistic labels serve to mediate learning processes, and (7) Language development is both a part of and a result of primary learning.

Jordan (1967) reports that speech therapy outcome studies with the mentally retarded reveal that special psycholinguistic instruction can significantly increase psycholinguistic attainment. He suggests that programmed learning and operant conditioning be utilized to teach language to the mentally retarded. Potter and Mattson (1968) also indicate that the educable mentally retarded are capable of manifesting and sustaining improvement in speech and language performance after therapy. Ensminger and Smith (1965) state, "knowing that specific language skills can be improved and that retardates display a rather distinctive profile of their own, group language programs should be developed with this pattern of abilities and disabilities as the focal point." (p. 104).

Early attempts at therapy for language disabilities were reported with optimism, but were not objectively evaluated. Encouraging progress has been reported with the educable retarded; the trainable child, however, presents

some difficulty. Since many of the children involved in these studies were institutionalized and since the size of the group was limited, it becomes difficult to generalize from these findings to the population of trainable mentally retarded children who are enrolled in special classes in the public schools.

A factor of possible significance which may serve to influence the results of research concerning the effectiveness of language stimulation for trainable mentally retarded children may be the amount of treatment which is provided. There is a lack of research information indicating, for example, how many periods of language training are necessary during the period of a year in order for such children to achieve significant improvements in language.

Section 4

Objectives of the Program

To determine the efficacy of providing a language stimulation program for trainable mentally retarded children who exhibit a chronological age of about seven to fourteen years.

To determine the intensity of effort needed to create significant change in the language skills of this group of trainable mentally retarded children.

To determine whether those children who are exposed to this type of program gain significantly in comparison to those children who are not exposed to this stimulation.

To determine whether stimulation provided eight times per week provides more significant results than when stimulation is provided four times per week.

To determine whether stimulation provided four times per week provides more significant results than when stimulation is not provided at all.

To determine whether this type of program can be effectively carried out in a classroom situation.

To attempt to indicate that an effective language stimulation program might be carried out by the special class teacher.

To attempt to determine the validity of utilizing the ITPA to assess the language skills of the elementary trainable mentally retarded.

To attempt to determine whether an effective language stimulation program can be developed based on the ITPA profile.

To attempt to indicate that the speech clinician might better be utilized as a consultant to the special class teacher for this type of program.

Section 5

Activities of the Program

The set of 8 classes which received no special language training went through their typical daily routines. However, the 8 classes which received language stimulation 4 times a week and the 8 classes which received the stimulation 8 times a week, were given specially structured lessons. The lessons were based primarily on the tasks embedded among the twelve subtests of the Illinois Test of Psycholinguistic Abilities (ITPA). There were 8 lessons for each subtest, or a total of 96 lessons. Each lesson lasted about 25 minutes. The training was spread out from the start of November to about the middle of May. Four experienced speech clinicians carried out the program. An important point is that the 8 lessons associated with any given ITPA subtest were not sequenced one after the other; rather, the set of lessons were distributed over the course of the total program so that the children would have more of a chance to retain and put into practice whatever benefits they had received.

Section 6

Involvement of Public and Nonpublic Agencies (Experimental Subjects)

As detailed in the Preface to this report, all of the public school systems within Montgomery County Intermediate Unit had children involved in this project. However, an inquiry of nonpublic agencies in the same region revealed the existence of only a few classes for trainable mentally retarded children whose chronological ages were approximately seven to fourteen years. Mr. Peter P. Polloni, Executive Director of the Montgomery County Association for Retarded Children, indicated that his agency had no classes for this group of children. Finally, Father John Neill, Assistant Superintendent of Schools for the Archdiocese of Philadelphia, informed Project personnel that St. Katherine's Day School in Overbrook was the only parochial school in Montgomery County to have classes for this group of children. In turn, the Project contacted Sister Mary Lawrence, Principal of the School. Sister stated that there were three classes for the trainable mentally retarded children between the ages of seven and fourteen years. The total population for these three classes was 37.

In summary, a total population of 157 children of the type described above was obtained from all sources. By means of the 24 intact classes to which these children were attached, the children then were assigned to one of the three treatment conditions: no stimulation, four times a week, or eight times a week. After the 157 children had received whatever treatments had been randomly assigned to their intact classes, their test data was subjected to several different analyses.

Section 7

In-Service Activities and Consultation

In-service meetings and consultation were rendered on a monthly basis by Dr. Harold A. Delp of the Department of Special Education, Temple University. At these meetings many valuable insights were achieved and helpful criticisms were raised. The six speech clinicians attended all in-service meetings.

Weekly meetings among Intermediate Unit staff involved in the Project were also held. These meetings served as a type of formative evaluation for continuously improving the programs.

At least two formal in-service programs were held for Project staff other than the above activities. Noted speakers were brought in for these purposes.

Finally, Project staff were allowed to attend two major conventions related to speech and language training and therapy.

Section 8

Evaluation Procedures and Design

As outlined in the proposal first submitted for this grant, pre-testing and post-testing was carried out with the Peabody Picture Vocabulary Test (PPVT) and the twelve subtests of the Illinois Test of Psycholinguistic Abilities (ITPA). Further, it was later decided to add the Mecham Verbal Language Development Scale (VLDS) to obtain still another outside criterion of language development. The testing was carried out at both the start and conclusion of the lengthy training period (November to May).

Every attempt was made to ensure that the three groups of classes were comparable at the start of the study. Because the children had to be kept in their original classes due to administrative and logistical reasons, randomization could be used only at the class level. Thus, the 24 classes were randomly distributed among the three group settings: (a) no stimulation, (b) four times a week, or (c) eight times a week. Further, initial comparability of the three sets of classes was achieved by analyzing pre-test differences on the PPVT, ITPA, and VLDS. Besides using the total raw scores from each of the three criteria, the twelve subtest raw scores from the ITPA were also analyzed. The BMD02V computer program for analysis of variance for factorial design (version of July 22, 1965) from University of California at Los Angeles was used. Each analysis of pre-test differences embodied three factors: (a) treatments, (b) IQ, and (c) sex. However, because IQ and sex differences were not of immediate interest for establishing initial equivalence of groups, only the factor

of treatments will be considered here. No significant pre-test differences with regard to treatments were found on any of the 15 analyses. Thus, for all intents and purposes of the evaluation design, the three sets of groups can be considered initially equivalent. (It should be noted that unequal cell frequencies were present in the original three-factor data matrix involving 157 children. Several chronic absentee children were among the 157 children. After the decision was made to remove these absentees from the initial data matrix, the new unequal cell matrix comprised 148 children. To achieve final equal cell frequencies, a cell size of ten was decided upon and children were randomly deleted from the appropriate cells. The resulting matrix, also used in later analyses, contained 120 children.)

Once initial equivalence of the three sets of groups was ascertained, a formal program evaluation design was selected. In particular, besides the three factors of treatments, IQ, and sex, a fourth factor of measures (pre-test versus post-test) was added. The resulting four-factor design was of repeated-measures type. As with the 15 pre-test analyses, 15 analyses were run in the repeated-measures framework. The computer program used was BMD08V of the UCLA Biomedical package (version of September 1, 1965).

The reader should note that in every one of the 15 analyses, a mixed effects model was derived. That is, the factors of treatments and sex were considered fixed, but the factor of IQ (high and low, as determined by an approximate median split) was taken to be random. (Of course, replications or subjects were considered random in the data matrix wherein 120 children were left after removing unequal cell frequencies.)

Apart from the four-factor, repeated-measures design used in the 15 gain analyses, descriptive analyses were also undertaken of the variable

of socioeconomic status (SES). While IQ has remained the main control variable of interest used in the above-mentioned 15 gain analyses, SES was also of interest. SES could not be included as a fifth factor in the design for the above 15 analyses because the distribution of frequencies among factors was too uneven. Thus, it was decided to analyze separately in a descriptive way the effect of SES on the three treatments. The SES measure was the Minnesota Scale for Paternal Occupations; categories I to IV were considered High SES, while V to VII were Low SES.

Section 9

Evaluation Results

Fifteen repeated-measures analyses of variance were run by computer. The reader will be aided in his understanding of the results by making use of Appendices A, B, C, and D. Appendix A contains a list of the 15 criteria used in the analyses. Appendix B provides a series of 15 tables of descriptive averages for each of the four factors in each analysis. In particular, the reader will be able to find the specific averages for each of the three treatment groups, the two IQ groups, the two sexes, and the two measures (the cover sheet of this appendix describes what the numerical designations correspond to). Appendix C contains the summary analysis of variance tables for the 15 criteria; the columns dealing with degrees of freedom and mean squares are of main interest for interpretation. In this appendix, one can determine the relative strength of the four main factor effects, as well as the interactions of two, three, or four factors taken at a time. Finally, Appendix D contains the F-test ratios derived from Appendix C, with the significance values attached to each ratio. No doubt Appendix D will be the one of main interest to the majority of readers.

Looking at Appendix D closely, the reader can draw several inferences about the efficacy of language training for the trainable retarded. First, one might question whether or not chance alone played a major role in producing the large number of significant results, since there are 16 effects being tested in each of the 15 analyses. Thus, because separate

analyses of variance are being run, there is a greater probability that chance will enter the picture than if one single (but highly complicated and difficult to interpret!) multivariate analysis of variance had been run. In particular, there are a total of 240 effects being tested in the 15 analyses. At the 10% level of confidence, one would expect 24 of these to be significant by chance alone. However, one sees that in fact there are 43 significant results at the 5% level at least so that more than chance is apparently at work in accounting for the variance in each separate analysis.

Proceeding further within the data of Appendix D, the reader sees that the control variable of IQ operated effectively to isolate variance in all but Criterion Number 10 (ITPA Visual Closure raw score). One can also conclude that there was no generalizable difference among treatments (frequency of stimulation); in the 15 analyses, all three treatments were equally effective (or ineffective). Further, when one looks at the gain achieved, only for Criteria Number 2 (VLDS total raw score) and Number 5 (ITPA Visual Recognition raw score) were any differences noted. In particular, on Number 2, the post-test average of 289.79 was significantly lower than the pre-test average of 322.79, while on Number 5 the post-test average of 10.88 was significantly higher than the pre-test average of 9.79.

While no generalizable treatment differences were found, several treatment-by-IQ interactions arose (Criteria Numbers 3, 4, 5, 6, 9, 10, and 12). In particular, on Number 3 (ITPA Total raw score), as one would expect, while there was no significant difference among the three methods, the high-IQ subgroup did significantly better than the low-IQ group

in the control group and in the eight-times a week group but not in the four times a week group. On Number 4 (ITPA Auditory Recognition raw score), the High IQ group in each treatment did significantly better than the Low IQ group but the difference was notably more the control group. On Number 5 (ITPA Visual Recognition raw score), a situation similar to that with Number 4 arose. On Number 6 (ITPA Visual Memory raw score), a situation similar to that of Number 3 arose. On Number 9 (ITPA Visual Association raw score), a situation similar to that with Number 3 again arose. On Number 10 (ITPA Visual Closure raw score), a situation similar to that with Number 4 arose again. Finally, on Number 12 (ITPA Grammatic Closure raw score), a situation similar to that with Number 4 also occurred. Thus, one sees there were really only two basic patterns of results among the seven interactions.

Further, the triple interaction of treatment-by-IQ-by-measure was significant in many cases (Criteria Numbers 1, 3, 4, 5, 7, 9, and 12). These analyses are for PPVT Total raw score, ITPA Total raw score, ITPA Auditory Reception raw score, ITPA Visual Reception raw score, ITPA Auditory Association raw score, ITPA Visual Association raw score, and ITPA Grammatic Closure raw score. However, because the details of these interactions are too complex for inclusion in this report, they will not be gone into further.

Finally, a few other isolated significant results could be noted. However, since the latter results add little to the total picture already presented above, it is left to the reader to attach his own weight of importance for the few remaining significant $\underline{F}$ ratios.

Before turning to discussion of findings, one might question what would have happened in the analyses if SES (socioeconomic status) had been included

as a factor. (Instead of SES, IQ has been used throughout as the primary control variable.) Two descriptive analyses were undertaken: (a) SES by treatments on PPVT raw scores, and (b) SES by treatments on total ITPA raw scores. Appendix E contains (a), while Appendix F contains (b). As one would expect, the High-SES groups outperformed the Low-SES groups on both the PPVT and ITPA. Further, fairly consistent patterns of increase from pretest to posttest occurred within each treatment group, but no single treatment group appeared to have more or less effective performance than any other treatment groups.

Section 10

Discussion of Results

The Language Training Project has many important implications for realistic school practice and for future research. The main variable of interest was the intensity of application of a single training approach based around the twelve subtest tasks of the ITPA.

There are two findings that have a huge impact on realistic school functioning. First, there were no significant differences among levels of intensity (the "treatments") in any of the 15 analyses. Second, only two out of the 15 analyses yielded any significant changes (one was a gain and the other was a loss); in general, there appeared to be little improvement of the children. From these two results, there seems to be only one conclusion possible: specific, prolonged language training based upon the ITPA is ineffective no matter what the intensity of application is. However, it should be noted that this does not mean that other types of language training with the trainable mentally retarded would be similarly ineffective. Nonetheless, this general conclusion must be tempered by the presence of some significant interactions.

The treatment-by-IQ interactions which occurred (seven significant ones out of 15 total) showed two situations. In three of the seven interactions, the logically expected superiority of the High-IQ group over the Low-IQ group did not materialize for the four-times-a-week group. In the other four interactions, the expected superiority situation did not occur for either the four-times-a-week group or the eight-times-a-week group. From these findings and insepctions of tables not included in this

because of their excessive detail, it appears that the specific language training actually impeded the High-IQ groups.

In summary, this research report of the first year's results showed that specific language training based upon the ITPA has no effect on trainable mentally retarded children and in fact seriously hinders the upper level IQ group in this population.

Section 11

Future Research

The first year of this project studied the intensity of application of specific language training based upon the Illinois Test of Psycholinguistic Abilities. Since no beneficial effects were found for the variable of intensity with the ITPA-based program, the second year of this three-year Title III Project will turn its attention away from both the variable of intensity and the ITPA-based training program itself. In particular, two different language training programs (Distar Language 1; Peabody Language Development Kit, Levels P and 1) will be compared with each other. During this second year of the Project, no control group as such will be used. Instead, the posttest scores will be compared with the pretest scores as a type of comparison within each method and between methods.

The third year of the Project will switch its attention from types of language training materials to the most effective roles that the speech clinician and teacher can play in implementing language therapy. The third year will thus focus on questions such as whether the clinician should take almost complete responsibility for the language training, whether the teacher and clinician should share major responsibility, and whether the primary responsibility should go to the teacher herself.

One can see how the three years of this Project logically relate to, and extend the findings of, each other. Once the final research report is compiled for the total three-year, Title III Project, even more implications for applied school practice and future research will emerge.

APPENDIX A

CRITERIA USED IN GAIN ANALYSES

CRITERIA USED IN GAIN ANALYSES

Number	Name
	Peabody Picture Vocabulary Test
1	Total Raw Score
	Mecham Verbal Language Development Scale
2	Total Raw Score
	Illinois Test of Psycholinguistic Abilities (Revised Edition)
3	Total Raw Score
4	Auditory Reception Raw Score
5	Visual Reception Raw Score
6	Visual Memory Raw Score
7	Auditory Association Raw Score
8	Auditory Memory Raw Score
9	Visual Association Raw Score
10	Visual Closure Raw Score
11	Verbal Expression Raw Score
12	Grammatic Closure Raw Score
13	Manual Expression Raw Score
14	Auditory Closure Raw Score
15	Sound Blending Raw Score

APPENDIX B

DESCRIPTIVE STATISTICS FROM REPEATED-MEASURES GAIN ANALYSIS

(COMPUTER PROGRAM BMDO8V FROM U. C. L. A.)

(Note.--"I" refers to "Treatments." Within "I", "1" refers to "0 times a week," "2" refers to "4 times a week," and "3" refers to "8 times a week." "J" refers to "IQ." Within "J," "1" refers to "Low IQ" and "2" refers to "High IQ." "K" refers to "Sex." Within "K," "1" refers to "Male" and "2" refers to "Female." "M" refers to "Measures." Within "M", "1" refers to "Post-test" and "2" refers to "Pre-test.")

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
PEABODY PICTURE VOCABULARY TEST RAW SCORES

FACTOR	LEVELS		
I =	1	2	3
	42.96250	40.17500	36.72500
J =	1	2	
	36.50000	44.74167	
K =	1	2	
	40.75833	40.48333	
M =	1	2	
	40.05000	41.19167	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
MECHAM VERBAL LANGUAGE DEVELOPMENT SCALE RAW SCORE

FACTOR	LEVELS		
I =	1	2	3
	324.00000	289.87500	305.00000
J =	1	2	
	292.45833	320.12500	
K =	1	2	
	299.41667	313.16667	
M =	1	2	
	289.79167	322.79167	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES TOTAL RAW SCORE

FACTOR	LEVELS		
I =	1	2	3
	117.13750	105.50000	117.38750
J =	1	2	
	94.33333	132.35000	
K =	1	2	
	114.15000	112.53333	
M =	1	2	
	112.25000	114.43333	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES AUDITORY RECEPTION RAW SCORE

FACTOR	LEVELS		
I =	1	2	3
	14.93750	10.65000	11.90000
J =	1	2	
	9.32500	15.66667	
K =	1	2	
	12.53333	12.45833	
M =	1	2	
	12.21667	12.77500	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES VISUAL RECEPTION RAW SCORE

FACTOR	LEVELS		
I =	1 10.76250	2 9.91250	3 10.33750
J =	1 8.59167	2 12.08333	
K =	1 10.27500	2 10.40000	
M =	1 10.88333	2 9.79167	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES VISUAL MEMORY RAW SCORE

FACTOR	LEVELS		
I =	1 9.37500	2 9.52500	3 9.11250
J =	1 7.86667	2 11.40833	
K =	1 9.74167	2 9.53333	
M =	1 10.15667	2 9.10833	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES AUDITORY ASSOCIATION RAW SCORE

FACTOR	LEVELS		
I =	1 10.73750	2 9.07500	3 10.90000
J =	1 7.65000	2 12.85833	
K =	1 10.01667	2 10.49167	
M =	1 9.90000	2 10.50833	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES AUDITORY MEMORY RAW SCORE

FACTOR	LEVELS		
I =	1 8.72500	2 7.36250	3 9.70000
J =	1 6.77500	2 10.41667	
K =	1 8.53333	2 8.65833	
M =	1 8.61667	2 9.57500	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES VISUAL ASSOCIATION RAW SCORE

FACTOR	LEVELS		
I =	1 12.05[illegible]	2 1[illegible]50[illegible]	3 11.22[illegible]
J =	1 11.08333	2 12.[illegible]000	
K =	1 11.41667	2 11.[illegible]7	
M =	1 12.08333	2 11.[illegible]2500	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES VISUAL CLOSURE RAW SCORE

FACTOR	LEVELS		
I =	1	2	3
	12.70000	10.91250	14.31250
J =	1	2	
	12.10833	13.17500	
K =	1	2	
	12.45833	12.82500	
M =	1	2	
	12.79167	12.49167	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES VERBAL EXPRESSION RAW SCORE

FACTOR	LEVELS		
I =	1 12.31250	2 11.93750	3 13.09000
J =	1 13.15333	2 14.70333	
K =	1 12.60000	2 12.26667	
M =	1 11.56667	2 13.30000	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES GRAMMATIC CLOSURE RAW SCORE

FACTOR	LEVELS		
I =	1 7.73750	2 6.10000	3 7.81250
J =	1 5.63333	2 8.75000	
K =	1 7.25000	2 7.18333	
M =	1 6.21667	2 8.21667	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES MANUAL EXPRESSION RAW SCORE

FACTOR	LEVELS		
I =	1	2	3
	17.23750	19.17500	19.03750
J =	1	2	
	18.33167	20.90833	
K =	1	2	
	19.32500	17.67500	
M =	1	2	
	17.35833	19.14167	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES AUDITORY CLOSURE RAW SCORE

FACTOR	LEVELS		
I =	1 8.55000	2 9.38750	3 9.55000
J =	1 7.36667	2 10.99167	
K =	1 9.51667	2 9.34167	
M =	1 8.40833	2 10.45000	

MAIN CELL MEANS FROM GAIN ANALYSIS FOR
ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES SOUND BLENDING RAW SCORE

FACTOR	LEVELS		
I =	1 9.50000	2 10.30000	3 9.08750
J =	1 8.30000	2 10.69167	
K =	1 9.52500	2 9.46667	
M =	1 8.30833	2 10.68333	

APPENDIX C

SUMMARY ANALYSIS OF VARIANCE TABLES FOR REPEATED-MEASURES GAIN ANALYSES

(COMPUTER PROGRAM BMD08V FROM U. C. L. A.)

(Note.--"I" refers to "Treatments," "J" refers to "IQ," "K" refers to "Sex," "M" refers to "Measures," and "R" refers to "Replications.")

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR PEABODY PICTURE VOCABULARY TEST RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	396012.5042	1	396012.5042	240.000 (1)	120.000 (3)	2.000(15)
2	I	742.1083	2	371.0542	80.000 (2)	40.000 (6)	2.000(16)
3	J	4075.5042	1	4075.5042	120.000 (3)	2.000(16)	
4	K	4.5375	1	4.5375	120.000 (4)	60.000 (8)	2.000(16)
5	M	78.2042	1	73.2042	120.000 (5)	60.000(10)	1.000(18)
6	IJ	745.8083	2	372.9042	40.000 (6)	2.000(16)	
7	IK	717.9250	2	358.9625	40.000 (7)	20.000(12)	2.000(16)
8	JK	266.7042	1	266.7042	60.000 (8)	2.000(16)	
9	IM	460.3083	2	230.1542	40.000 (9)	20.000(13)	1.000(18)
10	JM	408.2042	1	408.2042	60.000(10)	1.000(18)	
11	KM	185.5042	1	185.5042	60.000(11)	30.000(15)	1.000(18)
12	IJK	1156.7583	2	578.3792	20.000(12)	2.000(16)	
13	IJM	463.4083	2	231.7042	20.000(13)	1.000(18)	
14	IKM	767.7583	2	383.8792	20.000(14)	10.000(17)	1.000(18)
15	JKM	367.5375	1	367.5375	30.000(15)	1.000(18)	
16	R(IJK)	19125.6500	108	177.0894	2.000(16)		
17	IJKM	369.9250	2	184.9625	10.000(17)	1.000(18)	
18	MR(IJK)	19670.6500	108	182.1912	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR MECHAM VERBAL LANGUAGE DEVELOPMENT SCALE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	22515500.4167	1	22515500.4167	240.000 (1)	120.000 (3)	2.000(16)
2	I	46780.8333	2	23390.4167	80.000 (2)	40.000 (6)	2.000(16)
3	J	45926.6667	1	45926.6667	120.000 (3)	2.000(16)	
4	K	11343.7500	1	11343.7500	120.000 (4)	60.000 (8)	2.000(16)
5	M	65340.0000	1	65340.0000	120.000 (5)	60.000(10)	1.000(15)
6	IJ	12743.3333	2	6371.6667	40.000 (6)	2.000(16)	
7	IK	4697.5000	2	2348.7500	40.000 (7)	20.000(12)	2.000(16)
8	JK	1421.6667	1	1421.6667	60.000 (8)	2.000(16)	
9	IM	2167.5000	2	1083.7500	40.000 (9)	20.000(13)	1.000(18)
10	JM	350.4167	1	350.4167	60.000(10)	1.000(18)	
11	KM	3681.6667	1	3681.6667	60.000(11)	30.000(15)	1.000(18)
12	IJK	14360.8333	2	7180.4167	20.000(12)	2.000(16)	
13	IJM	1440.8333	2	720.4167	20.000(13)	1.000(18)	
14	IKM	3623.3333	2	1811.6667	20.000(14)	10.000(17)	1.000(18)
15	JKM	70.4167	1	70.4167	30.000(15)	1.000(18)	
16	R(IJK)	361120.0000	108	3343.7037	2.000(16)		
17	IJKM	7290.8333	2	3645.4167	10.000(17)	1.000(18)	
18	MR(IJK)	389910.0000	108	3610.2778	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES TOTAL RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	3083120.0167	1	3083120.0167	240.000 (1)	120.000 (3)	2.000(16)
2	I	7381.5083	2	3690.7542	80.000 (2)	40.000 (6)	2.000(16)
3	J	86716.0167	1	86716.0167	120.000 (3)	2.000(16)	
4	K	156.3167	1	156.3167	120.000 (4)	50.000 (8)	2.000(16)
5	M	286.0167	1	286.0167	120.000 (5)	60.000(10)	1.000(18)
6	IJ	12196.6083	2	6098.3042	40.000 (6)	2.000(16)	
7	IK	4408.0083	2	2204.0042	40.000 (7)	20.000(12)	2.000(16)
8	JK	6976.8167	1	6976.8167	60.000 (8)	2.000(16)	
9	IM	2869.9083	2	1434.9542	40.000 (9)	20.000(13)	1.000(18)
10	JM	6303.7500	1	6303.7500	60.000(10)	1.000(18)	
11	KM	1334.8167	1	1334.8167	60.000(11)	30.000(15)	1.000(18)
12	IJK	13231.5083	2	6615.7542	20.000(12)	2.000(16)	
13	IJM	5210.2750	2	2605.1375	20.000(13)	1.000(18)	
14	IKM	4763.8083	2	2381.9042	20.000(14)	10.000(17)	1.000(18)
15	JKM	510.4167	1	510.4167	30.000(15)	1.000(18)	
16	R(IJK)	198330.7000	108	1836.3954	2.000(16)		
17	IJKM	2211.5083	2	1105.7542	10.000(17)	1.000(18)	
18	MR(IJK)	178187.5000	108	1649.8843	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES AUDITORY RECEPTION RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	25647.3375	1	25647.3375	240.000 (1)	120.000 (3)	2.000(16)
2	I	28.9000	2	14.4500	80.000 (2)	40.000 (6)	2.000(16)
3	J	731.5042	1	731.5042	120.000 (3)	2.000(16)	
4	K	.9375	1	.9375	120.000 (4)	60.000 (8)	2.000(16)
5	M	71.5042	1	71.5042	120.000 (5)	60.000(10)	1.000(18)
6	IJ	165.8333	2	82.9167	40.000 (6)	2.000(16)	
7	IK	198.3000	2	99.1500	40.000 (7)	20.000(12)	2.000(16)
8	JK	75.9375	1	75.9375	60.000 (8)	2.000(16)	
9	IM	2.6333	2	1.3167	40.000 (9)	20.000(13)	1.000(18)
10	JM	.0375	1	.0375	60.000(10)	1.000(18)	
11	KM	9.2042	1	9.2042	60.000(11)	30.000(15)	1.000(18)
12	IJK	187.2000	2	93.6000	20.000(12)	2.000(16)	
13	IJM	10.8000	2	5.4000	20.000(13)	1.000(18)	
14	IKM	66.0333	2	33.0167	20.000(14)	10.000(17)	1.000(18)
15	JKM	34.5042	1	34.5042	30.000(15)	1.000(18)	
16	P(IJK)	2922.5500	108	27.0606	2.000(16)		
17	IJKM	2.2333	2	1.1167	10.000(17)	1.000(18)	
18	MP(IJK)	2651.5500	108	24.5514	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES VISUAL RECEPTION RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	22291.5375	1	22291.5375	240.000 (1)	120.000 (3)	2.000(16)
2	I	33.1750	2	16.5875	80.000 (2)	40.000 (6)	2.000(16)
3	J	752.6042	1	752.6042	120.000 (3)	2.000(16)	
4	K	2.6042	1	2.6042	120.000 (4)	60.000 (8)	2.000(16)
5	M	67.2042	1	67.2042	120.000 (5)	60.000(10)	1.000(18)
6	IJ	242.7583	2	121.3792	40.000 (6)	2.000(16)	
7	IK	85.8083	2	42.9042	40.000 (7)	20.000(12)	2.000(16)
8	JK	53.2042	1	53.2042	60.000 (8)	2.000(16)	
9	IM	17.6583	2	8.8292	40.000 (9)	20.000(13)	1.000(18)
10	JM	17.6042	1	17.6042	60.000(10)	1.000(18)	
11	KM	12.6042	1	12.6042	60.000(11)	30.000(15)	1.000(18)
12	IJK	22.0583	2	11.0292	20.000(12)	2.000(16)	
13	IJM	2.3083	2	1.1542	20.000(13)	1.000(18)	
14	IKM	135.5583	2	67.7792	20.000(14)	10.000(17)	1.000(18)
15	JKM	51.3375	1	51.3375	30.000(15)	1.000(18)	
16	R(IJK)	2222.7500	108	20.5810	2.000(16)		
17	IJKM	23.2750	2	11.6375	10.000(17)	1.000(18)	
18	MR(IJK)	2660.9500	108	24.6384	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES VISUAL MEMORY RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	37475.0042	1	37475.0042	240.000 (1)	120.000 (3)	2.000(16)
2	I	777.9083	2	388.9542	80.000 (2)	40.000 (6)	2.000(16)
3	J	2413.0042	1	2413.0042	120.000 (3)	2.000(16)	
4	K	.3375	1	.3375	120.000 (4)	60.000 (8)	2.000(16)
5	M	18.7042	1	18.7042	120.000 (5)	60.000(10)	1.000(18)
6	IJ	353.4083	2	176.7042	40.000 (6)	2.000(16)	
7	IK	351.2250	2	175.6125	40.000 (7)	20.000(12)	2.000(16)
8	JK	424.0042	1	424.0042	60.000 (8)	2.000(16)	
9	IM	73.9083	2	36.9542	40.000 (9)	20.000(13)	1.000(18)
10	JM	182.0042	1	182.0042	60.000(10)	1.000(18)	
11	KM	11.7042	1	11.7042	60.000(11)	30.000(15)	1.000(18)
12	IJK	630.0583	2	315.0292	20.000(12)	2.000(16)	
13	IJM	235.2083	2	117.6042	20.000(13)	1.000(18)	
14	IKM	224.5583	2	112.2792	20.000(14)	10.000(17)	1.000(18)
15	JKM	17.6042	1	17.6042	30.000(15)	1.000(18)	
16	R(IJK)	5858.5500	108	54.2458	2.000(16)		
17	IJKM	152.2583	2	76.1292	10.000(17)	1.000(18)	
18	MR(IJK)	6625.5500	108	61.3477	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES AUDITORY ASSOCIATION RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	25235.5042	1	25235.5042	240.000 (1)	120.000 (3)	2.000(16)
2	I	167.3563	2	83.6782	80.000 (2)	40.000 (6)	2.000(16)
3	J	1627.6042	1	1627.6042	120.000 (3)	2.000(16)	
4	K	13.5375	1	13.5375	120.000 (4)	60.000 (8)	2.000(16)
5	M	30.1042	1	30.1042	120.000 (5)	60.000(10)	1.000(18)
6	IJ	26.8083	2	13.4042	40.000 (6)	2.000(16)	
7	IK	137.9250	2	68.9625	40.000 (7)	20.000(12)	2.000(16)
8	JK	152.0042	1	152.0042	60.000 (8)	2.000(16)	
9	IM	14.4083	2	7.2042	40.000 (9)	20.000(13)	1.000(18)
10	JM	17.6042	1	17.6042	60.000(10)	1.000(18)	
11	KM	27.3375	1	27.3375	60.000(11)	30.000(15)	1.000(18)
12	IJK	315.6083	2	157.8042	20.000(12)	2.000(16)	
13	IJM	235.2583	2	117.6292	20.000(13)	1.000(18)	
14	IKM	177.7750	2	88.8875	20.000(14)	10.000(17)	1.000(18)
15	JKM	31.5375	1	31.5375	30.000(15)	1.000(18)	
16	R(IJK)	4672.1500	108	43.2606	2.000(16)		
17	IJKM	11.7250	2	5.8625	10.000(17)	1.000(18)	
18	MR(IJK)	4050.7500	108	37.5069	1.000(16)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES AUDITORY MEMORY RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	17733.2042	1	17733.2042	240.000 (1)	120.000 (3)	2.000(16)
2	I	220.5583	2	110.2792	80.000 (2)	40.000 (6)	2.000(16)
3	J	795.7042	1	795.7042	120.000 (3)	2.000(16)	
4	K	.9375	1	.9375	120.000 (4)	60.000 (8)	2.000(16)
5	M	.1042	1	.1042	120.000 (5)	60.000(10)	1.000(18)
6	IJ	58.0583	2	29.0292	40.000 (6)	2.000(16)	
7	IK	82.4250	2	41.2125	40.000 (7)	20.000(12)	2.000(16)
8	JK	.0375	1	.0375	60.000 (8)	2.000(16)	
9	IM	8.0083	2	4.0042	40.000 (9)	20.000(13)	1.000(18)
10	JM	.0042	1	.0042	60.000(10)	1.000(18)	
11	KM	127.6042	1	127.6042	60.000(11)	30.000(15)	1.000(18)
12	IJK	95.9250	2	47.9625	20.000(12)	2.000(16)	
13	IJM	253.6083	2	126.8042	20.000(13)	1.000(18)	
14	IKM	110.0083	2	55.0042	20.000(14)	10.000(17)	1.000(18)
15	JKM	10.8375	1	10.8375	30.000(15)	1.000(18)	
16	R(IJK)	4273.6500	108	39.5703	2.000(16)		
17	IJKM	2.2750	2	1.1375	10.000(17)	1.000(18)	
18	MR(IJK)	4148.0500	108	38.4079	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES VISUAL ASSOCIATION RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	30330.3167	1	30330.3167	240.000 (1)	120.000 (3)	2.000(16)
2	I	102.4333	2	51.2167	80.000 (2)	40.000 (6)	2.000(16)
3	J	322.0167	1	322.0167	120.000 (3)	2.000(16)	
4	K	7.3500	1	7.3500	120.000 (4)	60.000 (8)	2.000(16)
5	M	160.0667	1	160.0667	120.000 (5)	60.000(17)	1.000(16)
6	IJ	325.4333	2	162.7167	40.000 (6)	2.000(16)	
7	IK	91.8000	2	45.9000	40.000 (7)	20.000(12)	2.000(16)
8	JK	88.9167	1	88.9167	60.000 (8)	2.000(16)	
9	IM	46.2333	2	23.1167	40.000 (9)	20.000(13)	1.000(16)
10	JM	4.2667	1	4.2667	60.000(10)	1.000(18)	
11	KM	26.6667	1	26.6667	60.000(11)	30.000(15)	1.000(16)
12	IJK	342.3333	2	171.6667	20.000(12)	2.000(16)	
13	IJM	39.4333	2	19.7167	20.000(13)	1.000(18)	
14	IKM	32.5333	2	16.2667	20.000(14)	10.000(17)	1.000(16)
15	JKM	.2667	1	.2667	30.000(15)	1.000(16)	
16	R(IJK)	4695.0000	108	43.1019	2.000(16)		
17	IJKM	86.5333	2	43.2667	10.000(17)	1.000(18)	
18	MR(IJK)	3588.0000	108	32.7593	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES VISUAL CLOSURE RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	38354.8167	1	38354.8167	240.000 (1)	120.000 (3)	2.000(16)
2	I	462.8083	2	231.4042	80.000 (2)	40.000 (6)	2.000(16)
3	J	68.2667	1	68.2667	120.000 (3)	2.000(16)	
4	K	8.0667	1	8.0667	120.000 (4)	60.000 (9)	2.000(16)
5	M	5.4000	1	5.4000	120.000 (5)	60.000(10)	1.000(18)
6	IJ	300.1583	2	150.0792	40.000 (6)	2.000(16)	
7	IK	44.3083	2	22.1542	40.000 (7)	20.000(12)	2.000(16)
8	JK	12.1500	1	12.1500	60.000 (8)	2.000(16)	
9	IM	319.0750	2	159.5375	40.000 (9)	20.000(13)	1.000(18)
10	JM	228.1500	1	228.1500	60.000(10)	1.000(14)	
11	KM	12.1500	1	12.1500	60.000(11)	30.000(15)	1.000(18)
12	IJK	104.0250	2	52.0125	20.000(12)	2.000(16)	
13	IJM	23.7250	2	11.8625	20.000(13)	1.000(18)	
14	IKM	27.9750	2	13.9875	20.000(14)	10.000(17)	1.000(18)
15	JKM	60.0000	1	60.0000	30.000(15)	1.000(18)	
16	R(IJK)	3642.4000	108	33.7259	2.000(16)		
17	IJKM	69.5250	2	34.7625	10.000(17)	1.000(18)	
18	MR(IJK)	3025.0000	108	28.0093	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES VERBAL EXPRESSION RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	37131.2667	1	37101.2667	240.000 (1)	120.000 (3)	2.000(1e)
2	I	51.2583	2	25.6292	80.000 (2)	+0.000 (5)	2.000(16)
3	J	1242.1500	1	1242.1500	120.000 (3)	2.000(16)	
4	K	6.6667	1	6.6667	120.000 (4)	60.000 (8)	2.000(1e)
5	M	180.2667	1	180.2667	120.000 (5)	60.000(10)	1.000(1e)
6	IJ	72.4750	2	36.2375	40.000 (6)	2.000(16)	
7	IK	119.1583	2	59.5792	40.000 (7)	20.000(12)	2.000(1e)
8	JK	150.4167	1	150.4167	60.000 (8)	2.000(1e)	
9	IM	43.4083	2	21.7042	40.000 (9)	20.000(13)	1.000(1e)
10	JM	312.8167	1	312.8167	80.000(10)	1.000(15)	
11	KM	41.6667	1	41.6667	60.000(11)	30.000(1e)	1.000(16)
12	IJK	31.9083	2	15.9542	20.000(12)	2.000(16)	
13	IJM	62.6583	2	31.3292	20.000(13)	1.000(15)	
14	IKM	4.8083	2	2.4042	20.000(14)	10.000(17)	1.000(1e)
15	JKM	28.0167	1	28.0167	30.000(15)	1.000(14)	
16	R(IJK)	3472.9000	108	32.1565	2.000(16)		
17	IJKM	302.6583	2	151.3292	10.000(17)	1.000(15)	
18	MR(IJK)	4411.7000	108	40.8491	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES GRAMMATIC CLOSURE RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	12+93.2667	1	12+93.2667	240.000 (1)	120.000 (3)	2.000(16)
2	I	1+9.3333	2	7+.9292	80.000 (2)	+0.000 (6)	2.000(16)
3	J	564.2667	1	564.2667	120.000 (3)	2.000(15)	
4	K	.2667	1	.2667	120.000 (4)	60.000 (8)	2.000(16)
5	M	240.0000	1	240.0000	120.000 (5)	60.000(13)	1.000(18)
6	IJ	117.6033	2	58.80+2	40.000 (6)	2.000(16)	
7	IK	89.7533	2	44.8792	40.000 (7)	20.000(12)	2.000(16)
8	JK	24.0667	1	24.0667	60.000 (8)	2.000(16)	
9	IM	25.7250	2	12.8625	40.000 (9)	20.000(13)	1.000(18)
10	JM	+8.6000	1	48.6000	60.000(10)	1.000(18)	
11	KM	1.0667	1	1.0667	60.000(11)	30.000(15)	1.000(18)
12	IJK	153.1083	2	76.5542	20.000(12)	2.000(16)	
13	IJM	38.5750	2	19.2875	20.000(13)	1.000(18)	
14	IKM	38.1583	2	19.0792	20.000(14)	10.000(17)	1.000(18)
15	JKM	+1.6667	1	41.6667	30.000(15)	1.000(18)	
16	R(IJK)	2003.6000	108	18.5519	2.000(16)		
17	IJKM	59.0083	2	29.5042	10.000(17)	1.000(18)	
18	MR(IJK)	2117.2000	108	19.6037	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES MANUAL EXPRESSION RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	82140.0000	1	82140.0000	240.000 (1)	120.000 (3)	2.000(15)
2	I	177.1750	2	88.5875	80.000 (2)	40.000 (5)	2.000(15)
3	J	1392.0167	1	1392.0167	120.000 (3)	2.000(16)	
4	K	163.3500	1	163.3500	120.000 (4)	60.000 (6)	2.000(16)
5	M	98.8167	1	98.8167	120.000 (5)	60.000(10)	1.000(18)
6	IJ	226.1083	2	113.0542	40.000 (6)	2.000(15)	
7	IK	205.8250	2	102.9125	40.000 (7)	20.000(12)	2.000(16)
8	JK	123.2667	1	123.2667	60.000 (8)	2.000(16)	
9	IM	161.5083	2	80.7542	40.000 (9)	20.000(13)	1.000(18)
10	JM	232.0667	1	232.0667	60.000(10)	1.000(18)	
11	KM	.2667	1	.2667	60.000(11)	30.000(15)	1.000(16)
12	IJK	27.5583	2	13.7792	20.000(12)	2.000(16)	
13	IJM	88.1083	2	44.0542	20.000(13)	1.000(18)	
14	IKM	65.7583	2	32.8792	20.000(14)	10.000(17)	1.000(18)
15	JKM	.1500	1	.1500	30.000(15)	1.000(18)	
16	R(IJK)	5868.7000	108	54.3398	2.000(16)		
17	IJKM	243.0250	2	121.5125	10.000(17)	1.000(18)	
18	MR(IJK)	6900.3000	108	63.8917	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES AUDITORY CLOSURE RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	21338.2042	1	21338.2042	240.000 (1)	120.000 (3)	2.000(16)
2	I	44.8083	2	22.4042	80.000 (2)	40.000 (6)	2.000(16)
3	J	585.0375	1	585.0375	120.000 (3)	2.000(16)	
4	K	1.8375	1	1.8375	120.000 (4)	60.000 (8)	2.000(16)
5	M	250.1042	1	250.1042	120.000 (5)	60.000(10)	1.000(16)
6	IJ	100.2250	2	50.1125	40.000 (6)	2.000(16)	
7	IK	138.7750	2	69.3875	40.000 (7)	20.000(12)	2.000(16)
8	JK	283.8375	1	283.8375	60.000 (8)	2.000(16)	
9	IM	16.7583	2	8.3792	40.000 (9)	20.000(13)	1.000(16)
10	JM	3.0375	1	3.0375	60.000(10)	1.000(16)	
11	KM	7.0042	1	7.0042	60.000(11)	30.000(15)	1.000(18)
12	IJK	93.6250	2	46.8125	20.000(12)	2.000(16)	
13	IJM	142.6750	2	71.3375	20.000(13)	1.000(16)	
14	IKM	17.3583	2	8.6792	20.000(14)	10.000(17)	1.000(18)
15	JKM	78.2042	1	78.2042	30.000(15)	1.000(16)	
16	R(IJK)	3916.6500	108	36.2597	2.000(16)		
17	IJKM	13.1083	2	6.5542	10.000(17)	1.000(16)	
18	MR(IJK)	3621.2500	108	33.5301	1.000(18)		

SUMMARY ANALYSIS OF VARIANCE TABLE; GAIN ANALYSIS FOR ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES SOUND BLENDING RAW SCORE

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	EXPECTED MEAN SQUARE		
1	MEAN	216+1.00+2	1	21641.0042	240.000 (1)	120.000 (3)	2.000(16)
2	I	134.0083	2	67.0042	80.000 (2)	40.000 (6)	2.000(16)
3	J	3+3.20+2	1	343.2042	120.000 (3)	2.000(16)	
4	K	.20+2	1	.2042	120.000 (4)	60.000 (6)	2.000(16)
5	M	338.4375	1	338.4375	120.000 (5)	60.000(10)	1.000(18)
6	IJ	1+1.7583	2	70.6792	40.000 (6)	2.000(16)	
7	IK	215.6583	2	107.8292	40.000 (7)	20.000(12)	2.000(16)
8	JK	4.5375	1	4.5375	60.000 (8)	2.000(16)	
9	IM	55.9750	2	27.9875	40.000 (9)	20.000(13)	1.000(18)
10	JM	18.7042	1	18.7042	60.000(10)	1.000(18)	
11	KM	.0042	1	.0042	60.000(11)	30.000(15)	1.000(18)
12	IJK	186.4750	2	93.2375	20.000(12)	2.000(16)	
13	IJM	55.3583	2	27.6792	20.000(13)	1.000(18)	
14	IKM	76.5583	2	38.2792	20.000(14)	10.000(17)	1.000(18)
15	JKM	4.0042	1	4.0042	30.000(15)	1.000(18)	
16	R(IJK)	3079.6500	108	28.5153	2.000(16)		
17	IJKM	92.4083	2	46.2042	10.000(17)	1.000(18)	
18	MR(IJK)	21+3.0500	108	19.9616	1.000(18)		

APPENDIX D

F RATIOS FOR GAIN ANALYSES

(The reader should refer to Appendix A for the names of criteria corresponding to the numbers used in Appendix D.)

F Ratios For Gain Analyses

Source		Analysis								
		1	2	3	4	5	6	7	8	9
1	Mean	97.17	490.25*	35.55	15.53	35.06	29.62	15.50	160.80*	94.19
2	I	1.00	3.67	0.61	2.20	0.17	0.14	6.24	3.80	0.31
3	J	23.01**	13.74**	47.22**	44.48**	27.03**	36.57**	37.62**	20.11**	7.47**
4	K	0.02	8.09	0.02	0.00	0.01	0.05	0.09	23.50	0.08
5	M	0.19	186.46*	0.05	0.10	1787.50*	3.82	1.71	25.00	37.49
6	IJ	2.11	1.91	3.32*	3.26*	3.06*	5.90*	0.31	0.73	3.78*
7	IK	0.62	0.33	0.33	0.56	1.06	3.89	0.44	0.86	0.27
8	JK	1.51	0.42	3.80	7.82**	2.81	2.59	3.51	0.00	2.06
9	IM	0.99	1.50	0.55	0.31	0.24	7.68	0.06	0.03	1.17
10	JM	2.24	0.10	3.82	2.97	0.00	0.71	0.47	0.00	0.13
11	KM	0.50	52.28	2.62	0.66	0.27	0.25	0.87	11.77	9[illegible].78
12	IJK	3.27*	2.15	3.60*	5.81**	3.46*	0.54	3.65**	1.21	3.98*
13	IJM	1.27	0.20	1.58	1.92	0.22	0.05	3.14*	3.30*	0.60

F Ratios For Gain Analyses (continued)

Source	Analysis								
	1	2	3	4	5	6	7	8	9
14 IKM	2.08	0.50	2.15	1.47	29.48*	5.82	15.17	48.25*	0.34
15 JKM	2.02	0.02	0.31	0.29	1.41	2.08	0.84	0.28	0.01
16 R(IJK)	----	----	----	----	----	----	----	----	----
17 IJKM	1.02	1.01	0.67	1.24	0.05	0.47	0.16	0.03	1.47
18 MR(IJK)	----	----	----	----	----	----	----	----	----

* $P < .05$

** $P < .01$

F Ratios For Gain Analyses (continued)

	Source	Analysis					
		10	11	12	13	14	15
1	Mean	561.81*	29.87	22.15	59.01	36.42	63.06
2	I	1.54	0.71	1.27	0.78	0.45	0.95
3	J	2.02	38.62**	30.42**	25.62**	16.16**	12.03**
4	K	0.66	0.04	0.01	1.33	0.01	0.04
5	M	0.02	0.58	4.94	0.43	82.27	18.10
6	IJ	4.45*	1.13	3.18*	2.08	1.38	2.49
7	IK	0.43	3.74	0.59	7.47	1.48	1.16
8	JK	0.36	4.68*	1.30	2.27	7.83**	0.16
9	IM	13.45	0.69	0.67	1.83	0.12	1.01
10	JM	8.15**	7.66**	2.48	3.63	0.09	0.94
11	KM	0.20	1.49	0.03	1.80	0.09	0.00
12	IJK	1.54	0.50	4.13*	0.25	1.29	3.27*
13	IJM	0.42	0.77	0.98	0.69	2.13	1.39

F Ratios For Gain Analyses (continued)

Source	Analysis					
	10	11	12	13	14	15
14 IKM	0.40	0.02	0.65	0.27	1.33	0.83
15 JKM	2.14	0.69	2.13	0.00	2.33	0.20
16 R(IJK)	----	----	----	----	----	----
17 IJKM	1.24	3.70*	1.51	1.90	0.20	2.33
18 MR(IJK)	----	----	----	----	----	----

* $P < .05$

** $P < .01$

Appendix E

Descriptive Analysis of Socioeconomic Status and PPVT Total Raw Scores

Peabody Picture Vocabulary Test Total Raw Score

Socioeconomic Status	Control Group		Four Times a Week		Eight Times a Week		Across All Treatments	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Low	39.75	42.85	35.50	41.50	36.96	41.80	37.31	42.01
High	43.00	46.25	39.72	44.72	34.93	40.33	39.60	44.06

Appendix F

Descriptive Analysis of Socioeconomic Status and ITPA Total Raw Score

Illinois Test of Psycholinguistic Abilities Total Raw Scores

Socioeconomic Status	Control Group		Four Times a Week		Eight Times a Week		Across All Treatments	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Low	102.60	117.25	84.95	109.68	102.52	139.84	96.78	123.19
High	120.10	128.60	100.78	130.22	95.00	127.13	106.43	128.74