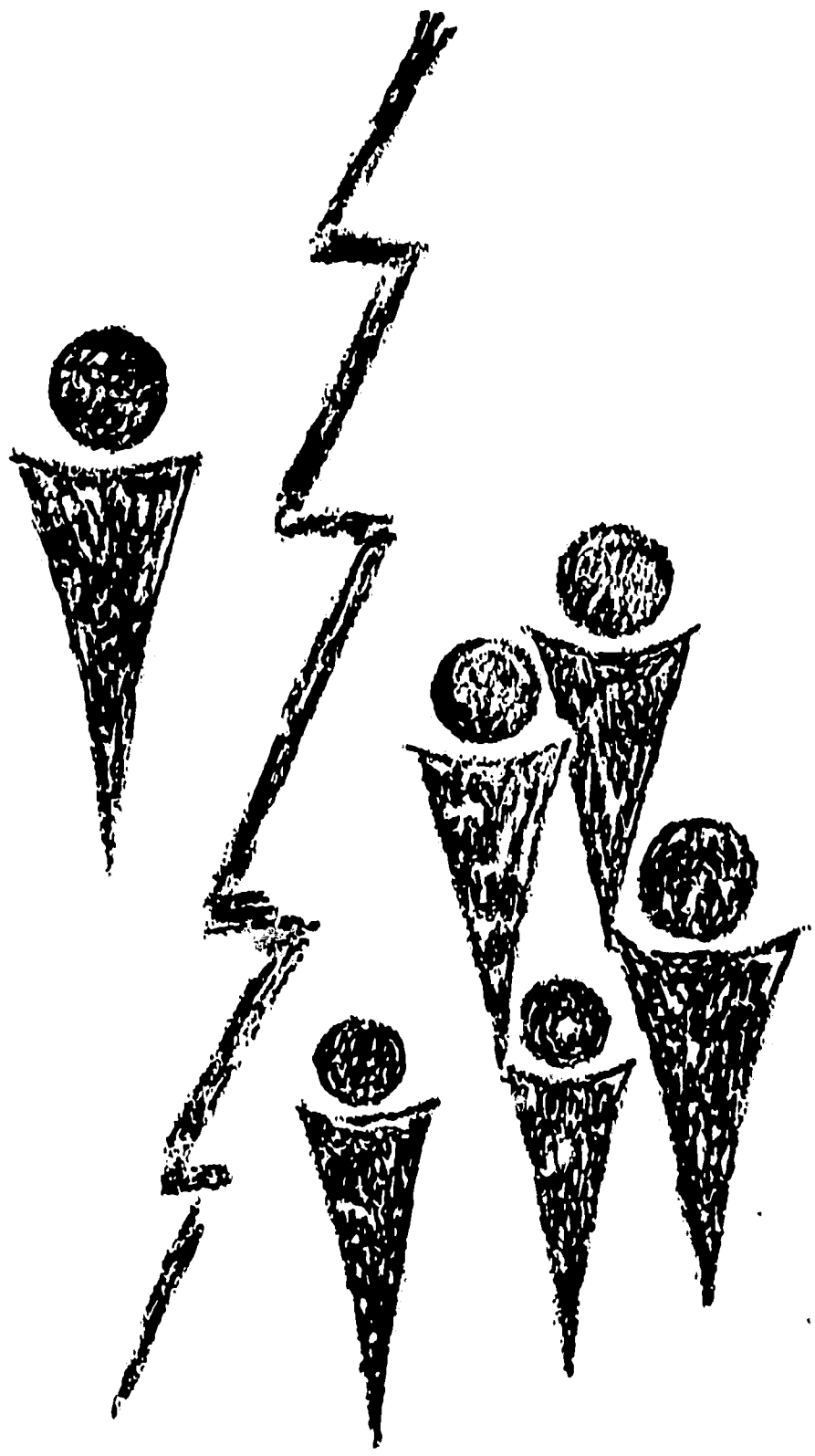
DOCUMENT RESUME

ED 032 688 24 EC 004 484

Individual Learning Disabilities Program: Pilot Incidence Study, Volumes I, II, and III. Technical Report.
Rocky Mountain Educational Lab., Inc., Greeley, Colo.
Spons Agency-Office of Education (DHEW), Washington, D.C. Bureau of Research.
Bureau No-BR-6-2828
Pub Date Aug 69
Contract-OEC-4-7-062828-30-63
Note-131p.
EDRS Price MF-$0.75 HC-$6.65
Descriptors-Behavior Patterns, Behavior Rating Scales, Clinical Diagnosis, Educational Testing, Evaluation Methods, *Exceptional Child Research, Identification, *Incidence, Individual Characteristics, *Learning Disabilities, Medical Evaluation, Psychological Testing, *Rating Scales, Screening Tests, Test Reliability
Identifiers-Classroom Screening Instrument, CSI

Three levels of screening procedures were used to identify the incidence and nature of learning disabilities. The first level involved the application by classroom teachers of the Classroom Screening Instrument (CSI), especially developed for the study, and of other measures; the second level involved psychoeducational differential diagnosis by qualified testers; and the third, medical examinations by appropriate personnel. Screening of 2,400 second grade children at level 1 resulted in identification of 361 for level 2 screening, of whom 134 were selected for level 3 screening. Results indicated that classroom teachers could use the CSI with accuracy to identify children with varied learning problems. The study further indicated approximate incidences of 4.7% for severe learning disabilities and 6% for less severe learning disabilities. A technical report is given in volume 1; descriptive data and statistical analysis are provided in volumes 2 and 3, respectively. (JD)



TECHNICAL REPORT

INDIVIDUAL LEARNING DISABILITIES PROGRAM PILOT INCIDENCE STUDY - VOL. I

ROCKY MOUNTAIN EDUCATIONAL LABORATORY

PILOT INCIDENCE STUDY

Technical Report **Volume I**

Prepared by

**ROCKY MOUNTAIN
EDUCATIONAL LABORATORY
GREELEY, COLORADO**

**Verl O. Cazier
Project Assistant**

**Dr. Marian T. Giles
Project Assistant**

**Dr. Willard G. Jones
Executive Director**

August, 1969

Prepared pursuant to a contract with the United States Office of Education, Bureau of Research, H.E.W. Contract No. OEC-4-7-062828-30-63

*Dr. Willard G. Jones
Executive Director*

**ROCKY MOUNTAIN EDUCATIONAL LABORATORY, INC.
1620 Reservoir Road
GREELEY, COLORADO 80631**

ACKNOWLEDGEMENTS

The RMEL wants to give special recognition to the following individuals for the part they played in making this study a reality. Each has provided expert advice and guidance for coordination of various phases of this study.

Newell C. Kephart, Ph.D.
Executive Director
Glen Haven Achievement Center
Fort Collins, Colorado

Carolyn E. Ritter, Ed.D.
Research and Academic Consultant
Colorado State College
Greeley, Colorado

Oliver P. Kolstoe, Ph.D.
Professor of Special Education
Colorado State College
Greeley, Colorado

Emmett A. Ritter, Ed.D.
Assistant Professor
College of Education
Colorado State College
Greeley, Colorado

Jean L. McMahon, M.D.
Director of Developmental
and Evaluation Clinic
Denver Children's Hospital
Denver, Colorado

TABLE OF CONTENTS

ILLUSTRATIONS

INDIVIDUAL LEARNING DISABILITIES

PILOT INCIDENCE STUDY

Foreword

This study was conducted as the initial effort of the Rocky Mountain Educational Laboratory in its individual learning disabilities program. It was undertaken to gain data on the occurrence and nature of individual learning disabilities. The results of this study would provide direction for the laboratory in the development and testing of classroom usable prescriptive materials for the prevention or remediation of problems confronting children with identified disabilities.

The Rocky Mountain Educational Laboratory is one of twenty regional laboratories primarily funded by the Office of Education, Bureau of Research, Division of Educational Laboratories. The Rocky Mountain Educational Laboratory area of operation includes: Arizona, Colorado, Idaho, Montana, Utah, Wyoming, and part of Nebraska and Kansas.

This study is presented in three volumes:

Volume
One: *Introduction and Procedures-Individual Learning Disabilities Pilot Incidence Study*

Volume
Two: *Descriptive Analysis of Level I, Level II, and Level III Data-Individual Learning Disabilities Pilot Incidence Study*

Volume
Three: *Statistical Analysis of Level I, Level II, Level III Data, Summary and Conclusions- Individual Learning Disabilities Pilot Incidence Study*

PILOT INCIDENCE STUDY

Introduction

This pilot study was conducted to determine the incidence of children with individual learning disabilities and the nature of their problems. Estimates of various authorities concerning the incidence of individual learning disabilities range from four to forty percent of the school-age population. Undoubtedly this wide range is a function of definition, at least in part. In its initial efforts, the RMEL used the following definition of individual learning disabilities.

Definition A child who has an individual learning disability is one who, according to present measures of intelligence, should be capable of learning in a typical classroom situation, but who is unable to perform as expected in said situation.

Limitations RMEL, for purposes of this study, limits its definition to children of average or above-average intelligence who have problems of relating, integrating, mediating, or processing school related inputs in order to produce appropriate school related outputs.

Delimitations RMEL, for purposes of this study, excludes from its definition children who have severe emotional problems, severe cultural deprivation, or severe organic or medical involvement, which probably accounts for an individual's being unable to perform in the classroom as expected. This definition also excludes children who are orthopedically handicapped, hard-of-hearing, partially sighted, or have other similar problems which inhibit appropriate mental inputs or restrict appropriate school related outputs or performances.

Objectives This study was conducted to achieve two major objectives:

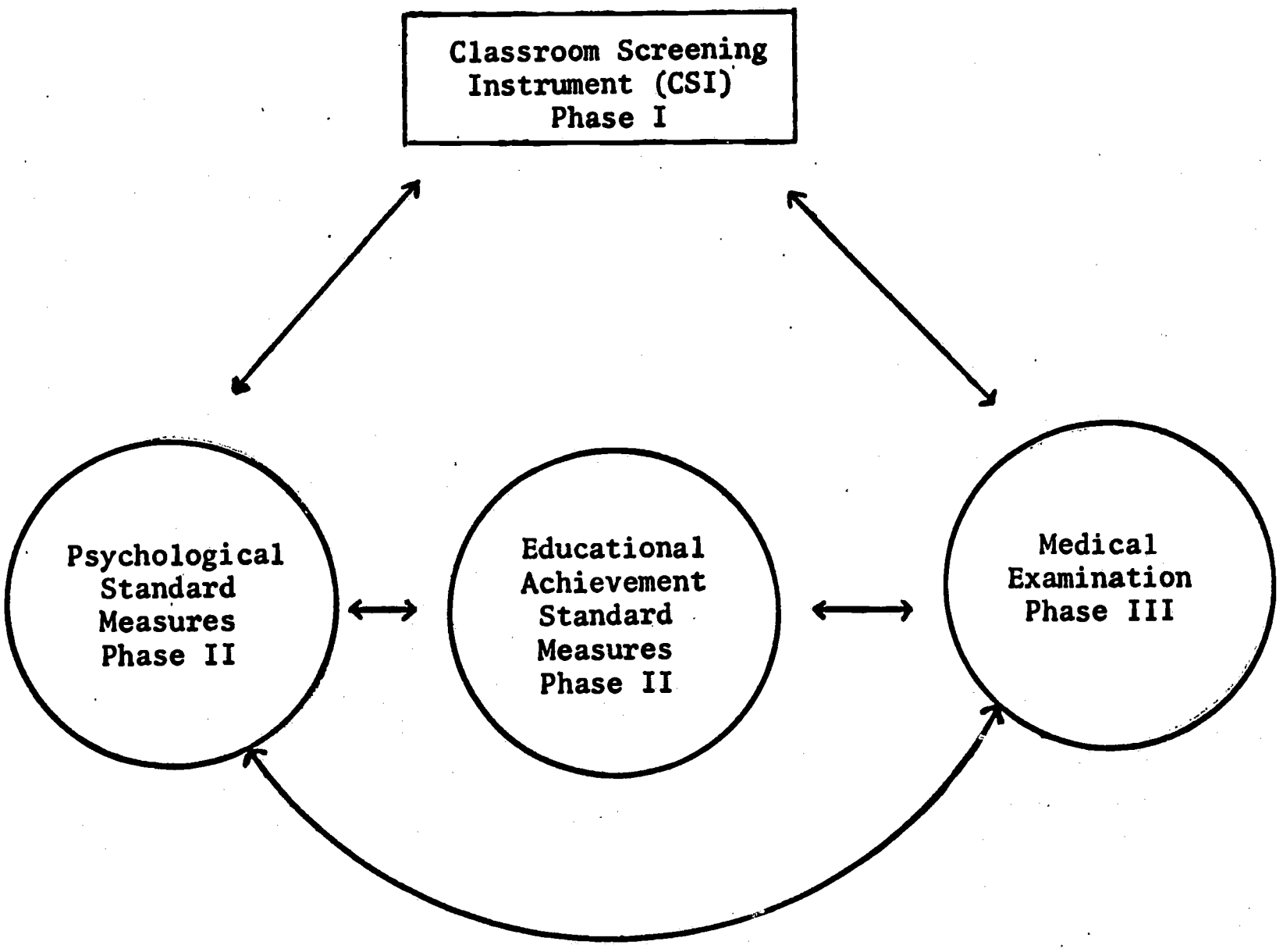
1. To determine the incidence and nature of problems among second grade children with individual learning disabilities who are assigned for instruction to regular classroom teachers.

2. To provide the basis for the development of further studies of children with ILD at other age and grade levels and to provide the basis upon which might be developed prescriptive materials which would alleviate the problems confronting pupils in the target population.

In order to conduct this study, it was necessary to develop and validate an instrument for use by classroom teachers for the identification of children with learning disabilities. The instrument was validated in terms of selected psycho-educational standard measures as well as medical examinations which have relevance for the identification of children with individual learning disabilities. It was conjectured that the instrument should be designed to over-identify the population as opposed to under-identify it. This precaution was observed in order that no children with individual learning disabilities would be overlooked.

The study was designed to explore the relationships of the classroom screening instrument behavioral indices with the psycho-educational standard measures and aspects of the medical examinations. The purpose of this analysis would be to determine the power of the classroom screening instrument in indicating appropriate referral (i.e., medical, perceptual, etc.) as well as its power to identify the nature of a child's learning disability specifically enough to indicate appropriate treatment which might be administered by the classroom teacher. Figure 1 indicates the relationships which are to be explored among the various instruments utilized:

Figure 1



Description of the General Strategy

A representative stratified random sample of children was selected from throughout the eight-state region. This was the population to be subjected to a series of three screening procedures. The first of these screening procedures (Level I screening) was conducted by classroom teachers utilizing the Classroom Screening Instrument (CSI) developed by the RMEL. The second screening procedure (Level II screening) was the administration of a series of psycho-educational tests by qualified personnel to a sub-sample of the children identified by classroom teachers in Level I screening. The third procedure (Level III screening) was a thorough physical examination conducted by physicians and their assisting personnel to a sub-population of the children identified by Level II screening.

Data collected from these various sources was analyzed to reveal relevant interrelationships among the various screenings and to attempt to discover both the incidence and nature of the individual learning disability problem in the sample population.

Description of Target Population Selection Procedures

A decision was reached that the target population would be second grade pupils. The primary reason for this decision was to insure that all pupils had at least one year of exposure to a structured educational program to facilitate teachers in the recognition of a child's inability to respond to classroom instructions commensurate with his ability. It is realized that a younger target population would have been desirable, however, the existence of kindergartens in the region's schools is relatively uncommon and did not make such a decision advisable.

In order to obtain a representative stratified random sample of children, the following procedures were used: First, representative proportion of population distribution was determined on the basis of three population groupings: (1) cities of 15,000 inhabitants or more, (2) cities of 5,000 to 15,000 inhabitants, and (3) towns and rural areas of fewer than 5,000 inhabitants. A proportionate number of population groups which is representative of their relative occurrence in the eight-state Rocky Mountain region was determined. Using a table of random numbers, applied to the 1967 edition of the Rand-McNally Atlas, twenty such locations were identified, with an additional twenty alternatives. On the basis of state department information and the RMEL Baseline Data Study, the ratio of public to private schools in the Rocky Mountain region was determined to establish a representative proportion of private schools for the study.

Letters were sent to superintendents of the selected school districts to enlist their cooperation in the study. Superintendents were then asked to identify either one, two, or three teachers in their district who met the following criteria: at least one year of satisfactory experience as a second grade classroom teacher (in one instance the superintendent was asked to identify an art teacher and in three instances to identify a physical education teacher in addition to, or in lieu of, a second grade classroom teacher). This procedure was used to identify some eighty teachers to conduct the initial screening. This procedure served to identify the pupil population to be included in the pilot incidence study. An estimated average class size of thirty children yielded a population of approximately 2,400 children to be included in the Level I screening.

Procedures

Development of the Classroom Screening Instrument

Objective The objective of this activity was to develop an instrument which could be utilized by teachers in a systematic way for the identification of pupils who might be called "high risk" in terms of individual learning disabilities. Further, the instrument was designed to provide significant data for diagnosticians, school psychologists, etc., who might be called upon to conduct in-depth evaluations of "high risk" pupils. As a portion of the pilot incidence study, an objective was to establish the content validity and functional reliability and usability of the instrument. The pilot incidence study enabled the laboratory to develop concurrent and predictive validity of the instrument since the Level I screening was following by Level II and III screening, differential diagnosis by both psycho-educational testers and medical personnel.

Procedures During the winter of 1967, a preliminary form of the Classroom Screening Instrument was devised. It was initially checked for usability in all thirty second grade classrooms of the Greeley Public School during the spring of 1967. The Classroom Screening Instrument first instructs teachers to identify those children in their classrooms who were having severe difficulty in learning. Next, they were asked to respond to a series of eighty behavioral indices for each of the pupils identified.

The behavioral indices which teachers were asked to complete for each pupil identified were checklist items of an essentially eclectic grouping of observable behavior which have been gleaned from the germane literature and which more or less collectively have been agreed upon as at least symptomatic of individual learning disabilities. Laboratory personnel attempted to translate the behaviors gleaned from the educational, psychological, and medical literature into "teacher talk." The goal was to design behavioral indices which would communicate clearly to second grade teachers.

Twenty-one selected experts were asked to critique the initial form of the Classroom Screening Instrument. Replies were received from sixteen, four of whom found that the press of other professional endeavors prevented their response to the request. The following persons chose to share their insights with laboratory personnel regarding the instrument:

Barbara Bateman, Ph.D.	Associate Professor of Educational Psychology University of Oregon Eugene, Oregon
Donald Carline, Ph.D.	Professor of Education University of Colorado Boulder, Colorado
Katrina DeHirsch, R.C.S.T.	Director Pediatric Language Disorder Clinic, Columbia-Presbyterian Medical Center New York, New York
Marianne Frostig, Ph.D.	Executive Director Marianne Frostig Center for Educational Therapy Los Angeles, California
John V. Irwin, Ph.D.	President-elect American Speech and Hearing Association University of Kansas Lawrence, Kansas
John B. Isom, M.D.	Diplomat, American Board of Pediatrics Associate Professor of Pediatrics and Neurology University of Oregon Medical School Portland, Oregon
Arthur H. Keeney, M.D.	Professor and Chairman Department of Ophthalmology Temple University School of Medicine, Wills Eye Hospital and Research Institute Philadelphia, Pennsylvania
John Lampe, M.D.	Denver Public Schools Department of Health Services 414 14th Street Denver, Colorado
John Money, M.D.	Associate Professor of Medical Psychology Johns Hopkins University School of Medicine Baltimore, Maryland

Gilbert Schiffman, Ph.D.	**Director of Instruction** **Prince George's County** **Upper Marlboro, Maryland**
George Spache, Ed.D.	**Reading Center** **University of Florida** **Gainesville, Florida**
Empress Y. Zedler, Ph.D.	**Professor and Chairman** **Department of Special Education** **Southwest Texas State College** **San Marcos, Texas**

These individuals not only complied with the RMEL request to rate each behavior on the Classroom Screening Instrument in accordance with their own experience and consequent judgment as to its diagnostic efficacy, but also included at least brief, and in some cases quite lengthy, narrative statements to qualify their reasons for rating a given behavior index as they did. Some feedback was also achieved by telephone and person-to-person conversation.

The consequent Classroom Screening Instrument represents a synthesis of the varied and quite helpful inputs from these experts as well as a reconsideration of the existing literature dealing with the diagnosis of individual learning disabilities.

It is noteworthy that there was considerable agreement across the panel of experts regarding the behavioral indices. There were some instances in which professional training and experience evidently caused various experts to take a diametrically opposed stand with regard to the relative efficacy of certain behavioral indices. This aspect of the panel of experts' reactions proved to be quite revealing and was not entirely unanticipated; in fact, the divergence supports the opinion of these and other experts in this field that the answers are by no means all in at this juncture. In instances where opposite ratings occurred, rather than arriving at some sort of deluded compromise, each point of view is categorically represented in the Classroom Screening Instrument. Where there was considerable consensus that an item had no significant relevance to the task defined for the instrument, it was eliminated. Several suggestions were heeded for inclusion of additional items and for the replacement of a weak item with a stronger one.

No particular attention was paid to the ultimate number of behavioral indices. The revised instrument contains eighty indices as opposed to seventy-eight on the preliminary form. The indices listed on the revised instrument are far more specific, and, according to the general consensus of the panel of experts, represent considerably more clear-cut diagnostic and pathognomonic signs which it was judged a classroom teacher could be expected to observe in her pupils.

The forms for a child's drawn and written production become somewhat more elaborate than were originally conceived in response to several suggestions by the panel of experts. These include a set of spelling and writing productions; reproductions of some simple designs; and the draw-a-man pupil production.

Subsequent to the revision of the CSI, twenty experienced classroom teachers were invited to help clarify the directions and language of the instrument. These persons, largely second grade teachers (a few elementary art and physical education teachers were included), convened for two days and attempted to apply the Classroom Screening Instrument to a series of forty- four appropriate behavioral segments displayed on video-tape. These forty-four segments were specifically selected to represent a wide variety of behaviors typically found in children with learning disabilities and listed among the behavioral indices. After viewing each segment, the teachers categorized the behavior according to the screening instrument and then discussed their choices. In most instances, agreement (reliability) was very high; in some cases, disagreements pointed up ambiguities in wording and, therefore, the statements were rewritten for clarity. Other comments during the discussion periods provided many practical suggestions for improving the format of the instrument and the overall screening process.

The Administration of the CSI

The Classroom Screening Instrument (CSI),* with directions for its administration, a history of its development, and other related materials were distributed to eighty teachers either by mail or in person during the month of April, 1968. It was requested that all instruments be completed and returned to the laboratory within a two week period. All instruments with complete data had been received at the laboratory by the middle of May, 1968.

Each teacher was instructed to have all children in his classroom take a uniform spelling test, complete a pupil productions sheet which provided a sample of handwriting and two reproduction designs, and the Goodenough "Draw a Person Test." The teacher was then instructed to identify "those children who were having severe difficulty learning in the second grade class you teach," to rank them in order of difficulty of learning with the child who had the most difficulty being placed first, and to enter their names in the place provided on the instrument. Each teacher was asked to check each of eighty behavioral indices listed in the CSI for the children identified as having learning difficulties. They were to mark (+) if the behavior was present, (-) if the behavior was absent, or (0) if there was no opportunity to observe the behavior. The teacher was also asked to complete a related information form concerning the child's school performance and family background. This data was compiled from the pupil's cumulative record folder.

The eighty teachers had a mean class size of thirty children; class sizes ranged from twelve to forty-six. Approximately 2,400 children were enrolled in the second grade classes which were screened by the teachers. The teachers reported 478 children by name who were "having severe difficulty learning in their class." The number of names listed by individual teachers on the screening instruments ranged from one to twelve.

Of the eighty teachers who were involved in administering the CSI to their pupils, fifty-five had been oriented by laboratory personnel in the use of the instrument. Their training consisted of an explanation of the CSI and its administration. Teachers were provided practice in their classifying, according to CSI indices, certain relevant ILD classroom behaviors portrayed on a series of video recorded vignettes. The purpose of the latter part of

* Exhibit A

this training was to clarify the language of the CSI and to achieve greater interrater reliability. At the end of the training session, the interrater reliability of the teachers exceeded .85 and, therefore, was judged adequate to proceed with its use.

The remaining twenty-five teachers who participated in the CSI screening received no instructions from the laboratory other than those which are incorporated in the instrument itself. These teachers identified 16 percent of their pupils as having learning disabilities while the trained teachers identified 17 percent.

Reduction of Pupil Population for Psycho-Educational Differential Diagnosis (Level II Screening)

Because of time constraints and limited resources, it was deemed necessary to reduce the target population for Level II screening.

The CSI was designed to identify a pupil population which was having severe difficulty learning in the regular classroom without regard for specifity of cause. As anticipated, the teachers did identify children with severe learning problems, the causes of which included mental retardation or severe cultural deprivation. Since the laboratory excluded these children from its definition of ILD, related information provided by the teachers regarding home background and intelligence was used by the laboratory staff to eliminate some pupils from the population. Intelligence data was not available from school records for all pupils in the population and, therefore, such a judgment could not be rendered in every case.

Children were classified as mentally retarded or slow learners and were eliminated from the population if their reported IQs were less than 80. Although these criteria are lower than those used in many studies and in the administration of most special education programs, it was deemed wise by the staff again to err in the direction of the liberal interpretation of "average or above intelligence." This judgment was based on the fact that intelligence tests do not appear to be as accurate as might be hoped, and it has been indicated recently in the literature that a substantial pupil population who have been classified as mentally retarded or slow learners may in fact be children with individual disabilities. (1)*

An examination of the Level I data pertaining to intelligence and achievement revealed that a number of pupils who had been identified as having learning difficulties were apparently experiencing less of a problem than most or had learned to compensate for their disability in school learning. These pupils were also eliminated from the population to be examined in Level II screening. This data was not available on all children and therefore such a judgment could not be rendered in every case.

The foregoing procedures excluded 117 pupils from the pupil population reported by teachers (478 pupils). This left a balance of 361 pupils who might be regarded as potential ILDs and who would be subjected to Level II screening, psycho-educational differential diagnosis.

Psycho-Educational Differential Diagnosis (Level II Screening)

The psycho-educational differential diagnosis was conducted for the following purposes:

1. to validate teacher judgment in the identification of children with individual learning disabilities

* Number in parenthesis denotes source in list of selected references

2. to provide information regarding the nature of the problems confronting children with individual learning disabilities

3. to validate the usefulness of the classroom screening instruments in identification of children with individual learning disabilities

4. to determine the power of the CSI to elucidate the nature of individual learning disabilities problems.

For Level II screening, a number of instruments were selected from those which had in the past been useful for the identification of pupils with individual learning disabilities and which illuminate specific aspects of their problems. Additional consideration in the selection of these instruments included availability of normative data appropriate for the age of the target population, ease of administration, ease and objectivity of scoring, and value in providing guidelines for the development of prescriptive materials and procedures to aid children with learning disabilities.

The examinations which were selected for use in Level II screening include:

1. Wechsler Intelligence Scale for Children (Wechsler) (21)

2. Wide-Range Achievement Test (Jastak) (13)

3. Developmental Test for Visual Motor Integration (Beery) (5)

4. Developmental Test of Visual Perception (Frostig) (9)

5. Illinois Test of Psycholinguistic Ability (Experimental Edition: Kirk and McCarty) (15)

6. Templin-Darley Tests of Articulation (Templin and Darley) (20)

7. A Standard Pure-Tone Audiometric Test (all audiometers were calibrated ASA)

Fifteen qualified and certified psychological and educational examiners were recruited by the laboratory to administer these tests. All of the examiners were brought to the headquarters of RMEL for a one-week orientation session to facilitate the consistent administration and scoring of the battery. The training included an orientation to the entire study being conducted by the laboratory, explanation of arrangements which had been made through parental and school contacts, procedures to be followed in the administration of Level II screening tests, and a review of administration and scoring procedures for each test in the battery to insure greater reliability among the testers. The fifteen examiners were organized into five three-man teams to conduct the Level II screening. Each team included a person qualified to administer each of the seven specified tests.

Prior to the arrival of the field diagnostic teams at each testing site, an RMEL staff member made all necessary arrangements for the conduct of the examinations. Contact was made with all school officials and each child's parents; and in some instances, where it was deemed

appropriate, teachers. These contacts were made to avoid legal problems and to insure a receptive attitude toward the testing in each site. The RMEL advance man also arranged and scheduled the itinerary for the five diagnostic teams. He made arrangements for appropriate testing stations, testing appointments for each pupil, and necessary transportation arrangements. These arrangements insured efficient use of the diagnostic team and adequate facilities to conduct the examinations.

Written permission was gained from each parent or guardian of each pupil for the conduct of the examination. Written permission was also gained from both parent and school officials to make use of each child's official school records. Each state department of education in the RMEL region was notified that the study was being conducted as well as the qualifications of each member of the diagnostic testing team.

All tests were scored by the field diagnosticians who administered a specific test and scores were recorded on forms specifically designed by RMEL to expedite keypunching and data processing. All data was checked and rechecked by RMEL in-house staff to insure accuracy. All examinations were scheduled and conducted during the months of June and July of 1968. The time lapse from administration of the CSI by teachers to the completion of the examinations by the diagnostic teams was less than two months.

Of the 361 children recommended for Level II screening, 286 actually were available and tested with the full battery. The 75 children who were not tested were either on vacation (33), had moved from the area (24), or permission was not granted by school officials (19 pupils in two locations). The apparent cause of the latter was dissatisfaction with some previous psychological testing which had been conducted by another agency. These are the only two locations where the RMEL personnel or testing team members met with anything less than complete cooperation and assistance.

The seventy-five children who were not reached through Level II screening were not sought out at a later date for followup because it was not feasible. It was considered that their absence from the study was random and non-contaminating. Of the 286 children actually examined by the field diagnostic teams, discrepancies in reported test data required the laboratory to eliminate two subjects from the study.

In summary, of the 361 children who actually were recommended for Level II screening, 284 were tested and the laboratory obtained complete and accurate data for each subject on each test in the battery. Of these 284 children, an examination of the data revealed that there were no false positives; that is, all children showed malfunction in at least one area tested. Thus, it can be concluded that teachers are indeed able to identify quite accurately those children in their classrooms who are having learning problems. Through further examination of the data it was found that the probable source of the learning problem in the case of twenty-four children was less than average intellectual capacity. As anticipated, it is possible for teachers to identify children with individual learning disabilities through utilization of the Classroom Screening Instrument. In the process, teachers will proably identify a number of children who are slow learners or mentally retarded but who are placed in their regular classrooms for instruction.

A question of concern to the laboratory was whether or not the teachers were actually missing some children who should have been identified (the occurrence of false negatives). To check this possibility, four total classes were selected from the original eighty classes in the pilot study, and Level II screening tests were given to all pupils who had not been identified by their teachers as having learning problems. For this total-class Level II screening, diagnostic testers were instructed to administer the Wide-Range Achievement Test, the Templin-Darley Tests of Articulation, Pure-Tone Audiometric Test, and Wechsler Intelligence Scale for Children. The diagnostic team members were asked to examine the results of the administration of these four tests for each pupil and to reach a judgment regarding signs of individual learning disabilities being present or absent. If present, they were to administer the remainder of the Level II screening tests. The diagnostic teams actually administered tests to eighty-seven pupils in the four communities.

A preliminary analysis of the test data indicated that the teachers had apparently not identified eight children who did, in fact, meet the criteria of having a learning disability. Laboratory personnel conducted interviews with each teacher regarding the pupils not identified and in each case found legitimate reasons for such non-identification. In two instances, children were not enrolled in the classrooms of the teachers at the time of the administration of the CSI. In three cases, the teachers misunderstood that they were allowed to list more than six children. In two instances, the teachers did not understand that children who had been retained should be included, and in one instance a child had been placed in the second grade classroom with the understanding that he would pursue the first grade curriculum. This data indicates to laboratory personnel that through minor clarification of instructions in the CSI, teachers in all probability would identify all children in their classrooms with learning problems.

Reduction of Pupil Population for Level III Screening

The purpose of Level III medical testing was not primarily designed to validate the CSI but rather to indicate to what extent organic dysfunction may be related to ILD.

The scores from the various tests administered in Level II screening were utilized to determine learning quotients for each behavioral dimension. These quotients were derived by using Myklebust's formula. This formula is designed to take into account a child's mental age, his chronological age, and his school experience in order to arrive at an expectancy age. The expectancy age is then divided into a child's performance age for various specific behavioral dimensions such as spoken language, reading, spelling, arithmetic, perception, visual motor integration, performance and verbal intelligence. By following these procedures, one derives a quotient from two or more of the dimensions.

The computer printout of all the meaningful quotients was examined to determine those children who were selected for Level III medical diagnosis. Included in the pupil population recommended for Level III screening were those children whose overall learning quotient (the average of eight specific quotients) was equal to, or less than ninety. Also included were those children whose learning quotients derived from two or more specific tests were eighty-four or less. This procedure, in effect, identified the children with the most severe learning problems.

Utilizing these criteria, 134 from the 284 who had completed Level II screening were identified for referral to a medical facility for medical examinations. These children are herein referred to as severe ILD's. The remaining pupils did have evidence of learning disabilities of a milder nature and are referred to in this study as ILD's. Figure 2 presents a summary chart of each step in the screening procedure at each level. Figure 3 presents data regarding pupils involved in each level of screening and population reduction.

Medical Examinations

This portion of the study was designed to thoroughly evaluate a child's physical functioning in order to ascertain either the specific types of physical abnormalities which may be related to his learning disability, or to rule out any physical malfunctioning as a possible explanation for his learning disability. The medical evaluations were performed in a central location, Children's Developmental and Evaluation Clinic at Children's Hospital, Denver, Colorado. Examinations were administered or information was collected for each child in regard to the following: medical history; social history; pediatric evaluation; neurological examination; audiology and speech evaluation; laboratory tests (blood, urine, acid screening and buccal); electroencephalogram (sleep tracing); ophthalmological examination; psychological testing; and occupational therapy examinations. Where deemed important by the medical personnel, children were referred for other examinations such as: x-rays; eye, ear, nose and throat; orthopedic; and psychiatric evaluations. In the case of the psychiatric evaluations, only those children who seemed to be impaired by emotional disturbance were referred and the staff psychiatrist at the clinic was asked to examine the child and give an opinion of the etiology of the emotional disturbance and judge the significance of the problem as it relates to the child's ability to learn.

The Level III medical evaluation was not designed to validate the CSI but rather to indicate to what extent organic dysfunction may be related to individual learning disability. This information would be useful to school personnel in reaching decisions regarding appropriate referral of children to the medical profession.

Administration of Medical Examinations

The advance man of the laboratory contacted each of the 134 families of children identified for medical examination. The purpose of the medical examination of each child was explained to the family and a tentative date for the examination of each pupil was established. The family was also informed about the particulars in terms of transportation and room and board while in Denver for the medical examination. Each family was to be reimbursed for expenses incurred in transporting one parent and the child to Denver, Colorado. Arrangements were made with the Children's Hospital to accommodate their food and lodging needs in their dormitory facility.

In most cases, the examinations were administered in a two-day period of time. In a few instances, where additional examinations seemed warranted or retesting a child in one aspect or another was implied, three days were consumed to complete the examinations. The maximum number of children who could be examined in a week's period of time was six. The examinations were initiated in October, 1968, and were completed by March 15, 1969.

Figure 2
ILD-PILOT INCIDENCE STUDY
Screening Procedures

Level I Screening (Administered by classroom teachers) Classroom Screening Instrument (CSI)

1. Identify children in your class who have severe learning disabilities
2. Spelling test
3. Pupil data sheet (pupil production)
4. Reproduction of two designs
5. Draw a person
6. Related pupil information

Population Reduction for Level II Screening on following criteria:

1. Doing as well as could be expected
2. Mental retardation (IQ 79 or less)
3. Culturally deprived (family and parent information)

Level II Screening (Administered by qualified psycho-educational testers) Psycho-Educational Differential Diagnosis

1. Wechsler Intelligence Scale for Children
2. Wide Range Achievement Test (reading, spelling, arithmetic)
3. Developmental Test of Visual perception (Frostig)
4. Developmental Test of Visual Motor Integration (Beery)
5. Illinois Test of Psycholinguistic Ability (Kirk and McCarty)
6. Templin-Darley Articulation Test
7. Pure-Tone Audiometric Test

Population Selection for Level III Screening on following criteria:

1. Derived total learning quotients 90 or less
2. Derived learning quotients on two standard tests (Level II nos. 1, 2, 3, 4, 5, 6) of 84 or below

Level III Screening (Administered by medical personnel) Medical Examination

1. medical history
2. social history
3. pediatric examination
4. neurological examination
5. audiology and speech evaluation
6. laboratory tests
7. electroencephalogram
8. opthalmolgical examination
9. psychological examination
10. occupational therapy examination
11. additional examinations as indicated (i.e. x-ray; eye, ear, nose and throat; orthopedic and psychiatric)

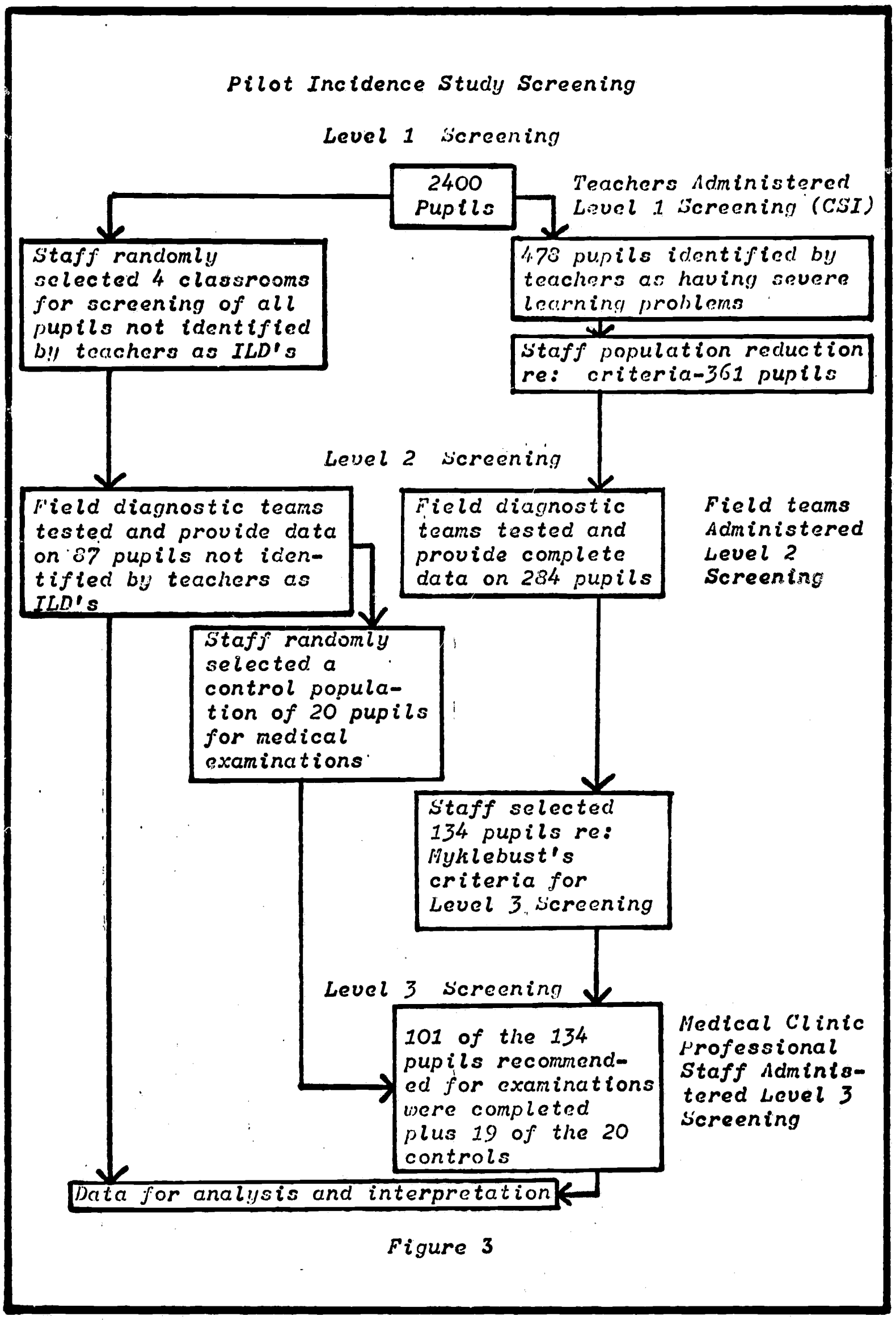

Pilot Incidence Study Screening
Level 1 Screening
2400 Pupils
Teachers Administered Level 1 Screening (CSI)
Staff randomly selected 4 classrooms for screening of all pupils not identified by teachers as ILD's
478 pupils identified by teachers as having severe learning problems
Staff population reduction re: criteria-361 pupils
Level 2 Screening
Field diagnostic teams tested and provide data on 87 pupils not identified by teachers as ILD's
Field diagnostic teams tested and provide complete data on 284 pupils
Field teams Administered Level 2 Screening
Staff randomly selected a control population of 20 pupils for medical examinations
Staff selected 134 pupils re: Myklebust's criteria for Level 3 Screening
Level 3 Screening
101 of the 134 pupils recommended for examinations were completed plus 19 of the 20 controls
Medical Clinic Professional Staff Administered Level 3 Screening
Data for analysis and interpretation

Figure 3

Of the 134 pupils actually recommended for medical evaluation, 102 were actually examined. In addition to this number, twenty randomly selected control pupils, having neither individual learning disabilities nor learning problems in the judgment of teachers, were also recommended for medical evaluation. This was to insure that medical examinations were administered without bias. Of these twenty children, nineteen actually arrived at Children's Hospital and were examined.

From data collected by the several members of the medical examination team, summary reports were developed for each child. All of the data was punched on a Speediotronic Standard Data Form utilized by Children's Hospital to facilitate data retrieval. This data was then transposed onto coding sheets and keypunched by the Colorado State College Computer Center for ultimate processing. It is important to mention that the neurological evaluation was conducted in accordance with guidelines provided by Dr. Mark N. Ozer, M.D., Children's Hospital of the District of Columbia. These guidelines were utilized in order to insure consistency in the sequence of the examination as well as coding procedures.

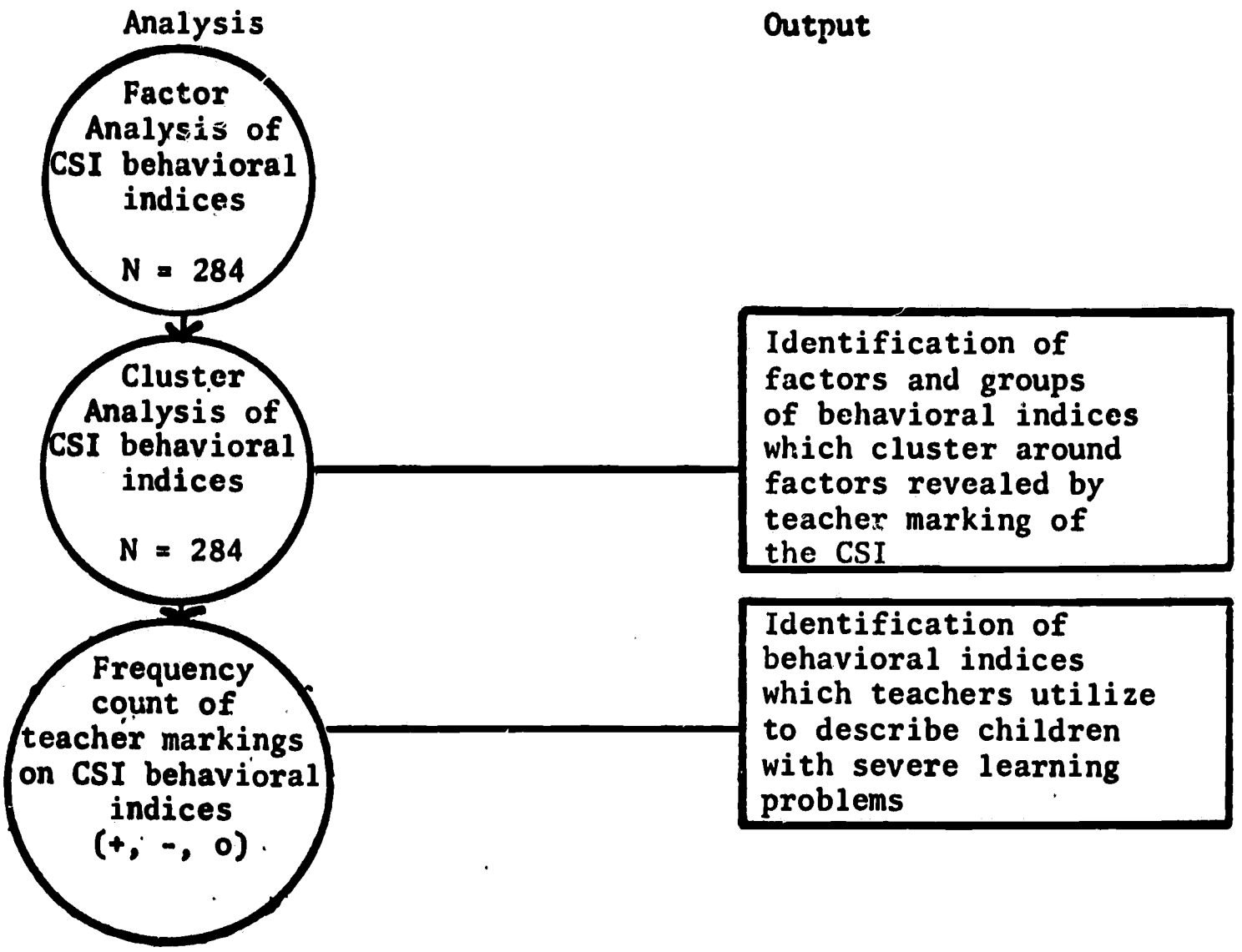
Following the collection of all data, the medical doctor in charge of coordinating this aspect of the study reviewed each case and made certain recommendations. These recommendations are similar to those made by the Children's Development and Evaluation Clinic for children who come to their attention through either school or physician referral.

DATA ANALYSIS DESIGN

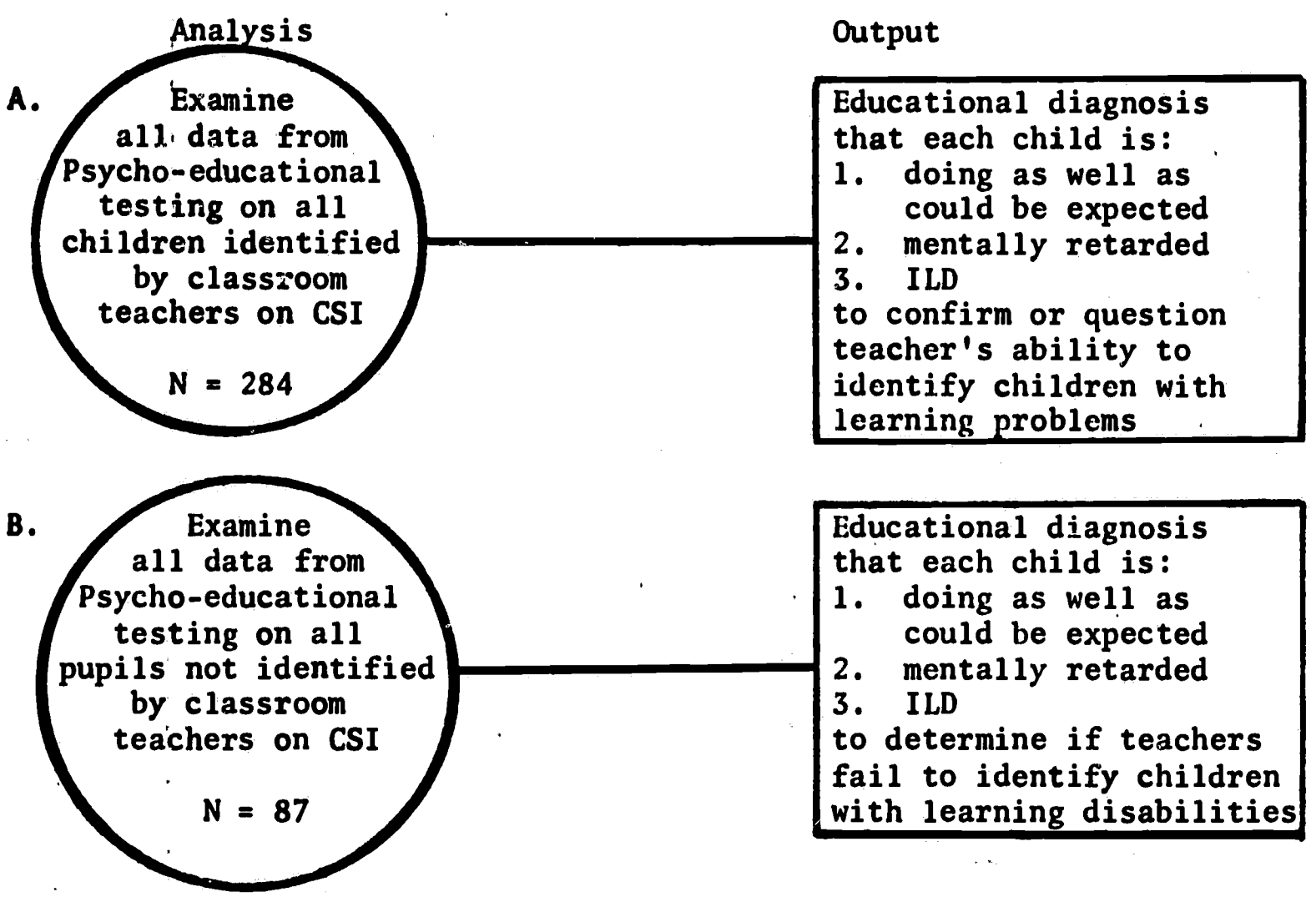
Following the collection, coding and key punching of all data, analysis was initiated. Procedures were followed in order to obtain both descriptive and statistical information. The design was conceived to explore teacher utilization of the Classroom Screening Instrument behavioral indices and to discover the relationships between and among each level of screening completed. The steps in the data analysis are indicated on charts presented on the following pages. Each analysis performed is indicated and the potential output anticipated. Because of the pressure of time to meet scope of work deadlines, and also the decision by the Office of Education to phase out its funding of the Rocky Mountain Educational Laboratory, it was impossible to complete a thorough analysis and interpretation of several important aspects of this study. Two aspects of the study which should be thoroughly investigated, but could not be by the laboratory, are the relationships between groups of CSI behavioral indices and psycho- educational diagnostic testing with medical diagnosis. It is our strong belief that significant relationships may exist in these areas.

In retrospect, the staff strongly feels that the study would have gained much power had medical examinations been completed not only on the children having severe learning problems, but on children who have evident disabilities of a milder nature, as well as a control population who appear to have no learning disabilities. This would have allowed staff members to make comparisons among the three groups on all the instruments and evaluations. The study was not conceptualized in this manner because of fiscal and temporal constraints. The staff would strongly recommend; however, that such a study needs to be conducted in order to elucidate more specifically the nature of problems confronting children with varying levels of learning disability.

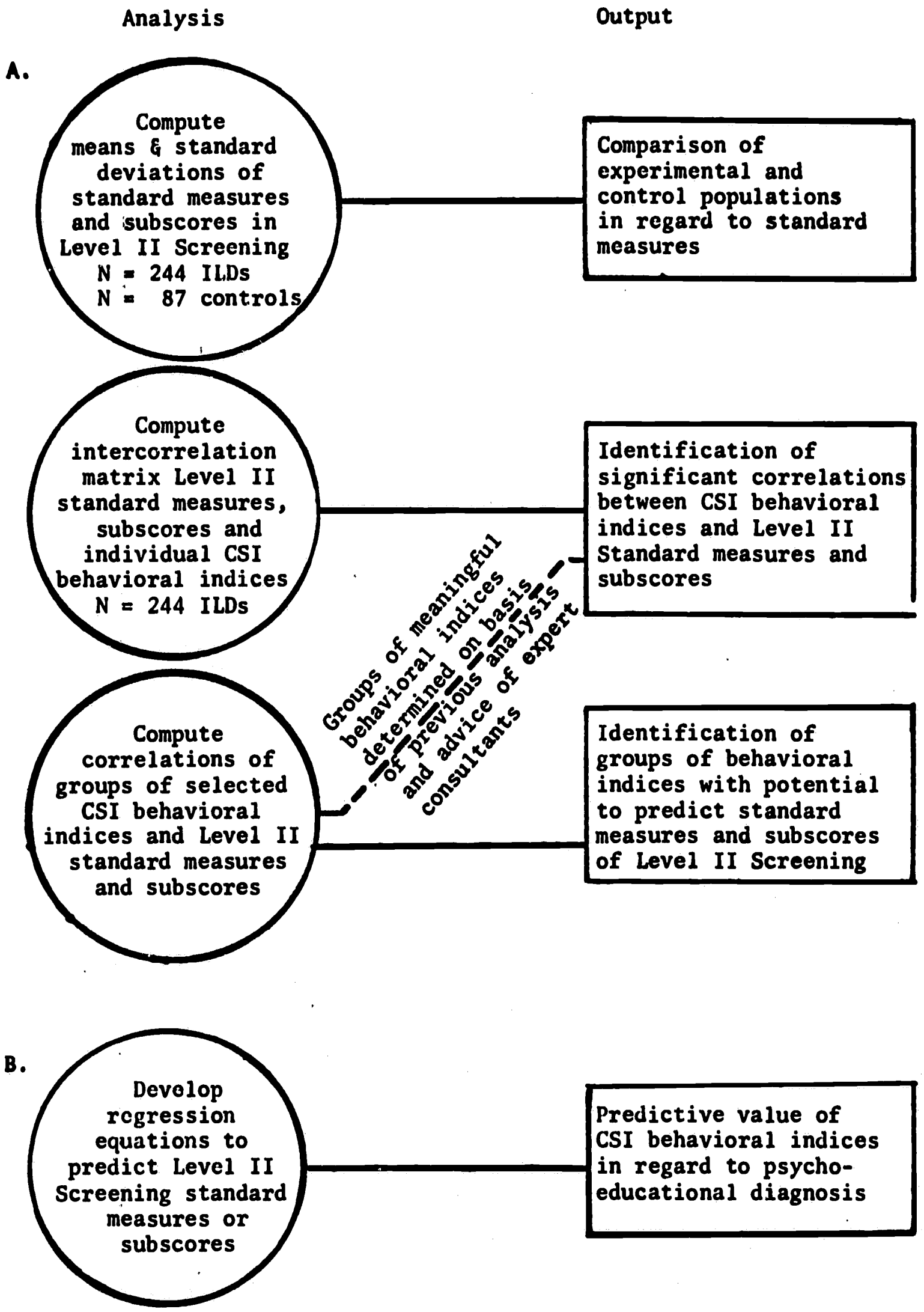
I. Data analysis regarding the Classroom Screening Instrument Behavioral Indices



II. Validation procedures teacher ability to identify all pupils with learning disabilities



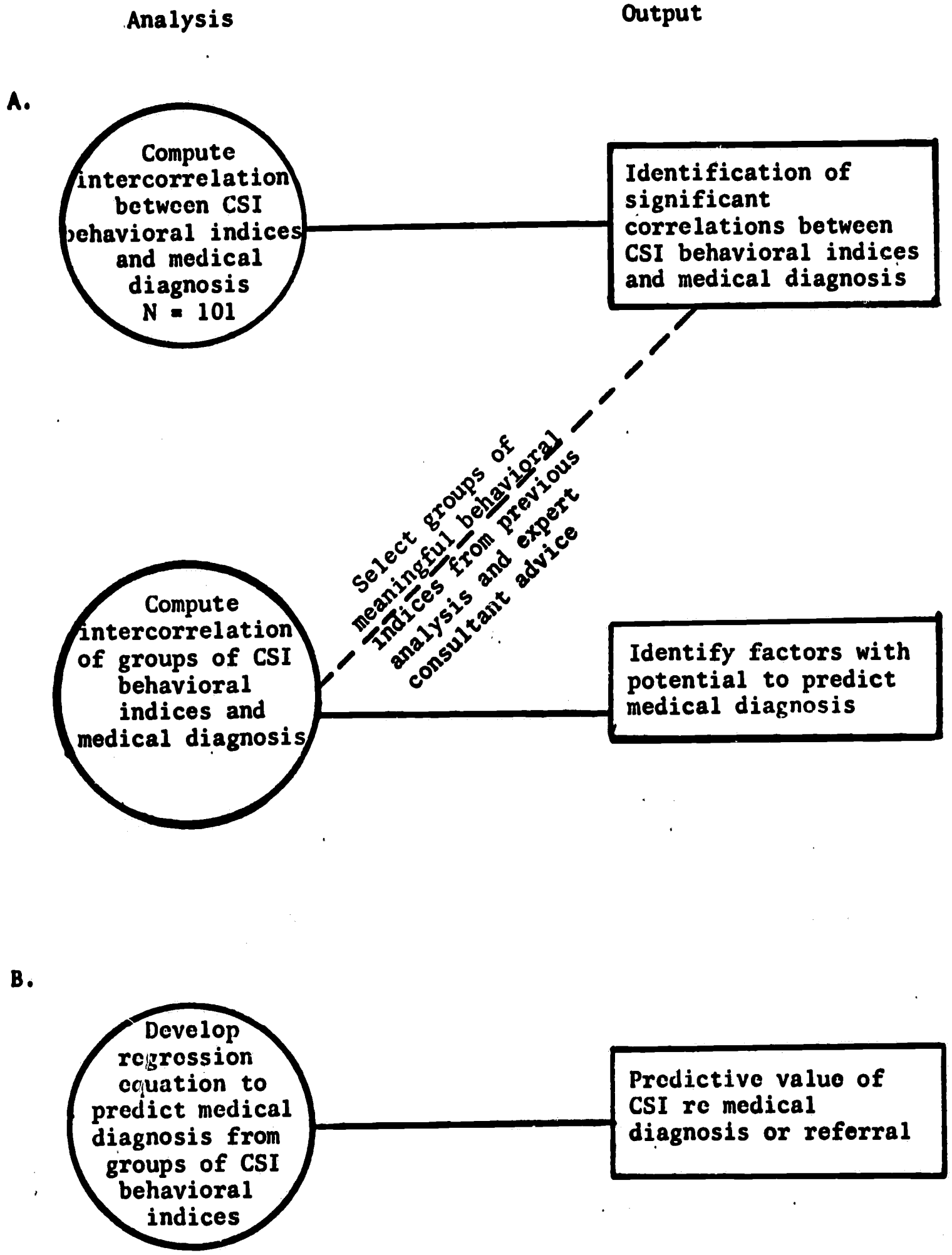
III. Data analysis regarding Psycho-Educational Differential Diagnosis and relationships with CSI behavioral indices



IV. Data analysis regarding the relationships between psycho-educational standard measures and medical diagnosis

	Analysis	Output
A.	Compute intercorrelation between psycho-educational standard measures and medical diagnosis N = 101	Identification of significant correlations between psycho-educational measures and medical diagnosis
	Compute all meaningful correlations between standard measures or combinations of same with medical diagnosis	Identification of standard measures of combinations of same with potential to predict medical diagnosis
B.	Develop regression equation to medical diagnosis from psycho-educational standard measures	Predictive value of psycho-educational standard measures re medical diagnosis

V. Data analysis regarding the relationship between CSI behavioral indices and medical diagnosis

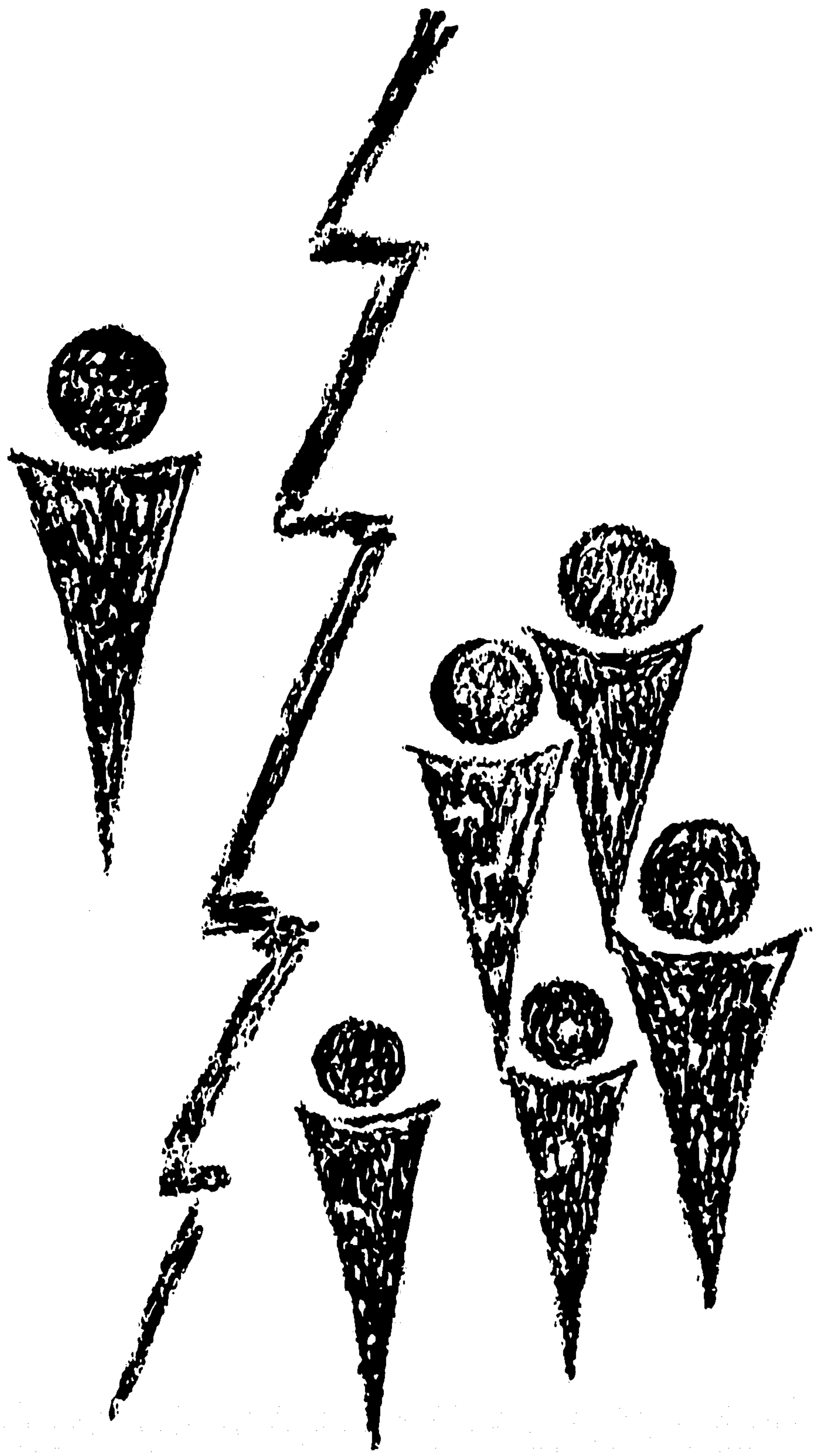


LIST OF SELECTED REFERENCES

1. Dunn, Lloyd M. "Special Education for the Mildly Retarded-Is Much of it Justifiable?" Exceptional Children, XXXV, No. 1 (Sept., 1968), 12. Washington, D.C.

Rocky Mountain Educational Laboratory, Inc.

1620 Reservoir Road • Greeley, Colorado 80631 • Telephone (303) 353-6350



TECHNICAL REPORT

INDIVIDUAL LEARNING DISABILITIES PROGRAM
PILOT INCIDENCE STUDY - VOL. II

DESCRIPTIVE ANALYSIS

ROCKY MOUNTAIN EDUCATIONAL LABORATORY

PILOT INCIDENCE STUDY

Technical Report **Volume II**

Prepared by

ROCKY MOUNTAIN
EDUCATIONAL LABORATORY
GREELEY, COLORADO

Verl O. Cazier
Project Assistant

Dr. Marian T. Giles
Project Assistant

Dr. Willard G. Jones
Executive Director

August, 1969

Prepared pursuant to a contract with the United States Office of Education, Bureau of Research, H.E.W.
Contract No. OEC-4-7-062828-30-63

Dr. Willard G. Jones
Executive Director

ROCKY MOUNTAIN EDUCATIONAL LABORATORY, INC.
1620 Reservoir Road
GREELEY, COLORADO 80631

TABLE OF CONTENTS

ILLUSTRATIONS

INDIVIDUAL LEARNING DISABILITIES

PILOT INCIDENCE STUDY

Foreword

This study was conducted as the initial effort of the Rocky Mountain Educational Laboratory in its individual learning disabilities program. It was undertaken to gain data on the occurrence and nature of individual learning disabilities. The results of this study would provide direction for the laboratory in the development and testing of classroom usable prescriptive materials for the prevention or remediation of problems confronting children with identified disabilities.

The Rocky Mountain Educational Laboratory is one of twenty regional laboratories primarily funded by the Office of Education, Bureau of Research, Division of Educational Laboratories. The Rocky Mountain Educational Laboratory area of operation includes: Arizona, Colorado, Idaho, Montana, Utah, Wyoming, and part of Nebraska and Kansas.

This study is presented in three volumes:

Volume
One: *Introduction and Procedures-Individual Learning Disabilities Pilot Incidence Study*

Volume
Two: *Descriptive Analysis of Level I, Level II, and Level III Data-Individual Learning Disabilities Pilot Incidence Study*

Volume
Three: *Statistical Analysis of Level I, Level II. Level III Data, Summary and Conclusions- Individual Learning Disabilities Pilot Incidence Study*

DESCRIPTION ANALYSIS OF LEVEL I DATA

The Level I screening utilizing the Classroom Screening Instrument (See Appendix for CSI description) was conducted by eighty classroom teachers in this eight- state region. As was mentioned earlier, the teachers identified and subsequently screened 478 pupils with the CSI. After further screening by the RMEL staff and the fifteen psycho-educational diagnosticians, (Mental Retardation and Culturally Disadvantaged etiology) the final ILD population was 284 pupils.

A frequency count of the teacher markings on the CSI behavioral indices was made on the 284 ILD subjects. Figure 1 shows the actual count of positive observations noted for each CSI item. The positive mark indicated that the particular behavior was present in the subject.

FIGURE 1

It is evident that teachers observed and marked positively (+) some behaviors much more frequently than others. This is probably due to the fact that the subjects clearly manifested these specific behaviors or that certain behaviors are more easily observed. It is interesting to note the items which described this population most clearly. Item 56, "substitutes words which distort meaning (when for where);" item 54, "reads slowly," and item 57, "can't sound out or "unlock" words," indicates the difficulties the children have with visual and auditory perception and neurological processing of information. These subjects were easily distracted and had many problems in organizing information for retrieval. These key factors are further identified in the Level II screening. However, four of the items were marked most often with a zero (neutral rating) and seemed to contribute very little to the screening. The items teachers appeared unable to discern or discriminate were:

(a) Item 18, "Lips remain apart when at rest (mouth breathing)"
(b) Item 51, "Can read better when print is upside down"
(c) Item 75, "Afraid of many things which most peers don't fear"
(d) Item 80. "Objects or refuses to go to school either because of fear or failure"

The teachers may not have marked these four items positively because of the maturation levels of these particular children. Had the screening been completed on a younger population, these items might have been quite descriptive. With revision, the CSI should be even more descriptive, becoming a highly discriminating learning behavior scale which could be utilized in all levels of early childhood education.

Following the psycho-educational diagnosis of Level II screening, the ILD subjects were classified into three groups according to the severity of their learning problems. This resulted in the following groupings:

(a) Slow learners N = 24

Frequency Distribution of teacher's posttive observations of learning behavior items described in the CSI (See Appendix for description of items)
N= 284 ILD Population

CSI Item	+	Item	+	Item	+	Item	+
1	49	21	71	41	78	61	49
2	112	22	40	42	102	62	175
3	52	23	70	43	131	63	79
4	55	24	72	44	121	64	132
5	24	25	160	45	147	65	105
6	41	26	96	46	148	66	121
7	73	27	101	47	183	67	159
8	8	28	37	48	43	68	141
9	7	29	22	49	135	69	159
10	117	30	18	50	79	70	91
11	173	31	69	51	8	71	47
12	153	32	37	52	107	72	52
13	59	33	73	53	126	73	59
14	36	34	190	54	194	74	28
15	95	35	187	55	140	75	21
16	67	36	111	56	200	76	38
17	47	37	19	57	182	77	110
18	52	38	34	58	123	78	122
19	53	39	15	59	186	79	59
20	124	40	77	60	180	80	9

Figure 1

(b) Severe ILD N = 115

(c) ILD N = 145

The staff then tallied the positive observation marks identified by the classroom teachers on the CSI and categorized them as to their particular ability group and into the specific learning behavior cells. Figure 2 shows the mean numbers of positive observations marked on the CSI for the ILD's, SILD's and slow learners.

MEAN NUMBER OF POSITIVE OBSERVATIONS MARKED ON CSI FOR THREE GROUP SPLIT OF ORIGINAL 284 ILD SUBJECTS BY LEARNING BEHAVIOR CELLS

	Physical Motoric	Visual Reception	Auditory Reception	Processing	Expression	Behavior
Slow Learners N = 24	5.0	16.0	10.0	19.0	3.0	11.5
SILD N = 115	4.0	15.0	10.0	18.0	2.5	12.0
ILD N = 145	3.5	11.0	7.0	14.0	2.0	9.5

FIGURE 2

When these means were plotted on a graph the learning characteristics of these subjects became quite evident. The graph developed from these means is Figure 3. It is interesting to note the similarities inherent in these separate groups. The learning strengths and weaknesses are the same except for the fact that the ILD group has fewer markings in each category. It might be inferred from this study, that slow learners (IQ 79 and below) and SILD subjects are described by teachers in much the same terms. In any case it can be concluded that the CSI is a sensitive and quite precise instrument for identifying these specific groups when used according to the instructions.

The 80 CSI items were studied and recategorized into six learning behavior cells by the RMEL psycho-educational diagnosticians. This new grouping was found to be more indicative of the logical learning functions described by the items. It can be seen in Figure 4 that many of the items describe more than one learning behavior. Item 15 is an example of this overlapping. "Can't pronounce the sounds of certain letters," requires the child to identify the letter visually (Visual Reception), or by hearing it (Auditory Reception), before he can get meaning (Processing) and finally pronounce it (Vocal Expression). This item was descriptive of 95 of the 284 ILD subjects screened by their second grade teachers. (Figure 4)

Comparison of Mean Numbers of Positive Observations

on CSI for ILD 3 Group Split

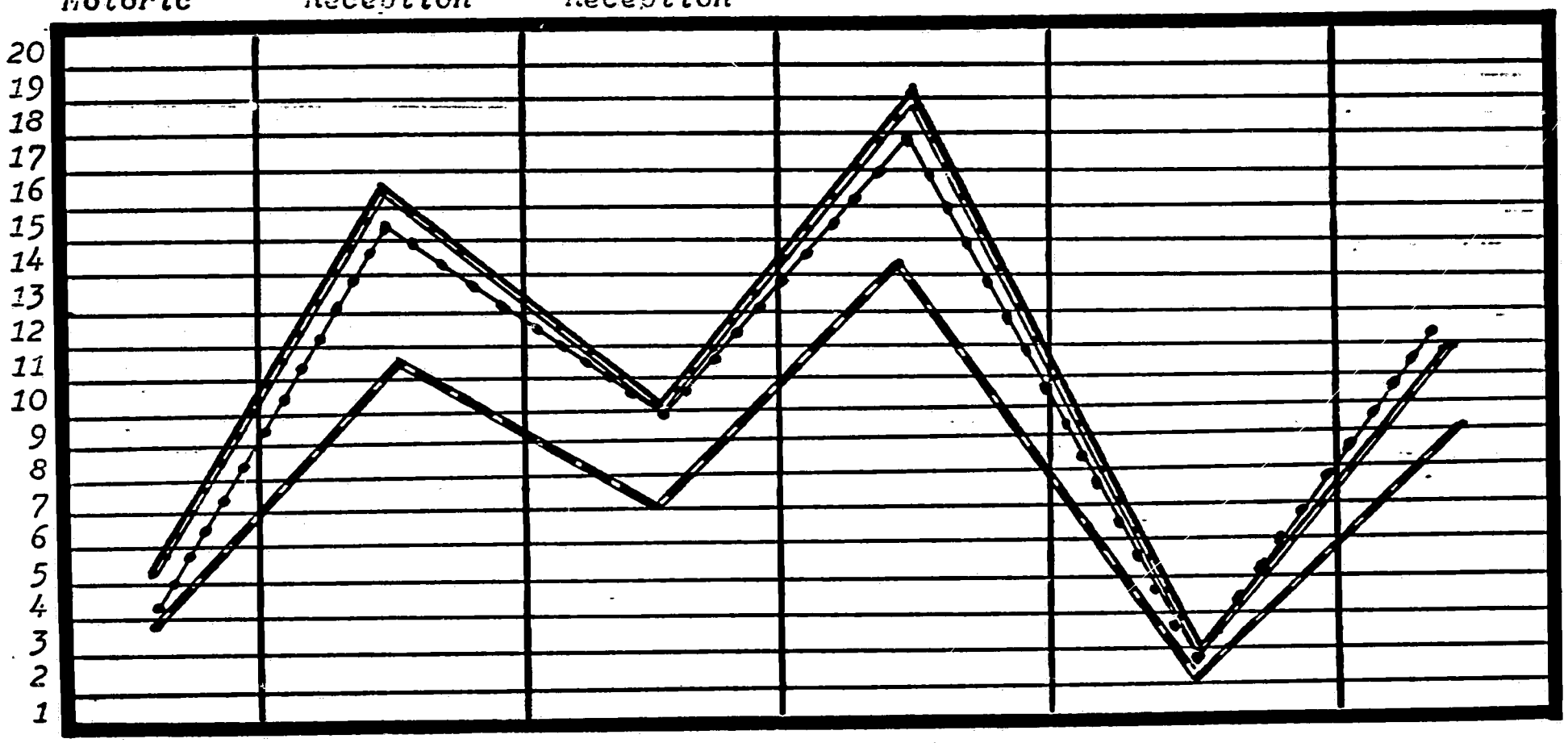


Figure 3

Level 1- CSI Items Categorized into Six Learning Behavior Cells

Physical Motoric	Visual Reception	Auditory Reception	Processing	Expression	Behavior
	1				1
	2				2
	3				3
	4				4
	5				
	6				6
	7				7
	8				
	9				
		10			
		11			11
		12	12		
		13	13		
	14		14	14	
	15	15	15	15	
		16	16	16	
		17	17	17	17
18					
19					
		20	20	20	
			21	21	
		22	22		
			23		
					24
					25
					26
					27
28					
29					
30					
31					
32					
33					
					34
					35
			36		
37	37		37		
38	38		38		
			39		
40					40

Figure 4

Level 1- CSI Items Categorized into Six Learning Behavior Cells

Physical Motoric	Visual Reception	Auditory Reception	Processing	Expression	Behavior
			41		
42	42		42		
43	43		43		
44	44		44		
45	45		45		
	46		46		
	47	47	47		
	48	48	48		
	49	49	49		
	50	50	50		
	51				
	52		52		
	53		53		
	54		54		
	55		55		55
	56	56	56		
	57	57	57		
			58		
	59	59	59		
	60	60	60		
			61	61	61
	62		62		
	63		63		
	64		64		
					65
					66
	67	67	67		67
	68	68	68	68	68
			69		69
					70
					71
					72
					73
					74
					75
					76
					77
					78
					79
					80

Figure 4

Analysis of Data

The Level II psycho-educational differential diagnosis was conducted for four major purposes, one of which was to provide information regarding the nature of the problems confronting children with individual learning disabilities. To accomplish this purpose, initially the computer printout showing total scores and quotients of the 284 ILD subjects and the 87 non-ILD control subjects was closely examined by educational diagnostic specialists on the RMEL staff. After this examination, the following groups of subjects were identified and classified as follows:

a. 67 control subjects with partial testing.
b. 20 control subjects with complete testing.
c. 134 ILD subjects identified for Level III (Medical) testing
d. 137 ILD subjects not identified for Level III (Medical) testing
e. 13 ILD subjects considered doing as well as could be expected.

The staff then began searching for numerical discrepancies between a subject's cognitive potential and his achievement level. It could be seen from this analysis that very little difference was evident here. The utilization of total scores simply verified the knowledge that these experimental subjects were falling, for the most part, into the average range of scholastic abilities.

As mentioned earlier, the subjects manifesting the most severe learning problems were referred to Children's Hospital, Denver, Colorado for complete medical diagnosis in order to see what relationships might exist between psycho-neurological disorders and individual learning disabilities. A learning quotient, derived from a formula used earlier by Dr. Helmer Myklebust, was utilized in determining the more severe ILD subjects. Every subject whose overall learning quotient (an average of eight specific quotients) was below 90, or who had quotients below 85 in two or more specific parameters was included in the Level III medical diagnosis group. This procedure identified 134 subjects (SILD) who appeared to have learning problems of a more severe nature. However, the RMEL staff was well aware of the fact that in many cases, very few points separated these severe ILD's from the milder cases (ILD).

The nagging question persisted in the minds of the staff: what do we know about the 150 children identified by their teachers as learning disabled, yet whose total test scores were too high to qualify them for the medical diagnosis?

In attempting to answer this question, the Level II (Psycho-Educational) sub-test scores of these ILD subjects were examined. At this time a reclassification of the groups appeared to be necessary. The following groups emerged quite naturally:

a. 24 slow learners (WISC Full Scale I.Q. 79 or below on Level II testing)
b. 85 severe ILD's who received the medical diagnosis re: Myklebust's I.Q. criteria.
c. 30 severe ILD's referred to Level III diagnosis but who for various reasons did not enter the hospital.
d. 145 ILD's including the 13 subjects who had previously been identified as doing about as well as could be expected considering their total scores.
e. 19 non-ILD control subjects who received the medical diagnosis.

The Level II sub-test scores were analyzed in the following manner: The deviate low scores were identified and a learning profile was drawn for each subject in all five groupings. (See Figure 5). When the high scores were examined, learning patterns began to emerge. It could be seen that the ILD subjects not referred to the medical diagnosis had some sub-test scores high enough to pull the low sub-test scores above the Myklebust L.Q. criteria limits. These children simply had higher "highs" than the group who received the medical diagnosis. However, their low scores were as low or lower than the severe ILD subjects. The staff diagnosticians then devised a criteria measurement scale to be used in judging the problem areas evident in individual learning disabilities. The sub-tests were listed numerically and a pattern involving two or more sub-scores in a particular area were deemed necessary in order to justify a true deficiency in learning for an individual subject. (See Figure 6 and 7) The learning function categories were as follows:

a. visual-motor
b. visual memory
c. auditory memory
d. integration or organization
e. problem solving
f. self-expression
   (1) motor
   (2) vocal
g. use of two sensory channels simultaneously (e.g., changing visual stimuli to auditory symbols as necessary for spelling or oral reading)

This diagnosis was also conducted on the test scores of the non-ILD control subjects in order to ascertain if there was any evidence of malfunction in the learning processes of children who did not appear to teachers to have any difficulty learning. A slight amount of difficulty was found in the visual memory and self-expression areas but seemed to be due to the maturation level of this age group:

These evident deficiencies in learning of all groups were then tallied. (See Figure 8) Within the groupings of subjects, a frequency count was made and percentiles were computed. (See Figure 9)

When these percentiles were placed on a graph, the 85 medical ILD subjects were combined with the 30 subjects referred for medical examination but who did not enter the hospital. Thus the 115 represent the full population of severe ILD's, originally identified by the Myklebust learning quotient formula.

Figure 10 shows the comparison of learning problems manifested by the four specific groups. It was interesting to note the overlapping of the ILD and SILD groups. However, the slow learners and controls were clearly identified as distinct groups, the former being quite deviate in all areas and the latter showing little or no difficulty in learning function.

Statistical Analysis-Level II

The intercorrelation matrix of Level I CSI data with Level II psycho-educational data was examined by the RMEL staff. Figures in parentheses indicate selections in List of References. The 263 variables were as follows:

1-80	CSI Behavioral Indices
81	Retained in school

LEVEL II
INDIVIDUAL DIAGNOSTIC FORM

Identification Sample Report Illustrating Deviate Low Scores

FROSTIG

____ Eye-motor coordination
____ Figure ground
____ Constancy of shape
X Position in space
____ Spatial relationships

I.T.P.A.

____ Auditory decoding
____ Visual decoding
____ Auditory vocal association
X Visual motor association
____ Vocal encoding
____ Motor encoding
X Auditory vocal automatic
X Auditory vocal sequential
____ Visual motor sequential

WRAT

____ Reading
X Spelling
____ Arithmetic

DURRELL-SPACHE

X Oral
____ Silent
____ Listening
____ Comprehension

W.I.S.C.

Verbal
____ Information
____ Comprehension
____ Arithmetic
____ Similarities
____ Vocabulary
X Digit Span

Performance
____ Picture Completion
X Picture arrangement
____ Block Design
____ Object assembly
____ Coding
X Mazes

AUDITORY

VISUAL MOTOR

Diagnosis: Breakdown in organizational skills. Poor auditory and visual memory. Has difficulty using two or more sensory channels simultaneously.

Figure 5

LEVEL II
TESTING INSTRUMENTS AND SUBTESTS

FROSTIG

1 - Eye-motor coordination
2 - Figure ground
3 - Constancy of shape
4 - Position in space
5 - Spatial relationships

I.T.P.A.

1 - Auditory decoding
2 - Visual decoding
3 - Auditory vocal association
4 - Visual motor association
5 - Vocal encoding
6 - Motor encoding
7 - Auditory vocal automatic
8 - Auditory vocal sequential
9 - Visual motor sequential

W.R.A.T.

1 - Reading
2 - Spelling
3 - Arithmetic

DURRELL-SPACHE

1 - Oral
2 - Silent
3 - Listening
4 - Comprehension

W.I.S.C.

Verbal

1 - Information
2 - Comprehension
3 - Arithmetic
4 - Similarities
5 - Vocabulary
6 - Digit Span

Performance

7 - Picture completion
8 - Picture arrangement
9 - Block design
10 - Object assembly
11 - Coding
12 - Mazes

AUDITORY

VISUAL MOTOR

Figure 6

CRITERIA USED FOR JUDGING

THE PROBLEM AREAS

EVIDENT IN ILD

In order to justify a deficiency in any problem area, a pattern involving two or more instruments should be evident.

Problem Areas

1. Visual Motor
   A. Frostig - 1
   B. WISC - 11, 12

2. Visual Memory
   A. Frostig - 3, 4
   B. ITPA - 9
   C. WRAT - 1, 2
   D. Durrell-Spache - 2
   E. WISC - 7, 9, 11

3. Auditory Memory
   A. ITPA - 8
   B. WRAT - 2
   C. WISC - 5, 6
   D. Durrell-Spache - 1, 3

4. Integration or Organization (Neurological)
   A. Frostig - 2, 4, 5
   B. ITPA - 3, 4, 7, 8, 9
   C. WRAT - 2
   D. Durrell-Spache - 1, 4
   E. WISC - 4, 6, 7, 8, 9, 10

5. Problem Solving
   A. Frostig - 5
   B. ITPA - 3, 4
   C. WRAT - 3
   D. WISC - 2, 3, 4, 8, 9, 10, 12

6. Motor Expression
   A. ITPA - 6

7. Vocal Expression
   A. ITPA - 5
   B. WISC - 2, 5
   C. Durrell-Spache - 4

8. Two or More Channels
   A. Frostig - 1, 5
   B. ITPA - 3, 4, 7, 8, 9
   C. WRAT - 1
   E. WISC - 11, 12

Figure 7

Number	Visual Motor	Visual Memory	Auditory Memory	Integration or Organization	Problem Solving	Self Expression Motor	Self Expression Vocal	Two or More Channels
001	X	X		X	X			X
003			X	X			X	X
005	X	X		X				X
009	X	X	X	X	X		X	X
010	X	X	X	X			X	X
013		X		X			X	X
014	X	X		X	X		X	X
018		X		X				X
024	X		X	X				X
025		X		X		X	X	X
029	X	X		X	X	X	X	
030					X		X	
034	X		X	X				X
035	X	X		X	X	X	X	X
037	X	X		X				X
038			X					
040				X	X	X	X	X
041		X		X	X	X		X
044		X	X	X	X		X	

Figure 8

Percentages of Subjects in Each Group Showing Deviate Scores RE: Criteria

	Visual Motor	Visual Memory	Auditory Memory	Integration or Organization	Problem Solving	Expression Motor Voc.		2 or more Channels
NR N=24	83	95	79	100	97	60	88	100
MED. ILD N=85	38	71	57	57	50	30	54	56
MED. & REF. SEVERE ILD N=115	37	63	60	63	52	40	50	55
REF. ILD N=30	36	55	64	69	54	50	45	54
ILD N=145	40	79	42	44	32	29	52	28
CONT. N=18	17	33	17	17	17	26	26	11

Figure 9

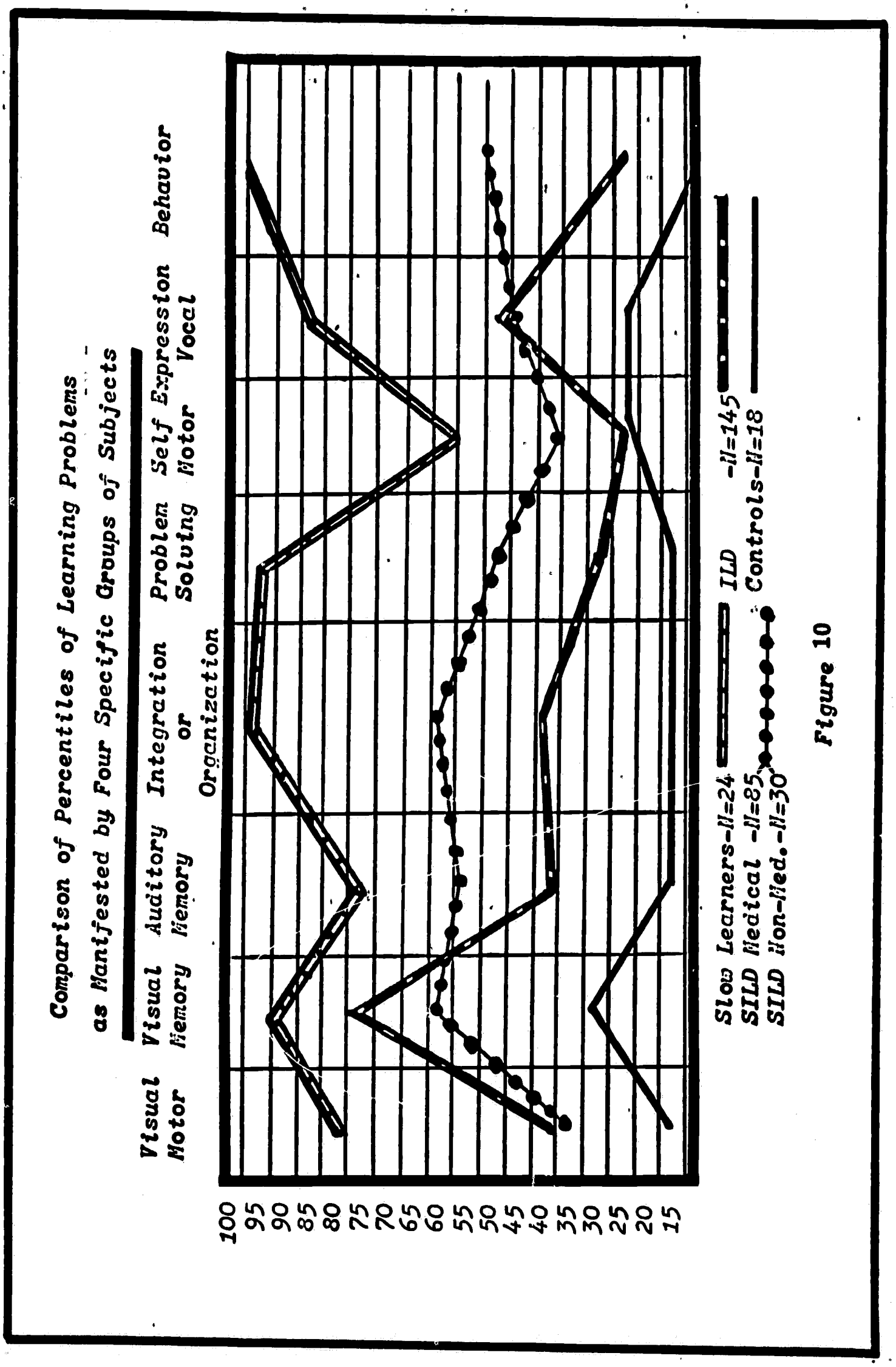

Comparison of Percentiles of Learning Problems
as Manifested by Four Specific Groups of Subjects
Visual Motor
Visual Memory
Auditory Memory
Integration or Organization
Problem Solving
Self Expression Behavior
Motor
Vocal
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
Slow Learners-N=24
SILD Medical -N=85
SILD Non-Med. -N=30
ILD -N=145
Controls-N=18

Figure 10

82	Spelling Words
83	Drawing a Diamond
84	Drawing Wavy Lines
85	Draw-a-Man (10)
86-109	Related School Information

Visual Motor Integration Scale (1)

110	Quotient

Developmental Test of Visual Perception (8)

111	Eye-Motor Coordination
112	Figure-Ground
113	Constancy of Shape
114	Position in Space
115	Spatial Relationships
116	Perceptual Age

Illinois Test of Psycholinguistic Abilities (13)

117	Auditory Decoding
118	Visual Decoding
119	Auditory Vocal Association
120	Visual Motor Association
121	Vocal Encoding
122	Motor Encoding
123	Auditory Vocal Automatic
124	Auditory Vocal Sequential
125	Visual Motor Sequential
126	Standard Score
127	Language Age

Wechsler Intelligence Scale for Children (19)

128	Information
129	Comprehension
130	Arithmetic
131	Similarities
132	Vocabulary
133	Digit Span
134	Picture Completion
135	Picture Arrangement
136	Block Design
137	Object Assembly
138	Coding
139	Mazes
140	Scaled Score-Verbal
141	Verbal IQ
142	Scaled Score-Performance
143	Performance IQ
144	Full Scale Score
145	Full Scale IQ
146-159	Audiometric-Pure Tone

Wide Range Achievement Test (11)

160	Reading

161 Spelling
162 Arithmetic

Articulation (17)

163-213 Articulation
214 Total Screening
215 Total Diagnostic

Durrell (7)
Spache (16)

216-234 Reading Analysis
235 Sex
236 State
237 Population
238 Chronological Age
239 Grade Age
240 Mental Age
241 Expectancy Age = $\frac{CA+GA+MA}{3}$
242 Frostig $\frac{PA}{EA}$
243 ITPA $\frac{LA}{EA}$
244 WISC $\frac{MA}{EA}$
245 VMI $\frac{VMA}{EA}$
246 Articulation $\frac{AA}{EA}$
247 Reading-Standard Score
248 Spelling
249 Arithmetic
250 Spatial-WISC (PC + BD + OA)
251 Conceptual-WISC (Comp + Simul + VOC)
252 Sequential-WISC (DS + PA + Coding)
253 Learning Quotient $\left\{-\frac{\text{No.s } 242,243 \ldots 249}{8}\right. \div EA$
254 Verbal IQ
255 Performance IQ

Raw Scores

256 Frostig
257 ITPA
258 WISC
259 VMI
260 Articulation
261 Reading
262 Spelling
263 Arithmetic

In order to show the significant relationships between the Level II diagnostic variables and the 80 behavioral indices of Level I, the CSI booklets were utilized. For example, the items significantly related to specific diagnostic variables could be seen in their relationships to several variables simultaneously. Figure 11 is a representative example of this technique.

Significant Correlations Between Level 1 CSI Items and Level 2 Psycho-Educational Variables.

Level 1 CSI Items	A Frostig	B ITPA	C WISC Verbal	D WISC Performance	E WRAT	F Spatial	G Conceptual	H Sequential
1. Holds book too close (6 inches or less)...	x		x	x			x	x
2. Avoids work requiring concentrated visual attention..........								x
3. Head forward or tilted to one side (more than 15°) when reading or engaged in other visual tasks..........	x		x	x			x	
4. Moves head or trunk excessively during visual tasks (instead of moving eyes).....								
5. Uncontrollable rapid jumping of eyes......	x		x				x	
6. Rubs eyes often when reading or engaged in other visual tasks..........					x			
7. Facial contortions with visual tasks (including squint)..........	x							
8. Seems to have pop-eyes..........								
9. Eyes are crossed..........					x			
10. Unable to learn the sounds of letters (can't associate proper phoneme with its grapheme)..........	x							
11. Doesn't seem to listen to daily classroom instructions or directions (often asks to have them repeated whereas rest of class goes ahead..........								
12. Can't correctly recall oral directions (e.g., item 11 above) when asked to repeat them..........								
13. Doesn't seem to comprehend spoken words (may recognize the words separately but not in connected speech)..........								
14. Can't name letters when they are pointed to..........	x	x	x		x			
15. Can't pronounce the sounds of certain letters..........			x				x	
16. Mild speech irregularities (can't pronounce common second grade words).........			x				x	
17. Immature speech patterns (still uses much baby talk)..........			x					

Figure 11

Through the intercorrelation technique, the staff was able to refine the categories of learning functions and reduce the number of problem areas. The revised categories utilized for further statistical analysis were:

a. Physical-motoric
b. Visual reception
c. Auditory reception
d. Neurological processing
e. Expression (both manual and verbal)
f. Behavior (social-emotional)

These categories appeared to be more useful in defining the learning functions more precisely. Figure 12 shows the revised list of instruments and sub-tests used in the statistical analysis. It was deemed necessary at this point to include the total scores of the VMI (Beery) and Articulation tests and to remove the Spache-Durrell Reading Scores. This decision was made in order to use the maximum number of Level II variables which could be utilized for computer analysis. The type of scoring used on the Spache-Durrell reading analysis was found to be inappropriate, and therefore was eliminated.

Figure 13 shows the revised criteria used in classifying the problem areas which were evident in the individual cases. The behavior category was not represented because the Level II diagnosis did not include a description of the behavior patterns of these subjects. However, this category was used in the medical diagnosis of Level III screening. A chart showing the Level II sub-tests categorized into the six learning behavior cells is shown in Figure 14.

By comparing the mean scores of the Level II screening with the standardized norms published with each instrument, it was evident that the RMEL total population had lower scores in most instances. Figure 15 shows a comparison of these means.

When the RMEL population is split into the three groups defined by the educational diagnosticians on the staff, significant differences between the groups are revealed. These scores are shown in Figure 16. It is evident that the ILD subjects with milder degrees of learning disabilities have some depressed scores, however they are not of the magnitude of the Severe ILD group and the group of slow learners.

Interpretation of Findings

According to some authorities:

"Learning disability refers to one or more significant deficits in essential learning processes requiring special education techniques for remediation. Children with a learning disability generally demonstrate a discrepancy between expected and actual achievement in one or more areas, such as: spoken, read, or written language, mathematics and spatial orientation. The learning disability referred to is not primarily the result of sensory, motor, intellectual, or emotional handicaps, or lack of opportunity to learn."

LEVEL II
INSTRUMENTS AND SUBTESTS

(insert I)

FROSTIG

1 - Eye-motor coordination

2 - Figure ground

3 - Constancy of shape

4 - Position in space

5 - Spatial relationships

I.T.P.A.

1 - Auditory decoding

2 - Visual decoding

3 - Auditory vocal association

4 - Visual motor association

5 - Vocal encoding

6 - Motor encoding

7 - Auditory vocal automatic

8 - Auditory vocal sequential

9 - Visual motor sequential

W.R.A.T.

1 - Reading

2 - Spelling

3 - Arithmetic

W.I.S.C.

Verbal

1 - Information

2 - Comprehension

3 - Arithmetic

4 - Similarities — AUDITORY

5 - Vocabulary

6 - Digit Span

Performance

7 - Picture completion

8 - Picture arrangement

9 - Block design — VISUAL MOTOR

10 - Object assembly

11 - Coding

12 - Mazes

V.M.I.

1 - Total score

ARTICULATION

1 - Total score

Figure 12

CRITERIA USED FOR JUDGING

THE PROBLEM AREAS

EVIDENT IN ILD

LEVEL II COMPUTER ANALYSIS

(insert H)

Problem Areas

1. Physical Motoric
   A. Frostig - 1, 2, 5
   B. ITPA - 6
   C. WRAT - 2, 3
   D. WISC - 7, 8, 9, 10, 11, 12
   E. VMI - 1 (Total score)

2. Visual Reception
   A. Frostig - 1, 2, 3, 4, 5
   B. ITPA - 2, 4, 9
   C. WRAT - 1, 2, 3
   D. WISC - 7, 8, 9, 10, 11, 12
   E. VMI - 1 (Total score)

3. Auditory Reception
   A. ITPA - 1, 3, 7, 8
   B. WRAT - 2
   C. WISC - 1, 2, 3, 4, 5, 6
   D. Articulation - 1 (Total score)

4. Processing
   A. Frostig - 2, 3, 4, 5
   B. ITPA - 3, 4, 7, 8, 9
   C. WRAT - 1, 2, 3
   D. WISC - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
   E. VMI - 1 (Total score)

5. Expression
   A. ITPA - 3, 5, 6, 7, 8
   B. WRAT - 1
   C. WISC - 1, 2, 3, 4, 5, 6
   D. Articulation - 1 (Total score)

Figure 13

Level 2 Tests Categorized into Six Learning Behavior Cells

Physical Motoric	Visual Reception	Auditory Reception	Processing	Expression	Behavior
		WISC-1	WISC-1	WISC-1	No Behavioral instruments were used in Level 2
		WISC-2	WISC-2	WISC-2	
		WISC-3	WISC-3	WISC-3	
		WISC-4	WISC-4	WISC-4	
		WISC-5	WISC-5	WISC-5	
		WISC-6	WISC-6	WISC-6	
WISC-7	WISC-7		WISC-7		
WISC-8	WISC-8		WISC-8		
WISC-9	WISC-9		WISC-9		
WISC-10	WISC-10		WISC-10		
WISC-11	WISC-11		WISC-11		
WISC-12	WISC-12		WISC-12		
VMI -1	VMI -1		VMI -1		
		Artic-1		Artic-1	
F-1	F-1				
F-2	F-2		F-2		
	F-3		F-3		
	F-4		F-4		
	F-5		F-5		
		ITPA-1			
	ITPA-2				
		ITPA-3	ITPA-3	ITPA-3	
	ITPA-4		ITPA-4		
				ITPA-5	
				ITPA-6	
		ITPA-7		ITPA-7	
		ITPA-8	ITPA-8	ITPA-8	
	ITPA-9		ITPA-9		
	WRAT-1		WRAT-1	WRAT-1	
WRAT-2	WRAT-2	WRAT-2	WRAT-2		
WRAT-3	WRAT-3		WRAT-3		

Figure 14

Comparison of RMEL and Normative Data
Means and Standard Deviation

WISC	RMEL N=266	Norms N=200
	Mean S.D.	Mean S.D.
1) Information	9.33 2.94	10.0 2.9
2) Comprehension	9.22 3.48	10.0 2.8
3) Arithmetic	8.53 2.45	10.1 2.7
4) Similarities	11.37 3.28	9.9 2.8
5) Vocabulary	10.57 2.70	10.1 2.6
6) Digit Span	8.53 2.41	9.8 2.7
7) Picture Completion	9.78 2.83	10.0 2.8
8) Picture Arrangement	9.96 2.72	10.1 2.9
9) Block Design	9.50 2.88	10.1 2.8
10) Object Assembly	9.67 2.65	9.9 3.0
11) Coding A	8.55 2.99	10.1 3.1
12) Mazes	9.03 2.19	10.0 3.0
Verbal I.Q.	97.55 12.68	100.0 10.3
Performance I.Q.	96.08 11.92	50.6 9.8
Full Scale I.Q.	96.59 11.58	100.3 18.0

Articulation	RMEL N=266	Norms N=60
	Mean S.D.	Mean S.D.
Total Score	100.99 11.61	167.1 11.1

Figure 15

Comparison of RMEL and Normative Data
Means and Standard Deviation

WRAT	RMEL N=266	Norms N=367
	Mean S.D.	Mean S.D.
Reading	90.34 10.78	99.00 12.68
Spelling	87.97 7.87	92.00 6.47
Arithmetic	90.37 7.58	89.00 4.51

Frostig	RMEL N=266	Norms N=100
	Mean S.D.	Mean S.D.
1) Eye Motor Coordination	8.97 1.72	10.36 2.50
2) Figure Ground	8.70 1.57	9.69 1.36
3) Form Constancy	8.80 1.77	10.07 1.74
4) Position in Space	8.64 1.43	9.76 1.50
5) Spatial	9.63 5.20	9.96 .99
Total P.Q.	88.41 10.08	99.68 16.18

Figure 15

Comparison of RMEL and Normative Data
Means and Standard Deviation

ITPA	RMEL N=266	Norms N=50
	Mean S.D.	Mean S.D.
1) Auditory Decoding	100.53 12.30	95.00 2.87
2) Visual Decoding	94.55 13.16	94.00 2.66
3) Auditory Visual Association	92.42 11.75	92.00 2.03
4) Visual Motor Association	93.68 10.75	99.00 2.96
5) Vocal Encoding	80.42 17.54	93.00 5.94
6) Motor Encoding	86.54 19.91	95.00 3.50
7) Auditory Vocal Automatic	92.29 13.54	91.00 3.56
8) Auditory Motor Sequential	86.32 17.51	94.00 4.96
9) Visual Motor Sequential	73.32 14.39	94.00 4.04
Language Age	90.03 10.41	95.00 17.61

VMI	RMEL N=266	Norms N=50
	Mean S.D.	Mean S.D.
Motor Age	96.02 25.43	95.00 2.91

Figure 15

a. *Deficits* are defined in terms of accepted diagnostic procedures in education and psychology.

b. *Essential learning processes* are those referred to in behavioral science as involving perception, integration and expression, either verbal or non-verbal.

c. *Special education techniques for remediation* refers to educational planning based on diagnostic procedures and results.(21)

In reviewing the concept of individual learning disabilities in the light of the RMEL study, one can see that there is a wide diversity of problems in the learning behaviors of separate children. This type of exceptionality does not lend itself to homogeneous grouping. These learning difficulties must be dealt with primarily on an individual basis but with some possible overlapping at times when group work is an enhancement to the learner.

The analysis of the Level II sub-test scores led the staff to the conclusion that many ILD subjects seemed to be compensating effectively for some of their deficits in learning. It would appear that, as a group, they were learning to "play the game" academically and were beginning to be able to use their learning strengths, continually overcompensating for their academic failures.

This phenomenon appeared to be in their favor until one realized that these constant compensations required a great deal of control. These children must stay up on their toes every hour of every day if they are to succeed in school. They undoubtedly experience pressures from without and from within which causes them to fatigue easily and which also contributes to emotional disturbance. This characteristic was already evident in the majority of subjects who received the Level III medical diagnosis. (See Descriptive Analysis-Level III)

It might be noted that the ILD group seems to be more proficient than the SILD's and slow learners in the art of compensation. As a group they have few difficulties learning through the auditory and vocal channels but considerable difficulty learning through the visual channel. The severe ILD's and slow learners appear to be equally deficient in both auditory and visual channels which tends to depress their total achievement level. In other words, the latter two groups have not been able to clear at least one major sensory channel through which compensation could occur. (12) As indicated in this study the groups showing the most severe learning problems are unable, at this stage of their maturity, to utilize two or more sensory channels simultaneously in processing and expressing language. Their brain's functions do not seem capable of organizing these two input systems very effectively. For example, M stands not only for something seen but also for something heard so that it has a double entry system into the brain. This is why reading, writing, and spelling in particular are so difficult for these children. More precisely, the brain must organize a symbol which stands for a sound and then retain it. In order for a child to reconstruct his language on paper, he must remember it well enough to put it back down on paper. This evident difficulty relative to neurological organization, noted in the Level II results, was clearly identified by the teachers in the Level I screening of these subjects as well as in the Level III medical diagnosis. It appears that these findings are verified and reinforced by each of the three screening phases.

Level 2

Data (Means) for Three Group Split, Defined by RMEL Educational Diagnosticians

	Control N= 87	Slow Learner N= 24	ILD N=145	Severe ILD N= 115	Composite ILD Total N= 284
Chronological Age	101.51	112.71	98.24	104.39	101.95
Grade Age	96.00	96.00	96.00	96.00	96.00
Mental Age	102.00	83.42	99.08	98.28	97.43
Expectancy Age	99.86	97.42	97.77	99.59	98.48
Perception	104.94*	74.00	93.65	85.80	88.81
Language	93.00*	80.38	93.04	87.95	89.91
Cognition	100.74	75,46	101.50	94,78	96.49
Visual Motor	110.05*	77.42	102.86	91.58	96.14
Articulation	106.85	95.58	105.64	100.63	102.76
Reading	105.79	81.58	96.86	85.16	90.83
Spelling	99.03	80.71	92.94	84.53	88.50
Arithmetic	95.95	81.96	94.30	87.96	90.69
Spatial	100.69	64.38	103.02	94.03	96.12
Conceptual	103.53	62.54	109.22	102.54	102.57
Sequencing	101.80	71.50	95.53	86.79	89.96
Verbal I.Q.	100.56	75.75	102.46	95.56	97.41
Performance I.Q.	101.23	78.63	99.95	94.79	96.06

*Administered to Control Group N=20

Per Cent correct classification = 81%

(Mahalanobis D-Square for Group Mean Differences = 436.33, significant beyond the .01 level, with 24 degrees of freedom.)

Figure 16

Level 3 Tests Categorized into Six Learning Behavior Cells

Physical Motoric	Visual Reception	Auditory Reception	Processing	Expression	Behavior
Motor Acc. Ayres Figure Gram Kinesthetic PMS-1 PMS-2 PMS-3 PMS-4 PMS-5 PMS-6 PMS-7 PMS-8 PMS-9 PMS-10 PMS-11 PMS-12 PMS-13 PMS-14 PMS-15	PMS-5 PMS-6 PMS-7 PMS-10 PMS-11 PMS-12 PMS-13 PMS-14 PMS-15		PMS-6 PMS-7 PMS-8 PMS-9 PMS-10 PMS-11 PMS-12 PMS-13 PMS-14 PMS-15		Overt Behavior Hyperactive Lethargic Irritable Withdrawn Low Self-Concept Aggressive Emotional Easily Upset Preschool Awareness School Awareness Report from Psychologist

Figure 17

Level 3 Tests Categorized into Six Learning Behavior Cells

Physical Motoric	Visual Reception	Auditory Reception	Processing	Expression	Behavior
PMS-16	PMS -16		PMS -16		
PMS-17					
PMS-18					
PMS-19					
PMS-20					
PMS-Total	PMS -Total		PMS -Total		
PSLT-1	PSLT-1		PSLT-1		
PSLT-2	PSLT-2		PSLT-2		
PSLT-3	PSLT-3		PSLT-3		
PSLT-4	PSLT-4		PSLT-4		
		Puretone-Audiometry			
		Wepman-1	Wepman-1		
		Mem. for Sen.	Mem. for Sen.	Mem. for Sen.	
		Monroe	Monroe	Monroe	
	G-Mc-O-V	G-Mc -O-V	G-Mc -O-V	G-Mc -O-V	
			G-Mc -Seq.	G-Mc -Seq.	
			G-Mc -following		
			Linguistic	Linguistic	

Figure 17

Descriptive Analysis of Level III Data

The Level III Medical diagnosis was conducted for two major purposes; (1) to thoroughly evaluate a child's physical functioning in order to ascertain the specific types of abnormalities which may be related to his learning disability, or (2) to rule out any physical malfunctioning as a possible explanation for his learning disability. This phase of the study was performed at the Children's Developmental and Evaluation Clinic at Children's Hospital, Denver, Colorado.

As mentioned earlier, 134 SILD subjects were referred to the clinic for the following examinations:

(1) Pediatric

(2) Neurological

(3) Audiology and Speech

(4) Laboratory (blood, urine, acid screening, and buccal)

(5) Electroencephalogram (sleep tracing)

(6) Ophthalmological

(7) Psychological

(8) Occupational therapy

Full medical data was collected on 85 SILD subjects, 16 slow learners, and 19 non-ILD control subjects. (See Volume I for description of screening).

The diagnostic tests utilized in the Level III phase were studied and categorized into the six learning behavior cells by the RMEL diagnosticians in order to show the completeness of the medical diagnosis. (See Figure 17)

Description of Medical Examinations

It became the task of the Audiology and Speech Pathology Department at Children's Hospital to identify areas of strengths or weakness which might be significantly related to school achievement, to provide a more complete assessment of the auditory, speech, and language behavior of the children being studied; and to explore the potential usefulness of certain non-standard tests.

The following tests were selected and administered by the staff of this department:

1. *Peabody Picture Vocabulary Test, Form B.* American Guidance Service, Inc., 1965. (6)

This widely used and easily administered test provides a measure of receptive vocabulary. It is dependent upon visual-perceptual and visual-motor function, hearing, and environmental stimulation as well as the child's intelligence. In our clinic we usually report only the M.A. and call it "receptive vocabulary level" rather than "mental age", for which it is only an approximation.

2. *Picture Story Language Test,* Grune & Stratton, Inc., 1965. (14)

This test of written language was designed to be used as a diagnostic instrument for the study of children with language disorders and learning disabilities. It provides standardized measures of productivity, correctness (syntax) and meaning (level of abstraction).

3. *Wepman Test of Auditory Discrimination, Form 1,* by Joseph Wepman, Ph.D., 950 E. 59th Street, Chicago, Illinois, 1958. (20)

This test is designed to determine the child's ability to recognize the fine differences that exist between the phonemes used in English speech. No visual ability is necessary. It is standardized for children in the 5 to 8 year range as follows:

Inadequate development is shown on the test for 8 year olds and older by X errors greater than three.

The X errors represent failures to discriminate. The Y errors are used to judge validity of the test. "All tests showing an X score more than fifteen or a Y score greater than three should be put aside as invalid."

For purposes of statistical analysis for this study, we have decided to report the raw scores (X errors and Y errors) so that every child can be included. Excessive errors, (X 15 or Y 3) usually show poor attention or inability to follow directions and may be useful in describing this population.

4. *Memory for Sentences* - not published. (18)

This is a test of auditory memory span employing the oral repetition of sentences. It was constructed by E. M. Spencer and reported in her Ph.D. thesis completed at Northwestern University in 1958. The norms reported for 8-9 year old children are 11 sentences repeated correctly.

5. Subtests of the *Reading Aptitude Tests, Primary Form,* by Marion Monroe, published by Houghton Mifflin Company, copyright 1935, 1963.

   a. *Auditory test 3* is a measure of the child's ability to repeat the details of a story which is read to him by the examiner. The raw score represents the number of ideas which the child reproduces. We are reporting only this raw score since the test manual does not give norms for the individual subtests.

   b. *Language test 2* requires the child to name all the *animals* he can think of (in 20 seconds), then *things to eat,* then *toys*. This subtest measures vocabulary and facility in verbal ideation. The raw score reported here is the total number of appropriate things named by the child within the time allotted.

   c. *Language test 3* requires that the child describe a picture which is shown to him by the examiner. We have asked him to "tell about the picture" (or to "tell a *story* about the picture" if he merely lists things he sees). The raw score for this subtest is the number of words contained in the longest sentence or partial sentence used spontaneously by the child.

   d. *Articulation test 2* is a measure of the child's speed of articulation and is included here to detect children with poor coordination of the oral musculature or rapid fatigability. The child is asked to say "banana, banana,..." as quickly as he can and is timed for 15 seconds. The same procedure is carried out for "long ago" and "take a bite". The raw score is the total number of times the child repeats the three phrases.

6. *Gates-McKillop Reading Diagnostic Test,* Teachers College, Columbus University, New York City. (9)

   a. The *Oral Vocabulary* subtest provides a measure of vocabulary in spoken context. This test does not depend upon vision. A multiple-choice question is read aloud by the examiner as follows: "A head is a part of a...coat, saw, man, box" and the child repeats one of the four words. The raw score is obtained from the formula "number correct-1/3 number wrong." A grade score equivalent may be taken from a set of grade norms.

   b. The *Auditory blendings* subtest measures the child's ability to recognize a word from hearing it spoken in parts such as "h-or-s" (horse). The examiner reads the word parts and gives the child a second trial if his first response is not correct. The raw score equals the number correct on the first trial plus ½ the number correct on the second trial. Grade equivalents may be obtained from the table of norms.

7. *Sequencing:* days of the week and months of the year. This is not a standardized test. The child is asked to tell the days of the week in order. He is given two trials. On the second trial, his responses are recorded in the order given. His score is the number of days given consecutively in correct sequence. The same procedure is employed with months of the year, the score being the number of months given consecutively in correct sequence.

8. *Ability to follow when read to from a book.* This is an experimental diagnostic procedure which has proved useful in clinical practice at Children's Hospital. Reading selections are taken from standard school reading texts. A rating of 0 (very good) to 7 (total inability) is reported.

9. *Linguistic measures.* The story told orally by the child for the Monroe Reading Aptitude Tests, Language Test Three, was transcribed by the examiner and analyzed for the following measures: Total number of words used, total number of sentences (where thought content determines what is judged to be a sentence), average number of words per sentence, proportion of sentences which were complete morphology rating (not yet completed), and abstract-concrete rating of the story content.

10. *Audiometric Testing:* This test was performed to accomplish three major purposes.

    1. To test the validity of RMEL clearance on Level II Screening test.

    2. To make a comparison of child's ability to discriminate P/B word tests in quiet and in masking signals consisting of white noise at a signal to noise ratio of zero.

    3. As a test of Interaction of the child's ability to discriminate P/B word tests in noise and their performance or other auditory tasks in the full test battery, viz. Wepman Auditory Discrimination Test, Auditory Memory Span for Sentences and Auditory Blending of Words.

Procedure:

1. 36 Spondee words are presented binaurally (Grason-Stedler Speech Audiometer) at comfort level 40dB.

2. Binaural Speech Reception Thresholds are obtained using the Ascending-Descending Threshold technique.

3. The Haskins Kindergarten P/B tests No. 2 or No. 3 are delivered binaurally at 40dB above SRT.

4. Haskins Kindergarten P/B List No. 2 or No. 3 are delivered binaurally at 40dB re SRT in noise. White noise at 40dB re SRT (S/N of OdB) is used.

5. The KP/B tests are alternated: No. 2 is quiet through No. 3 in noise on one patient; No. 3 in quiet through No. 2 in noise on the next child. This order is then repeated on each successive child.

6. Pure-tone tests at 250, 500, 1000, 2000, 3000 and 8000 cps. monaurally to both right and left ears (Beltone 15-B).

The following rating scale indicates the degree of auditory involvements which might be observable in a specific subject.

RATING SCALE-AUDIOMETRIC TESTS

0. NORMAL HEARING

CRITERIA: Pure tone average (500, 1000, 2000 cps.)
0-15dB, P/B's 90%-100%.

1. SLIGHT INVOLVEMENT

CRITERIA: Pure tone average (500, 1000, 2000 cps.)
16-25dB P/B's 80%-90% discrimination binaural.

MANAGEMENT: May need otological consultation and repeat audiometrics.
If non-reversable, preferential seating in classroom.

2. MILD INVOLVEMENTS

CRITERION: Pure tone average (500, 1000, 2000 cps.)
26-45dB, 45% or better P/B's score.

MANAGEMENT: Otological consultation. Repeat audiometrics preferential seating. May need aural rehabilitation program, including wearable amplification.

3. MODERATE INVOLVEMENT

CRITERION: 46dB to 75dB.
P/B score 65% or better.

MANAGEMENT: Otological consultation. Hearing aid consultation and Audiological evaluation. Aural rehabilitation program.

4. SERIOUS INVOLVEMENT

CRITERION: 75dB to 110dB.
P/B score 0-65%.

MANAGEMENT: Otological consultation. Audiological and Deaf Education Program.

% P/B SCORE

...% Discrimination score in quiet.
...% Discrimination score in noise.

The Occupational Therapy Department of Children's Hospital administered the following tests:

1. *The Southern California Motor Accuracy Test* by A. Jean Ayres, Western Psychological Services: California, 1964 (4). This test was designed to measure degree of and changes in sensorimotor integration of upper extremities of individuals with nervous system dysfunction.

2. *The Ayres Space Test* by A. Jean Ayres, Western Psychological Services: 1968 (1). This instrument measures the perceptual speed and space visualization abilities of young children who are suspected of having sensory integrative dysfunctions.

3. *The Southern California Figure-Ground Visual Perception Test* by A. Jean Ayres, Western Psychological Services, 1966 (2). This test is designed to detect a deviation in perceptual function which is reflected in the visual domain by difficulty in separating visual stimuli from a rival background.

4. *The Southern California Kinesthesia and Tactile Perception Test* by A. Jean Ayres, Western Psychological Services, 1966 (3). This test is designed to evaluate dysfunction in somesthetic perception in young children. None of the six SCKT tests require verbal responses.

5. *The Purdue Perceptual-Motor Survey* by Eugene G. Roach and Newell C. Kephart, Charles E. Merrill Publishing Co. Ohio; 1966 (15). This survey is designed to identify those children who do not possess perceptual-motor abilities necessary for acquiring academic skills.

The remainder of the examinations administered by the professional staff of Children's Hospital were performed in the same procedure commonly used in the clinic. To insure that the examinations were administered without bias, the RMEL non-ILD control subjects (N=19) were interspersed with the SILD's and slow learners in order that the medical staff would not be prematurely aware of the learning difficulties of any subject.

The information collected for each child relevant to his medical history, social history, pediatric evaluation, neurological evaluation, electroencephalogram tracing, opthalmological examination, audiological and language evaluations, occupational therapy evaluations, psychological examinations, and laboratory tests (blood, urine, acid screening, and buccal) was carefully studied and reported by the medical doctor coordinating this phase of the study.

Descriptive Analysis of Data

A frequency count of all Level III medical data was made and subsequently converted to percentiles for this analysis. The RMEL staff diagnosticians studied the results and indicated areas which would appear to warrant specific attention. The SILD, slow learners, and non-ILD control subjects were compared and possible interpretations were presented when it was deemed necessary. It should be noted here that the RMEL staff was aware that the nineteen subjects comprising the control group and the 16 slow learners were not a large enough sample from which to draw valid conclusions.

It was indicated by the clinical staff that emotional instability was apparent in only 6% of the parents of the SILD group. This, however, was not a factor with either the slow learner or control groups. The divorce rate of the parents of the SILD group was twenty-five percent. There was no incidence of divorce reported by either the slow learners' or controls' parents. Evidence of remarriage was rare when it was noted that only eight percent of the SILD children were step- children to the fathers and only four percent were step-children to the mothers.

Less than five percent of the SILD subjects were born after their mothers reached age forty while eight percent of their fathers were past forty years old. These percentages increased in the slow learner population. Nineteen percent of both mothers and fathers exceeded age forty when the child was born. Conversely, only five percent of the control subjects' mothers and none of their fathers exceeded age forty at the time of their child's birth.

The racial frequency seems typical of the geographical area from which this sample was drawn. Ninety percent of the SILD's, eighty-one percent of the slow learners, and eighty-nine percent of the controls were reported to be Caucasian.

Pertinent prenatal information included data concerning a history of miscarriages, pregnancy accidents, and medications used by the mother. Figure 18 indicates the percentages of prenatal disturbances reported by the subjects' parents to the medical staff. The SILD group had evidence of smaller percentages of premature births and miscarriages than the group of slow learners but a much higher percent of pregnancy accidents and maternal medication. The control group also had a surprisingly high incidence of accidents and use of medications by the mother during pregnancy.

Chronic illness (e.g., diabetes), was evident in fifteen percent of the mothers of the SILD group. Only six percent of mothers of the slow learner group and none of the mothers of the controls reported chronic illnesses.

There appeared to be sufficient scatter of birth order in all three groups to show little significance.

The neurological examination was done in accordance with Dr. Mark N. Ozer's development and procedure. Neurological abnormalities were reported in eighty-eight percent of the cases with the SILD child. Ninety-four percent of the slow learners and seventy-four percent of the control population were diagnosed as neurologically abnormal. Neurological is herein referred as soft signs and not as hard signs indicative of brain tumor or cerebral palsy. The soft signs seem to be related to the integration and processing of neurological information and to the subjects' fine motor functions.

Clinical evidence shows high percentages of organic brain syndrome within the groups. Ninety-eight percent of the SILD, eighty-eight percent of the slow learners and fifty-eight percent of the controls fit this category.

The diagnosis of organic brain syndrome was made by the medical professional staff when a pattern, including many of the soft neurological signs, was found to be consistently evident in the child.

Forty-four percent of both the SILD and the slow learners had signs of other genetic components. This was evident in only five percent of the control cases. There was presence of mental retardation or neurological abnormalities in the families of seventy-five percent of the SILD group. It was present in eighty-eight percent of the slow learner group and fifty-three percent of the controls.

As can be seen in Figure 19 it is difficult to use the EEG as a conclusive diagnostic tool. It is, however, a procedure whereby some signs may appear that would be relevant and highly correlated to other medical findings.

Frequency Percentiles of Level 3 Medical Data

Social History

	Control	SILD	S.L.
Emotional Instability	0	6	0
Divorce Rate	0	25	0
Stepchild to Mother	0	4	0
Stepchild to Father	0	8	0
Mother — High School Graduate	16	40	19
Father — High School Graduate	26	38	38
Mother — Two Years College	5	5	6
Father — Two Years College	21	8	0
Mother — College Graduate	0	1	6
Father — College Graduate	21	4	0
Caucasian — Race	89	90	81
Other — Race	11	10	19
Mother — Born after Parents reach 40	5	5	19
Father — Born after Parents reach 40	0	8	19

Antenatal

	Control	SILD	S.L.
Chronic Illness	0	15	6
Genetic Component	5	44	44

Prenatal

	Control	SILD	S.L.
Infections	11	11	6
Pregnancy Accidents	31	25	0
Maternal Medication	47	41	13
Abnormal Labor	11	14	14
Birth Accidents	0	0	0
Poor Response at Birth	0	6	0
35 Week Pregnancy	5	9	0
5 1/2 Pounds at Birth	5	14	38
Congenital Anomalies	0	1	14
Miscarriage	47	43	78

Figure 18

Frequency Percentiles of Level 3 Medical Data

Slow Development

	Control	SILD	S.L.
Physical	5	7	13
Language	11	20	13
Both Physical and Language	5	15	38
Congenital Physical Abnormalities	5	9	25

Neurological Abnormalities

	Control	SILD	S.L.
Neurological	74	88	94
Organic Brain Syndrome	58	98	88
Mental Retardation or Neurological in Family	53	75	88
E.E.G.	47	44	25
Epileptiform	16	21	0
Slow and Poorly Organized	11	8	13
14-6 Spikes	5	9	6
Other E.E.G. Anomalies	21	12	6
Convulsive	0	6	19
Impairment of Special Senses	21	27	56

Behavioral

	Control	SILD	S.L.
Behavior Problem	0	40	31
Hyperactive	0	19	0
Lethargic	0	2	0
Irritable	0	19	6
Withdrawn	0	11	12
Low Self Concept	0	19	19
Aggressive	0	13	12
Problem Evident to Parents before School Entry	0	15	38
Problem Evident to Parents only after School Entry	0	85	62
Emotional	5	65	63
Easily Upset	0	62	62

Figure 19

Congenital physical abnormalities were present in nine percent of the SILD cases. The slow learner population climbed to twenty-five percent while the controls only had five percent abnormalities.

The physical development during the first eight years of life was abnormal in seven percent of the SILD cases. Thirteen percent of the slow learners had abnormal physical development. The control population had five percent. Apparent language development problems were found among twenty percent for the SILD, thirteen percent for the slow learner and eleven percent for the control group.

Some of the subjects were abnormal not in just one area but in both physical and language development. This was the case for fifteen percent of SILD subjects, thirty-eight percent of the slow learners and only five percent of the control group.

Psychological examinations were administered whenever it was deemed appropriate. The child's social and behavioral history was obtained from all parents except four in which case the child was a ward of the court or was brought to the clinic by a friend or relative.

Among SILD pupils, only 15% of their parents realized they had any learning or emotional problems prior to the child's entry into school. These parents reported instances of deviate behavior prior to the child's entry into school which included the need for frequent medical attention in some cases; however, they apparently did not draw the conclusion their child might have either a learning or an emotional problem. Instances of deviate behavior reported by parents included flares of temper, lighting fires, and other attention-getting behaviors. This is contrasted by the fact that 38% of the parents of slow learners were aware of the fact that their child had problems before he entered school.

It is interesting to note that 40% of the SILD children's parents were aware of the fact that their child had certain learning and behavioral problems after two years attendance in school.

31% of the parents of slow learners reported that by the end of the second year of school, their children were reported to be behavioral problems in the regular classroom.

As a result of the psychological examinations conducted at Children's Hospital, the clinicians concluded that approximately 65% of the SILD pupil population had some indication of emotional disturbance. It appears plausible that the etiology for the deviate behavior and indications of emotional disturbances could very well be the result of a learning disability as defined in this study.

63% of the slow learners showed indications of some emotional disturbance. By way of contrast, no manifestations or indications of emotional problems existed among the control populations with the exception of one subject who was, in fact, achieving in school at a level much higher than would be expected. The psychologist's report indicated that the high achievement of this child might well be an escape from emotional stress.

The classifications of these behaviors as reported by parents and clinicians for these populations are indicated by the percentages of occurrence and are shown in Figure 19.

The mean scores of Level III Medical Evaluations were computed for the severe ILD (N=85) subjects, the slow learners (N=16), and the non ILD control subjects (N=19).

It was evident from this data that the control subjects performed consistently higher on all measures. Figure 20 shows the differences between these groups relevant to the mean scores of the specific tests used in the medical phase of this study. For example, it was noted that there was an eleven point spread between the Intelligence Quotients of the control and experimental groups as measured by *The Peabody Picture Vocabulary Test.* Another wide difference apparent here was found in the *Picture Story Language Test.* The subjects with learning disabilities performed significantly lower on all sections of this test than did the non ILD control subjects.

However, on several of the tests, this difference was not as apparent. For example, the means were very similar on the *Memory for Sentences Test* and the *Monroe Reading Aptitude Tests* as well as on the audiometric measures.

The *Purdue Perceptual-Motor Survey* shows evident differences between the mean scores of each section with the experimental (SILD and SL) subjects showing more perceptual-motor dysfunction than the control subjects. However, these scores when compared to the highest possible score reported in the PPMS manual were indicative of average motor functions for both groups of subjects. These children seem to be at a level in their motor development where disabilities of this nature are not apparent. This was evident following the Level II diagnostic screening, also. The subjects appeared to function very effectively in their gross and fine motor abilities.

Mean Scores of Level 3 Medical Evaluations of Experimental (SILD and S.L.) and Non ILD Control Subjects

	Experimental N=85+16	Control N=19
Southern California Accuracy Test		
Right Hand - Standard Score	.1000	.2158
Right Hand - Standard Score	.1158	.4000
Left Hand - Standard Score	.1347	.2947
Left Hand - Standard Score	.1941	.4579
Ayres Space Test		
Standard Score	.5793	.2326
Southern California Figure Ground Test		
Standard Score	.1327	-.0368
Peabody Picture Vocabulary Test		
I.Q.	93.3726	104.4211
Picture Story Language Test		
Total Words	25.9010	48.6842
Total Sentences	3.5743	5.5263
Syntax Quotient	80.3465	93.1053
Abstract-Concrete Rating	8.7030	12.8947
Wepman Test of Auditory Discrimination		
Form 1 - X Errors	4.1584	2.8947
Memory For Sentences		
Numbers of Sentences Repeated Correctly	8.9307	9.3684
Numbers of Syllables in Longest Sentence	14.5842	15.2632
Monroe Reading Aptitude Tests		
Auditory Test 3: number of ideas	10.8713	12.9474
Language Test 2: number of things named	25.1386	24.1579
Language Test 3: number of words in longest sentence	12.8416	13.26
Articulation Test 2: number of repeated phrases	53.3168	53.3684

Figure 20

Mean Scores of Level 3 Medical Evaluations

of Experimental (SILD and S.L.) and Non ILD Control Subjects

	Experimental N=85+16	Control N=19
Gates-McKillop Reading Diagnostic Tests		
Oral Vocabulary-raw score	8.3861	11.6842
Auditory Blending-raw score	12.4554	14.1053
Sequencing: Total Days	5.9703	6.7895
Sequencing: Total Months	4.2871	7.8947
Ability to Follow when Read to from a book	2.4554	.6316
Audiometric Test		
Hearing on Puretone Average and Discrimination	.1485	.0526
Percent Discrimination in Quiet	95.9604	97.8974
Percent Discrimination in Noise	62.4950	65.3684
Linguistic Measures		
Total Words	57.2871	55.2623
Percent Complete Sentences	81.6337	85.5263
Total Sentences	6.8911	6.5789
Morphology Rating	56.1881	58.5263
Words Per Sentence	8.4653	8.8947
Abstract-Concrete Rating	11.5446	12.6842
Neurological Examination		
Following Directions on Subjects		
Number Correct	4.7800	5.8421
Number Wrong	1.2200	.1579
Consistency	3.5600	5.6842
Following Directions on Examiner		
Number Correct	2.3700	3.0000
Number Wrong	1.6300	1.0000
Consistency	.8200	2.0000
Purdue Perceptual-Motor Survey		
Balance and Posture Perfect Score-16	13.3030	14.6842
Body Image and Differentiation Perfect Score-20	15.2828	17.2632
Perceptual-Motor Match Perfect Score-28	21.0202	22.8947
Ocular Control Perfect Score-16	12.2121	12.2105
Form Perception Perfect Score- 8	4.8283	5.7368
Total PMS Perfect Score-88	66.6465	72.7895

Figure 20

MEDICAL RECOMMENDATIONS

From a purely medical point of view, with no regard for possible associated learning problems, medical treatment was recommended for forty-nine percent of the SILD population, seventy-five percent of the slow learner population, and thirty-seven percent of the control population. (See Figure 21)

The second area concerned a medical judgment regarding the use of specific medication in the form of either amphetamines or anti-convulsants. Twenty-two percent of the SILD's, nineteen percent of the slow learners, and only five percent of the control group were recommended for this treatment.

The third recommendation was made relevant to the need for counseling for the child, his family, or both. The need for counseling was recommended for fifty-eight percent of the SILD's, nineteen percent of the slow learners and only five percent of the controls.

The fourth and fifth recommendations concerned a medical judgment in regard to the appropriate kinds of training which might be provided by schools or private agencies in order to aid a child in ameliorating his disability. This judgment was based on the assumption that ideal conditions would prevail in the home and/or school to facilitate successful treatment in perceptual training and speech therapy. Perceptual training was recommended for thirty-five percent of SILD group with six and five percent respectively for the slow learners and the controls. Speech therapy was recommended for only eight percent of the SILD group and zero percent of the slow learners and the control group.

It should be mentioned that the personnel at Children's Hospital strongly believe, with considerable evidence to support them, that recommendations of this sort are different for children between the ages of six and eight than from those who are older (i.e., perceptual training). It is their judgment that at the approximate age of nine or ten individual special tutoring appears to be the most beneficial form of treatment of children's learning disorders. Since this is in fact their frame of reference, the coordinator of the project subsequently made certain recommendations for the treatment of the child since children examined in the study are now nine, approaching ten. (See Figure 21)

Of the 85 SILD children receiving medical examinations 100% of them had evidence of perceptual problems on an organic basis which interferes with their ability to learn as quickly as most children their age. (The term organic basis as used in this report refers to the fact that perceptual or learning disabilities are due to a deviation in the function of the central nervous system rather than to emotional or environmental causes).

Some of the children could benefit from medication (anti-convulsant or amphetamines) and/or counseling; however, for the majority there is no treatment other than an altered educational program.

Frequency Percentiles of Level 3 Medical Data

Hospital Recommendations

	Control	SILD	S.L.
Medical	37	49	75
Drugs	5	22	19
Counseling	5	58	19
Perceptual Training	5	35	6
Speech Therapy	0	8	0

Figure 21

LIST OF SELECTED REFERENCES

1. Ayres, A. Jean. *The Ayres Space Test,* Western Psychological Services: California, 1968.

2. Ayres, A. Jean. *Southern California Figure-Ground Visual Perception Test,* Western Psychological Services: California, 1966.

3. Ayres, A. Jean. *Southern California Kinesthesia and Tactile Perception Tests,* Western Psychological Services: California, 1966.

4. Ayres, A. Jean. *Southern California Motor Accuracy Test,* Western Psychological Services: California, 1964.

5. Berry, K. *Developmental Test of Visual-Motor Integration,* Follett Publishing Co., Chicago.

6. Dunn, L. *Peabody Picture Vocabulary Test,* American Guidance Service, Inc.: 1965.

7. Durrell, D. D. *Durrell Analysis of Reading Difficulty,* Harcourt, Brace & World, Inc.: New York, 1955.

8. Frostig, M. *Development Test of Visual Perception,* Follett Publishing Co.: Chicago.

9. Gates, A. I. and McKillop, A. S. *Gates-McKillop Reading Diagnostic Tests-Pupil Record Booklet II-Manual of Directions,* Teachers College Press: Columbus, New York, 1962.

10. Harris, D. B. *Goodenough-Harris Drawing Test and Manual, Harcourt, Brace & World,* Inc.: New York, 1965.

11. Jastak, J. E. and Jastak, S. R. *The Wide Range Achievement Test,* Guidance Associates: Wilmington, Delaware, 1965.

12. Johnson, Doris. "Increasing Productivity and Self-Monitoring with Written Language," A lecture presented to RMEL Teacher Training Session, August, 1968, Denver, Colorado.

13. Kirk, S. and McCarthy, J. *The Illinois Test of Psycholingustic Abilities,* University of Illinois Press: Urbana, Illinois, 1961 (Experimental Edition).

14. Myklebust, H. R. *Picture Story Language Test,* Grune & Stratton, Inc.: New York, 1965

15. Roach, E. G. and Kephart, N. C. *The Purdue Perceptual-Motor Survey*, Charles E. Merrill Books, Inc.: Columbus, Ohio, 1966.

16. Spache, G. D. *Diagnostic Reading Scales-Examiner's Manual-Examiner's Record Booklet*, McGraw-Hill Book Co.: Monterey, California, 1963.

17. Templin, M. C. and Darley, F. L. *The Templin-Darley Tests of Articulation*, University of Iowa Press: Iowa City, 1960.

18. Spencer, E. M. *Memory for Sentences Test*, Unpublished Ph.D. Thesis, Northwestern University, 1958.

19. Wechsler, D. *Wechsler Intelligence Scale for Children*, The Psychological Corp.: New York, 1949.

20. Wepman, J. M. Auditory Discrimination Test-Manual of Directions-Auditory Discrimination Test Form I, 1958.

21. Wolfe, William G. "New Definitions: Learning Disability and Multiple Handicaps," Proceedings of the Institute for Advanced Study of Preparation of Teachers of the Mentally Retarded, Austin: Texas University, 1968.

APPENDIX A

Rocky Mountain Educational Laboratory, Inc.
1620 Reservoir Road
Greeley, Colorado 80631

INDIVIDUAL LEARNING DISABILITIES PROGRAM
Classroom Screening Instrument
Battery #1

Prepared pursuant to a contract with the United States
Office of Education, Bureau of Research, H.E.W.
Contract #OEC-4-7-062828-30-63

School _____

Name _____

Identification Code _____

INSTRUCTIONS

The packet of materials you have received contains, in addition to this explanation, one copy of the Classroom Screening Instrument, sufficient copies of the three page Pupil Productions section for your class, eight copies of a Related Information form, and a stamped, self-addressed return envelope.

CLASSROOM SCREENING INSTRUMENT

Fill in the first page of the Classroom Screening Instrument. Please *print* your name, the name and address of the school in which you teach, the date you finish filling in the screening instrument form, the average number of hours you spend with the class each day, and the number (#) of days you have been teaching this class until the date you finished filling in the screening form.

Now carefully read the paragraph of instructions on the first page. After you have given some thought to the matter, *print* the names of those children in your class whom you believe are having the greatest difficulty with learning; print their last names in the same order at the top of the proper column on each rating sheet. If you believe that more than eight of your pupils should be listed, call the Laboratory collect and a second form will be sent to you.

Fill in all of the ratings for each child except numbers 42, 43, 44, and 47; these three should be done after your pupils have completed the Pupil Productions section.

PUPIL PRODUCTIONS (for pupils identified above)

Choose a convenient time, preferably during the same week you receive the materials, for completion of the Pupil Productions section. Allow twenty-five minutes of uninterrupted time for this. Have the children use pencils for this task. Be sure there are enough for every child in the class to have *one* copy. Keep the extra copies and in no case permit a child to start over on an unused form. If you do not have enough copies, call the Laboratory collect and tell us how many additional copies you need. Do not begin this portion until every child has his own copy. Unused forms should be returned with the completed materials.

On the first page of the Pupil Productions section you should tell each child to write his name, age, birthday, a statement about what he likes most about school, and to circle his sex. You should read each item to the class but not supply any additional information, spellings or explanations. If you are asked for help just say, *I have read each word to you and cannot tell you any more. Do your best to figure it out.* You may repeat the directions once if necessary. Allow sufficient time for this to be completed (eight minutes should be ample).

Next, tell the children that you are going to give them some spelling words.

The following spelling list is provided for use with item 47 of the Classroom Screening Instrument. Have the child write or print each word on the lines provided. You pronounce each word, then say the sentence in which it occurs, then pronounce it once again. Do not repeat this sequence. Allow about ten minutes for this section.

1.	cat	the cat has a long tail	cat
2.	in	we are in the room	in
3.	go	children go to school	go
4.	man	the man works all day	man
5.	will	they will come for you	will
6.	saw	Jack saw a cowboy	saw
7.	girl	the girl went home	went
8.	make	I can make a square	make
9.	cut	mother cut the cake	cut
10.	dress	the dress fits well	dress
11.	run	Bob can run fast	run
12.	say	please say it slowly	say
13.	him	we saw him in town	him
14.	cook	we cook our own dinner	cook
15.	wall	the old wall broke down	wall
16.	light	the light is bright	light
17.	left	his left arm hurts	left
18.	must	I must go now	must
19.	train	the train was crowded	train
20.	watch	my watch is fast	watch

On the second page each child is asked to draw both designs in the space to the right when the word TOP is in the correct position (this requires rotating the page 90° clockwise before beginning). You say, *Now, on the next page you are to copy designs just like the ones on the paper. Make your designs just like the ones that are there. Use the space on the right for your designs.*

You may repeat these directions once. If you see a child using the space to the left of the examples, allow him to do so without correction. Allow sufficient time (about three minutes) for these to be completed.

On the third page, which is simply a blank sheet of paper, the children are asked to draw a man. The drawing is to be completely free-hand with no model or hints given. You say, *And now on the last blank page you are to draw a picture of a man. Be sure to draw a whole man, not just his head. Do the best you can.* You may repeat these directions once. Allow about five minutes for this task.

Then say, *Print your name on the bottom left-hand corner of your picture of a man.* You may repeat this direction once. Allow them to put their names wherever they choose after this direction has been given. When all are finished putting their names on their drawings, collect all of the materials.

Now complete items 42, 43, 44, and 47 on the rating form, based on your inspection of the Pupil Productions. Staple onto the Classroom Screening Instrument the Pupil Productions which were done by those children you originally listed.

RELATED INFORMATION

The Related Information sheet must be completed for each child whose name appears on the Classroom Screening Instrument. Please attempt to complete each item with whatever information you have or can gather from the pupil's records. If the Percentile Rank is not given on the achievement or readiness tests, write in the scores given and label them appropriately. If more than one score is reported, choose the most recent one. If no score or information is available for a particular item, leave the space blank.

Please gather all materials together, including any unused materials and mail them back to us. You should plan to take about two hours of your time for completing the entire screening battery. Please return all materials no later than November 29. Thank you in advance for your cooperation in this effort.

CLASSROOM SCREENING INSTRUMENT FOR TENTATIVE IDENTIFICATION OF CHILDREN WITH INDIVIDUAL LEARNING DISABILITIES*

Please Print

Teacher's Name: Miss / Mrs. / Mr. _____
Last *First*

School Name: _____

Address: _____
Street

_____
City *State* *Zip*

Date Completed: _____
Day *Month* *Year*

Time with Class: _____
Hrs. per day (avg.) / # days to above date

First, please list those children who are having severe difficulty learning in the second grade class you teach. Place the child who has the most difficulty learning first (A) and rank the others in descending order of learning disability. You do not have to fill in all eight columns. Second, mark *every* behavioral index with reference to the child: if you have observed the behavior and regard it as typical, place a plus (+) in the appropriate box; if you have observed the child in a situation where the behavior would likely occur but it does not, use a minus (−); if you have had no opportunity to observe the child in a situation where the behavior would likely occur, use a zero (0). Third, attach to this form the samples of drawings, writing, spelling and the Related Information sheet for each child whose name appears on this form. If there are more than eight children having severe difficulty learning in your class, use a second form.

Child's Name *Last* *First*	Birth *Month*	Birth *Year*	Sex *M/F*
A			
B			
C			
D			
E			
F			
G			
H			

BEHAVIORAL INDICES

		CHILD'S LAST NAME							
		A	B	C	D	E	F	G	H
VISUAL	1. Holds book too close (6 inches or less).....								
	2. Avoids work requiring concentrated visual attention.....								
	3. Head forward or tilted to one side (more than 15°) when reading or engaged in other visual tasks.....								
	4. Moves head or trunk excessively during visual tasks (instead of moving eyes)								
	5. Uncontrollable rapid jumping of eyes.....								
	6. Rubs eyes often when reading or engaged in other visual tasks.....								
	7. Facial contortions with visual tasks (including squint).....								
	8. Seems to have pop-eyes.....								
	9. Eyes are crossed.....								
AUDITORY	10. Unable to learn the sounds of letters (can't associate proper phoneme with its grapheme).....								
	11. Doesn't seem to listen to daily classroom instructions or directions (often asks to have them repeated whereas rest of class goes ahead								
	12. Can't correctly recall oral directions (e.g., item 11 above) when asked to repeat them								
	13. Doesn't seem to comprehend spoken words (may recognize the words separately but not in connected speech).....								
SPEECH	14. Can't name letters when they are pointed to								
	15. Can't pronounce the sounds of certain letters.....								
	16. Mild speech irregularities (can't pronounce common second grade words).....								
	17. Immature speech patterns (still uses much baby talk).....								

SPEECH (Continued)	CHILD'S LAST NAME A	B	C	D	E	F	G	H
18. Lips remain apart when at rest (mouth breathing)								
19. Tongue thrust forward between teeth and often beyond lips (especially when using hands for writing, cutting, etc.)								
20. Unable to correctly repeat a 7-10 word statement by the teacher (omits or transposes words)								
21. Errors in own oral expression—confuses prepositions such as over, under, in, out, etc. ("put water *under* a fire to boil it")								
22. Transposes sounds in words (says "nabana" instead of "banana")								
23. Can't recite the days of the week in correct order								
BODY/MOTORIC								
24. Underactive (seems lazy, couldn't care less) in classroom and on playground								
25. Is slow to finish work (doesn't apply self, daydreams a lot, falls to sleep in school)								
26. Overactive (can't sit still in class—shakes or swings legs, fidgety)								
27. Tense or disturbed (bites lip, needs to to go to bathroom often, twists hair, high strung)								
28. Occasional lapses of contact with classroom activities (has "spells" when hands and/or body shakes, eyes blink or don't seem to see)								
29. Very small for age (less than 36 inches tall at age 7)								
30. Misses school frequently (average five days a month) due to illness								
31. Poor coordination (can't skip or hop on one foot more than three times)								
32. Fingers tremble when hands held forward and arms supposed to be steady								

BODY/MOTORIC (Continued)	CHILD'S LAST NAME A	B	C	D	E	F	G	H
33. Accidentally breaks and tears things (clumsy, awkward)								
34. Unusually short attention span for daily school work								
35. Easily distracted from school work (can't concentrate with even the slightest disturbances from other student's moving around or talking quietly)								
36. Mistakes own left from right (confuses left-hand with right-hand side of paper)								
37. Often begins tasks with one hand and finishes with the other								
38. Can't tie shoes and/or hold scissors properly								
39. Loses way in school (gets turned around and doesn't know which way to go)								
DRAWING/WRITING 40. Improper pencil grasp (clutched in fist, held too lightly or presses so hard as to break lead and tear paper)								
41. Draws circles clockwise								
42. Poor drawing of diamond compared with peers' drawings								
43. Poor drawing of crossing, wavy lines compared with peers' drawings								
44. Poor drawing of a man compared with peers' drawings								
45. Poor handwriting compared with peers' writing								
46. Reverses and/or rotates letters, numbers and words (writes "p" for "q", "saw" for "was", "2" for "7", "16" for "91") far more frequently than peers								
47. Does very poorly in written spelling tests compared with peers								
READING 48. Unable to learn the forms of letters (can't recognize letters when they are named)								

READING (Continued)	CHILD'S LAST NAME A	B	C	D	E	F	G	H
49. Reverses and/or rotates letters and numbers (reads "b" for "d", "u" for "n", "6" for "9") far more frequently than most peers								
50. Reverses and/or rotates words and numbers (reads "tac" for "cat", "left" for "felt", "327" for "723") far more frequently than peers								
51. Can read better when print is upside down								
52. Loses place more than once while reading aloud for one minute								
53. Omits words while reading grade-level material aloud (omits more than one out of every ten)								
54. Reads silently or aloud far more slowly than peers (word by word while reading aloud)								
55. Points at words while reading silently or aloud								
56. Substitutes words which distort meaning ("when" for "where")								
57. Can't sound out or "unlock" words								
58. Can read orally but does not comprehend the meaning of written grade-level words (word-caller)								
59. Can't follow written directions, which most peers can follow, when read orally or silently								
60. Reading ability at least 3/4 of a year below most peers								
RELATIONAL CONCEPTUAL 61. Tells barren or incoherent stories (they don't even make sense to peers)								
62. Has trouble telling time								
63. Doesn't understand the calendar (what day follows Wednesday, etc.)								

CHILD'S LAST NAME

RELATIONAL/CONCEPTUAL (Continued)	A	B	C	D	E	F	G	H
64. Difficulty with arithmetic (e.g., can't determine what number follows 8 or 16; may begin to add in the middle of a subtraction problem)								
65. Cannot apply the classroom or school regulations to own behavior whereas peers can								
66. Excessive inconsistency in quality of performance from day to day or even hour to hour								
67. Has trouble organizing written work (seems scatterbrained, confused)								
68. Seems very bright in many ways but still does poorly in school work								
69. Repeats the same behavior over and over								
SOCIAL/EMOTIONAL								
70. Doesn't get along with most peers (can't make or keep friends, is picked on, wants to change rules, poor loser)								
71. Shows excessive affection toward peers or adults in school or on playground								
72. Unusually aggressive toward peers or adults in school or playground								
73. Unusually shy or withdrawn								
74. Cries easily and often for no apparent reason								
75. Afraid of many things which most peers don't fear								
76. Explodes for no apparent reason								
77. Demands unusual amount of attention during regular classroom activities								
78. Seems quite immature (doesn't act his/her age)								
79. Seems insensitive to others' feelings								
80. Objects or refuses to go to school either for no apparent reason or because of fear of failure.								

PUPIL PRODUCTIONS

NAME
(last name first)

BOY GIRL
(circle one)

BIRTHDAY
(month, day, year)

AGE

WHAT I LIKE MOST ABOUT SCHOOL

SPELLING

1._____	8._____	15._____
2._____	9._____	16._____
3._____	10._____	17._____
4._____	11._____	18._____
5._____	12._____	19._____
6._____	13._____	20._____
7._____	14._____	

RELATED INFORMATION

Child's Name_____

Please write the appropriate number in each blank provided; disregard the numbers in the margin to the left of the blanks

18 _____ Type of Individual IQ Test (none = leave blank, Wechsler Intelligence Scale for Children (WISC) = 3, other = 4). When more than one, use most recent.

19-21 _____ Child's Individual IQ Score on above test (none = leave blank).

22 _____ Type of Group IQ Test (none = leave blank, California Test of Mental Maturity (CTMM) = 1, Large-Thorndike = 2, Pintner = 3, Primary Mental Abilities (PMA) = 4, other = 5). When more than one, use most recent.

23-25 _____ Child's Group IQ Score on above test (none = leave blank).

26 _____ Type of Achievement Test (none = leave blank, Stanford Achievement Test = 1, Iowa Test of Basic Skills = 2, California Achievement Test = 3, Science Research Associates (SRA) = 4, other = 5). When more than one, use most recent.

27-28 _____ Child's Percentile Rank on above test (none = leave blank).

29 _____ Type of Reading Readiness Test (none = leave blank, Gates = 1, Metropolitan = 2, McKee = 3, other = 4). When more than one, use most recent.

30-31 _____ Child's Percentile Rank on above test (none = leave blank).

32 _____ Retained (never = 0, once = 1, twice = 2).

33 _____ Number of physical handicaps (e.g., no front teeth, wears hearing aid, etc.) which might impair his listening, seeing, speaking, or writing.

34 _____ Father
35 _____ Mother

Parental Occupation (0 = none, 1 = professional and semi-professional, 2 = clerical and sales, 3 = domestic services, 4 = agricultural, 5 = skilled, 6 = semi-skilled, 7 = unskilled, 8 = unknown).

36 _____ Father
37 _____ Mother

Educational Level (0 = never attended school, 1 = completed fourth grade or less, 2 = eighth grade or less, 3 = tenth grade or less, 4 = twelfth grade or less, 5 = college freshman, 6 = two years of college, 7 = three years of college, 8 = college graduate, 9 = post graduate schooling).

38 _____ Number of older siblings (none = 0).

39 _____ Number of younger siblings (none = 0).

40 _____ Number of siblings known to have learning disabilities (including mental retardation, partially sighted, emotionally disturbed, perceptually handicapped, etc.).

41 _____ Child prefers which hand (right = 1, left = 2, neither = 0).

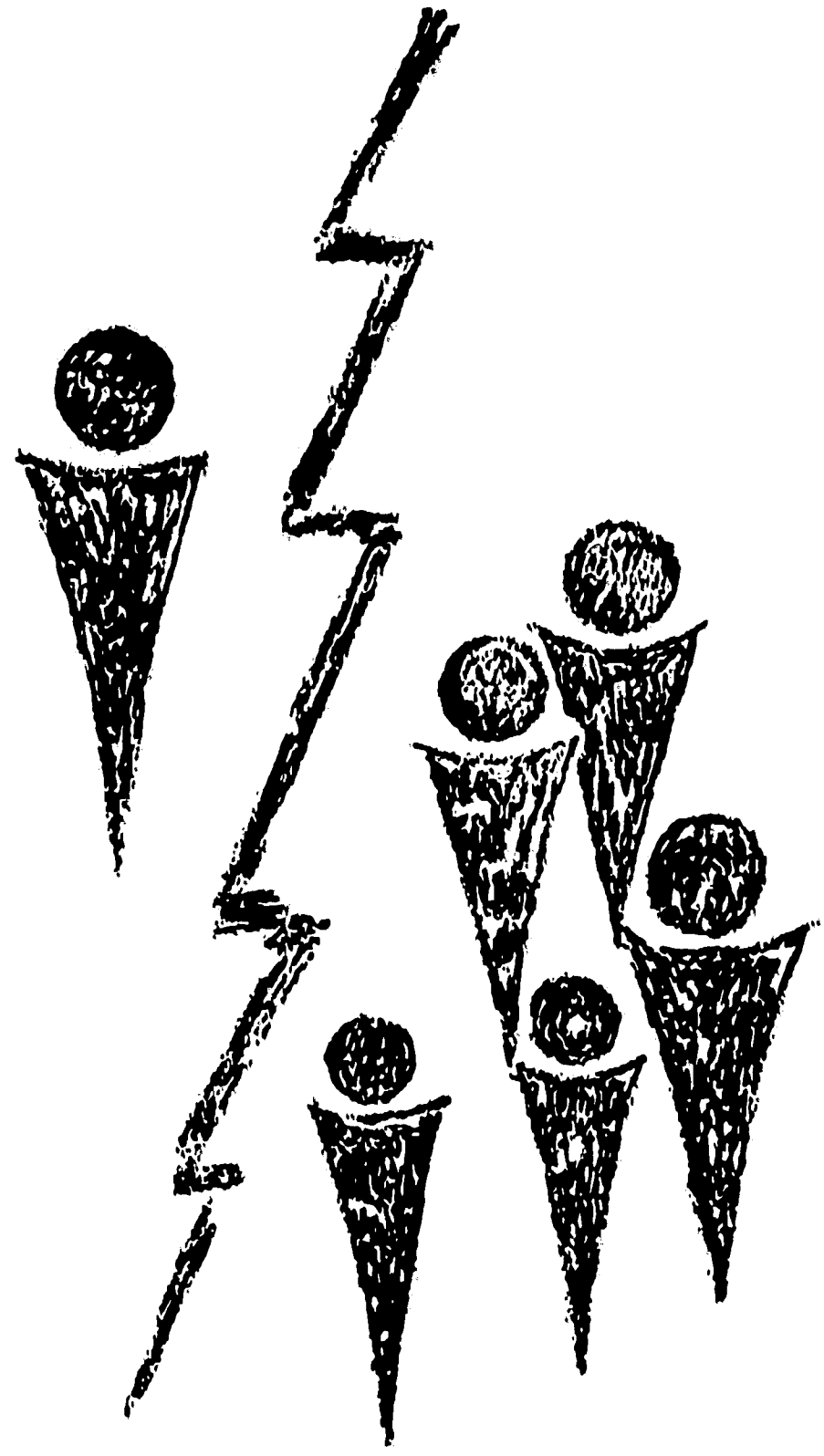
42-43 _____ Number of spelling words correct on standard list.

44-45 _____ Column number on CSI (e.g., Column D = 04).

46-47 _____ Total number of pupils listed on CSI.

Rocky Mountain Educational Laboratory, Inc.

1620 Reservoir Road • Greeley, Colorado 80631 • Telephone (303) 353-6350



TECHNICAL REPORT

INDIVIDUAL LEARNING DISABILITIES PROGRAM PILOT INCIDENCE STUDY - VOL. III

STATISTICAL ANALYSIS

ROCKY MOUNTAIN EDUCATIONAL LABORATORY

INDIVIDUAL LEARNING DISABILITIES PROGRAM

PILOT INCIDENCE STUDY

Prepared by

ROCKY MOUNTAIN EDUCATIONAL LABORATORY GREELEY, COLORADO

Verl O. Cazier
Project Assistant

Dr. Marian T. Giles
Project Assistant

Dr. Willard G. Jones
Executive Director

BUREAU OF EDUCATIONAL RESEARCH UTAH UNIVERSITY SALT LAKE CITY, UTAH

Dan R. Anderson
Associate Director of Research
Tri-University Project

Van B. Norman
Research Associate
Bureau of Research and
University Computer Center

August, 1969

Prepared pursuant to a contract with the United States Office of Education, Bureau of Research, H.E.W.
Contract No. OEC-4-7-062828-30-63

Dr. Willard G. Jones
Executive Director

ROCKY MOUNTAIN EDUCATIONAL LABORATORY, INC.
1620 Reservoir Road
GREELEY, COLORADO 80631

TABLE OF CONTENTS

ILLUSTRATIONS

INDIVIDUAL LEARNING DISABILITIES

PILOT INCIDENCE STUDY

Foreword

This study was conducted as the initial effort of the Rocky Mountain Educational Laboratory in its individual learning disabilities program. It was undertaken to gain data on the occurrence and nature of individual learning disabilities. The results of this study would provide direction for the laboratory in the development and testing of classroom usable prescriptive materials for the prevention or remediation of problems confronting children with identified disabilities.

The Rocky Mountain Educational Laboratory is one of twenty regional laboratories primarily funded by the Office of Education, Bureau of Research, Division of Educational Laboratories. The Rocky Mountain Educational Laboratory area of operation includes: Arizona, Colorado, Idaho, Montana, Utah, Wyoming, and part of Nebraska and Kansas.

This study is presented in three volumes:

Volume
One: ***Introduction and Procedures-Individual Learning Disabilities Pilot Incidence Study***

Volume
Two: ***Descriptive Analysis of Level I, Level II, and Level III Data-Individual Learning Disabilities Pilot Incidence Study***

Volume
Three: ***Statistical Analysis of Level I, Level II. Level III Data, Summary and Conclusions- Individual Learning Disabilities Pilot Incidence Study***

STATISTICAL ANALYSIS, INTERPRETATIONS AND RECOMMENDATIONS

SCORING AND VALIDATION

This section describes (1) the scoring of the Classroom Screening Inventory, (2) the techniques utilized to relate the CSI scores to Level II criteria and (3) the resulting validity coefficients.

Specifically, the following analyses were performed:

1. *Factor Analysis:* the entire pool of CSI items were factor analyzed and rotated to an oblique cluster solution in an attempt to more parsimoniously describe the relationships existing among the items.

2. *Item Analysis:* regression equations were developed, using each of the 80 items in the CSI as a predictor variable, for a selected set of Level II variables.

3. *Sub-Scale Scoring:* two sets of sub-scores were developed, the first consisting of eight scales, one for each section included within the CSI; the second consisting of six logically developed scales based on a re-categorization of the original 80 CSI items. The latter set of scales were developed by expert educational diagnosticians, and are referred to hereafter as the "Learning Behavior Scales." A score was defined for any sub scale as the sum of checks within that scale which indicate that the teacher had observed the behavior indicated by the item. This score was subtracted from 50, in order to maintain reference consistency i.e., high scores on the CSI sub scales mean the same as high scores on the Level II variables.

The names assigned to each scale described in an earlier section are as follows:

CSI SUB-SCALES

Name	Name
Visual	Drawing/Writing
Auditory	Reading
Speech	Related Concepts
Body Motoric	Social Emotional

EDUCATIONAL DIAGNOSTICIAN

Name	Name
Physical Motoric	Processing
Visual Reception	Expression
Auditory Reception	Behavior

In addition, discriminant functions were developed for several combinations of Level I and Level II data, in an attempt to determine the CSI's ability to discriminate among diagnostic categories as defined by educational diagnosticians.

4. *Regression of Sub-Scale Scores:* A step-wise regression procedure was employed in order to determine the ability of the best six of the fourteen scales described in 3 above to predict a selected set of Level II data.

It would be wise here to reiterate the fact that the CSI is still in its experimental and developmental form. The results which follow are in some cases quite gratifying, in others, not so gratifying. Nevertheless, a great deal of work remains to be done on the instrument, both in terms of the instrument itself and in terms of the methods utilized to analyze the instrument, before a completely informed decision can be made concerning its merit.

It is presently anticipated that replication studies will be undertaken in the near future, using a revised form of the instrument, and incorporating new scoring and validation methods as they are refined.

A number of similar and contemporary studies have utilized a cluster analysis to define key categories and to identify items which relate to them. While the cluster analysis procedure is probably not the most desirable for the type of instrument it was nevertheless executed with the idea that it might be of help in revising the scales by identifying the key items within a scale (those about which other items tend to cluster).The outcome, however, did not offer the desired results since even so-called key items in a CSI scale are often significant contributors in one or more of the other scales. Items which are contributors to only one scale are difficult to define in an instrument such as the CSI and may not be desired. The cluster analysis is presented in Figure 1. Statisticians have indicated that second order analyses might improve the coefficients. The cluster analysis results were only of value then, in that they confirmed the fact that the CSI did not have- and that the items could not be rearranged to have-scales consisting of items exclusively contributing one of its particular scales. The factor analysis data, accompanied by confirming regression analysis procedures, offered the greatest amount of useful information in redefining the scales of the CSI.

ITEM ANALYSIS

Another method of determining the relationship between the various behavioral items in the Classroom Screening Inventory is to relate all 80 items, using a Multiple Regression procedure, to a selected set of Level II data. This procedure results in one equation for each criterion variable. Weights are generated for each item in the prediction equation, which

FIGURE 1

VARIABLES IN OBLIQUE CLUSTER 1

Category	Variables	Oblique Fact. Coeff.	Communality
4	30. Misses school frequently (average five days a month) due to illness.	.7694	.5961
4	29. Very small for age (less than 36 inches tall at age 7).	.7330	.5505
4	37. Often begins tasks with one hand and finishes with the other.	.7164	.5260
4	28. Occasional lapses of contact with classroom activities (has "spells" when hands and/or body shakes, eyes blink or don't seem to see).	.6450	.4546
1	8. Seems to have pop-eyes.	.6439	.5123
4	39. Loses way in school (gets turned around and doesn't know which way to go).	.5949	.3850
1	9. Eyes are crossed.	.5867	.4503
1	5. Uncontrollable rapid jumping of eyes.	.5603	.3837
4	38. Can't tie shoes and/or hold scissors properly.	.4783	.2771
1	3. Head forward or tilted to one side (more than 15^{o}) when reading or engaged in other visual tasks.	.4218	.3149
1	1. Holds book too close (6 inches or less).	.4186	.2274
3	18. Lips remain apart when at rest (mouth breathing).	.4174	.2610
1	3. Avoids work requiring concentrated visual attention.	.4090	.3103
4	33. Accidentally breaks and tears things (clumsy, awkward).	.4088	.2744

Variables in Oblique Cluster 1 - Page two

Category		Variables	Oblique Fact. Coeff.	Communality
4	32.	Fingers tremble when hands held forward and arms supposed to to be steady.	.4074	.2119
4	24.	Underactive (seems lazy, couldn't care less) in classroom and on playground.	.3980	.2653
1	6.	Rubs eyes often when reading or engaged in other visual tasks.	.3945	.2711
1	7.	Facial contortions with visual tasks (including squint).	.3941	.2525
4	31.	Poor coordination (can't skip or hop on one foot more than three times.	.3726	.2349
7	61.	Tells barren or incoherent stories (they don't even make sense to peers).	.3405	.2496

Looks like factors 1 (visual) and 4 (body/motoric) are hard to distinguish between. The low communalities may be misleading: i.e., if factor scores based on best items were used with such items in a second order analysis, they might improve. At a first glance, neither factor 1 or 4 looks too good.

VARIABLES IN OBLIQUE CLUSTER 2

Category		Variables	Oblique Fact. Coeff.	Communality
8	72.	Unusually aggressive toward peers or adults in school or playground.	.8094	.6624
8	70.	Doesn't get along with most peers (can't make or keep friends, is picked on, wants to change rules, poor loser).	.7804	.6222
8	79.	Seems insensitive to others' feelings.	.7290	.5546
8	76.	Explodes for no apparent reason.	.6457	.4248
7	65.	Cannot apply the classroom or school regulations to own behavior whereas peers can.	.6182	.4707
8	74.	Cries easily and often for no apparent reason.	.6065	.4401
8	77.	Demands unusual amount of attention during regular classroom activities.	.6040	.4540
7	66.	Excessive inconsistency in quality of performance from day to day or even hour to hour.	.5223	.3324
8	78.	Seems quite immature (doesn't act his/her age).	.4298	.3103
8	80.	Objects or refuses to go to school either for no apparent reason or because of fear of failure.	.4154	.2697
4	27.	Tense or disturbed (bites lip, needs to go to bathroom often, twists hair, high strung).	.3902	.3180

Variables in Oblique Cluster 2 - Page two

Category		Variables	Oblique Fact. Coeff.	Communality
8	71.	Shows excessive affection toward peers or adults in school or on playground.	.3815	.2212
8	75.	Afraid of many things which most peers don't fear.	.3797	.2645

factor 8 (social/emotional) looks pretty good. A second order analysis might improve low communalities.

VARIABLES IN OBLIQUE CLUSTER 3

Category		Variables	Oblique Fact. Coeff.	Communality
6	57.	Can't sound out or "unlock" words.	.6775	.4683
6	60.	Reading ability at least 3/4 of a year below most peers.	.6684	.4691
6	59.	Can't follow written directions, which most peers can follow, when read orally or silently.	.6245	.4538
5	47.	Does very poorly in written spelling tests compared with peers.	.5845	.3725
6	54.	Reads silently or aloud far more slowly than peers (word by word while reading aloud).	.5500	.3394
2	10.	Unable to learn the sounds of letters (can't associate proper phoneme with its grapheme).	.5139	.3671
6	56.	Substitutes words which distort meaning ("when" for "where").	.5005	.3579
6	55.	Points at words while reading silently or aloud.	.4589	.2768
6	58.	Can read orally but does not comprehend the meaning of written grade-level words (word-caller).	.3910	.2356
3	23.	Can't recite the days of the week in correct order.	.3094	.2211

factor 6 (reading) looks real good--only a small amount of building from other variables.

VARIABLES IN OBLIQUE CLUSTER 4

Category		Variables	Oblique Fact. Coeff.	Communality
5	43.	Poor drawing of crossing, wavy lines compared with peers' drawings.	.8292	.6933
5	42.	Poor drawing of diamond compared with peers' drawings.	.6584	.4483
5	44.	Poor drawing of a man compared with peers' drawings.	.6517	.4389
5	45.	Poor handwriting compared with peers' writing.	.4508	.3102

VARIABLES IN OBLIQUE CLUSTER 5

Category		Variables	Oblique Fact. Coeff.	Communality
7	64.	Difficulty with arithmetic (e.g. can't determine what number follows 8 or 16; may begin to add in the middle of a subtraction problem)	.7609	.6101
7	69.	Repeats the same behavior over and over.	.7339	.5839
7	62.	Has trouble telling time.	.6870	.5324
7	68.	Seems very bright in many ways but still does poorly in school work.	.5914	.3880

VARIABLES IN OBLIQUE CLUSTER 6

Category		Variables	Oblique Fact. Coeff.	Communality
2	11.	Doesn't seem to listen to daily classroom instructions or directions (often asks to have them repeated whereas rest of class goes ahead.	.7028	.5085
2	12.	Can't correctly recall oral directions (e.g., item 11 above) when asked to repeat them.	.7028	.5085
7	67.	Has trouble organizing written work (seems scatterbrained, confused).	.4789	.3466
4	34.	Unusually short attention span for daily school work.	.4256	.2251
4	35.	Easily distracted from school work (can't concentrate with even the slightest disturbances from other student's moving around or talking quietly).	.4214	.2394
4	25.	Is slow to finish work (doesn't apply self, daydreams a lot, falls to sleep in school).	.4015	.2192
4	26.	Overactive (can't sit still in class-shakes or swings legs, fidgety).	.3776	.2656
3	20.	Unable to correctly repeat a 7-10 word statement by the teacher (omits or transposes words).	.3745	.2378

Doesn't look like much of a factor, at least as defined by the existing inventory.

VARIABLES IN OBLIQUE CLUSTER 7

Category		Variables	Oblique Fact. Coeff.	Communality
6	49.	Reverses and/or rotates letters and numbers (reads "b" for "d", "u" for "n", "6" for "9") far more frequently than most peers.	.7399	.5593
6	50.	Reverses and/or rotates words and numbers (reads "tac" for "cat", "left" for "felt", "327" for "723") far more frequently than peers.	.7024	.5052
5	46.	Reverses and/or rotates letters, numbers and words (writes "p" for "q", "saw" for "was", "2" for "7", "16" for "91") far more frequently than peers.	.7019	.5277
6	53.	Omits words while reading grade-level material aloud (omits more than one out of every ten).	.5317	.3396
6	52.	Loses place more than once while reading aloud for one minute.	.4992	.4074
1	4.	Moves head or trunk excessively during visual tasks (instead of moving eyes).	.4680	.3667
5	40.	Improper pencil grasp (clutched in fist, held too lightly or presses so hard as to break lead and tear paper).	.3844	.2528

Mostly factor 6 item.
Notice that correlation of cluster 3 and cluster 7 (p. 2 of this section) is quite low--contrary to what one would expect if the items really do go together.
Perhaps 6 is making up two factors.

VARIABLES IN OBLIQUE CLUSTER 8

Category		Variables	Oblique Fact. Coeff.	Communality
3	15.	Can't pronounce the sounds of certain letters.	.7446	.5630
3	16.	Mild speech irregularities (can't pronounce common second grade words).	.7446	.5630
3	17.	Immature speech patterns (still uses much baby talk).	.5755	.4498
3	21.	Errors in own oral expression--confuses prepositions such as over, under, in, out, etc. ("put water under a fire to boil it")	.5550	.3654
3	14.	Can't name letters when they are pointed to.	.5487	.3965
6	48.	Unable to learn the forms of letters (can't recognize letters when they are named).	.5392	.4257
3	22.	Transposes sounds in words (says "nabana" instead of "banana")	.5279	.3373
2	13.	Doesn't seem to comprehend spoken words (may recognize the words separately but not in connected speech).	.3956	.2721
8	73.	Unusually shy or withdrawn.	.2529	.2529

Looks good for factor 3 (speech). May improve with 2nd order analysis.

maximizes the linear prediction for a given criterion variable.

The table in Figure 2* illustrates the Multiple R's, R^2's and the standard error of estimate for each of the Level II criterion selected. Only those subjects having complete Level II protocols were utilized in this analysis, thus reducing the number of subjects included to 266.

Difficulties inherent in this type of item analysis include:

1. The Multiple R can be expected to shrink when applied to another sample of subjects. Guilford (1965, p. 401) provides a formula whereby this shrinkage can be estimated,

$$R_c^2 = 1-(1-R^2)\frac{(N-1)}{(N-m)}$$

Where R_c^2 = the square of the corrected coefficient

N = the number of subjects

m = the number of variables correlated

Although it is implied that this shrinkage will not be large when the original sample is greater than 100, the interested reader may wish to evaluate the reported Multiple R's with this equation.

2. The equations generated are not in a convenient form for use by a person without access to a computer or other such high speed scoring devices, since each equation contains a total of 81 weights (a constant term and a weight for each of the 80 items) by which the student's protocol must be multiplied in order to obtain a total score, resulting in 80 multiplication and 81 addition operations for each subject on each criterion.

Future development of scoring techniques for this instrument will explore the assignment of unit weights (e.g. ± 1) to each item, in order to facilitate the ease of scoring and interpretation. Previous research (8:506) has indicated that the use of unit weights results in little, if any, loss in validity or reliability unless the total number of items is small.

In summary, the reported Multiple R's are, in general, satisfactorily high, indicating that further development and refinement of the Classroom Screening Inventory should be pursued.

COMMENTS ON MULTIPLE REGRESSION

An examination of the table reveals that the Multiple R's on all Level II criterion measures are near to or exceed .80 with the exception of the VMI. Attention should also be called to the large standard error related to the VMI score. Except for reading and spelling all Multiple R's are higher with scores derived directly from tests than with those derived by

*Copies of each regression equation have been placed on file with Division of Educational Laboratories of the Bureau of Research and Bureau of Handicapped of the U.S. Office of Education.

MULTIPLE REGRESSION OF ALL 80 CSI ITEMS
ON SELECTED LEVEL 2 CRITERIA
ON 266 ILD Subjects

VARIABLE	MULTIPLE R	R^2	STD. ERROR
Chronological Age	.869	.754	5.377
Mental Age	.788	.621	10.546
Expectency Age	.925	.856	2.817
Frostig LQ	.805	.648	6.393
ITPA LQ	.851	.723	4.744
WISC LQ	.813	.660	6.603
Articulation LQ	.817	.668	6.944
Reading LQ	.870	.757	4.450
Spelling LQ	.875	.765	3.698
Arithmetic LQ	.956	.914	7.103
Spatial	.703	.494	16.148
Conceptualizing	.694	.482	18.317
Sequencing	.753	.567	11.741
Average LQ	.888	.787	4.384
Verbal IQ	.850	.723	6.666
Performance IQ	.822	.676	7.517
Frostig Perceptual Age	.880	.775	4.564
ITPA Language Age	.815	.665	10.548
WISC Full Scale IQ	.847	.717	7.948
VMI Quotient	.654	.428	20.529
Articulation Total Score	.844	.712	7.882
Reading St. Score	.919	.845	12.157
Spelling St. Score	.794	.630	9.286
Arithmetic St. Score	.907	.823	15.194

Figure 2

dividing the standard scores by Expectancy Age, which produce "learning quotients". It should also be noted, however, that Multiple R's calculated on the basis of scores derived directly from tests are accompanied by larger standard errors.

The lowest Multiple R's, of scores other than those specifically identified above, occur in three breakdowns of the WISC intelligence scales entitled: spatial, conceptualizing, and sequencing.

The following sections will describe several other methods devised and implemented for the purpose of determining the relationship between this instrument and selected Level II data.

SUB-SCALE SCORING

Multiple discriminant analysis is a procedure for determining group membership from a linear combination of scores. The subjects in this study were conceptually divided by several different classifications. For each classification procedure a multiple discriminant analysis was performed using two sets of scores: (1) the CSI scores and (2) the Level II criterion scores. The linear equation which leads to the prediction of group membership is that equation which combines the scores on the variables in such a manner that the within group's variance is minimized and the between group's variance is maximized, i.e. the equations "unites" the members of a group and "separates" them from other groups. If there are n original groups then the expected or most likely percent correct classifications based on the classification equation is 1/n X 100 percent, e.g. if there are 3 groups then by chance alone you would expect about 33% correct classifications, or with 2 groups 50%.

An additional part of the multiple discriminant analysis is a statistical comparison of the n groups being studied. For example, if there are 3 groups and group membership is to be predicted from 5 scores then the following means are produced:

		Variables				
		1	2	3	4	5
Group	1	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}
	2	X_{21}	X_{22}	X_{23}	X_{24}	X_{25}
	3	X_{31}	X_{32}	X_{33}	X_{34}	X_{35}

The Mahalanobis D^2 statistic is used to test the hypothesis that the complete set of means for all groups are identical. This statistic may be interpreted as an X^2 statistic with degrees of freedom = (n-1) X m where n is the number of groups and m is the number of scores for each subject.

The following three tables presented in Figure 3 present the results of the Multiple Discriminant Analyses. For each of these analyses the groups were defined as follows:

Level 2

Data (Means) for Three Group Split, Defined by RMEL Educational Diagnosticians

	Control N= 87	Slow Learner N= 24	ILD N=145	Severe ILD N= 115	Composite ILD Total N= 284
Chronological Age	101.51	112.71	98.24	104.39	101.95
Grade Age	96.00	96.00	96.00	96.00	96.00
Mental Age	102.00	83.42	99.08	98.28	97.43
Expectancy Age	99.86	97.42	97.77	99.59	98.48
Perception	104.94*	74.00	93.65	85.80	88.81
Language	93.00*	80.38	93.04	87.95	89.91
Cognition	100.74	75.46	101.50	94.78	96.49
Visual Motor	110.05*	77.42	102.86	91.58	96.14
Articulation	106.85	95.58	105.64	100.63	102.76
Reading	105.79	81.58	96.86	85.16	90.83
Spelling	99.03	80.71	92.94	84.53	88.50
Arithmetic	95.95	81.96	94.30	87.96	90.69
Spatial	100.69	64.38	103.02	94.03	96.12
Conceptual	103.53	62.54	109.22	102.54	102.57
Sequencing	101.80	71.50	95.53	86.79	89.96
Verbal I.Q.	100.56	75.75	102.46	95.56	97.41
Performance I.Q.	101.23	78.63	99.95	94.79	96.06

*Administered to Control Group N=20

Per Cent correct classification = 81%

(Mahalanobis D-Square for Group Mean Differences = 436.33, significant beyond the .01 level, with 24 degrees of freedom.)

Figure 3

CSI Subscale and Total Mean Scores for 3-Group Split Defined by Diagnostic Experts

Scale	Slow Learners N=24	Severe ILD N=115	ILD N=145
Visual	47.29	48.51	49.08
Auditory	47.71	47.94	48.55
Speech	46.42	47.12	48.36
Body/Motoric	44.92	45.23	46.07
Drawing/Writing	45.88	46.32	46.79
Reading	43.62	43.15	44.80
Relational/Conceptual	45.92	45.68	46.38
Social.Emotional	47.46	47.59	47.94
Total Scores	369.21	371.09	377.98

Per cent correct classification = 56%, when expected per cent =33%

Mahalanobis D-Square for Group Mean differences = 69.28, significant beyond the .01 level, with 16 degrees of freedom.

Classification Matrix for 3-Group Split Defined by Diagnostic Experts

1) Level 2 Data	Assignment			
Actual Membership	1	2	3	Total
1 Severe ILD	84	22	9	115
2 ILD	26	119	0	145
3 Slow Learners	0	0	24	24

2) CSI Data	Assignment			
Actual Membership	1	2	3	Total
1 Severe ILD	39	44	32	115
2 ILD	25	105	15	145
3 Slow Learners	5	5	14	24

Figure 3

Diagnostic Experts Scales And Total Mean Scores for 3-Group Split Defined By Diagnostic Experts

Scale	Slow Learners N=24	Severe ILD N=115	ILD N=145
Physical Motoric	45.00	45.73	46.40
Visual Reception	34.00	35.09	38.94
Auditory Reception	40.25	40.34	42.98
Processing	30.96	32.47	36.43
Expression	46.96	47.43	48.19
Behavior	38.79	38.06	40.67

Per cent correct classification = 50%, where expected per cent =33%

Mahalnobis D-Square for group mean differences = 56.05, significant beyond the .01 level, with 12 degrees of freedom.

Classification Matrix For 3-Group Split Defined by Diagnostic Experts

	Assignment			
Actual Membership	1	2	3	Total
1 Slow Learners	13	5	6	24
2 Severe ILD	32	46	37	115
3 ILD	28	31	86	145

Figure 3

Group I: the severe ILD's; an average LQ of 90 or less or at least 2 or more specific LQs, derived from Level II criterion measures, less than 85.

Group II: the ILD's; this group was identified by the classroom teachers as having learning problems but did not meet the criterion of Group I.

Group III: the slow learners; this group had IQ scores less than 80.

The reader will note that three analyses were performed for each of two group classifications, one classification being the groups as defined above, the other resulting from combining Groups I and III and comparing them with Group II.

1. Level II data means were evaluated to determine the extent to which the RMEL defined groups were different from each other.

2. CSI sub-scale scores were evaluated to determine the extent to which the scores formed within the CSI could effectively discriminate between the RMEL defined groups.

3. Learning Behavior Categories were evaluated to determine the extent to which the scores formed within the logical scales defined by the Diagnostic Experts could effectively discriminate between the RMEL defined groups.

The following analyses, presented in Figure 4, represents a new grouping formed by adding the slow learners to the severe ILD group. This was done because of the similarity of profiles of the two groups on the Level II variables.

The following two Multiple Discriminant Analyses tables presented in Figure 5 represent a quantitative division of the entire Group into two groups based on their total CSI scores (formed by adding the 8 sub scales together). The cutting line for the two groups was a CSI score of 375 out of a total possible of 400. 375 was chosen because it was approximately the median score for all 284 subjects.

REGRESSION OF SUB-SCALE SCORES

The 80 CSI items were analyzed to form sub scales by two different methods. Specifically, a subject's score was defined as the total number of items checked, indicating that the teacher had observed the behavior represented by the item. Each of the sub-scale scores were subtracted from 50, in order to allow uniform interpretation of the validity data. One set of sub scales was developed for each of the 8 sections in the CSI behavioral indices and another subset was developed based on six sub scales developed by a panel of educational diagnostic experts. The development of each of these scales has been described previously. The names assigned to the scales are reproduced below.

The above 14 sub scales were then used to predict the following 15 Level II variables:

Level 2 Data (Means) for Two Group Split

Formed by Combining Severe and Slow Learner Group and ILD Group

Defined by Diagnostic Experts

Variable	Control N=87	Total N=284	Slow and Severe ILD N=139	ILD N=145
Chronological Age	101.51	101.09	104.55	98.24
Grade Age	96.00	96.00	96.00	96.00
Mental Age	102.00	98.82	95.71	99.08
Expectancy Age	99.86	98.63	99.22	97.77
Perception	104.94*	91.00	83.76	93.65
Language	99.00	90.95	86.64	93.04
Cognition	100.74	98.56	91.27	101.50
Visual Motor	110.05*	101.10	89.14	102.86
Articulation	106.85	103.73	99.76	105.64
Reading	105.79	93.17	84.54	96.86
Spelling	99.03	89.82	83.87	92.94
Arithmetic	94.95	92.10	86.92	94.30
Spatial	100.69	98.30	88.91	103.02
Conceptual	103.53	105.73	95.63	109.23
Sequencing	101.80	92.52	84.15	95.53
Verbal I.Q.	100.56	99.20	92.14	102.46
Performance I.Q.	101.23	97.98	92.00	99.95

*Administered to Control Group (N=20).

Per cent correct classification = 86% where expected per cent =50%

Mahalanobis D-Square for Group Mean differences = 260.33, with 13 degrees of freedom, significant beyond the .01 level.

Figure 4

CSI Subscale and Total Mean Scores for 2-Group Split Formed by Combining Severe and Slow Learner Group and ILD Group Defined by Diagnostic Experts

Scale	Slow Learner and Severe N=139	ILD N=145
Visual	47.92	49.08
Auditory	47.90	48.55
Speech	47.00	48.36
Body/Motoric	45.17	46.07
Drawing/Writing	46.24	46.79
Reading	43.73	44.80
Relational/Conceptual	45.72	46.38
Social/Emotional	47.57	47.94
Total Score	370.66	379.98

Per cent correct classification = 70%, where expected value is 50%
Mahalanobis D-Square for Group Mean differences= 55.08, with 8 degrees of freedom, significant beyond the .01 level.

Classification Matrix for 2-Group Split Formed by Combining Severe and Slow Learner Group and ILD Group Defined by Diagnostic Experts

1) Level 2 Data

Actual Membership	Assignment 1	2	Total
1 Slow Learners and Severe ILD	115	23	139
2 ILD	18	127	145

2) CSI Data

Actual Membership	Assignment 1	2	Total
1 Slow Learners and Severe ILD	86	53	139
2 ILD	33	112	145

Figure 4

Diagnostic Expert's Scales and Total Mean Scores for 2-Group Split Formed by Combining Severe and Slow Learner Group and ILD Group Defined by Diagnostic Experts

Scale	Slow Learner and Severe N=139	ILD N=145
Physical Motoric	45.60	46.40
Visual Reception	34.90	38.94
Auditory Reception	40.32	42.98
Processing	32.21	36.43
Expression	47.35	48.19
Behavior	38.19	40.67

Per cent correct classification = 64%, where expected per cent = 50%
Mahalanobis D-Square for group mean differences = 46.52, significant beyond the .01 level, with six degrees of freedom.

Classification Matrix for 2-Group Split Defined by Diagnostic Experts

CSI Diagnostic Expert's Scale

Actual Membership	Assignment 1	2	Total
1 Slow Learners and Severe ILD	86	53	139
2 ILD	48	97	145

Figure 4

Level 2 Data (Means) for Two Group Split Defined by CSI Total Score

Variable	Control N=87	ILD N=284	ILD 1 N=153	ILD 2 N=131
Chronological Age	101.51	101.95	101.09	102.96
Grade Age	96.00	96.00	96.00	96.00
Mental Age	102.00	97.43	98.82	95.81
Expectancy Age	99.86	98.48	98.63	98.31
Perception	104.94*	88.81	91.00	86.25
Language	93.00*	89.91	90.95	88.69
Cognition	100.74	96.49	98.56	94.08
Visual Motor	110.05*	96.14	101.10	90.35
Articulation	106.85	102.76	103.73	101.63
Reading	105.79	90.83	93.17	88.10
Spelling	99.03	88.50	89.82	86.96
Arithmetic	94.95	90.69	92.10	89.04
Spatial	100.69	96.12	98.30	93.57
Conceptual	103.53	102.57	105.73	98.89
Sequencing	101.80	89.96	92.52	86.98
Verbal I.Q.	100.56	97.41	99.20	95.32
Performance	101.23	96.06	97.98	93.82

*Not administered to Control Group

Per cent correct classification = 70% where expected per cent =50%

Mahalanobis D-Square for Group Mean difference = 45.77, significant beyond the .01 level, with 13 degrees of freedom.

Figure 5

CSI Subscale and Total Mean Scores for 2-Group Split

Split Defined by CSI Total Score

Scale	ILD 1	ILD 2
Visual	49.34	47.56
Auditory	48.81	47.56
Speech	49.03	46.14
Body/Motoric	47.19	43.81
Drawing/Writing	47.26	45.66
Reading	45.77	42.00
Relational/Conceptual	47.17	44.76
Social/Emotional	48.71	46.65
Total Score	383.28	364.12

Cutting Point at 375.00
Per cent correct classification = 97%, where expected valve =50%
Mahalanobis D-Square per group mean differences = 583.44, significant beyond the .01 level, with 8 degrees of freedom.

Classification Matrix for 2-Group Split

CSI Total Score

1) Level 2 Data	Assignment		
Actual Membership	1	2	Total
1 ILD-1	100	53	153
2 ILD-2	35	96	131

2) CSI Data	Assignment		
Actual Membership	1	2	Total
1 ILD-1	152	1	153
2 ILD-2	6	125	131

Figure 5

1 M.A.

2 E.A.

3. Perceptual Quotient

4 ITPA Language Age

5 WISC Full Scale IQ

6 VMI Quotient

7 Articulation Total Score

8 WRAT Reading Standard Score

9 WRAT Spelling Standard Score

10 WRAT Arithmetic Standard Score

11 Spatial WISC (Picture Completion, Block Design, Object Assembly)

12 Conceptual WISC (Comprehension, Similarities, Vocabulary)

13 Sequential WISC (Digit Span and Picture Arrangement and Coding)

14 Verbal IQ

15 Performance IQ

All 14 sub scales were not used in trying to predict the above 15 variables, instead, only those six variables resulting in the highest predictive coefficient were included in the prediction equation. This was accomplished by using a step-wise linear regression procedure, where given a criterion measure, y, and several predictor variables (sub scales in this case) say x_i, x_j, x_k the program first selects the predictor variable, x_i that correlates highest with y, thus forming a prediction equation $Y=b_i x_i+C$ where C is a constant term. Then another sub scale is chosen which improves the prediction by yielding a better equation of the form $Y_i=b_i X_i+B_j X_j+C$

The next variable added is always that variable which has the highest correlation with the criterion and the lowest correlation with the previously entered variable. This procedure was continued for each criterion variable until the best sub scales sub-scales were found. They are presented in Figures 6 through 20.

Each table includes the order in which a given sub scale was entered into the prediction equation, the multiple correlation for each step and the percent variance accounted for at

STEP WISE MULTIPLE REGRESSION OF 14 CSI VARIABLES ON MENTAL AGE

STEP NUMBER	VARIABLE	MULTIPLE R	MULTIPLE R2
1	Speech	.1553	.0241
2	Reading	.2063	.0426
3	*Visual Reception	.2815	.0792
4	*Behavior	.3210	.1031
5	*Expression	.3353	.1125
6	Social Emotional	.3476	.1208

Standard Error of Estimate=9.3246

* Denotes Significant Value

Figure 6

STEP WISE MULTIPLE REGRESSION OF 14 CSI VARIABLES ON EXPECTANCY AGE

STEP NUMBER	VARIABLE	MULTIPLE R	MULTIPLE R2
1	Reading	.1443	.0208
2	*Processing	.2493	.0622
3	*Behavior	.2821	.0796
4	Related Concepts	.2909	.0846
5	Social Emotional	.2973	.0884
6	*Visual Reception	.3027	.0916

Standard Error of Estimate=3.9866

Figure 7

STEP WISE MULTIPLE REGRESSION

OF 14 CSI VARIABLES AGAINST PERCEPTUAL QUOTIENT

STEP NUMBER	VARIABLE	MULTIPLE R	MULTIPLE R2
1	*Visual Reception	.3103	.0963
2	Visual	.3326	.1106
3	*Behavior	.3705	.1372
4	Social Emotional	.3878	.1504
5	Body Motoric	.4105	.1685
6	Auditory	.4227	.1787

Standard Error of Estimate=9.6683

Figure 8

STEP WISE MULTIPLE REGRESSION

OF 14 CSI VARIABLES ON ITPA

STEP NUMBER	VARIABLE	MULTIPLE R	MULTIPLE R2
1	Speech	.1609	.0259
2	*Behavior	.2699	.0729
3	Body Motoric	.3036	.0922
4	Visual	.3311	.1096
5	Auditory	.3495	.1222
6	Social Emotional	.3749	.1406

Standard Error of Estimate=9.8446

Figure 9

STEP WISE MULTIPLE REGRESSION

OF 14 CSI VARIABLES AGAINST WISC

STEP NUMBER	VARIABLES	MULTIPLE R	MULTIPLE R2
1	Visual	.2605	.0678
2	*Behavior	.2934	.0861
3	*Physical Motoric	.3261	.1064
4	Auditory	.3436	.1180
5	Social Emotional	.3682	.1355
6	Related Concepts	.3763	.1416

Standard Error of Estimate=10.8956

Figure 10

STEP WISE MULTIPLE REGRESSION

OF 14 CSI VARIABLES ON VHI

STEP NUMBER	VARIABLES	MULTIPLE R	MULTIPLE R2
1	*Physical Motor	.2343	.0549
2	Social Emotional	.2564	.0657
3	Reading	.2626	.0690
4	*Visual Reception	.2841	.0807
5	Visual	.2978	.0887
6	Related Concepts	.3052	.0931

Standard Error=24.353

Figure 11

STEP WISE MULTIPLE REGRESSION OF 14 CSI VARIABLES ON ARTICULATION

STEP NUMBER	VARIABLES	MULTIPLE R	MULTIPLE R2
1	Speech	.2545	.0648
2	Related Concepts	.2987	.0892
3	*Physical Motoric	.3213	.1032
4	Reading	.3292	.1083
5	Auditory	.3331	.1109
6	Auditory Reception	.3478	.1210

Standard Error=11.565

Figure 12

STEP WISE MULTIPLE REGRESSION OF 14 CSI VARIABLES ON WRAT READING

STEP NUMBER	VARIABLES	MULTIPLE R	MULTIPLE R2
1	Reading	.4424	.1957
2	*Behavior	.4593	.2110
3	Visual	.4778	.2283
4	Social Emotional	.4939	.2439
5	Auditory	.5024	.2524
6	*Physical Motoric	.5076	.2577

Standard Error=9.781

Figure 13

STEP WISE MULTIPLE REGRESSION

OF 14 CSI VARIABLES ON WRAT SPELLING

STEP NUMBER	VARIABLES	MULTIPLE R	MULTIPLE R2
1	*Visual Reception	.3387	.1147
2	*Behavior	.3791	.1437
3	Drawing Writing	.3981	.1585
4	Auditory	.4035	.1628
5	Visual	.4078	.1663
6	*Physical Motoric	.4114	.1692

Standard Error=7.655

Figure 14

STEP WISE MULTIPLE REGRESSION

OF 14 CSI VARIABLES ON WRAT MATH

STEP NUMBER	VARIABLES	MULTIPLE R	MULTIPLE R2
1	*Visual Reception	.2621	.0687
2	Drawing Writing	.2884	.0832
3	*Expression	.3228	.1042
4	Reading	.3469	.1203
5	Speech	.3644	.1328
6	*Processing	.3697	.1367

Standard Error=7.267

Figure 15

STEP WISE MULTIPLE REGRESSION

OF 14 CSI VARIABLES ON WISC SPATIAL

STEP NUMBER	VARIABLES	MULTIPLE R	MULTIPLE R2
1	Drawing Writing	.1935	.0374
2	Visual	.2353	.0554
3	Reading	.2804	.0786
4	Auditory	.2951	.0871
5	*Behavior	.3182	.1012
6	Social Emotional	.3290	.1082

Standard Error=20.769

Figure 16

STEP WISE MULTIPLE REGRESSION

OF 14 CSI VARIABLES ON WISC CONCEPTUAL

STEP NUMBER	VARIABLES	MULTIPLE R	MULTIPLE R2
1	Visual	.2303	.0531
2	*Behavior	.3101	.0962
3	Speech	.3523	.1241
4	Reading	.3665	.1343
5	*Auditory Reception	.3750	.1406
6	Social Emotional	.3796	.1441

Standard Error=25.142

Figure 17

STEP WISE MULTIPLE REGRESSION OF 14 CSI VARIABLES ON WISC SEQUENCING

STEP NUMBER	VARIABLES	MULTIPLE R	MULTIPLE R2
1	Visual	.3211	.0534
2	*Physical Motoric	.2670	.0713
3	*Expression	.3093	.0957
4	*Processing	.3246	.1054
5	*Behavior	.3333	.1111
6	Social Emotional	.3505	.1228

Standard Error=16.667

Figure 18

STEP WISE MULTIPLE REGRESSION OF 14 CSI VARIABLES ON VERBAL I.Q. (WISC)

STEP NUMBER	VARIABLES	MULTIPLE R	MULTIPLE R2
1	Visual	.2325	.0540
2	*Behavior	.3027	.0916
3	Speech	.3592	.1290
4	Social Emotional	.3704	.1372
5	Related Concepts	.3800	.1444
6	Auditory	.3890	.1513

Standard Error=11.864

Figure 19

STEP WISE MULTIPLE REGRESSION

OF 14 CSI VARIABLES ON PERFORMANCE I.Q. (WISC)

STEP NUMBER	VARIABLES	MULTIPLE R	MULTIPLE R2
1	Drawing Writing	.2272	.0516
2	Visual	.2846	.0810
3	*Expression	.3153	.0994
4	Speech	.3268	.1068
5	Reading	.3365	.1133
6	*Processing	.3627	.1315

Standard Error=11.199

Figure 20

each step, also the standard error of estimate and a test to determine if the multiple coefficient of correlation is significantly different from zero. All of the following regression equations were derived from a sample size equal to 280. In the following Tables one asterisk will indicate a probability of less than .05 that the population coefficient of correlation is equal to 0.0 and two asterisks will indicate that the probability level is less than .01.

The reader will note that all of the final multiple R's are significant at or beyond the .01 level. However, they tend to be somewhat lower than one might desire for this type of instrument. As previously indicated, further analysis and continued evaluation of the instrument should be undertaken in order to develop scoring procedures which will improve upon the instruments present ability to predict. In each table the criterion categories developed by the educational diagnosticians are identified by an asterisk. Those from the original CSI are blank.

The two scales-educational diagnostic and classroom screening instrument-are different arrangements of the same 80 sub items of the CSI. The essential difference lies in the fact that the educational diagnostic scale allows a single item to be present in more than one category whereas the CSI categories are mutually exclusive. Attempts to interpret the contributions of the various categories therefore become difficult because the items represented cannot be clearly delineated. In the prediction of Mental Age, for example, the CSI categories of Speech and Reading contribute to an f. of .2063. It is quite likely that expression contains some of the same items as speech, and that visual reception is intimately related to reading. Similarly, the educational diagnostician's category of behavior includes some of the items from the CSI category, social-emotional. Totally the correlation of .3476 while representing 6 categories probably actually contains many overlapping items. However, determination of the relationship between items in the categories and the criterion variables must await extensive analyses not possible under present time and economic constraints. Present findings, however, give every promise of substantial predictive payoff from continued efforts to improve the instrument.

CONCLUDING REMARKS

It is appropriate that a few pertinent and salient remarks be addressed to potential users or developers of similar studies and instruments. First, a few brief summary statements regarding the study: (1) Classroom teachers are able to accurately and adequately mark the Classroom Screening Instrument, identifying critical behaviors in young children which are symptomatic of learning disabilities. (2) Teachers can, by utilizing the Classroom Screening Instrument, identify children in their classrooms who are having learning problems and provide data which can be helpful in making the work of the educational diagnostician more efficient. (3) The Classroom Screening Instrument Behavioral Indices scales appear to be descriptive and highly discriminate. (4) The Classroom Screening Instrument can be utilized for the identification of children with learning problems at an early age. (5) According to the teachers' markings of the CSI, slow learners (IQ 79 and below) and children of severe learning disabilities are described in much the same terms. (6) Numerical discrepancies in the number of behavioral indices checked positively by teachers, discriminate quite accurately between children with severe learning disabilities and those with lesser learning disabilities. (7) Using the Classroom Screening Instrument, teachers not only identified children with severe learning disabilities, children with less severe learning disabilities, but also children who were mentally retarded. (8) The results of this study would indicate that among children in second grade classrooms of this region, approximately 4.7 percent have severe learning disabilities and approximately 6% have learning disabilities of a less severe nature.

In the form of recommendations to potential researchers or developers of similar instruments, the staff would make the following recommendations: (1) The Classroom Screening Instrument can be made even more valuable through continued efforts to improve items and scales of the CSI as well as the development of scoring techniques which can be used without the benefit of computers. (2) Although the data was processed primarily to validate the Classroom Screening Instrument, further exploration of the data as well as replication of the study is essential. Further analysis and replication should be conducted by a multidisciplinary team. It is proposed that this team should not only include individuals who are competent in psychology, education and medicine, but also other disciplines as well in order that the broadest view of analysis and interpretation can be brought to bear on this important topic. (3) It is deemed advisable for a group who may intend to replicate this or a similar study to target in on a limited geographic area from which it can draw children of all backgrounds. This recommendation is made in order that tight control may be maintained for the study and that it would be less expensive both financially and temporally. This procedure could also facilitate longitudinal studies which would facilitate more comprehensive and indepth interpretation. (4) Efforts should be made to test the Classroom Screening Instrument and/or to redevelop it to facilitate the identification of children with learning disabilities at an earlier age than eight going on nine. If such an instrument could be devised successfully, this would facilitate the development of preventive programs as opposed to remedial programs. This would also provide the opportunity for childrens' problems to be overcome prior to the time when emotional dimensions of the problem come into play because of expectancies of society and, in particular, of the school. (5) The staff would encourage interested researchers and developers to utilize the data which has been the substance of this study. This data can be obtained from the Division of Educational Laboratories of the Bureau of Research, or the Bureau of Handicapped of the U. S. Office of Education. Complete data tapes with appropriate technical explanations have been placed on deposit with these two agencies for interested persons.

LIST OF SELECTED REFERENCES

1. Guilford,
   J. P. *Fundamental Statistics in Psychology and Education,* Fourth Edition, McGraw-Hill, Inc.: 1965, p. 401.

2. Mahalanobis,
   P. C. "Analysis of Race-Mixture in Bengal", *Asiatic Social Bengal,* 1927, 23, p. 301-333.

Rocky Mountain Educational Laboratory, Inc.
1620 Reservoir Road • Greeley, Colorado 80631 • Telephone (303) 353-6350