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A COOPERATIVE JOB TRAINING PROGRAM FOR RETARDED YOUTH. PART II, THE RELATIONSHIP BETWEEN SELECTED VARIABLES AND SUCCESS OF THE RETARDATE IN THE COOPERATIVE WORK-STUDY PROGRAM, AN ANALYSIS OF PREDICTIVE POWER.

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DESCRIPTORS- *COOPERATIVE EDUCATION, *EDUCABLE MENTALLY HANDICAPPED, SENIOR HIGH SCHOOLS, SPECIAL EDUCATION, *VOCATIONAL EDUCATION, *VOCATIONAL ADJUSTMENT, *PREDICTIVE ABILITY (TESTING), TESTS, STUDENT EVALUATION, ACHIEVEMENT RATING, EVANSVILLE, INDIANA,

A RANDOM SAMPLE OF 55 EDUCABLE MENTALLY RETARDED STUDENTS WAS SELECTED FROM THOSE IDENTIFIED ON THE BASIS OF INTELLIGENCE TEST SCORES, ACHIEVEMENT TEST SCORES, SCHOLASTIC GRADES, AND TEACHER'S APPRAISAL. THIS SAMPLE WAS STUDIED TO -- (1) DETERMINE THE NATURE OF A SERIES OF SELECTED PREDICTOR VARIABLES AS THEY RELATE TO THE SUCCESS OF MENTALLY RETARDED YOUTH IN WORK-EXPERIENCE PROGRAMS, AND (2) IDENTIFY EFFECTIVE COMBINATIONS OF THESE PREDICTOR VARIABLES. VARIABLES WERE AGE, SEX, READING ACHIEVEMENT, ARITHMETIC ACHIEVEMENT, WECHSLER ADULT INTELLIGENCE SCALE (WAIS) VERBAL, WAIS PERFORMANCE, WAIS FULL SCALE, TAPPING TEST, STEADINESS TEST, PERCEPTUAL MOTOR SURVEY, BEHAVIORAL RATING SCALE, ADJECTIVE CHECKLIST, PICTURE ARRANGEMENT LIST, TEACHER PROGNOSIS, AND TEACHER PERSONALITY RATING. THE DEPENDENT VARIABLE WAS SUCCESS ON THE JOB AS RATED BY FOUR CERTIFIED COOPERATIVE COORDINATORS. IT WAS RELATED TO EACH AND TO VARYING COMBINATIONS OF THE PREDICTOR VARIABLES BY MEANS OF A MULTIPLE REGRESSION ANALYSIS. ONLY FIVE OF THE 15 PREDICTOR VARIABLES WERE FOUND CAPABLE OF MAKING STATISTICALLY SIGNIFICANT (.05 LEVEL) CONTRIBUTIONS TO THE PREDICTION OF SUCCESS IN THE PROGRAM -- (1) THE ADJECTIVE CHECKLIST, (2) PICTURE ARRANGEMENT TEST, (3) WAIS PERFORMANCE IQ, (4) STANFORD ARITHMETIC ACHIEVEMENT TEST, AND (5) STEADINESS TEST. THE ADJECTIVE CHECKLIST ESTABLISHMENT AND OPERATION OF THE WORK-STUDY PROGRAM. CRITERION TO INDEPENDENTLY BE OF PRACTICAL SIGNIFICANCE IN PREDICTING SUCCESS IN THE WORK-STUDY PROGRAM. THE STUDY REPRESENTS AN EARLY AND TENTATIVE STEP TOWARD THE ESTABLISHMENT OF THE "TRUE" RELATIONSHIP BETWEEN SELECTED PREDICTION MEASURES AND SUCCESS IN A PARTICULAR TYPE OF VOCATIONAL EDUCATION. PART I DESCRIBES THE ESTABLISHMENT AND OPERATION OF THE WORK-STUDY PROGRAMS (VT 000 839). (EM)

A COOPERATIVE JOB TRAINING PROGRAM FOR RETARDED YOUTH

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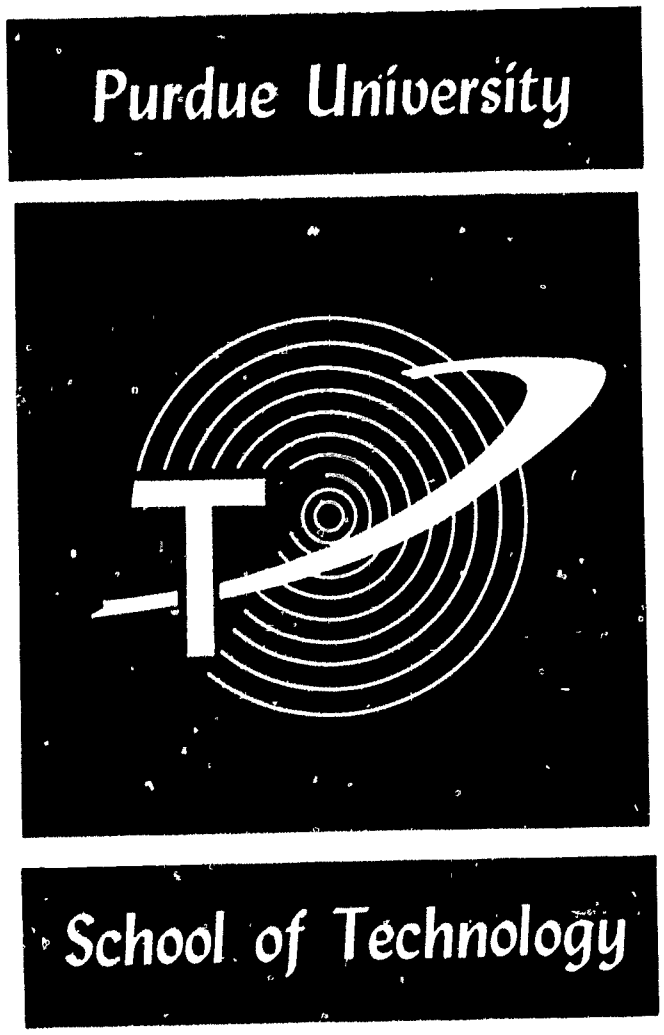
PART II

The Relationship Between Selected Variables and Success of the Retardate in the Cooperative Work-Study Program: An Analysis of Predictive Power

Richard C. Erickson



1966

in cooperation with
Evansville-Vandeburgh School Corporation
Evansville, Indiana

FINAL REPORT OF PROJECT NIMH 1139

PART II

THE RELATIONSHIP BETWEEN SELECTED VARIABLES AND SUCCESS OF THE RETARDATE IN THE COOPERATIVE WORK-STUDY PROGRAM: AN ANALYSIS OF PREDICTIVE POWER

National Institute of Mental Health Project #1139

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Lafayette, Indiana

1966

Part I of this report is bound separately under the title The Establishment and Operation of the Cooperative Work-Study Program.

FOREWARD

Placing a student in a curriculum area where he is doomed to failure is costly and cruel under any circumstance. When considering the habilitation of the retardate, the importance of being able to predict success in a particular educational program cannot be overemphasized. For him it seems imperative that the frustration of failure be avoided if at all possible. Thus, as new curricula are developed and new methodologies are applied, the study of factors which may relate to student success is indicated.

The problem of predicting success of an individual in a work oriented endeavor is a complex one at best. The problem of predicting success of retardates is even more complex. A reading of the investigation reported herein will point up the small beginning that has been made in analyzing the factors upon which the success of the retardate in a cooperative work-study program is dependent.

To the experienced researcher, it may appear as though additional facets of the data in this investigation might have been explored and reported. However, it seemed desirable to limit the reporting to those data and analyses which would best contribute to a layman's and average schoolman's understanding of the basic problem. In short, an attempt has been made to emphasize those aspects and findings of the analyses that appeared to have value for educators and administrators who are consumers of research and, consequently, more interested in implementation, than continued exploration in this area.

A few essential items contained in the separately covered Part I of this report have been duplicated in Part II to clarify the

context of the material discussed herein and to assist the readers in obtaining a more complete understanding of the text.

Acknowledgements

Many persons have contributed to the design, instrumentation, data gathering, and data treatment activities of the research effort reported herein. All individuals contributing cannot be named here, but their efforts are none-the-less appreciated.

It would be remiss not to mention the contribution of Dr. N. C. Kephart, Purdue University, and Dr. John Paterson, formerly of Purdue University for their contribution to this aspect of the project #1139. A special word of thanks is due Mr. John Wolford, Project Supervisor, Evansville-Vanderburgh School Corporation, for expediting the matter of necessary controls in operation and organizing and overseeing the data-gather process. We are indebted to Mr. Jim L. Windle and Miss Zita de la Cruz for their contribution, especially in instrumentation, data collection, and organization of raw data.

And finally, sincerest thanks are offered to Dr. Richard C. Erickson, Department of Industrial Education, Purdue University for taking the data and designing the treatment, making the analysis, and writing the scholarly, but down-to-earth, report that follows.

Max Eddy
Project Director NIMH #1139

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INTRODUCTION

Since approximately the turn of the present century there has been what might be considered a growing concern for meeting the educational needs of mentally retarded children - a concern for providing these exceptional children with an education that will assist them develop to the fullest extent their particular capabilities, no matter how modest these capabilities may be. It was only quite recently, however, that attention has been directed specifically toward the void which currently exists between special education for mentally retarded children and the world of work - those critical years between the day these students can legally leave the sheltering school environment and the day they finally secure regular and suitable employment.

This is the second of a two-part report on an extensive probe into this void that was conducted jointly by research oriented educators from Purdue University, Lafayette, Indiana and the Evansville Vanderburgh School Corporation, Evansville, Indiana.[1] As such, it is primarily concerned with the psychometric aspects of that project.

Objectives

The Evansville project was an educational venture aimed at developing a practical program of vocational education at the high school level for educable mentally retarded youth. In addition to the development and evaluation of this program, the project was concerned with two concomitant objectives.

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[1] Eddy, E. Max. A Cooperative Job Training Program for Retarded Youth. (Report of the National Institute of Mental Health No. MH 1139) Lafayette, Indiana: Purdue University, 1966.

One, determining the nature of a series of selected predictor variables as they relate to the success of mentally retarded youth in vocational work-experience programs; and two, identifying effective combinations of predictor variables and utilizing them in the development of prediction formulas for predicting success of mentally retarded youth in vocational work-experience programs.

Population and Sampling

The population for this investigation was defined to include the mentally retarded male and female students, 16 years of age and older, from three Evansville, Indiana senior high schools. In order to identify the elements belonging to this population without the benefit of an extensive individual testing program, a four-point program of group identification processes was employed. This program included the following phases.

1. Intelligence Test Scores - For the most part, standardized group intelligence tests had been administered to all Evansville pupils at regular intervals. As a preliminary assessment, those pupils having two IQ measures of 79 or below out of their three most recent tests administrations were considered to be in the mentally retarded population.

2. Achievement Test Scores - In almost every case, each Evansville pupil had been administered standardized scholarship achievement tests at regular intervals. Scores from these tests were used to validate the selections based on the IQ criterion. As a general pattern, it was assumed that an individual who achieved above grade level 6.5 during his eighth grade (or later) in reading or arithmetic achievement was not mentally retarded - and the respective IQ score, in this case, did not represent an accurate assessment.

3. Scholastic Grades - Since the population was originally defined as being composed of persons already enrolled in high school, their grades for courses being taken and courses already completed were a matter of record. These grades were used in an effort to further validate the standardized intelligence and achievement.

test measures. Those students whose scholastic records showed a large portion of A or B grades were considered suspect in terms of belonging to the population.

4. Teacher Appraisal - It was assumed that all three of the foregoing criteria might be affected by one or more of a variety of elements extraneous to mental retardation. For example, students identified as sociopaths and those who were extremely physically handicapped were not considered to be a part of the population that the present study was concerned with. Therefore, each pupil's high school teachers were asked to make a judgment relating to the validity of the IQ and achievement measures as well as other factors.

With the above information at hand, a committee was selected to determine which of the high school students in the Evansville system could be classified as mentally retarded and belonging to the defined population. The analyses, findings, and prediction formulas in this portion of the final report were based on data obtained from a random sample containing 55 of those students who were so classified.

INSTRUMENTATION AND PROCEDURES

In identifying a battery of instruments or measures to be used in the prediction of a specific criterion an attempt should be made to maximize the validity of each entry into the battery and at the same time to minimize the correlations between each of these entries. This statement, while true in every respect, is an over-simplification of the process of assembling a battery of instruments possessing high predictive value. It does, nevertheless, point up the necessity for including many tests and measurements of a diverse nature in the early stages when developing a predictive battery.

In this section of the report the instrumentation and/or procedures used in obtaining the data for the present investigation is described. Data was obtained for fifteen independent or predictor variables and one dependent or criterion variable. The latter was a measure of each subject's success in the cooperative work-study program. The former, while very diverse in nature, can be classified into the following catagories:

Physiological Variables
- -age
- -sex

Mental Variables
- -scholastic achievement
- -intelligence

Psychomotor Variables
- -fine and gross hand coordination
- -perceptual motor skills

Personality Variables
- -observed behavior
- -projected behavior

The complexity, length, and/or apparent predictive value of some of the instrumentation and procedures used in this investigation render detailed descriptions of them beyond the scope of this

report. Consequently, some of the descriptions presented here are necessarily incomplete and risk some misrepresentation. However, only a general familiarity with the instrumentation and procedures employed is required for understanding the ensuing discussion of the analyses and findings of this investigation. Sources for detailed descriptions of these materials are presented in the bibliographic entries of this report and may be consulted at the reader's convenience.

The Predictor Variables

Physiological Variables

The physiological variables considered as potential predictor variables in this investigation were students' age and sex.

Students' Age. The chronological age of the student subjects, computed to the nearest one-tenth of a year on the basis of their date of birth and their date of entrance into the work-study program, served as the first independent or predictor variable in the analysis.

Students' Sex. Subjects were dichotomously classified either male or female on a strictly physiological basis. This classification was the second independent variable.

Mental Variables

Data for potential predictor variables in the area of mental development was obtained from two measures of scholastic achievement (arithmetic and reading) and three measures of intelligence or mental ability (verbal, performance, and general).

Reading Achievement. Subjects' scores on the Stanford Achievement Tests - Reading (Form N) served in the analysis as data for the

first mental predictor variable. The reading portion of the Stanford battery was designed to measure student achievement with respect to both paragraph meaning and work meaning.

Information on the construction and standardization of the Stanford Tests is presented in the manual of directions that accompanies the test booklets (Kelly, T.L. and others, 1953).

Arithmetic Achievement. The arithmetic portion of the Stanford Achievement Tests - (Form N) was used to secure data for the fourth predictor variable, arithmetic ability. This portion of the Stanford battery was designed to measure student achievement with respect to both arithmetic reasoning and computational skills.

WAIS Verbal. The fifth predictor variable in the analysis and the third mental variable was a measure of verbal ability. The Wechsler Adult Intelligence Scale (WAIS) is composed of 11 subtests. Six make up the verbal scale, five the performance scale. Subjects' scores on the verbal portion of the WAIS served as the fifth predictor variable.

Information relative to test standardization and construction for the WAIS is presented in Wechsler (1949 and 1958), and Cronbach (1960).

WAIS Performance. Some poor performances on verbally oriented measures of mental ability can be accounted for by emotional blocking, bilingual backgrounds, reading difficulties, and things of this nature that in themselves have little or no real relationship to one's general level of mental ability. Cronbach (1960, 199) in discussing the relative merits of differing types of intelligence tests, points out that

> Since performance tasks depend very little on schooling and the directions use simple language, verbal handicaps reduce the (IQ) score only slightly. Many adults, who might be regarded as defective if judged only by their verbal comprehension are able to perform nonverbal tasks at an average level.

It was because of this phenomena that subjects' scores on the performance or "non-verbal" portion of the Wechsler Scale were included in the analysis as a predictor variable.

WAIS Full Scale. A global measure of general mental ability is obtained by combining scores from the verbal and nonverbal portions of the WAIS and forming a full scale IQ score. Students' scores on these two sub-parts of the WAIS were so treated in this study and formed the data for the seventh predictor variable, a global measure of general mental ability.

Psychomotor Variables

Data for potential predictor variables in the psychomotor domain were derived from the following sources: a tapping test and steadiness test (Whipple, 1924) and a survey of perceptual-motor skills (Kephart, 1960).

Tapping Test. This test was used to secure an index of voluntary motor ability with respect to fine hand coordination for use as the first psychomotor predictor variable in the analysis. Tapping tests of various kinds have probably been more frequently applied than any other motor test and have been thought to afford a better index of motor capacity than any other single test.

The tapping test employed in the present investigation used a mechanical tapping device similar to a telegrapher's key. Subjects were seated before the tapping device and instructed to tap as rapidly as possible from the signal "now" to the signal "stop",

which was given after a 30 second interval. This procedure was repeated three times and the average number of taps for the three trials was r corded as the subject's index of voluntary motor ability.

Steadiness Test. The Steadiness Test was used in this investigation to secure a measure of accuracy of movement with respect to gross hand coordination, the second psychomotor predictor variable. The purposes for which tracing has been used are similar to those for the steadiness test, but the present test differs from the former in that the movement is continuous, analogous to that made in drawing a line.

The testing technique adopted for the present investigation involved passing a metalic needle or stylus along a narrowing slit between two thin metalic strips that were 21 cm. in length, mounted side by side, and spaced from 1/4 inch to 1/16 inch apart. The test administrator noted by an electric buzzer the distance traveled in inches before the stylus touched one of the metalic strips which completed the electrical circut and energized the buzzer. In the present investigation, this procedure was repeated three times by each subject and the average distance traveled by the stylus before the buzzer sounded was recorded as the subject's index of accuracy of movement.

Perceptual Motor Survey. Research studies have indicated that slow-learning children lack basic readiness skills which average and above average children bring with them when they first enroll in school. Some educators would hold that time with slow-learning children could better be spent by concentrating on the development

of these "pre-academic" skills than by continued drilling on the academic activities from which these children are seemingly not ready to profit.

Many children who show difficulty in school learning also give evidence of deficiency in their perceptual-motor development and these perceptual-motor difficulties seem to be related to the problem of school achievement. In these instances, the problem of remedial education becomes one of identifying the point of breakdown in the student's perceptual-motor development and then applying training techniques which will aid the child in overcoming his difficulty and permit more normal continuation of his education.

Kephart (1960, 121-22) devoted a major portion of his text to describing

> ... a series of performances designed to permit the observation of a child's perceptual-motor behavior. . . These performances are designed to reveal the perceptual-motor performance of the child at each developmental stage.

Designed to permit observation of the child in a relatively short period of time and without the use of complicated devices and apparatus, this survey technique is composed of ten sub-parts.

1. Walking Board
2. Jumping
3. Identification of Body Parts
4. Imitation of Movements
5. Obstacle Course
6. Angels-in-the-Snow
7. Stepping Stones
8. Chalkboard
9. Ocular Pursuits
10. Visual Achievement Forms

Kephart (1960, 123-54) presented a detailed description of the tasks included in each of the foregoing subparts. A copy of the test administrator's form for the Perceptual-Motor Survey, as used in

this investigation, is presented in Appendix C. Each subject's total score on this survey served as the data for the tenth predictor variable in the analysis.

Personality Variables

Data for potential predictor variables in the area of personality development were obtained from four scores: a behavior rating scale, a checklist, a projective technique that used a picture arrangement task as the stimulus, and a teacher evaluation.

Behavior Rating Scale. This scale, developed by Blodgett and staff (1959), is an attempt to secure a more adequate way of describing and evaluating some of the "less intellectual" or behavioral traits that are exhibited by retarded children. It directs the ratee's attention to fourteen areas of behavior and asks that he indicate which of the five descriptive catagories within each area best describes the subject in question. The behavioral areas considered are:

1. Conformity to Requests - General Co-operativeness
2. Individual Constructive Activities
3. Participation with the Group
4. Interaction with Individuals
5. Interest and Progress in Learning
6. Independence and Self-help
7. Persistence with Tasks
8. Constructive Conversation and Communication
9. Excessive Conversation
10. Stability of Activity Level - Degree of Freedom from Hyperactivity
11. Absence of Antisocial Behavior and Fighting
12. Absence of Irritability
13. Ability to Tolerate Frustration
14. Apparent Health

Values from one to five are assigned to five descriptive catagories within each of the above behavioral areas. In the present study, the average of the values indicated for each of the fourteen

catagories was used as the data for this variable in the analysis. The scale in its entirity, as used in the present investigation, is presented in Appendix D.

Adjective Checklist. This second of the three personality measures used in the present investigation, the Adjective Checklist (Reynolds and MacEachern, 1955 and Reynolds and Stunkard, 1960), was derived from a list of over 400 descriptive behavioral terms abstracted from biographical data collected from mentally defective graduates of Owatonna State School, Owatonna, Minnesota. These terms were analyzed on the basis of frequency of use and ability to discriminate between favorable and unfavorable adjustment catagories, and consequently reduced in number because of the many overlapping factors that appeared in the analysis.

In this study, teachers rated the subjects with respect to each of the 45 items on the Checklist. A sample copy of the form used is presented in Appendix E.

Picture Arrangement Test. The third measure of personality used in the present investigation was obtained from the student subjects' projected reactions to items in the Tomkins-Horn Picture Arrangement Experiment (Tomkins and Horn, 1944). This particular test is somewhat unique in that it is a projective test that possesses the advantages of individual testing, group testing, and machine scoring. It has 156 content areas that are grouped into 32 general areas of personality variables such as conformity, optimism, social-restlessness, and high-low general work and/or work interest. Tomkins and Miner (1960, p. 24-25) offered the following description of this instrument:

> The test consists of twenty-five plates each containing line drawings of three different but related situations with the same "hero" depicted in all situations within each plate, and in all twenty-five plates. It is the subject's task to specify in what order these three situations should be placed to make the most reasonable sequence. He is asked to indicate by means of three symbols (a triangle, a rectangle, and a circle) which appear in each plate at the bottom of each line drawing and which are to be reproduced in the appropriate order on three successive lines at the bottom of each page. He is also required to write a sentence on each of the three bottom lines of each page explaining briefly what is going on in each situation. The three drawings are shown at angles of 120 degrees so that one is always upside down. The plate must, therefore, be rotated to be completely inspected and thus no particular sequence of drawings is favored by order of presentations.

Over the years considerable normative data has been gathered for this test. At present, 655 scoring keys or patterns have been devised. However, not all of these patterns are applicable to any one individual or sub-group. From the scoring keys or patterns that are appropriate for an individual or sub-group, the number exhibiting "rare" arrangements of responses is regarded as a measure of extreme personality characteristics which may affect one's ability to be a successful student or worker. In the present investigation the number of rare patterns appearing in each subject's profile was used as the data for this predictor variable in the analysis.

Teacher-Evaluation. Teachers' evaluations of the subjects' personality were used as the final two potential predictors of success in the program. It seemed logical that both personality and prognostic ratings by previous teachers who had had extended periods of personal contact with these subjects would be of value in predicting student success in the special work-study program.

These teachers were asked to evaluate those of their former students who were to be enrolled in the work-study program on the basis of the following personality characteristics:

1. Cooperation
2. Adjustment
3. Friendliness
4. Coordination
5. Organization
6. Maturity

Subjects were classified with respect to each of the above personality characteristics in one of the following five catagories.

H - High - 4
A - Average - 3
L - Low - 2
VL - Very Low - 1
U - Undicided - 0

In addition to the assessment of the foregoing personality characteristics, these teachers were also requested to provide a prognostic evaluation of the probable success of each of their former students in the cooperative work-study program. For this evaluation the subjects were classified by their former teachers into one of the above five catagories with respect to the probability of their success.

An appraisal was obtained for each of the students in the program, from their former homeroom teachers. Catagories were assigned values from zero to four as shown above and the mean value of these appraisals served as the data for these predictor variables in the analysis.

An example of the form used in soliciting both the personality and prognostic ratings is presented in Appendix F.

The Criterion

The criterion in this investigation was student success in the special cooperative work-study program. A quantitative estimate of the degree to which each student had achieved in the program was obtained by having four state certified DCE coordinators independently rank the participating students from the most successful student, to the least successful student, in a linear fashion relative to their overall performance in the program. The rankings were based on information obtained from each student's Job Description Form, Job Adjustment Form, and Time and Wage Report. Sample copies of these forms are presented in Appendix G-I.

A special sorting technique was used by the coordinators in obtaining their sets of ranks. The directions for this sorting technique are presented in Appendix G-II.

Analysis of variance techniques (Winer, 1962, 124-32) were employed to obtain an estimate of the reliability of the coordinators' rankings. The obtained coefficient estimating the reliability of the average of the four rankings made on each of the subjects was .96.

This coefficient may be interpreted as follows: If the rankings were to be repeated with another set of four judges, but with the same students, the correlation between the mean rankings obtained from the two sets of data would be approximately .96.

The mean of the four rankings given to each student by the coordinators was the criterion data used in the multiple regression analysis for estimating the relationship between the predictors and the criterion and for developing the formulas for predicting success of mentally retarded youth in vocational work-study programs.

ANALYSIS AND FINDINGS

The foregoing independent or predictor variables were related to the dependent or criterion variable via a multiple regression analysis. Basic to all attempts to identify the personal variables or characteristics which are most significantly related to the vocational potential of an individual or particular group of individuals is the process of isolating characteristics that have some value as predictors of success in a particular vocationally oriented endeavor. Underlying this "process of isolating characteristics" is the assumption that a multi-dimentional approach to the measurement of relevant characteristics of the individual or individuals will be necessary to "cover" the myriad of human attributes that are related to, involved in, and/or requisite to success with respect to the criterion. In most instances both the criterion and the human organism are many faceted and by far too complex for a significant portion of this interrelatedness to be predictable on the basis of a single predictor.

Multiple regression is one statistical technique that employs, in combination, data from several more-or-less independent sources toward the prediction of a particular criterion. This technique is frequently employed in industrial settings in the development of test batteries and prediction formulas to be used in areas such as personnel selection and classification. The value or usefulness of a battery obtained through an analysis of this type is estimated by a multiple correlation coefficient (R), a coefficient of the relationship between the criterion (usually success in some vocational endeavor) and the several predictors of success.

This portion of the report will briefly describe the regression analysis and multiple correlation techniques used to relate the predictor variables to the criterion in the present investigation and present the experimenter's interpretations with respect to the findings of these analyses.

The Multiple Correlation

Multiple correlation techniques were used to estimate the relationship between the students' scores on the 15 predictor variables and their individual mean rankings awarded by the four coordinators. The Weighted Regression Analysis Program (WRAP) was used to perform the bulk of the computational labor in this analysis.

WRAP is a computer program designed to perform separate multiple linear regression analyses (least squares technique) on as many as 80 independent and 25 dependent variables. Often referred to as the "tearing down" method of regression analysis, all independent variables to be included in the model are introduced, then WRAP automatically deletes statistically non-significant variables at a fixed probability level.

In the present analysis, alpha was purposely set at an abnormally low level (.0001) to force the computer to finish the complete series of fourteen multiple R's, automatically eliminating the least significant predictor variable of those remaining after each run.

The results of these runs are presented in Table II Appendix A. Multiple R's for the 14 most economical combinations of these predictors are presented along with the zero-order correlations between the 15 individual predictors and the criterion.

Listed below are the variables selected from the computer output as the most efficient battery in the order in which they contribute to the multiple correlation. The contributions of each of these tests were all found to be statistically significant beyond the .05 level

Tests	Multiple Correlations
Adjective Checklist	.471
Picture Arrangement Test	.525
WAIS Performance IQ	.572
Stanford Arithmetic Achievement Test	.644
Steadiness Test	.679

By combining data from the Picture Arrangement Test with data from the Adjective Checklist the correlation with the criterion was raised from .471 to .525. The second addition, the WAIS Performance IQ increased this correlation to .572. The addition of the Stanford Arithmetic Achievement Test increased the coefficient to .644. The final addition, the Steadiness Test increased the multiple correlation to its highest and yet most efficient point, .679.

The contributions that the remaining ten tests were able to make to this multiple R were not found to be statistically significant at the .05 level. Consequently, the addition of any of these tests to the prediction battery, is not warranted since they apparently can contribute only minimally to any prediction score that is derived from the present analysis.

The multiple correlation using all 15 of the predictor variables was found to be .738, indicating that 54 per cent of the variation in the criterion is dependent upon, associated with, and/or predicted by the 15 independent variables when they are combined with the regression weights used. The remaining variation, 46 per cent, is still to be accounted for.

The multiple correlation using the five predictors that made statistically significant contributions accounted for 48 per cent of the total variation in the criterion and left 52 per cent unaccounted for. Thus a battery of fifteen predictors has been reduced to a more economical battery of five predictors with a loss of but 6 per cent of the ability to predict the variation in the criterion. Guilford (415-16) offers an explanation of this phenomenon:

> The reason why only four or five tests have often seemed to be the limit in a useful battery is that only a limited number of the human abilities and other traits that are involved in a practical criterion have been represented in the tests. Although a dozen different tests have been tried out, the same limited number of fundamental factors have been measured by them and the measurement is duplicated several times over. . . If one knows that there are 10 traits involved in the criterion that are worth covering with tests, and if it takes 10 tests to do it, then one could put 10 tests in a battery and expect that every one would have something unique to contribute toward prediction.

The multiple R represents the maximum correlation between a dependent variable and a weighted combination of the predictor or independent variables. The least squares solution to the regression equation insures this result, but really insures it too much. It capitalizes upon any chance deviations that are present and happen to favor the multiple correlation. The obtained multiple R is therefore an inflated value and a biased estimate of the multiple correlation in the population.

A common way of "shrinking" an obtained R to a more probable estimate of the population value is given by the formula.

$$R_c = \sqrt{1-(1-R^2)\ \left(\frac{N-1}{N-M}\right)}$$

where N = number of elements in the sample correlated
and M = number of variables correlated.

For the present investigation where R = .68 the corrected or "shrunken" R_c was found to be .64. The correction here does not

appear to make an appreciable difference because the sample (N = 55) was fairly large and the number of variables small.

The Prediction Formulas

A multiple-prediction problem calls for the solution of a regression equation that involves all of the independent or predictor variables - a multiple regression equation. Such an equation can be used as a formula to predict an X_o value or criterion score for any individual for whom scores on all the predictor variables have been obtained. In the present investigation, and for the five significant predictor variables, the correlation between such predicted values (X_o') and the later observed criterion scores (X_o) would be approximately .69. This is another interpretation of the multiple correlation coefficient.

For a five-variable problem, the regression equation has the general form

$$X_o' = b_1X_1 + \cdots b_5X_5 + \alpha .$$

The b coefficients are the multiplying constants or weights for the X values. The value of the b's indicates the number of units X_o' increases for every unit of increase in its associated X_o when the effects of the scores for the remaining predictor variables have been nullified or held constant. The coefficient α is a constant whose function is to ensure that the mean of the X_o' values coincides with the mean of the X_o values.

The various regression equations or prediction formulas for predicting the achievement of slow learners enrolled in cooperative work-study programs from the five significant predictor variables discussed earlier are given below. For predicting achievement in the

work-study program (X_o) through the use of the Adjective Checklist (X_{12}), the Picture Arrangement Test (X_{13}), the WAIS Performance IQ (X_6), the Stanford Arithmetic Achievement Test (X_4), and the Steadiness Test (X_9), the correlation being R = .679, the prediction formula is as follows:

$$X_o' = -1.88X_{13} + 2.00X_{12} + 1.35X_9 - .87X_6 + 8.81X_4 - 24.83$$

When the Steadiness Test (X_9) is omitted in the prediction of achievement in the work-study program and when the four remaining variables are used in combination, the correlation being R = .644, the prediction formula becomes:

$$X_o' = -1.71X_{13} + 1.90X_{12} - .79X_6 + 9.87X_4 - 8.28$$

When the Stanford Arithmetic Achievement Test (X_9) is eliminated from the foregoing prediction battery and success in the work-study program is predicted from the combined remaining variables, the multiple correlation being R = .572, the prediction formula then becomes:

$$X_o' = -1.46X_{13} + 1.78X_{12} - .46X_6 + 17.01$$

When the WAIS Performance IQ (X_6) is extracted from the battery of predictors leaving the Adjective Checklist (X_{12}) and the Picture Arrangement Test (X_{13}) to be used in combination as predictors of the criterion, the multiple correlation being R = .525, the prediction formula then degenerates to:

$$X_o' = -.92X_{13} + 1.92X_{12} - 28.11$$

The final prediction formula to be noted here is the regression equation for predicting success in the work-study program from the one variable out of the original fifteen that held the largest percentage of its variation in common with the criterion (r = .471).

This equation, using the Adjective Checklist (12) as the single predictor, takes the following form:

$$X_o' = 1.76X_{12} - 26.30$$

It should be noted here that the multiplying constants (b's and α's) in the foregoing formulas are valid only in their respective formulas and only then when data for their particular formula is complete. In other words, the prediction formulas presented here are entities within themselves and cannot be added to or subtracted from and still maintain the degree of accuracy associated with their ability to predict this particular criterion.

Standard Error in Prediction

Procedures for computing the standard error of multiple estimate may be employed in conjunction with any of the foregoing prediction formulas to obtain an estimate of the extent to which values predicted on the basis of these formulas could be expected to deviate from obtained criterion values. For the general case the formula for the standard error of multiple estimate takes the form

$$\sigma_{o.12...p} = \sigma_o \sqrt{1-R^2_{o.12...p}}$$

For the five predictor formula presented earlier, the standard error of multiple estimate was computed to be 13.57; for the four predictor formula 14.18; for the three predictor formula 15.13; and for the two predictor formula 15.68. The margin of error increases as the number of significant contributors in the battery of predictors is reduced.

By way of interpreting the computed standard error of multiple estimate, it can be said that, with the five predictor estimate for, example, two thirds of the obtained X_o values will lie within 13.57

points of the predicted X_o' values. From the radical term in the formula, the margin of error with knowledge of scores on the five predictor variables is approximately 46 per cent, or about one half as great as the margin of error would be without that knowledge. These interpretations presuppose predictions made on the basis of the obtained prediction formula, and the predictions made for individuals belonging to a random sample of the population this study was concerned with.

Of course, the calculation of the standard error of multiple estimate and its interpretation is not restricted to prediction formulas with five predictor variables. Similar calculations and interpretations could be made relative to the error terms associated with the multiple prediction formulas containing, four, three, and two predictors that were presented here.

DISCUSSION

The criterion or dependent variable in this investigation, success of mentally-retarded students in a cooperative work-study program, was related to each and varying combinations of fifteen independent or predictor variables by means of a multiple regression analysis. Of the original fifteen predictor variables, five were found capable of making statistically significant contributions to the prediction of success in the program. When used in combination, students' scores from these five sources, the Adjective Checklist, the Picture Arrangement Test, the WAIS Performance IQ, the Stanford Arithmetic Achievement Test, and the Steadiness Test, were found to correlate with the criterion R = .679.

A correlation matrix summerizing the relationships among these five predictors and the criterion is presented in Table I.

TABLE I

Correlation Matrix for

Significant Predictor Variables and the Criterion.

Predictor Variable	Variable Number	12	13	6	4	9	0
Adjective Checklist	12	1.00	.18	-.23	-.19	-.18	.47
Picture Arrangement Test	13		1.00	-.54	-.14	.03	-.14
WAIS Performance IQ	6			1.00	.49	.22	-.18
Arithmetic Achievement	4				1.00	.27	.08
Steadiness Test	9					1.00	.09
Criterion	0						1.00

From the preceding table it can readily be seen that the single most relevant predictor in this analysis was the score on the Adjective Checklist ($r = .47$). It can also readily be seen that this variable not only correlated comparitively high with the criterion but it correlated relatively low with the other predictors in the group as well. Normally, this is considered to be the ideal relationship between independent variables in a multiple R - high degree of relationship between each variable and the criterion and little or no relationship among the variables. When this is the case the contributions of the predictors tend to be unique and non-overlapping and the efficiency with respect to predicting the criterion is maximized.

In this instance, however, while none of the four remaining variables were found to be even moderately related to the Adjective Checklist score, they were not found to be even moderately related to the criterion either. A question arises as to the source of their variation that was responsible for their apparent contributions to the multiple correlation.

Further scrutinization of the interrelationships among the variables in question revealed that variable 13, score on the Picture Arrangement Test, made its statistically significant contribution to the multiple R by serving as a suppression variable in the regression analysis (Guilford 1965, 405-06). As such, it supressed, in the other four independent variables and particularly in the Checklist scores, variance that was not represented in the criterion but which was in some other variable that did correlate with the criterion.

The remaining three variables, the WAIS Performance IQ, the the Stanford Arithmetic Achievement Test score, and the Steadiness Test score, were capable of making statistically significant contributions to the multiple R in this analysis because they were negatively related to the most significant predictor variable, the Checklist score. One explanation of the function of negatively correlated independent variables in a multiple regression analysis is offered by Guilford (1965, 406). From the matrix presented in Table I it can be seem that, in the case of these three predictor variables, the more negative their correlation with the primary predictor variable the longer WRAP retained them as potential predictors in the analysis.

Discussion thus far in this section of the report has ce ered primarily around the five statistically significant predictor variables as they relate to one another and the criterion when they are combined for use in a prediction battery. For reasons of a practical nature one might wish to eliminate one or more of the five instruments in this battery and employ the shortened battery. Therefore, some reference to the affects of eliminating a test or tests from the battery seemed appropriate at this point.

A review of the prediction formulas and their respective multiple R's that were presented in the preceeding portion of this report will reinforce two important points in multiple regression analysis relative to altering a prediction battery:

> One, as the number of contributing predictors included in the battery is reduced, the degree to which the battery is capable of predicting the criterion is also reduced; and two, the beta or regression weights associated with each predictor variable change in value as predictors are either added to or substituted from the battery.

Simply interpreted, the first point implies that any of the five prediction formulas presented earlier can be used, but the user should be aware that the degree of accuracy in predicting the criterion will decrease as the number of variables included in the predictive battery becomes smaller. How much predictability will be lost by employing a smaller number of predictor variables is indicated by the reduction in the numerical value of the multiple R.

Decisions relative to using any, all, or only a select few of the predictors and their respective formulas as presented in this report are administrative decisions and, as such, have relevance only for particular situations. In making such decisions, one can only ask whether or not there is a favorable balance between the degree of predictability that is obtainable and the expense of obtaining predictability to that degree. The answer to this question, then, becomes the basis for making these types of decisions.

The implication from the second point is that the contribution made by each variable to the multiple R is dependent, to a substantial degree, upon which other variables are or are not used in combination with it. In the present analysis, score on the Adjective Checklist was the only variable of the five identified as having made statistically significant contributions to the multiple R that correlated high enough with the criterion ($r = .47$) to independently be of practical significance in predicting success in the work-study program. Taken independently, the four remaining predictors of the statistically significant five do not possess enough variation in common with the criterion to be of any practical

value in predicting it. For the present analysis, at least, they appeared to possess predictive value only when used in combination with the Checklist scores where they could serve as either a suppression variable or a negatively correlated covariable.

If limited to a cursory overview of the correlations presented in this report one might be inclined to conclude that none of the independent or predictor variables investigated here possess great value as predictors of success in vocational work-study programs for the present population. One might also conclude that very few of these fifteen predictors are even worthy of further investigation. Conclusions such as these at this point would indeed be unfortunate.

The "ideal" battery of predictors is always presented as being composed of tests and/or measurements possessing high individual correlations with the criterion and zero intercorrelations. Generally, when striving for low intercorrelations between tests in a prediction battery (when each test measures a unique factor) the end result is that each test tends to correlate low with the criterion. This is because a practical criterion such as training achievement or job performance is usually a complex variable; it has a number of unique variance components. When attempting to increase the correlation between a single test and the criterion, the result is almost invariably an increase in the number of variance components present in the new test. This, then automatically raises the correlations between the new test and the other tests in the battery, because they have more variance in common.

In short, the basic problem in assembling a prediction battery becomes one of choosing between maximum correlation of tests and

criterion or minimum intercorrelations among tests. In the real world it seems that one cannot have both.

Guilford (1965, 408) indicates that where there is a choice, greater attention should be given to the latter of the two alternatives - minimizing intercorrelations.

> If there are 20 independent factors represented in a practical criterion, and if each is of practical importance, each would contribute .05 of the total variance. Each test, measuring only one of the factors, would need to correlate only $\sqrt{.05}$, which is .224, with the criterion. In this case raising the correlation between any one test and the criterion would be of little use . . . . Thus it can be concluded that low correlations of tests with practical criteria can be tolerated, provided we can combine enough tests in a battery and provided their intercorrelations are near zero.

For the most part, the intercorrelations of the tests analyzed in this investigation were quite low, which in light of the foregoing remarks, should certainly be considered before any value judgements are made on them with respect to their ability to contribute as predictors in this area.

Two other factors might also be considered in assessing the value of any of these predictors. One, the group of subjects used in the present investigation was very homogenious in nature. This restriction in range was to a large extent responsible for the apparent lack of relationship or small correlations between the individual predictors and the criterion. Correlations obtained on the basis of samples that are severely restricted with respect to some variate rarely, if ever, attain numerically high values and must be interpreted in light of this phenomenon.

Two, in multiple regression analysis the degree to which a particular variable is potentially able to contribute to the prediction of the criterion is not always apparent. At least one of the predictor variables in this investigation, score on the Behavior Rating Scale, was rejected early in the analysis as being unable to make a statistically significant contribution to the multiple R even though it held approximately 15 per cent of its variation in common with the criterion. However, this variable was also correlated -.819 (See Table III, Appendix B) with the Adjective Checklist scores. This is the reason it was rejected. Nearly all the variance it held in common with the criterion had already been accounted for by the best predictor in the battery, the Checklist. However, if the latter variable had not been included in the original battery of predictors, the Behavior Rating Scale would have emerged from the multiple regression analysis as the most significant of the 14 remaining.

A note of caution should accompany the data and findings presented in this report. The information obtained in the present study represents, at best, an early and tentative step toward the establishment of the "true" relationship between selected prediction measures and success in a particular type of vocational education program for a rather special and restricted group of individuals. Associated prediction formulas have been developed and presented. These formulas represent definate progress but additional research will be needed to validate and refine them to within a range of workable accuracy. Consequently, this investigator would emphasize that any projected use of the prediction formulas and other findings presented here must be made in light of the limitations of this

investigation. The interpretation of results obtained with other samples must necessarily be approached with an open mind and with considerable caution.

The present investigator would, however, encourage attempts to cross-validate the emperical findings of this report and/or other research in this area that will contribute to a body of knowledge concerned with the vocational habilitation of mentally retarded youth.

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APPENDICES

APPENDIX A

TABLE II

MULTIPLE AND ZERO ORDER CORRELATIONS OBTAINED FROM THE REGRESSION ANALYSIS

Predictor Variable	Variable Number	Correlation with Criterion	Multiple Correlations	Contribution to Multiple R
Adjective Checklist	12	.47	--	.47*
Picture Arrangement List	13	-.14	.53	.06*
WAIS Performance IQ	6	-.18	.57	.04*
Arithematic Achievement	4	.08	.64	.07*
Steadiness Test	9	.09	.68	.04*
Reading Achievement	3	.11	.69	.01
WAIS Verbal	5	.04	.69	.00
WAIS Full Scale	7	-.18	.70	.01
Teacher Rating (Prognosis)	14	-.14	.71	.01
Perceptual Motor Survey	10	.03	.72	.01
Sex	2	.08	.73	.01
Teacher Rating (Personality)	15	-.22	.73	.00
Age	1	-.04	.74	.01
Behavioral Rating Scale	11	-.38	.74	.00
Tapping Test	8	-.02	.74	.00

* = significant beyond .05 level.

APPENDIX B

TABLE III

INTERCORRELATION MATRIX FOR INDEPENDENT VARIABLES

Variable	Variable Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Age	1	1.00	-.08	.02	.01	-.22	-.15	-.21	-.13	.04	-.20	.13	-.14	.14	.24	-.19
Sex	2		1.00	.33	-.08	-.17	-.19	-.21	-.30	-.06	-.05	-.01	.05	.29	.07	.13
Reading Achievement	3			1.00	.43	.19	.19	.21	-.21	-.09	.14	.09	-.03	.06	.14	.08
Arithmetic Achievement	4				1.00	.38	.49	.44	.14	.27	.38	.26	-.19	-.14	-.04	.10
WAIS Verbal	5					1.00	.54	.87	.30	.14	.40	.09	.02	-.39	-.02	.11
WAIS Performance	6						1.00	.88	.28	.22	.49	.29	-.23	-.54	-.03	.25
WAIS Full Scale	7							1.00	.34	.21	.51	.22	-.13	-.54	-.02	.21
Tapping Test	8								1.00	.30	.17	.76	-.05	-.18	.19	-.02
Steadiness Test	9									1.00	.25	.14	-.18	.03	.17	.20
Perceptual-Motor Skills	10										1.00	.41	-.32	-.45	.14	.35
Behavior Rating Scale	111											1.00	-.82	-.18	.41	.33
Adjective Checklist	12												1.00	.18	-.29	-.29
Picture Arrangement Test	13													1.00	.09	-.10
Teacher Rating (Personality)	14														1.00	.30
Teacher Rating (Prognastic)	15															1.00

APPENDIX C

PERCEPTUAL-MOTOR SURVEY

PERCEPTUAL-MOTOR SURVEY

Name _____ Date of birth _____

Address _____ Sex _____ Grade _____

_____ School _____

Examiner _____ Date of examination _____

	Score 4	3	2	1	
Walking Board:					Balance and Posture
Forward					
Backward					
Sidewise					
Jumping					
Identification of Body Parts					Body Image and Differentiation
Imitation of Movement					
Obstacle Course					
Kraus-Weber					
Angels-in-the-snow					
Chalkboard:					Perceptual-Motor Match
Circle					
Double Circle					
Lateral Line					
Vertical Line					
Rhythmic writing:					
Rhythm					
Reproduction					
Orientation					
Ocular Pursuits:					Ocular Control
Both eyes					
Right eye					
Left eye					
Push-up					
Visual Achievement Forms:					Form Perception
Form					
Organization					

Achievement Center for Children
Purdue University
Lafayette, Indiana

BALANCE AND POSTURAL FLEXIBILITY

1. WALKING BOARD

Forward

Steps off board	Comments
Pauses frequently	
Uses one side of body more consistently than other	
Avoids balance:	
Runs	
Long steps	
Feet crosswise on board	
Maintains inflexible posture	
	Score ▱

Backward

Steps off board	Comments
Pauses frequently	
Uses one side of body more consistently than other	
Avoids balance:	
Runs	
Long steps	
Feet crosswise on board	
Twists body to see where he is going	
Must look at feet	
Maintains inflexible posture	
	Score ▱

Sidewise

Unable to shift weight from one foot to the other	Comments
Confusing or hesitation in shifting weight	
Crosses one foot over the other	

Steps off board ___ Performs more easily in one direction than the other: Right lead ___ Left lead ___	Score ▱

2. JUMPING

Both feet

Cannot keep both feet together ___ Uses one side of body only ___ "Ties" one side of body to the other ___	Comments

One foot

Postural shift not smooth ___ Cannot keep opposite foot off the floor ___ Performance better on one foot than other: Right ___ Left ___	Comments

Skip

Movement not free ___ Hesitates after each step to determine which side to use ___	Comments

Hop

Cannot remain in one spot while performing ___ Cannot shift easily from side to side ___ Movements jerky and lack rhythm: All patterns ___ Asymetrical patterns only ___	Comments

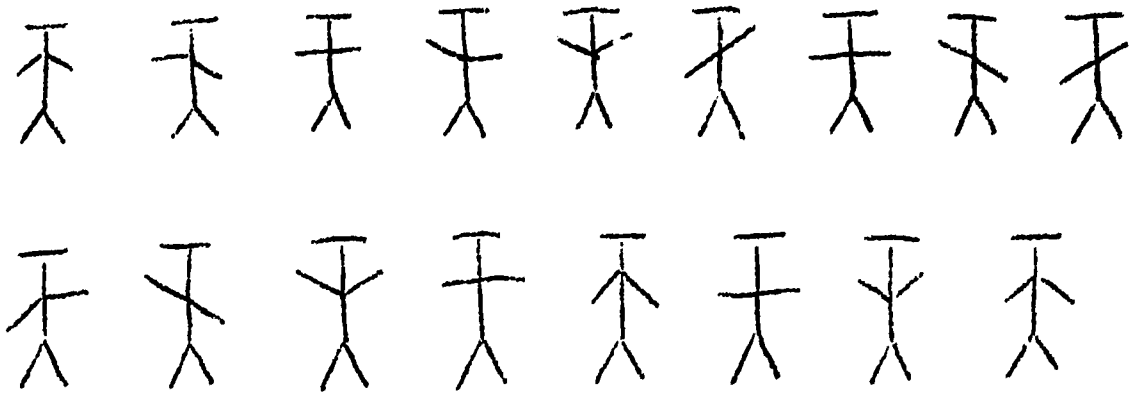
Score ▱

BODY IMAGE AND DIFFERENTIATION

3. IDENTIFICATION OF BODY PARTS

Show hesitancy in one or more responses ___	Comments
Does not touch both members of paired parts ___	
Must "feel around" to find parts ___	
Makes more than one error in identification ___	Score ▱

4. IMITATION OF MOVEMENT



Does not mirror the patterns ___	Comments
Not consistent (sometimes mirror not parallel) ___	
Shows hesitation or lack of certainty ___	
Makes abortive movements ___	
Moves wrong limbs ___	
Does not recognize errors spontaneously ___	
Recognizes errors after some delay ___	Score ▱

5. OBSTACLE COURSE

Going over

Overestimates (steps too high) ___

Catches foot on bar ___

Cannot correct on one repetition ___

Comments

Going under

Knocks bar off ___

Bends too low to clear bar ___

Cannot correct on one repetition ___

Comments

Going between

Does not turn body ___

Score ▱

6. KRAUS-WEBER

Cannot raise chest and hold ___

Cannot raise legs and hold ___

Comments

Score ▱

7. ANGELS-IN-THE-SNOW

Must look from one limb to the other to identify ___

Cannot identify by visual data alone ___

Requires tactual information to identify limbs ___

Taps or moves limb on floor to identify ___

Abortive movements to get started ___

Hesitation at beginning of movement ___

Movements are hesitant and jerky ___

Overflow into other limbs than those called for ___

Comments

Movements do not reach maximum extension ___ Requests repetition of instructions ___ Cannot correct response on one repetition ___	Score ☐

PERCEPTUAL-MOTOR MATCH

8. CHALKBOARD

Circle

Does not reach proper size ___ Direction incorrect for hand used ___ Drawing not directly in front of child ___ Does not cross midline ___ Shape of circle not accurate ___ Must stop to "think out" next move during performance ___ Wrist is stiff and difficult to control ___ Still shows difficulty after 3 or 4 attempts ___	Comments Score ☐

Double Circle

Does not reach proper size ___ First attempts are small and far apart ___ Circles overlap ___ One circle larger than the other ___ One more accurate than the other ___ Circles drawn one on top of the other ___ Direction incorrect: Hands parallel ___ Opposite but wrong direction ___	Comments

Circles flat toward inside —

Inaccuracies which are not parallel in both circles —

Visual attention directed to one hand —

Movement of two arms not synchronized —

Score ▱

Lateral Lines

"Walks" across the board —

Draws left half with left hand, right half with right hand —

Pivots body to avoid crossing midline —

Difficulty when hand is on opposite side of midline —

False starts —

Pauses and confusion —

Inaccuracies —

Comments

Score ▱

Vertical Lines

Lines bow
- Slightly —
- Markedly —

Visual attention to one hand only —

One hand ceases to function during performance —

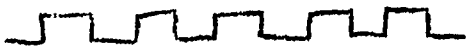
Hands move alternately, not simultaneously —

Comments

Score ▱

9. RHYTHMIC WRITING

Motifs

1. 
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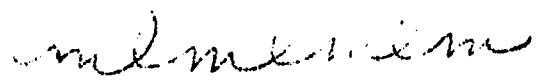
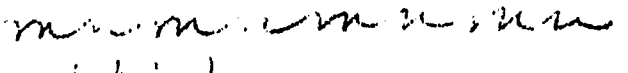
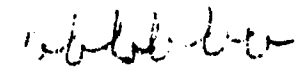
3. 
4. 
5. 
6. 
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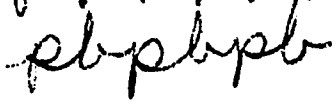
8. 

Hesitant and jerky ___	Comments
Movement cramped and inflexible ___	
Rhythm not constant ___	
Directional reversals or confusion ___	
Order reversals or confusion ___	
Line of motifs slant ___	
Characters in motifs slant ___	
Inaccurate reproduction ___	
Size does not remain constant throughout performance ___	Scores:
	Rhythm ▱
Characters become smaller as performance is sustained ___	Reproduction ▱
	Orientation ▱
Excessive movement of hips or trunk ___	

OCULAR CONTROL

10. OCULAR PURSUITS

Moves head instead of eyes ___	Comments
Eye movements are jerky	
Throughout ___	
At extremes only ___	
Movement jerks at midline ___	
Eyes do not work together ___	
One eye remains stationary as other moves ___	
One eye leads the other markedly ___	
Overshoots or undershoots during pursuit ___	
Looses visual contact with target during movement ___	

When contact is lost, cannot regain easily ___

One eye "wanders off" the target:
- Throughout ___
- At extremes only ___

Changes eyes at midline ___

Convergence:
- Impossible at 4 inches ___
- Sluggish ___
- Uneven ___

Scores:
- Both eyes ▱
- Right eye ▱
- Left eye ▱
- Convergence ▱

FORM PERCEPTION

11. VISUAL ACHIEVEMENT FORMS

Form

Changes orientation of paper to alter direction of movement ___

Segments drawings ___

Internal lines of divided rectangle segmented ___

"Ears" on forms ___

Drawings markedly larger or smaller than copy ___

Comments

Score ▱

Organization

No discernible organization ___

Organization on page is:
- Left to right ___
- Vertical ___
- Circular ___

Comments

Score ▱

APPENDIX D

BASAL BEHAVIOR RATING SCALE

BASAL BEHAVIOR RATING SCALE[a]

Student's Name _____

Directions: Fourteen areas of behavior are listed below with five descriptive categories in each area. Place a plus mark (+) before that category under each area which best describes the child's behavior. If you feel that the child varies sufficiently from day to day so that other categories with the area are also appropriate, please a check mark (✓) before these additional categories.

1. Conformity to requests---general cooperativeness:
   ___1. Typically refuses, resists, and means it---cannot give cooperation voluntarily.
   ___2. Often refuses, but is open to persuasion---can be talked with.
   ___3. Frequently refuses, but only when upset, or teasing, or for some special reason.
   ___4. Rarely refuses, and only with special provocation.
   ___5. Typically complies and is spontaneously helpful.

2. Individual constructive activities:
   ___1. Even with suggestion and direction, usually "rams around", cannot carry on any constructive activity; generally destructive, although not necessarily by intention.
   ___2. With some suggestion and direction, can get a constructive activity under way, but needs almost constant adult attention to keep at it.
   ___3. Needs help at beginning, but can carry on an activity suitable for him "on his own."
   ___4. Initiates own constructive activity, seeks help when needed, but generally is constructive.
   ___5. Initiates own constructive activity, in variety; gets satisfaction from them; completes them without special assistance.

3. Participation with the group:
   ___1. "Lone wolf"; very rare participation in group; typically solitary. In group only with adult forcing for inclusion.
   ___2. Rare group participation, in only a few activities, and with adult steering.
   ___3. Selective participation in a group, depending on who else is in it.
   ___4. Generally is a part of whatever group activity is going on; prefers group activities.
   ___5. Typically a group is around him; shows high degree of participation and organization; a "leader."

(a) Adapted from 1967 Behavior Ratings Basal Scale, developed by Dr. Harriet Blodgett and her staff at Sheltering Arms, research and day care center for retarded children in Minneapolis, Minnesota.

4. Interaction with individuals:
   ___1. Typically alone; very rare interaction with an individual on own initiative; may be with another child at other's initiative.
   ___2. Interacts with adults more than with children; dependent rather than social.
   ___3. Frequent interaction with individuals; may not be successful, but many contacts.
   ___4. Very frequent interaction with individuals; longer duration than No. 3, without special supervision.
   ___5. Very successful with individual contacts; initiates and sustains them.

5. Interest and progress in learning:
   ___1. Shows regressive behavior; or seems to resist learning.
   ___2. Rather a "dead level" on progress in learning; shows little forward motion.
   ___3. Shows interest in learning in some areas; not consistently, and may be short-lived; progress variable.
   ___4. Consistently can be aroused to interest; makes moderate progress and shows moderate effort in most areas.
   ___5. Consistently eager to learn; asks useful questions; seems motivated; voluntary effort quite consistently.

6. Independence and self-help:
   ___1. Dependent, won't try to do things for self. Expects and demands things done for him.
   ___2. Generally dependent in "practice" but willing to try; will do some things for self with direction and encouragement and help.
   ___3. Takes moderate self-responsibility to extent of ability, does not need constant attention; verbal help may be increasingly substituted for physical help.
   ___4. Takes major responsibility for self most of the time; occasional encouragement or praise helpful.
   ___5. Likes to do things for himself; takes pride in independence; shows good judgment and tolerates help when really needed.

7. Persistence with tasks:
   ___1. Highly distractible; "flits"; minimal interest in making any effort.
   ___2. Easily distracted, but can show some persistence with an occasional favorite activity.
   ___3. Fairly persistent with something he likes or wants to do; gives up easily with tasks lacking special interest.

___4. Consistently persistent with most activities; can return to task when distracted momentarily; gives up only when really stymied.
___5. Determined to finish whatever he's working on; won't give up; not readily distracted. Lots of task orientation.

8. Constructive conversation and communication:
___1. Can or does talk very little; communication efforts minimal, either by gesture or word.
___2. Tries to communicate; speech often nonsensical or elliptical, or difficult to comprehend what child is trying to convey.
___3. Regardless of speech skill, expresses self and communicates; may be random or meaningless.
___4. Regardless of speech skill, conveys meanings reasonably well; generally sensible.
___5. Good verbal expression skills; uses language meaningfully to communicate with others. "Talks sense."

9. Excessive conversation:

___1. Incessant talking---not conversational; attention-getting, controlling, repetitious, or as dependency; or disconnected content.
___2. Rambling and random chatter, but sometimes has a point, and child beginning to show some control.
___3. Generally not constant chatter, but purpose often unclear.
___4. Conversation is two-way most of the time, but less mature than No. 5.
___5. Conversation is two-way, communicative, reasonable, purposive.

10. Stability of activity level---degree of freedom from hyperactivity:
___1. Typically restless and overactive; behavior random, unpredictable, impulsive, non-socially aware.
___2. Frequently hyperactive, impulsive, and random, but can control to some extent with adult help.
___3. Generally not hyperactive, "on his own", but overresponds to group stimulation and needs adult help to settle down.
___4. Occasional bursts of hyperactivity, but increasing degree of self-control.
___5. May be active and enthusiastic when appropriate, but rarely hyperactive; activity generally controlled by child, shows purpose and organization.

11. Absence of anti-social behavior and fighting:
    ___1. Randomly and constantly aggressive toward any person or thing; unselective, really hurts, doesn't care.
    ___2. Typically aggressive and anti-social, but with some selectivity as to object; comes under adult control with difficulty when angry.
    ___3. Frequently aggressive and anti-social, but with some provocation; comes under adult control easily.
    ___4. Rarely aggressive or anti-social; seems not to get involved in fights often; takes quite a lot before retaliating.
    ___5. Relationships with others, both children and adults, are harmonious; child seems aware of others' feelings and does not fight without real cause.

12. Absence of irritability:
    ___1. Hyperirritable; over-reacts to any stimulus, including teasing, without ability to interpret situations.
    ___2. Very easily irritated; over-reacts to most stimuli, but irritations do not "pile up" uncontrollably if adult is near to help stabilize.
    ___3. Easily irritated by teasing or other stimulation; cries easily, but generally quick recovery. Child trying to control.
    ___4. Generally can be counted on to react good-humoredly; usually in a good mood, but may have outbursts with provocation.
    ___5. Unusually easy-going and even in disposition; successful at give and take with other children.

13. Ability to tolerate frustration:
    ___1. Will not try anything he might fail---avoids frustration by limiting activities, cannot tolerate being frustrated.
    ___2. Very easily frustrated, upset, "stormy", with minimal cause.
    ___3. Get frustrated often but "snaps back" quickly with encouragement or help.
    ___4. Shows frustration only with observable, realistic causes; tries to control.
    ___5. Very rarely shows frustration; overcomes difficulties; makes patient effort.

14. Apparent health:

___1. Shows observable and objective symptoms of not feeling well (runny nose, cough, etc.).

___2. Seems vaguely tired, listless, non-participating, but no objective observable symptoms.

___3. Shows average energy, looks okay, seems in average health.

___4. Energetic, positive response; seems in good health.

___5. Bubbling with pep, vitality, enthusiasm.

APPENDIX E

ADJECTIVE CHECKLIST

ADJECTIVE CHECKLIST

Student's Name _____

Directions: The following words and phrases (terms) have been used to describe the behavior of young people. Check as many of the following items as necessary to give us a description of the child's behavior. The behavior may or may not be extreme in order for you to check the item. Check those items which are more characteristic of this child than of other children of the same age with whom you work. Leave blank those which are not particulary descriptive of this subject.

___ 1. annoying
___ 2. anti-social
___ 3. anxious to learn
___ 4. anxious to please
___ 5. attentive
___ 6. bad influence
___ 7. behavior problem
___ 8. belligerent
___ 9. bossy
___10. cannot get along with others
___11. changeable
___12. cooperative
___13. courteous
___14. daring
___15. defiant
___16. destructive
___17. difficult to control
___18. disobedient
___19. distractible
___20. gets along well with others
___21. good natured
___22. hard to discipline
___23. incoherent
___24. incorrigible
___25. indifferent
___26. irresponsible
___27. likeable
___28. moody
___29. no discipline problem
___30. obedient
___31. pleasant
___32. quarrelsome
___33. quick-tempered
___34. quiet
___35. rebellious
___36. stubborn
___37. sullen
___38. temper tantrums
___39. unable to play with others
___40. unreliable
___41. unstable
___42. untruthful
___43. well-behaved
___44. well-liked
___45. willing

APPENDIX F

TEACHER EVAIUATION FORM

STUDENT DATA SHEET

Full Name: _____ Birthdate: _____ Sex: _____ Grade: _____

Address: _____ Living With: _____

Average Grade: Last Year _____ This Year _____ Times Tardy _____ Absent _____ Truant _____

Physical Condition: _____ Years In Sp. Ed. if any) _____

In/Out School Work Exp: (specify) _____ Date: _____ Course Grades: I. A. __ H. E. __

*GROUP INTELLIGENCE TESTS						*ACHIEVEMENT TESTS						
Date Given	Test & Form	Grade	CA	MA	IQ	Date Given	Test & Form	Grade	Rdg	Arith	S. S.	Sci.

*INDIVIDUAL INTELLIGENCE TESTS

Name & Form	Date	I.Q. and Notes (Results)	Examiner

OTHER PERTINENT INFORMATION:

TEACHER EVALUATION

Teacher-Subject	Cooperation					Adjustment					Friendliness					Coordination					Organization					Maturity				
	U	VL	L	A	H	U	VL	L	A	H	U	VL	L	A	H	U	VL	L	A	H	U	VL	L	A	H	U	VL	L	A	H
1.																														
2.																														
3.																														
4.																														
5.																														
assessment																														

Teacher-Subject	Validity, IQ					Success In W-S				
	U	VL	L	A	H	U	VL	L	A	H
1.										
2.										
3.										
4.										
5.										
assessment										

Code
Each symbol denotes a degree:
H- high
A- average
L- low
VL- very low
U- undecided

Special Abilities Or Aptitudes	Emotional Or Physical Problems	Remarks or Observation
1. *		
2.		
3.		
4.		
5.		

* Refers to Teacher above.

APPENDIX G.-I

CRITERION FORMS FOR COORDINATOR EVALUATING

EVANSVILLE-VANDERBURGH SCHOOL CORPORATION

EVANSVILLE, INDIANA

EXPERIMENTAL WORK-STUDY PROGRAM

JOB DESCRIPTION

Date _____

udent Name _____ Age _____ School _____

oordinator _____ Job Title _____

ame of Firm _____ Firm Address _____

ind of Business or Industry _____

ours of work per day _____ Current rate of pay _____ per hour

1. Kind of stock or materials handled: Days of work per week.....

_____ _____ _____

_____ _____ _____

2. Tools, machines or equipment used:

_____ _____ _____

_____ _____ _____

3. Working Conditions:

Inside _____ Air Conditioned _____ Noise Level, High _____

Outside _____ Temp. no problem _____ Low _____

High Temp. _____ Odors _____ No Problem _____

Low Temp. _____ Lighting _____ Others _____

4. List probable job hazards: (Example: floors, slippery when wet, moving objects and parts, exposure to burns, etc.)

_____ _____ _____

_____ _____ _____

5. Physical demands:

Lifting _____ Pushing _____ Others (specify)

Pulling _____ Standing _____ _____

Carrying _____ Sitting _____ _____

6. General Comments:

_____

7. Work Performed:

		Level of Performance					Degree of Student Decision					Supervision Needed			Service or Product Check		
		Excellent 5	Very Good 4	Good 3	Fair 2	Poor 1	Maximum 5	4	3	2	Minimum 1	Constantly	Occasionally	Rarely	Often	Occasionally	Seldom
Task #_____:	Decision Involved in Task Activities.																
Most Significant Activities																	
a.																	
b.																	
c.																	
d.																	
Task #_____:																	
Most Significant Activities																	
a.																	
b.																	
c.																	
d.																	
Task #_____:																	
Most Significant Activities																	
a.																	
b.																	
c.																	
d.																	

Date: _____ Coordinator: _____

EVANSVILLE-VANDERBURGH SCHOOL CORPORATION

EXPERIMENTAL WORK-STUDY PROGRAM

(SUPPLEMENT TO JOB DESCRIPTION FORM)

Name of Student _____ No. _____

School _____

General Job Adjustment

(Rate the student by placing one check on each of the scales below)

1. Present job satisfaction:

Not satisfied				Very Satisfied
___1	___2	___3	___4	___5

2. Adjustment to work group:

Cannot get along with work group			Readily and Satisfactorily Adjusts to Work Group	
___1	___2	___3	___4	___5

3. Attitude towards present job:

Poor				Excellent
___1	___2	___3	___4	___5

4. Acceptance of responsibility on the job:

Non-Acceptance				Full Acceptance
___1	___2	___3	___4	___5

5. Job Attendance:

Tardiness:

Often				Very Rare
___1	___2	___3	___4	___5

Absenteeism:

Often				Very Rare
___1	___2	___3	___4	___5

6. Acceptance of present job status (or level):

Unrealistic				Realistic
___1	___2	___3	___4	___5

7. Personal relations with employer:

Poor Excellent

____1 ____2 ____3 ____4 ____5

8. Do you feel that the student is making logical and appropriate use of earnings? Yes ____ No ____

How? (State approximate percentage of earning spent on:)

Personal ____ Family Contribution ____ Savings ____

Others: (Specify) _____

_____

9. Comments: (Descriptive impression on student's job success)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Teacher-Coordinator

_____ High School

Date _____

EVANSVILLE-VANDERBURGH SCHOOL CORPORATION
Evansville, Indiana

EXPERIMENTAL WORK-STUDY PROGRAM

Student-Learner Time and Wage Report

______ School

______ Coordinator

______ Marking Period

______ Semester Date ______

Student	Hours of On-The-Job Experience																																																								Total Hours
	Week								Week								Week								Week								Week								Week								Week								
	S	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S		

APPENDIX G.-II

DIRECTIONS FOR SORTING

APPENDIX G.-II

DIRECTIONS FCR SORTING

1. In each of the forms you have been given, you will find the following information from each of the student's files:

   A. Job Description Form
   B. Job Adjustment Form
   C. Time and Wage Report

2. These files must be sorted according to your judgment of the success of the retarded students in the work-study program. Sorting will be most readily accomplished by the following procedures:

   A. Read through all the files to familiarize yourself with the material.
   B. Sort the cards into <u>three</u> groups labled as follows:
      1.A - <u>MOST SUCCESSFUL</u>: students whose file information indicate markedly successful over-all performance in the work-study program.

      2.B - <u>AVERAGE</u>: students whose file information indicate average over-all performance on the program.
      3.C - <u>LEAST SUCCESSFUL</u>: students whose file information indicate least successful in over-all performance in the program.

   Note: <u>There must be 22 cards in each stack, A. B. C.</u>:

3. To do the final sorting, begin with the student's files belonging to the Most Successful group (A). Examine the content more critically and closely. Then, sort them into another set of three groups. Follow same procedure for group B and C. Now you will have nine stacks. These stacks <u>do not</u> have to have equal numbers.

MOST SUCCESSFUL (A)			AVERAGE (B)			LEAST SUCCESSFUL (C)		
a	b	c	a	b	c	a	b	c
etc	etc	etc	etc	etc	etc	etc	etc	etc

4. From pile A-a, select the most successful student and rank him as 1; select the next most successful, ranking him 2; and so on. Then take pile A-b and repeat procedure indicated. The best student in pile A-b will then be assigned the number consecutive to last in pile A-a. Continue ranking until you have exhausted all the piles from A-a - C-c.

5. After the ranking procedure on item 4, you will have a single pile again with the students ranked from highest (A-a) to lowest (C-c).

6. Record your final sort in the form attached, noting only the student's file number. (Red numbers in upper right hand corner).

Note: Do not mark the files for these will be used again by another sorter.