THE UTILITY OF THE REVISED NONREADING APTITUDE TEST BATTERY VS. THE GENERAL APTITUDE TEST BATTERY

by

Robert M. Barber

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APPROVED:

Phillip R. Jones, Co-Chairman

Lawrence H. Cross, Co-Chairman

Thomas H. Hohensil

John A. McLaughlin

Frederick W. Clemens

Frederick W. Clemens, Cognate

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BY
ROBERT M. "TOMMY" BARBER

COMMITTEE CHAIRMEN
Dr. Phillip R. Jones
Administrator and Supervisor of Special Education

Dr. Lawrence H. Cross
Educational Research

ABSTRACT

The study focused on the aptitude test performances of intellectually sub-normal subjects on the Nonreading Aptitude Test Battery (R-NATB) vs. the General Aptitude Test Battery (GATB). There were two research questions investigated: (1) Are there performance differences on the R-NATB vs. GATB of borderline and/or mildly retarded individuals?, and (2) Is the Wide Range Achievement Test-Revised (WRAT-R) a better predictor than the Wide Range Scale (WRS) of R-NATB and/or GATB aptitude performances in borderline and/or mildly retarded individuals?

Two groups were selected for the study - 80 borderline and 80 mildly retarded subjects, ages 15-25 years. Each group contained 40 subjects with high reading skills and 40 with low reading skills as determined by the WRS. The order of aptitude test administration was also controlled. The research data collection began in November 1984 and was completed in October 1987.

The following were the major findings for borderline and mildly retarded subjects, ages 15-25: (1) individuals with higher reading skills performed significantly higher on the General Intelligence (G), Verbal (V), and Numerical (N) aptitudes on the GATB and R-NATB than those with lower reading skills; (2) generally, the GATB and R-NATB did not meet the established criteria for tests known to have acceptable levels of convergent and discriminant validity; (3) subjects performed higher on the General Intelligence (G), Verbal (V), and Numerical (N) aptitudes when taking the GATB in comparison to the R-NATB; (4) subjects performed higher on the Spatial (S), Form Perception (P), and Clerical Perception (Q) when taking the R-NATB in comparison to the GATB; and (5) neither the Wide Range Scale nor the Wide Range Achievement Test-Revised proved to be effective predictors of higher GATB vs. R-NATB aptitude performances in intellectually subnormal individuals.

If the GATB or R-NATB must be taken, borderline and mildly retarded individuals would optimize their aptitude test performances if they would take the B-1001 form of the GATB so they could mark their answers in the test booklet instead of on an answer sheet. Furthermore, the WRS and WRAT-R are not adequate screeners for predicting optimal aptitude performances.

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CHAPTER I

DEVELOPMENT OF THE PROBLEM

Introduction

The development of valid, reliable and non-discriminatory measures of human traits, abilities, and aptitudes has been a major concern of many in the field of education. These concerns are generally from users of tests as part of their clinical, educational, or employment practices, but also those who have been or will be affected by inappropriate testing.

Testing discrimination was an issue in a United States Supreme Court decision in 1971. The Court ruled 8 to 0 (Griggs v. Duke Power Co., 401, U.S. 424) that under the Civil Rights Act of 1964 employers may not use tests and other procedures that are "neutral on their face if they operate to freeze the status quo of prior discriminatory practices." This case involved an employer who instituted a policy after passage of the Civil Rights Act of 1964 that persons wanting placement in any but its labor department must obtain satisfactory scores on an intelligence and a mechanical aptitude test given by the company. Neither test, the Court said, was intended to measure the ability to learn to do a particular job or qualify an individual for a category of jobs. Moreover, requisite scores were set so high that they would screen out half of all the high school graduates in the United States (U.S. Department of Labor Manpower Admin., 1971). In view of the above, the U.S. Department of Labor issued the following statement:

> "Any test given by employers as a condition of employment or promotion must not operate as a 'built-in headwind' for minority groups and must also have demonstrable relationship to job performance...." (U.S. Department of Labor Manpower Admin., 1971)

As the courts have set legal precedents regarding discriminatory practices by employers, businesses and industries have revised personnel selection, psychometric criteria and other human resources procedures. Likewise, public education has had to undergo major changes with the passage of Public Law 94-142, Education for All Handicapped Children Act (1975). This legislation has mandated that local education agencies (LEA's) provide appropriate non-discriminatory assessment of educational, psychological, and vocational abilities, interests and training needs for all handicapped students. These requirements have been promulgated in both federal and state regulations to implement the Act.

More recently the Carl D. Perkins Vocational Education Act of 1984 (Public Law 98-524) has created new challenges and opportunities for local educational agencies (LEAs) to improve vocational programs and services for the disadvantaged and handicapped students. Title II, Part A, entitled a total of 32% of its funds (22% for qualified disadvantaged and 10% for handicapped) be used for the following purposes:

1. To assure that individuals who are presently served inadequately by vocational education programs are provided access to quality vocational education programs, especially individuals who are handicapped, who are disadvantaged, and individuals that have limited English proficiency.

2. To promote greater cooperation between public agencies and the private sector in preparing individuals for employment.

3. To improve the academic foundation of vocational students and to aid in the application of newer technologies.

4. To assist the most economically depressed areas of the state to raise employment and occupational competencies of its citizens.

5. To utilize a full range of supportive services, special programs, and guidance counseling and placement.

One assurance that LEAs made in receiving P.L. 98-524 funds is that the disadvantaged or handicapped student shall receive "...an assessment of the interests, abilities, and special needs with respect to completing successfully the vocational education program best suited for them." (Virginia Department of Education, 1986)

The measurement of an individual's vocational capabilities for specific occupations and job groups has been one function of the U.S. Training and Employment Service (USTES). Since 1947, the USTES General Aptitude Test Battery (GATB) has been a valuable tool in the measurement of vocational aptitudes of job applicants and candidates for occupational training. There are nine GATB aptitudes:

1. Intelligence -- General Learning Ability (G)
2. Verbal Aptitude (V)
3. Numerical Aptitude (N)
4. Spatial Aptitude (S)
5. Form Perception (P)
6. Clerical Perception (Q)
7. Motor Coordination (K)
8. Finger Dexterity (F)
9. Manual Dexterity (M)

The GATB is a series of paper and pencil tests to assess aptitudes G, V, N, S, P, Q and K. Finger and manual dexterity boards are used to assess aptitudes of manual (M) and finger (F) dexterity. The GATB test booklets I and II, Parts 1, 2, 4 and 6 require reading skills ranging

from third through sixth grade level; the remaining test booklet Parts 3, 5, 7 and 8, and the dexterity boards require no reading skills. Total testing time is approximately two and one-half hours. The GATB has two versions, B-1001 and B-1002, furthermore B-1002 has two forms, Form A and Form B.

The GATB aptitudes were identified by factor analytic studies of more than fifty standardization tests conducted by the USTES. In all, twelve tests were chosen to provide a measure of all nine GATB vocational aptitudes. Two criteria were applied in choosing the tests: factorial validity and concurrent validity against an external criterion. Sometimes the test with the highest factorial validity was disregarded in favor of a test that had acceptable factorial validity but also had repeatedly demonstrated its validity against external criteria of success for a number of jobs.

Since 1947, the GATB has been subjected to a continuing USTES program of development and occupational validation studies. By 1977, 515 validation studies have been performed on hundreds of non-supervisory occupations. Each study found one to four GATB aptitudes that were significantly correlated with job performance in a specific occupation. The results have generally supported the belief that GATB examinees having aptitude scores at or above certain "cut-off" scores of an occupation's Aptitude Qualification Profile (A.Q.P.) would be considered to possess a comparable level of specific vocational aptitudes found in

successful workers in that occupation. The USTES GATB validation program has made the GATB the most extensively validated measure of occupational aptitude known in the field.

The GATB validation program also has identified Occupation Aptitude Patterns (O.A.P.s), which are combinations of one to four aptitudes that were significantly correlated to successful job performances in a group (or cluster) of related occupations. Hence, if a GATB examinee scored at or above the minimum aptitude "cut-off" score of a given O.A.P., then the examinee would have performed comparably to that of "successful" workers in a particular group of related occupations that demand a series of specific aptitude development. After an examinee is administered the GATB, aptitude scores are then compared to the sixty-six occupational groups in order to determine if the examinee qualifies for one or more of the O.A.P. occupational clusters. (See Appendix A)

From 1947 to 1980, the USTES' GATB validation program had completed over 500 studies establishing specific GATB aptitude "cut-off" scores with successful job performance criteria. However, many of these studies were completed with relatively small samples and thus had large sampling errors which lowered their validity in other job settings (Hunter, 1982). Furthermore, there were over 12,000 jobs listed in the Department of Labor's Dictionary of Occupational Titles (D.O.T.), 1977 and there was not enough USTES manpower nor funds to perform a GATB validity study on each specific occupational group.

In 1983, the Department of Labor implemented their GATB Validity Generalization Program which enabled the GATB's three factorial aptitude components: cognitive (general, verbal, numerical), perceptual (spatial, form perception, clerical perception), and psychomotor (motor coordination, finger dexterity and manual dexterity) to predict job performance and training efficiency of potential employees in over 12,000 jobs identified in the U.S. work force (U.S. Department of Labor, 1983). Through the innovative work of J.E. Hunter (1982), all 12,000 jobs listed in the Dictionary of Occupational Titles (D.O.T.), 1977, were analyzed according to how every job required a worker to function in relation to the dimensions of "data, people, and things." From these functional analyses, all jobs were then categorized into one of five job families described below:

		Generalized Factors Percentage of Contribution		
Number	Descriptors	GVN	SPQ	KFM
1	Setting Up, Building	59	30	11
2	Feeding, Off Bearing	13	0	87
3	Synthesizing, Coordinating	100	0	0
4	Analyzing, Compiling, Computing	73	0	27
5	Copying, Comparing	44	0	56

When the Department of Labor reanalyzed the GATB job data of its previously completed 515 validity studies according to various job families in a full validity generalization study, they found that the average true validity across all jobs for both training and job proficiency was .40 (U.S. Department of Labor, 1983).

Because of the U.S. Employment Service's Validity Generalization Program, state operated "employment service" offices can refer employment candidates to prospective employers in a top-down percentile ranking on the basis of their GATB (factorial) aptitude performances and having the potential for greater productivity and/or training success. This obviously saves employer time and money and makes it possible for the state employment service offices to refer those candidates most capable of performing well on the job. It also makes the GATB the most valid predictor of job performance known in the field of personnel selection as well as a "primary decision maker" rather than other personnel selection procedures, i.e., interviews, evaluations of training and experience which typically have substantially less validity (U.S. Department of Labor, 1983).

The USTES has also undertaken extensive reliability research concerning: 1) test - retest stability of GATB measurements over time and 2) the equivalence of forms B-1002 Forms A vs. Form B. The general findings were as follows: (See Appendix B)

1. The GATB aptitudes were measured reliably in the various employment and rehabilitation counseling situations in which the battery is commonly used. These studies were conducted with samples from a variety of high school, college and adult populations, and with intervals between initial testing ranging from one day to three years. Under these conditions reliability coefficients for most of the aptitudes were in the range of .80 to .90. In a few studies that involved adults tested and retested after brief intervals, the reliabilities of aptitudes G, V, and N consistently exceeded .90 and the other aptitudes often exceeded this level.
2. A practice effect by examinees was consistently observed for all aptitudes. The mean score often increased as much as 10 points for some aptitudes, a fact which should be noted by counselors who may be faced with the problem of interpreting retest GATB scores.
3. Test reliability was maintained and practice effects were observed when the interval between test administrations was as long as three years. Although practice effects decreased over time, these remained substantial on most aptitudes even after the three year administration.

4. There were no consistent differences in the reliability of aptitudes or magnitude of the practice effects between subsamples of female and male examinees in the populations studied.

5. In the studies of B-1002 form equivalence, there were no consistent differences between the equivalence coefficients. Although coefficients of stability (TEST-RETEST) were approximately the same for Forms A and B of B-1002, they tended to be somewhat higher than coefficients of equivalence between Forms A and B (U.S. Department of Labor, 1970).

A statistical summary of the GATB reliability studies is found in Appendix B.

Additionally, other major findings revealed that the five GATB tests measuring aptitudes K, F and M could be administered without revision to individuals who were deficient in basic academic skills or who lacked in the ability to comprehend general testing instructions (U.S. Department of Labor, 1964). In this regard, the U.S. Department of Labor (1964) reported there were many "hard-core" unemployed who needed vocational counseling and remedial services to help them become employable and who had great difficulty taking the GATB. These examinees possessed inadequate basic academic skills and had difficulty understanding the

directions of the GATB. Based upon these findings the U.S. Department of Labor concluded:

> "In its present form, the GATB is not appropriate for use with disadvantaged individuals. The reasons are as follows:
>
> 1. The GATB was standardized on employed workers most of whom were not disadvantaged, and most of the occupational validation studies were done on nondisadvantaged groups.
>
> 2. Four of the twelve GATB tests require a sixth grade readability level of reading skills which many of the disadvantaged do not have.
>
> 3. There are problems associated with administration of the tests, including problems of understanding directions geared to nondisadvantaged individuals and problems in using a separate answer sheet, difficult for many disadvantaged individuals. In addition, disadvantaged individuals tend to be poorly motivated, uneasy about taking tests, and lacking in a speed set important for doing well in many of the tests.
>
> These conclusions led to a decision by USTES to conduct research to develop a nonreading edition of the GATB for use with the disadvantaged. The GATB was used as the model in this development for two reasons:
>
> 1. The GATB measures the most important, vocationally significant aptitudes. This has been demonstrated through factor analyses, correlations with other tests, and extensive occupational validation studies.
>
> 2. The GATB has been validated extensively against occupational criteria. The occupational norms developed in these studies provide a ready-made basis for interpreting scores on a nonreading edition of the GATB." (U.S. Department of Labor Manpower Admin., 1970).

In the development of the Nonreading Aptitude Test Battery (NATB), extensive efforts were undertaken to equate the NATB to comparable GATB aptitude levels by means of conversion tables (Manual for the NATB, 1970, USTES). Once the NATB aptitude scores are converted to comparable GATB aptitude scores, then one's aptitude scores may similarly be compared to specific occupation clusters found from the O.A.P. profiles. Droege and Mugaas (1976), however, have stated that the validity of the NATB can only be inferred. It has not been externally validated against criteria of job and training success with disadvantaged persons. It derives what validity it has on the basis of its relationship to the GATB, which has been validated extensively on external criteria. Little research is available regarding the external validation of the NATB against job performance or training success criteria. The NATB research was completed in 1969 and the test battery was installed in local employment commission offices throughout the nation over a two-year period between 1970-1972.

Another test, the Wide Range Scale (WRS), was introduced by the USTES during this period to accompany the NATB (Appendix C). The WRS was developed to assist in the determination of whether a disadvantaged person has sufficient literacy skills to take the GATB or whether the examinee should be tested with the NATB. The WRS consisted of two tests

of eight items each - vocabulary and arithmetic. In these areas USTES (1964) found that cut-off scores of vocabulary (3) and arithmetic (6) were minimal literacy standards in being able to take the GATB.

A national survey was conducted to determine reasons for the low numbers of individuals being tested with the NATB in local employment offices (U.S. Department of Labor, 1973). The results indicated that there was a decreasing emphasis in the Employment Service on human resource development (counseling), but a corresponding emphasis on job placement related duties. Other factors identified in the survey were negative reactions of some counselors who believed that the NATB test administration time was too long and that some of the tests were very difficult to administer. As an outcome of the 1973 survey, USTES developed a revised edition of the NATB. New experimental tests were constructed to provide more appropriate measures of aptitudes G, V, N and Q. Experimental research designs were developed to obtain data for selecting tests for the new edition. In 1979 the USTES completed a study that field tested the Revised-NATB (R-NATB) and GATB on a "disadvantaged" standardization sample (U.S. Training and Employment Service, 1980).

A major finding from the study revealed that subjects scored about the same on the GATB and R-NATB regardless of how they scored on the WRS. Furthermore, subjects who did not obtain the mean cut-off score on the WRS (Vocabulary - 3 and Arithmetic - 6) still scored about the same on

the R-NATB and the GATB. According to USTES, two explanations for this finding were:

> "(1) The WRS is not the proper instrument for determining whether the GATB or R-NATB is appropriate.
>
> (2) There is no proper instrument for determining whether the GATB or R-NATB is appropriate -- the people for whom the NATB is intended score about the same on the R-NATB and GATB (U.S. Training and Employment Service, 1980)."

Although the results of the 1979 USTES study were inconclusive regarding the R-NATB utility with disadvantaged, educationally deficient examinees, agency officials concluded that:

> "....it would be worthwhile to retain the NATB because the disadvantaged or educationally deficient prefer to take the R-NATB rather than the GATB. But if people were going to score about the same on the R-NATB or GATB, it would be difficult to justify the time and expense of administering the R-NATB just because people feel more comfortable taking the R-NATB rather than the GATB." (U.S. Training and Employment Service, 1980)

Based upon the findings of this study, USTES published an inter-departmental communique entitled Alternate Approaches to Aptitude Testing of Educationally Deficient Individuals. In this publication there were three research alternatives suggested relating to the GATB/R-NATB. They were as follows:

> "1. Do not initiate any new research or development in this area. The rationale for this alternative is that we have done our best to develop a suitable nonreading aptitude test battery and additional work would probably not be very productive. The pretesting orientation techniques available in English and Spanish seem adequate and comprehensive.

2. Do a more definitive study to determine whether there are individuals who would benefit from the R-NATB. The number of cases on which the GATB/R-NATB comparison was made was not large and there may be better ways of identifying those who should be tested with the R-NATB than using cut-off scores on the Wide Range Scale. Perhaps a limited study should be done concentrating on the retarded, very low literacy individuals, or those with low levels of cultural exposure. Half of the sample selected would be administered the R-NATB. In addition, each sample member could be asked to react to the testing experience at the time of an interview when the scores would be discussed and interpreted. The data analysis would indicate more conclusively than the analysis for the current study whether the R-NATB can be useful for at least some individuals.

3. Do a study like that described in 2 above, but include a third group which would be tested with the B-1001 (mark-in-booklet) edition of the GATB. The results would provide a research basis for choice among the operational alternatives discussed in the first section of this paper." (U.S. Training and Employment Service, 1980)

In summary, the USTES has suggested further research that will serve to: (1) define the utility of the R-NATB with an illiterate/low functioning segment of the population, and (2) determine more effective screening instruments to predict the examinee needing to take the R-NATB vs. GATB. To date, there have been no studies investigating other GATB/R-NATB "screeners".

The Problem

The practicing professional would appear to have greater success with clients who are average or above in abilities when being assessed

for vocational aptitudes via the GATB or the R-NATB. However, lower academically and/or acculturated clients have been documented as more problematic due to their inability to obtain representative measures of vocational aptitude. In this regard, the USTES has suggested further research that would serve to define the utility of the R-NATB with a low functioning segment of the population and to determine more effective instrumentation that would predict an examinee's potential to take either of the two aptitude measures. To date no research efforts have been instituted to address these recommendations. Therefore, the problem to be addressed in this study is twofold: (1) the lack of information that exists in defining the utility of the R-NATB and GATB with borderline and mildly retarded individuals and (2) the need to identify a suitable measure of achievement that would predict a client's potential success upon being administered the GATB or R-NATB.

Research questions appropriate to address the problem defined for this study are as follows:

Research Question #1: Are there aptitude performance differences on the GATB vs. R-NATB of borderline and/or mildly retarded individuals?

Research Question #2: Is the Wide Range Achievement Test-Revised a better predictor than the Wide Range Scale of GATB and/or R-NATB aptitude performance in borderline and/or mildly retarded individuals?

The focus of this investigation will address the needs of borderline and mildly retarded individuals as suggested by USTES. Furthermore, as there is an absence of research regarding screener alternatives to the Wide Range Scale (WRS), this researcher has selected the Wide Range Achievement Test-Revised (WRAT-R), (Jastak and Jastak, 1984), as a potentially more effective instrument than the WRS. The WRAT-R is similar in qualities to the WRS. It assesses academic development from kindergarten through college levels in the areas of reading, spelling, and arithmetic skills. A review of the literature suggests the WRAT-R to have a predictive relationship with several measures of intellectual development, particularly verbal intelligence (Hale, Douglas, Cummens, Rittgarn, Breed, and Dabbert, 1978; Schwarting and Schwarting, 1977).

The next sections, Chapters II and III, will describe in more detail the selection of the target population and the instrumentation to be used in this study.

Rationale and Significance of the Study

Over the last two decades, USTES has invested considerable funds and professional manpower in developing the NATB (and R-NATB). However, based on the 1979 standardization study, the utility of the GATB vs. the R-NATB with "educationally deficient" examinees was inconclusive.

Therefore, additional research is needed to assess the performance differences of the R-NATB's intended population.

These findings will also be useful to USTES personnel and educators in the following ways:

1. Determine if the mentally retarded, in general, obtain higher aptitude scores on the R-NATB than on the GATB, or if there is a certain retardation severity level that is associated with higher R-NATB vs. GATB aptitude scores. Thus, the present study will serve to assist the practicing professional in deciding which aptitude test will yield the optimum results for the retarded client. These results may further suggest that a combination of the GATB and the R-NATB be administered to borderline or mildly retarded examinees in an attempt to obtain the highest aptitude scores. Furthermore, should a specialized "GATB/R-NATB battery" be developed which is related to either/both of these retarded subclassifications (or even WRS or WRAT-R score combinations), then this information would improve the vocational assessment decision-making and diagnostic efforts with approximately fifteen percent of the general population aged fifteen and over.
2. Determine if the WRS vs. WRAT-R can predict whether the mentally retarded, in general or by severity subclassification subgroups,

should use the R-NATB vs. the GATB in order to obtain higher scores. The present study is intended to sample individuals having a broader range reading and mathematics skills deficiencies as well as a lower level of intellectual functioning than did the USTES 1979 study.

3. This investigation will determine if the R-NATB is more appropriate for one or both of the mentally retarded severity subclassification elements in this study. This would, in part, justify the amount of time and money invested by the USTES and their efforts to standardize the R-NATB.
4. Since the R-NATB is now approximately 30 minutes shorter than the GATB, employment specialists and other practicing professionals would be more prone to use the R-NATB as a vital component in vocational assessment and/or career exploration endeavors with higher functioning mentally retarded clients.
5. The research approach used in the present study may encourage further GATB vs. R-NATB research with other educationally handicapped or deficient populations; for example, the learning disabled, emotionally disturbed, illiterates, and school dropouts.
6. There are many practicing professionals who respect the efforts of USTES to validate the GATB and R-NATB. Additional research

information would be helpful in determining thousands of "aptitude qualification profiles" for successful job placements. Thus, the utility of the GATB and R-NATB will assist in the determination of various types of jobs for which borderline and mildly retarded may qualify.

7. Finally, the information derived from this study would be of interest to other governmental agencies, practitioners, and researchers who have generated interest in this research project (See Attachments I-IV). The results of this study would add to the existing knowledge of appropriate aptitude assessment of mentally retarded individuals with regard to vocational decision making.

If it could be determined that the WRAT-R could better predict higher scores on the R-NATB vs. the GATB in mild or borderline retarded examinees, there would be an advantage to using the alternative rather than the WRS because:

1. Many vocational assessment procedures in centers, clinics, and schools administer the WRAT-R as a quick estimate of a client's academic development in the areas of reading, spelling and mathematics (Barber, 1981). Thus if a WRAT-R "cut-off score criteria" were established for taking the R-NATB vs. GATB, then the WRAT-R scores would serve two purposes in the vocational assessment procedure.

2. There will be a savings of testing time if an additional GATB/R-NATB screener such as the Wide Range Scale does not have to be given.
3. The Wide Range Achievement Test-Revised is already a widely used and accepted quick estimate of academic achievement by many school and mental health agencies as well as rehabilitation counselors.

Assumptions/Delimitations/Limitations

The focus of this study is to determine if there are aptitude score performance differences in borderline and/or mild retardates taking the GATB vs. the R-NATB. If these differences exist, and it can be established according to: (1) retardation subclassification (severity) levels, (2) Wide Range Scale criteria, or (3) Wide Range Achievement Test-Revised criteria, then it is expected that vocational aptitudes of these individuals may be more optimally and efficiently assessed. In this regard, several research assumptions, delimitations, and limitations will be made relative to the present study.

The validity of the R-NATB (especially for aptitudes G, V, N, S, P and Q) will be based solely on the empirical relationship with corresponding aptitude areas of the GATB (U.S. Department of Labor, 1970). Thus, the R-NATB, like the original NATB, is only indirectly

related (via the GATB) to successful, on-the-job work criteria of individuals in various Occupational Aptitude Patterns (O.A.P.s). For the purposes of this study, it will be assumed that the R-NATB aptitude scores are significantly related (even though not to the same degree) to external work performance criteria, as are their comparable GATB aptitude indices. USTES has acknowledged this as a validation criticism and has asked for assistance from all sources in the external validation of the original and R-NATB.

The generation of standardization data of the R-NATB and GATB scores for all severity levels of mentally retarded will not be a product of this study. The present study will only focus upon a relatively small number of accessible mentally retarded subjects identified in the borderline and mild severity levels. Hence, the interpretation of this study's results are limited in their generalizability.

The present study will select samples of borderline and mildly retarded subjects in an attempt to more appropriately represent the educationally deficient/illiterate continuum that exists in at least the lower (intellectually/academically subnormal) fifteen percent of a typical population. However, lack of educational achievement and/or illiteracy is not confined solely to those functioning intellectually in the I.Q. range 50-84. There are others who could have been included in the present study that do not possess adequate literacy skills, yet are

functioning on a higher intellectual level than the subjects selected for this research. However, it is felt that delimiting the present investigation to a population's intellectual subnormal segment would more adequately represent the "disadvantaged or low-literacy skilled" continuum of individuals for which the R-NATB was intended.

Definition of Terms

Since this research will be studying the higher functioning mentally retarded individuals, ages fifteen to twenty-five, the two severity levels of retardation will be defined as follows:

"Borderline Retardation - total of full scale intellectual quotient of 71-84;

Mild Retardation - total or full scale intellectual quotient of 50-70."

(American Psychiatric Association, 1980, pp. 39-40)

As was mentioned earlier, the United States Testing and Employment Service developed the GATB and subsequently its non-reading version in order to assess nine vocational aptitude dimensions in individuals ages 15 and over:

> "The following are the definitions of the nine aptitudes measured by the GATB and R-NATB:

G - Intelligence - General learning ability. The ability to 'catch on' or understand instructions and underlying principles; the ability to reason and make judgments. Closely related to doing well in school.

V - Verbal Aptitude - The ability to understand meaning of words and to use them effectively. The ability to comprehend language, to understand relationships between words and to understand meanings of whole sentences and paragraphs.

N - Numerical Aptitude - Ability to perform arithmetic operations quickly and accurately.

S - Spatial Aptitude - Ability to think visually of geometric forms and to comprehend the two-dimensional representation of three-dimensional objects. The ability to recognize the relationships resulting from the movement of objects in space.

P - Form Perception - Ability to perceive pertinent detail in objects or in pictorial or graphic material. Ability to make visual comparisons and discriminations and see slight differences in shapes and shadings of figures and widths and length of lines.

Q - Clerical Perception - Ability to perceive pertinent detail in verbal or tabular material. Ability to observe differences in copy, to proofread words and numbers, and to avoid perceptual errors in arithmetic computation. A measure of speed of perception which is required in many industrial jobs even when the job does not have verbal or numerical content.

K - Motor Coordination - Ability to coordinate eyes and hands or fingers rapidly and accurately in making precise movements with speech. Ability to make a movement response accurately and swiftly.

F - Finger Dexterity - Ability to move the fingers, and manipulate small objects with the fingers, rapidly and accurately.

M - Manual Dexterity - Ability to move the hands easily and skillfully. Ability to work with the hands in placing and turning motions."

(U.S. Department of Labor, 1970, pp. 1-2)

Since the NATB and now the R-NATB were developed for the "educationally deficient," the following is the U.S. Department of Labor's definition for such an individual:

"Educationally Deficient - Individuals possessing inferior literacy skills (reading, mathematics, etc....) and poor direction comprehension and following traits." (U.S. Department of Labor, p. 1)

CHAPTER II

REVIEW OF RELATED LITERATURE AND RESEARCH

Over the last two decades, the employment accomplishments of specific retarded individuals have refuted many common misconceptions regarding the occupational potential of the mentally retarded. The classification "mentally retarded" has been known to predetermine what takes place in programs of vocational rehabilitation, employment procurement, employment security, and occupational education and training (Dexter, 1960; Greenbaum and Wang, 1965; Edgerton, 1967; Phelps, 1965; Elo and Hendel, 1972). For this reason, advocates for the mentally retarded are continually in search of assessment instruments which accurately predict the optimum vocational potential of retarded individuals (Conference Proceedings of Vocational School Psychologists, 1982).

For the educational diagnostician, selecting a valid instrument for use with the mentally retarded is difficult due to the reading requirements of most vocational aptitude tests. However, there are certain standardized tests that hold more promise than others due to the nature of the test and the population for which these instruments were designated to serve (Gold, 1973). In this regard, the GATB and R-NATB would appear to have applicability to the mentally retarded population.

Since 1947, the GATB has been involved in over six hundred research studies. A variety of these studies have involved psychiatric disordered subjects (Socief and Metuialley, 1961; Taylor, 1963; Floyd, 1964;

Klugman, 1964; Tellegen, 1965; Briggs, 1966; Kish and Cheney, 1968 and Clemmons and others, 1984), and the intellectually retarded (Tigard, 1950; O'Connor and Tigard, 1951; O'Connor, 1952; Rotman, 1963; Banas, 1966; Woolington, 1966; Huddy, 1968, and Young and others, 1985). An advantage of the GATB is that is provides for measurement of a variety of aptitudes important for success in the occupational world, not just an index of intelligence. Furthermore, an approach toward differential aptitude measurement is generally important in the counseling of intellectual "normals". Likewise, assessment of differential aptitudes is equally important in the vocational counseling of intellectually retarded clients.

Several GATB studies have been conducted to determine the extent that retarded persons perform well on the GATB. In 1955, Murray collected GATB data on 249 employment office applicants from New York City, Erie and Philadelphia, Pennsylvania, who had G aptitude scores of 75 or below. The results of this study revealed that seventy-two percent of the applicants obtained scores in the average to above average ranges in one or more of the other GATB aptitudes. Furthermore, the percentages of those scoring at or above 100 (average) on other aptitudes ranged from zero percent on Verbal to fifty-four percent on Motor Coordination. At least twenty-five percent or more of the applicants scored at or above 100 on Form Perception, Finger Dexterity, Manual Dexterity, as well as on Motor Coordination. Thus, while it cannot be said that a person

compensates for low intelligence with higher aptitudes in other areas, average and above aptitude frequently exists concurrently with low intelligence (Murray, 1966).

The New York State Employment Service (1965) administered the GATB to a total of 162 high school "slow learners" and 93 educable mentally retarded secondary students for "occupational potential" exploration. In this study, slow learners were defined as having an I.Q. between 76-89 and functioning on a low academic level. The mentally retarded group consisted of persons who possessed I.Q.s of 75 or below. Also, the design encompassed a control group of 672 normal high school students of equivalent grade placement. Significant differences were found among the mean scores of the three groups on all aptitudes, with retardates scoring the lowest and "normals" the highest. Furthermore, on all subtests of the GATB, the normals attempted more items than the slow learners who in turn attempted more items than the retardates.

The same study also addressed the issue regarding the GATB as a reliable instrument used with persons of low ability. In this regard, the study attempted to determine if inordinate guessing of the examinee would take place and whether the test would differentiate among persons at lower ability levels. It was found that for most subtests of the GATB, guessing was not a factor for the items attempted by the mentally retarded and slow learner groups, and that the items attempted were at a

level of difficulty that permitted differentiation among examinees. Less than half of the mentally retarded group (39 percent of males and 45 percent of females) qualified for one or more Occupational Aptitude Patterns (O.A.P.s). In the "slow learner" group, 76 percent of the males and 63 percent of the females qualified for one or more OAPs.

Woolington (1966) investigated the appropriateness of the General Aptitude Test Battery as a useful instrument in assessing the vocational potential of sixty-eight institutionalized mild and moderate mental retardates being considered for rehabilitation. The results indicated that the Verbal Aptitude (V) was the only one of the nine aptitude measures where no subject reached the minimum established score for O.A.P. consideration. More subjects did better on the Motor Coordination (K) aptitude than on any other. Female subjects achieved higher mean scores on all measured aptitudes than did the males, but these differences were not statistically significant. While no significant correlations were obtained between any of the three Wechsler I.Q.s and the "performance" aptitudes of Motor Coordination (K); Manual Dexterity (M); and Finger Dexterity (F), statistically significant correlations were obtained between certain combinations of all the other aptitudes and the three I.Q.s. Woolington concluded the following relative to these findings:

1. The mentally retarded tend to have relatively greater potential in psychomotor and perceptual abilities than in primary intellectual factors.

2. O.A.P.'s 28-Equipment Operation, 31-Production Technology, and 32-Production Work and 35-Elemental Work (Industrial) are more frequently qualified for by the retarded than any other O.A.P. group.

3. A significant correlation exists between the GATB intelligence (G) score and the full scale I.Q.

However, the study did not support Murray's (1956) findings of the tendency for retardates to achieve average or better scores in "non-intellectual" aptitudes measured by the GATB. Also, Woolington's study did not affirm, as in other studies, that the GATB can be highly useful in assessing certain vocational abilities among the retarded. This study concluded that the GATB did not appear to be an effective instrument for assessing the vocational potential of retardates, particularly the "institutionalized" retardate.

Huddy (1968) tested "educable retarded" and "slow learner" high school students (ages 15-0 to 16-11) and adult subjects with I.Q.s ranging from 50-89. The purpose was to determine whether the GATB could provide useful occupational guidance to this group of the intellectual population. The results were as follows:

1. No significant differences were found at the .01 level when the performances of the "educable retarded" subjects were compared to that of the "slow learners" having taken the "normal" and the "extended time" administrations of the GATB.

2. No significant differences were found at the .01 level between the aptitude score means obtained by "educable mentally retarded" and "slow learner" pupils who received the GATB under "normal" administration conditions and the national aptitude norms established by the U.S. Employment Service for 9th and 10th graders of normal ability.

3. No significant differences were found at the .01 level between the aptitude score means obtained by "educable mentally retarded" and "slow learner" pupils who received the "extended time" administration of the GATB and the national aptitude norms established by the U.S. Employment Services for 9th and 10th graders of normal ability.

4. A significant difference was found at the .01 level in the number of O.A.P.s identified for each intelligence level studied. Subjects with I.Q.s of 80-89 were ranked first and qualified for the most number of O.A.P.s. Ranked second, third, and fourth were I.Q. groups in the following descending order: 70-79, 60-69, and 50-59.

5. No significant differences were found at the .01 level between any combination of the following groups:

   - National Adult Norms
   - 9th and 10 Grade Norms
   - Educable Mentally Retarded and Slow Learner Pupils
   - Educable Mentally Retarded and Slow Learner Adults
   - Educable Mentally Retarded and Slow Learner Adults working in "electronic assembly" occupations
   - "Average" Adults working in "electronic assembly" occupations.

Lofquist, Dawis, and Weiss (1970) concluded a series of GATB studies on mentally retarded vocational rehabilitation clients throughout Minnesota's sheltered workshops. Their findings support the GATB as a highly appropriate tool in assessing the multifactor (vocational) abilities of the mentally retarded by stating:

> "The findings concerning the GATB strongly support the feasibility of a multidimensional (multifactor) approach to the assessment of 'vocational potential' (work potential) in mentally retarded individuals. This approach contrasts sharply with, on the one hand, the I.Q. approach (wherein the I.Q. is the basic determiner of the range of work possibilities to be considered for the individual) and on the other hand, the work sample approach (wherein vocational rehabilitation counseling is based

> on try-out experience). In the latter approaches, the range of work possibilities that can be considered are limited -- by invalidity of the I.Q. in its lower ranges as a predictor of job success, and by time and space constraints on the number of work samples that any one individual can attempt to try out." (p. 94)

Since modifications for the retarded examinees have been suggested in the literature for the GATB subtests and its testing procedures, the authors investigated these modifications and further concluded that:

> "Rather than revise the content of the GATB tests, it was thought that modifying test administration procedures would enable the meaningful use of these tests with mentally retarded persons. Consequently, a series of studies were conducted to investigate the effects of the following administration modifications: (A) eliminating the separate answer sheet; (B) increasing the number of practice problems; (C) individual (vs. group) administration of the GATB tests; (D) administering the tests under untimed conditions; (E) eliminating items that correlate significantly with verbal ability; (F) simplifying test instructions and directions; and (G) simplifying practice problems. None of these modifications were found consistently to exert any significant influence on the test performance of the mentally retarded subjects. One might conclude that the GATB as presently administered can yield useful work-personality information about mentally retarded individuals in the higher I.Q. ranges (the 'borderline' category). Individuals in the mild or lower categories would be better served by a new ability test battery which would have to be constructed in such a way as to calibrate with the GATB." (p. 99)

After Lofquist, Dawis, and Weiss' study, the decision was made to develop a nonreading revision of the GATB. The nonreading version, NATB, was developed in 1970; and, employment and rehabilitation counselors began using it in 1971. By early 1973, the NATB was being used extensively in the fields of state employment and rehabilitation services, and complaints were emanating from counselors about the NATB's

total testing time and the difficulty of administering several subtests. Thus a NATB revision effort was initiated in the mid-1970's, even though USTES still allowed private and public personnel service agencies to continue using the original NATB. During this period of time there were only a few NATB studies performed regarding the mentally retarded before the NATB was taken completely out of circulation in the late '70s due to the USTES NATB revision efforts.

Carbuhn and Wells (1973) tested 102 institutionalized mentally retarded subjects and correlated their NATB scores to indices of on-the-job training success. The authors found the NATB to be a very useful tool in several respects:

> "Many types of standardized tests are inappropriate for use with the mentally retarded, since they require some skill in reading or verbal ability; but the occupations for which the retarded can be competitively employed seem to require dexterity, memory, and perhaps what Jensen calls the 'ability to learn from looking and doing.' The NATB appears to fulfill most of these test requirements quite satisfactorily. An added advantage is group administration (6 to 10 persons) by a less highly trained examiner with a saving in examiner's time and effort." (p. 465)

Concerning the applicability of the NATB to various severity levels of retardation, Carbuhn and Wells felt that a retardate would need to be functioning on a moderate, mild, or borderline level of retardation (approximate I.Q. of 40 and above) for the NATB to be appropriately administered. Finally, in making some other conclusions relative to the NATB's utility, the authors stated that:

> "Although the research reported here involved institutionalized retardates, the application of the results should be generalizable to students in special education classes or to slow learners in regular public school classes. School and rehabilitation counselors and other guidance personnel should find the NATB an additional source of measurement data for differential assessment of vocational aptitude." (p. 466)

In 1976, Hull and Halloran investigated the use of the NATB for predicting the vocational aptitude of 140 educable and borderline retarded students throughout the high schools of Vermont. Based on t-test comparison of the retardates' scores on both the NATB and GATB, it was found that subjects basically made significantly higher scores on the NATB as compared to the GATB in relation to the following aptitude areas:

Aptitude	t Values	Level of Significance
Intelligence (G)	5.86	.001
Verbal (V)	-2.51	.02
Numerical (N)	8.43	.001
Spatial (S)	9.78	.001
Form Perception (P)	20.34	.001
Clerical Perception (Q)	8.59	.001

Only on the Verbal Subtest did subjects score consistently higher using the GATB vs. the NATB. Furthermore, in analyzing additional relationships between the GATB and NATB, the authors found a significant predictive correlation of .846 between the O.A.P.s on both tests. This

suggested that the students who had obtained the greater number of O.A.P.s on the GATB likewise could be predicted to obtain those O.A.P.s and possibly more O.A.P.s when taking the NATB. Finally, the authors concluded relating to the utility of the NATB that:

> "...the study found that the NATB identified significantly more OAPs (P < .0005) for educable mentally retarded and borderline intelligence public school students than did the GATB. After the NATB's Verbal Aptitude (V) subtests have been revised, the increase in the number of NATB OAPs obtained by EMR and Borderline intelligent students should be even greater." (p. 551)

The most recent research regarding the NATB was reported by the U.S. Employment and Testing Administration (1980) as being the "final study" of the GATB and their newly developed R-NATB. Basically, it was found that 617 "disadvantaged examinees scored about the same on the GATB and R-NATB. Furthermore, subjects who did not obtain the WRS mean cut-off scores (at or above 3 Vocabulary and 6 Arithmetic) still scored comparably on the R-NATB vs. GATB. Thus, USTES suggested that the WRS was ineffective as a GATB/R-NATB "screener." Table I provides descriptive statistics of the study's examinees and Table II provides descriptive statistics of those examinees not passing the WRS cut-off criteria.

TABLE I

Means ($\bar{X}$), Standard Deviations (SD) and Ranges of Age, Education, and Wide Range Scale Performances

	Group 1* N = 307			Group 2+ N = 310			Combined N = 617		
	$\bar{X}$	SD	Range	$\bar{X}$	SD	Range	$\bar{X}$	SD	Range
Age	22.9	8.2	16-59	23.0	8.2	15-57	23.0	8.2	15-59
Education	10.7	1.8	4-16	10.8	1.9	0-18	10.8	1.8	0-18
WRS Vocabulary	6.0	1.7	0-8	6.2	1.6	1-8	6.1	1.7	0-8
WRS Arithmetic	6.0	1.9	0-8	5.8	1.8	0-8	6.9	1.9	0-8

TABLE II

Means, Standard Deviations and T-Tests on Age, Education, WRS Vocabulary and WRS Arithmetic for Group 1 and Group 2 of Subjects Not Passing WRS "Cut-Off" Criteria

	Group 1* N = 110			Group 2+ N = 114		Combined N = 224	
	$\bar{X}$	SD	T	$\bar{X}$	SD	$\bar{X}$	SD
Age	23.5	8.5	.93	22.5	6.9	23.0	7.8
Education	10.3	2.0	-.18	10.3	1.6	10.3	1.8
WRS Vocabulary	5.1	2.0	-1.17	5.4	1.8	5.3	1.9
WRS Arithmetic	3.9	1.4	.52	3.8	1.3	3.9	1.4

*Group 1 subjects were administered the GATB, then the R-NATB.
+Group 2 subjects were administered the R-NATB, then the GATB.

A review of Tables I and II raise the question of the representiveness of the USTES sample that was defined as "educationally deficient" for which the R-NATB was intended. These observations are as follows:

1. The level of education (10.3 years) of the non-passing subsample average only .8 of a school year below that of those who passed the WRS "cut-off" criteria (11.1 years). According to the screening standards, an adult who would be typically taking the R-NATB having over ten years of formal education is not descriptive of the illiterate, educationally deficient population at which the R-NATB was directed.
2. If it were not for the deficient mathematics computational skills, a majority of those in the "non-passing" subsample would have passed the WRS "cut-off" criteria. Assuming that the WRS' Vocabulary performances of the 224 subjects described in Table II were normally distributed, approximately 88 percent of the subjects had WRS Vocabulary scores of 3 or above* indicating adequate reading and comprehension skills according to the WRS "cut-off" criteria. This would have enabled them to take the GATB rather than the R-NATB if it were not for their poor performance on the WRS Arithmetic subtest.

*In Table II, a WRS Vocabulary score of 3 is -1.21 standard deviation below the mean WRS Vocabulary mean score of 5.3. Thus, according to normal curve theory, approximately 88 percent of the 224 subjects scored at least 3 or above on the WRS Vocabulary subtest.

Based upon the findings of the 1979 USTES study, an interdepartmental communique' was issued which suggested that additional GATB/R-NATB research be undertaken with retarded samples and that the WRS may not be the most efficient "screener" (Droege, 1980). Thus, the basis of the present study was established by USTES's invitation for additional research on the GATB/R-NATB WRS dilemma. The Wide Range Scale (WRS) does not have any formal research on it other than as a screening device in relation to the GATB, NATB, and presently the R-NATB.

The Wide Range Achievement Test-Revised (WRAT-R) in comparison to the WRS, has had a variety of uses and research performed with it since its origin in 1936. It is similar in qualities to the WRS in that it assesses academic development from kindergarten through college levels in the areas of reading, spelling, and arithmetic skills.

The WRAT-R edition was published in 1984 as a restandardized version of its five WRAT predecessors -- editions 1936, 1946, 1965, 1976, and 1978. It is divided into two levels, 1 and 2. Level 1 is designed for use with children between the ages of 5 years, 0 months and 11 years, 11 months. Level 2 is to be used on individuals 12 years, 0 months through adulthood. For the most part, the WRAT-R items are the same as the WRAT's last three editions -- 1965, 1976, and 1978. There have been ten simple arithmetic items added to the Level 2 Arithmetic subtest in order to lower the range of the test so that lower functioning individuals

would not reach a frustrating level as quickly. Also, in Level 1 of the Arithmetic subtest, one more subtraction item (borrowing) and a few computation problems to the oral section have been added. Since the WRAT-R and its previous editions were so similar, the correlation coefficients between the revised 1984 edition and previous editions are very high as one can see below (Jastak & Jastak, 1984):

Subtest	r
Reading Level 1	.92
Reading Level 2	.91
Spelling Level 1	.99
Spelling Level 2	.98
Arithmetic Level 1	.95
Arithmetic Level 2	.92

Considering that the WRAT-R is a relatively new test in the field, there is little research to date on its concurrent validity with other academic achievement tests, screeners, etc. or with various ability/aptitude tests. Nevertheless, in view of its very high correlations with its previous WRAT editions, one could anticipate that the WRAT-R will have very similar correlational qualities to other individual and group tests of achievement, ability, etc. as those of its predecessors. The following is a review of the more pertinent WRAT and WRAT-R research regarding their concurrent validity with many of the more widely used and reputable psychometrics in the field.

The WRAT has been researched using various types of subjects, namely juvenile delinquents (Diller, 1955), second graders (Smith, 1961),

concurrent and construct validities (Hopkins, Dobson, and Oldridge, 1962), with the Gates Reading Survey (Fortenberry and Broome, 1963), with emotionally disturbed (Stone and Racubey, 1964), with the Gilmore Oral Reading Test (Garlock, Dollarhide and Hopkins, 1965), concurrent validity to the Peabody Individual Achievement Test and learning disabled students (Stoneburner and Brown, 1979). Furthermore, the literature suggests that the WRAT has a predictive relationship with several measures of intellectual/mental ability development, particularly verbal intelligence (Hale, Douglas, Cummens, Rittgarn, Breed, and Dabbert, 1978; Hale, 1978; Schwarting and Schwarting, 1977).

In their WRAT manual Jastak and Jastak (1978) report on the 1962 Wagner and McCloy study of high WRAT correlations with other indices of reading achievements. These correlations are reported as follows:

(a) +.81 WRAT Reading with New Stanford Paragraph Reading
(b) +.84 WRAT Reading with New Stanford Word Reading
(c) +.93 WRAT Spelling with New Stanford Dictation Test
(d) +.91 WRAT Arithmetic with New Stanford Arithmetic

Lewis R. Chatham (1967, 1974) directed the most comprehensive WRAT validity national survey for the National Center for Health Statistics in studying first through twelfth graders comparing the Stanford and Metropolitan Achievement Tests to the WRAT's Reading and Arithmetic subtests. It was found that the WRAT Reading was highly correlated with the verbal coding achievement areas as was also the WRAT Arithmetic equally correlated with the arithmetical coding subtests of the Stanford and Metropolitan Achievement tests.

Not only does the WRAT have the documentation of its concurrent validity with the aforementioned, more popular, group series, Wetter and French found that it could be used interchangeably with the Peabody Individual Achievement Test (PIAT) in assessing the achievement levels of learning disabled students. Furthermore, Soethe (1972) found the WRAT Reading subtest to possess the highest relationship with the PIAT while Stoneburner and Brown (1979) found the WRAT Reading and Spelling subtests to have very high relationships with the PIAT in learning disabled students. Krawrec and Spadafore (1983) found that grade level scores on the Brigance Diagnostic Inventory of Basic Skills were consistent with those of the Wide Range Achievement Test.

More recently, educational researchers as Grossman (1981), Bristow (1983), Morton (1985), Newville and Hamm (1985) began cautioning educators that the WRAT may not be an accurate measure of primary achievement in many educational tests and series currently used in schools. Grossman cited that a six year 4 month old child need only to write two letters of their name and copy 18 marks to have a standard score of 103 and a grade equivalency rating of 1.3 in spelling. If they could recognize two letters of their name, identify 13 upper case letters and match 10 upper case letters, they could achieve a standard score of 103 and a grade rating of 1.3 in reading (1981). Newville and Hamm randomly selected 70 primary aged students in a midwest suburban school division. They found that the students surveyed possessed significantly

higher WRAT performances when compared to the 1978 WRAT manual performance midpoints for their specific grade placements. Hence, the WRAT norms reported in the manual are significantly lower than those found in the present middle class suburban sample, with the exception of Arithmetic for second graders (1985). As can be seen below, each grade level surveyed yielded significantly higher WRAT Reading and Arithmetic performances than their actual grade/textbook placements:

	GRADE/TEXTBOOK LEVEL					
WRAT Performance	K.7[2]		1.7[b]		2.7[c]	
	M	SD	M	SD	M	SD
Reading Standard Score	112.9	10.9	119.6	15.0	118.4	12.6
Reading Grade Equiv.	1.7	.48	3.2	.924	5.1	1.20
Arithmetic Standard Score	112.2	7.3	113.0	7.2	103.5	7.23
Arithmetic Grade Equiv.	1.9	.63	2.8	.366	3.3	.208

$n^a = 25$ $n^b = 22$ $n^c = 23$

Results as shown above, motivated Jastak and Jastak to renorm and revise the WRAT in 1984 so to make it more attuned to the current academic performances of students in the primary grades.

In relation to tests of intelligence, Jastak and Jastak (1978) reported that intelligence quotients measured by the California Mental Maturity Scale were positively correlated to the WRAT's Reading (.81),

Spelling (.74), and Arithmetic (.84) standard scores. Furthermore, J.B. Foster of the Louisiana Polytechnic Institute Special Education Center studied 75 children ages 6-16 to determine the merits of a battery of individual tests for diagnostic and research purposes in the area of special education. Foster, recognizing that his group has limited sampling characteristics, reported (in a personal communication) the following intercorrelations between standard scores or test quotients (Jastak and Jastak, 1978). These correlations were as follows:

		WRAT	
N = 75	Reading	Spelling	Arithmetic
Grade Placement	.56	.60	.53
Peabody Picture Vocabulary Test - I.Q.	.71	.66	.77
Wechsler Intelligence Scale for Children - Revised:			
Verbal I.Q.	.78	.78	.71
Performance I.Q.	.50	.49	.50
Total I.Q.	.71	.71	.67

When studying the relationship between the WRAT and the children and adult versions of the Wechsler Intelligence Scales, Jastak and Jastak (1978) report the following:

Wechsler Intelligence Scales	WRAT Reading	WRAT Spelling	WRAT Arithmetic
WISC-R I.Q. (N=200 males, ages 9-11)	.85	.77	.75
WISC-R I.Q. (N=200 females, ages 9-11)	.82	.77	.81
WAIS I.Q. (N=200 males, ages 18-24)	.84	.82	.83
WAIS I.Q. (N=200 females, ages 18-24)	.87	.83	.83

In concluding their analysis of the WRAT's relationship with the WISC-R and WAIS's subtests, the WRAT authors concluded that:

> "The correlations between the verbal subtests of the WISC-R or WAIS and the WRAT are higher than between the performance subtests and the WRAT. Comprehension and reasoning tests of the WISC and WAIS tend to be less highly correlated with the WRAT subtests than the more reconstructive subtests of vocabulary, information, digit span and coding (Jastak and Jastak, 1978)."

Also in 1978, Hale investigated the WISC-R relationship to the WRAT on a sample of rural area referred children diagnosed primarily as slow learner, educable mentally retarded, and learning disabled. He found the WISC-R's Verbal I.Q. to be a better predictor of Reading and Arithmetic than its Performance I.Q. These results were consistent with those cited above by Jastak and Jastak (1978).

More recently, Smith and Smith (1986), examined the relationship between the WISC-R and the WRAT-R on a sample consisting of 66 learning disabled and 58 educable mentally retarded, rural students, ages 6-16. Their findings are summarized in the correlational matrix below:

Variable	Reading	Spelling	Arithmetic	Verbal I.Q.
WRAT-R Spelling	.75*			
WRAT-R Arithmetic	.46*	.42*		
WRAT-R Verbal I.Q.	.58*	.41*	.64*	
WISC-R Performance I.Q.	.34*	.21**	.50*	.68*

* = sig. @ .01 level
** = sig. @ .05 level

Consistent with previously cited research, Smith and Smith found that the WRAT-R correlated more favorably with subjects' WISC-R Verbal I.Q. than with their Performance I.Q., although all correlations were significant.

Using borderline and mildly retarded subjects, Spruill and Beck (1986) examined the concurrent validity of Level II of the WRAT-R using the Wechsler Adult Intelligence Scale-Revised (WAIS-R) Verbal, Performance, and Full Scale I.Q. scores as criterion measures. They found highly significant correlations between the criterion measures and WRAT-R subtests:

Variable	Reading	Spelling	Arithmetic	Mean	Standard Deviation
WAIS-R Verbal IQ	.70*	.50*	.60*	77.33	6.32
WAIS-R Performance IQ	.68*	.47*	.57*	78.31	8.75
WAIS-R Full Scale IQ	.71*	.50*	.60*	76.60	6.90
Mean	65.51	70.44	69.10		
Standard Deviation	14.99	13.85	13.85		

* = sig. @ .01 level

Their results were consistent with those found by Ryan and Rosenberg (1983) when they examined the WAIS-R/WRAT relationship in mixed institutionalized adults.

Finally, Grossman and Johnson (1982) investigated the capability of the WISC-R verbal comprehension, perceptual organization and freedom from distractibility factor scores to predict academic achievement as measured by the Wide Range Achievement Test. Multivariate multiple regression analyses revealed that freedom from distractibility and verbal comprehension factors significantly predicted WRAT reading, spelling and arithmetic standard scores.

Not only has the WRAT correlated significantly with the WISC-R and WAIS-R, there are other mental ability instruments with which it has

significant correlations. Raskin and others (1978) discovered that the Stanford Binet's mental age correlated with WRAT achievement scores. Paramesh (1982) administered the Quick Test (of general mental ability), the WISC-R and the WRAT to a sample of 87 boys and 53 girls being assessed in a juvenile correction facility. It was found that the Quick Test correlated significantly with the WRAT Reading subtest. Vance (1985) found similar results in exploring the relationship between the Peabody Picture Vocabulary Test-Revised (PPVT-R) and the WRAT using 37 students referred for special education services. Results indicated that PPVT-R standard scores correlated positively and significantly with the WRAT reading standard scores.

In view of the above, the WRAT has also been involved in considerable research involving the borderline mentally retarded/disadvantaged as well as the psychometric procedures pertaining to their vocational assessment and job placements. The following brief research descriptions should give the reader an understanding of this involvement:

* (Woodard, Santa-Barbara and Roberts, 1975)...found the WRAT was a remarkably consistent and stable (test-retest) measure of academic achievement with emotionally disturbed and borderline retarded-slow learner children seen in a clinic setting.

* (Lindsey, 1983)...220 elementary and secondary educable mentally retarded students were administered the Inventory of Basic Skills on the Brigance Inventory of Essential Skills, Peabody Individual Achievement Test (PIAT), and Wide Range Achievement Test (WRAT). Results suggested that the Brigance measures not as accurately estimate achievement in mildly retarded subjects as do the PIAT and WRAT.

* (Nglieri, 1980)...the McCarthy Scales and the WISC-R given to mildly retarded and learning disabled correlated positively and equally to the WRAT's Reading subtest.

* (Janke, 1980)...used the WRAT with 8-18 year old mildly retarded students in analyzing their arithmetic computational errors.

* (Reger, 1966)...the WRAT scores were positively correlated to WISC scores in mentally retarded students.

* (Carsrud, 1977)...found the WRAT to be a quick assessment of a client's academic achievement in several vocational assessment procedures.

* (Nelms, 1982)...investigated the impact of socio-economic status (SES) and WRAT achievement scores on job choice for 128 disadvantaged participants in a Labor Market Orientation Training Program. Neither SES nor the program measure ("World of Work") yielded significant correlations, but the Wide Range Achievement Test gain scores did significantly correlate with job choice.

* (Berry, 1966)...the WRAT score variables were positively related to successful completion of vocational training of behaviorally disordered students.

* (Bae, 1968)...observed that WRAT Reading scores among other variables were significantly and positively correlated with various vocational training programs.

* (Kaufman, 1967)...one of the cognitive indices of employability in 17-21 year old retardates was the WRAT score.

In view of the above WRAT and WRAT-R literature on borderline and mildly retarded subjects, their vocational training/employability traits as well as measures of intellectual development, there is a rationale to consider this instrument in the present study as a more effective "screener" for those taking the GATB vs. R-NATB.

In conclusion, the literature suggests that the U.S. Department of Labor's General Aptitude Test Battery has been and continues to be an effective instrument for assessing the vocational aptitudes of normals as well as for the subnormal. Generally, borderline and mildly retarded persons possessed the necessary perceptual and psychomotor GATB aptitude development enabling them to perform competitively on such jobs as production work, equipment operation, as well as other elemental work. During the early 1970's, the GATB's nonreading version, the NATB, was introduced and found to be particularly effective with the "educationally deficient" individual who had traditionally been extremely frustrated by the GATB's reading and mathematics demands. Subsequent research found that these lower socioeconomic, academically limited individuals made higher aptitude scores, and thus, qualified for more Occupational Aptitude Profile groups of jobs when taking the NATB rather than the GATB. The USTES had even developed an effective screening test, Wide Range Scale, which determined whether an examinee should take the GATB vs. the R-NATB.

Since the NATB was a lengthier test in administration time as well as a more difficult test to administer, the USTES developed the R-NATB in the late 1970's. However, when this newly developed nonreading aptitude test underwent a standardization study on "educationally deficient" examinees in 1979, their findings were inconclusive. It was found that

1) the subjects selected for the study scored about as well on the GATB as they scored on the R-NATB, and 2) the Wide Range Scale did not effectively predict which of the study's examinees scored higher on the GATB vs. R-NATB. Shortly afterwards, the USTES issued a call for additional research regarding the utility of the R-NATB in hopes that a population of lower functioning (possibly retarded) individuals may be identified which were better suited for the R-NATB and to explore other "screeners" which may be more effective in determining who should take the R-NATB vs. the GATB.

Previous research has found that borderline and mildly retarded individuals consistently made higher scores when taking the R-NATB vs. the GATB. Furthermore, this author feels that it may be for these individuals that the R-NATB has its greatest utility. In addressing the "screener" issue, the literature suggests the Wide Range Achievement Test-Revised to be a very promising alternative to the Wide Range Scale. This author is optimistic that a study similar to the USTES 1979 standardization study using higher functioning, retarded subjects and including the WRAT as a GATB/R-NATB "screener" will provide the USTES as well as employment and rehabilitation practitioners with some additional, highly needed information regarding several areas suggested in the literature.

CHAPTER III

DESCRIPTION OF RESEARCH DESIGN AND STATISTICAL PROCEDURES

Research Design

Currently, the GATB is being used extensively by employment and rehabilitation counselors, vocational assessment specialists and personnel offices throughout the United States. Yet, the R-NATB is in a "limited printing" status awaiting further, more definitive research regarding its utility and relationship to its screener, the Wide Range Scale (Droege, 1984). It is hoped that this additional research will, at least, suggest a direction in which the USTES can initiate additional research regarding the following issues:

1. What type of "educationally deficient" individual will benefit (score higher) from taking the R-NATB vs. the GATB?
2. Is the Wide Range Scale the best GATB/R-NATB "screener" or is the Wide Range Achievement Test-Revised better?

The present research is essentially a replicative study of the 1979 USTES study -- the major differences being:

1. Instead of "disadvantaged" subjects being selected for the study, 80 borderline and 80 mildly retarded individuals having a variety of reading, spelling, and mathematics skill levels were selected for the investigation (U.S. Training and Employment Service, 1980).

2. The present research examined the capabilities of the Wide Range Scale vs. the Wide Range Achievement Test-Revised to determine which should be taken by borderline and mildly retarded individuals in order to obtain the highest vocational aptitude scores.
3. As part of the subject selection criteria, mild and borderline retarded subjects were selected from the age range 15-25 years. Also, unlike the 1979 USTES study, fifty percent of the borderline retarded group and the mildly retarded group made a score of 3 or lower on the Wide Range Scale's Vocabulary subtest. This "cut-off" score of 3 is not much higher than the expected score of 1.6 if one were to respond to this eight item subtest by chance.

The present investigation compared the performances of borderline and mild retardates on particular aptitudes G, V, N, S, P and Q as measured by the distinctly different GATB vs. R-NATB subtests. Aptitudes K, F and M were also tested as part of this investigation; however, they are measured similarly on both the GATB and the R-NATB.

In Table III, various subtests of the GATB and R-NATB are identified according to the aptitude(s) which they measure.

TABLE III

Vocational Aptitudes
as Measured by GATB and R-NATB Subtests

Vocational Aptitude	GATB Subtest(s)	R-NATB Subtest(s)
(G) Intelligence-General Learning	Part 3 - Three-Dimensional Space	Test F - Three-Dimensional Space
	Part 4 - Vocabulary	Test B - Oral Vocabulary
	Part 6 - Arithmetic Reason	Test D - Design Completion
(V) Verbal	Part 4 - Vocabulary	Test B - Oral Vocabulary
(N) Numerical	Part 2 - Computation	Test B - Oral Vocabulary
	Part 6 - Arithmetic Reason	Test C - Number Comparison
		Test D - Design Completion
(S) Spatial	Part 3 - Three-Dimensional Space	Test F - Three-Dimensional Space
(P) Form Perception	Part 5 - Tool Matching	Test E - Tool Matching
	Part 7 - Form Matching	Test G - Form Matching
(Q) Clerical Perception	Part 1 - Name Comparison	Test C - Number Comparison
(K) Motor Coordination	Part 8 - Mark Marking	GATB Part 8 - Mark Marking
(F) Finger Dexterity	Part 11- Assemble	GATB Part 11 - Assemble
	Part 12- Disassemble	GATB Part 12 - Disassemble
(M) Manual Dexterity	Part 9 - Place	GATB Part 9 - Place
	Part 10- Turn	GATB Part 10- Turn

The present study sampled approximately 80 borderline and 80 mildly retarded persons, ages 15-25. Thus, these subsamples represent a lower intelligence portion of a normal distribution as well as being characterized by subnormal/delayed reading and mathematics skills development:

Retardation Level	I.Q. Range	Reading/Math Skill Range
Borderline	71-84	4th - 7th Grade
Mild	50-70	2nd - 5th Grade

The age range selection criteria was adopted because it is intended to include only mild or borderline retarded individuals who were in public school (special) education in the early to mid-1970's when the following were enacted/implemented:

1. Code of Virginia, Section 22-10.3, Special Education for Handicapped Children (1972).
2. Section 504 of the 1973 Rehabilitation Act (P.L. 93-112) and several years thereafter.
3. The Education of All Handicapped Children Act (P.L. 94-142), 1975.

It was only during and after the year 1973 (or 1972-73 school year) that the amount and quality of special education academic and vocational programs improved dramatically, especially in Southwest Virginia. The present researcher wished to select subjects who directly experienced and/or benefited from the "upgrading effects" of "legislatively-improved"

special education programs and services in the public schools. Such a subject selection criterion is felt to be particularly important since it is their basic literacy (academic) skills which are a major issue relative to their optimal performance on the GATB vs. R-NATB. Borderline and mildly retarded populations residing in the Southwest Virginia cities of Salem and Roanoke, as well as the counties of Floyd and Roanoke, served as the target populations. The following are facility descriptions from which the study's retarded examinees were selected according to their age and level of intellectual development:

1. Secondary Public Schools - having mild and borderline retarded students ages 15-22 who were receiving academic and vocational instruction.
2. Sheltered Workshops - having late adolescent (age 18) to elderly employees possessing mild or more severe levels of retardation.
3. Department of Rehabilitative Services' Vocational Assessment Centers - assesses a variety of handicapped (ages 16 to 50) in the areas of vocational interests, aptitudes and basic work habits in order to maximize client vocational training and/or job placement opportunities.

All of the testing was performed by this writer at the three facility locations cited above. The maximum number of subjects in a testing group at a time was six with borderline examinees and four with mildly retarded examinees.

Control Variables

The present study controlled the variables of test administration order and levels of reading within retardation groups like that done in the USTES 1979 study. Each subject was screened on the Wide Range Scale in order to determine their general level of reading (High or Low). Then they were randomly assigned by order of occurrence and followed either the Group X or Group O's test administration schedule shown below.

TEST ADMINISTRATION SCHEDULE

Wide Range Scale - to determine general reading level
"Hi" - WRS score of 4 or more
"Low" - WRS score of 3 or less

Group X	Group O
R-NATB Pretest-A	GATB Book I (Parts 1-4)
R-NATB Book 1 (Test B-D)	BREAK -- 10 min.
BREAK -- 10 min.	GATB Book II (Parts 5-7)
R-NATB Book II (Tests E-G)	BREAK -- 10 min.
BREAK -- 10 min.	GATB (Parts 8, 9, 10, 11, 12)
GATB (Parts 8, 9, 10, 11, 12)	BREAK -- 2 days
BREAK -- 2 days	R-NATB Pretest A
GATB Book I (Parts 1-4)	R-NATB Book I (Tests B-D)
BREAK -- 10 min.	BREAK -- 10 min.
GATB Book II (Parts 5-7)	R-NATB Book II (Tests E-G)
BREAK -- 10 min.	BREAK -- 10 min.
Wide Range Achievement Test-Revised	Wide Range Achievement Test-Revised

The following is a diagram of the study's subject selection design:

		TEST ADMINISTRATION GROUP	
		GROUP "X"	GROUP "O"
Level of Retardation	Borderline (IQ 71-84) 80 Subjects	# of Ss 20 - "Hi" Readers 20 - "Low" Readers 40 Total Subjects	# of Ss 20 - "Hi" Readers 20 - "Low" Readers 40 Total Subjects
	Mildly Retarded (IQ 50-70) 80 Subjects	20 - "Hi" Readers 20 - "Low" Readers 40 Total Subjects	20 - "Hi" Readers 20 - "Low" Readers 40 Total Subjects

Description of Statistical Procedures

After gathering the above test data, the following statistical procedures were undertaken:

1. A descriptive statistical profile of the borderline and mildly retarded samples regarding the subjects demographics as well as their academic functioning via the WRS and WRAT-R.

2. A correlation matrix was calculated of the GATB/R-NATB aptitude subtest scores in order to determine whether the six aptitudes measured by the two instruments satisfied the criteria for acceptable convergent and divergent validity (Campbell and Fiske, 1954).
3. A 3-Way ANOVA investigated whether variables: a) test administration order, b) level of intellectual functioning, or c) reading proficiency had any significant effects on the subjects' GATB/R-NATB aptitude performances.
4. A series of aptitude t-tests (for repeated measurements) were computed to answer Research Question #1 - "Do borderline and/or mildly retarded score higher on the GATB or the R-NATB."
5. Assuming that significant aptitude performance differences were found in answering Research Question #1, a series of regression and inferential statistics were planned in order to determine whether the Wide Range Scale vs. the Wide Range Achievement Test-Revised is a better predictor of the GATB vs. R-NATB aptitude performance differences in the study's borderline and mildly retarded subjects.

This study was approved by the Research Committee of Southwestern State Hospital (Marion, Virginia), Mount Rogers Mental Health and Mental Retardation Services Board, the Southwestern Department of Corrections Regional Administrative Office, the Virginia Department of Corrections Research Planning/Evaluation Unit, the Virginia Department of Rehabilitative Services, the Virginia Employment Commission, as well as the U.S. Training and Employment Service, Department of Labor.

CHAPTER IV

RESULTS AND ANALYSIS OF THE DATA

The present GATB/R-NATB research was undertaken using 160 subjects -- 80 mildly retarded and 80 borderline retarded persons. A majority of the subjects were students in secondary special education programs operated by Salem and Roanoke City Public Schools, as well as Floyd and Roanoke County Public Schools. The remainder of the subjects came from the Department of Rehabilitative Services' Vocational Assessment Centers in Wytheville and Roanoke, Virginia. All of the above school systems and assessment centers are located in Southwest Virginia.

Each subject was deemed eligible for the research according to whether his/her Full Scale I.Q. fell within the mildly retarded or borderline retarded range on an individually administered test of intelligence given within three years of the GATB/R-NATB research. Next the subjects were given the Wide Range Scale in order to determine if they were a high or low reader according to the WRS criteria general reading level cited in Chapter III. Finally, each subject was randomly assigned to either the "X" or "O" test administration group. The most difficult subjects to find were the 20 mildly retarded who were high readers according to the WRS criterion. Almost as equally difficult to find were the 20 borderline subjects who were low readers according to the WRS criterion. After giving approximately 220 borderline and mildly retarded subjects the Wide Range Scale, 160 of them fulfilled the present

research design's subject selection criteria and were subsequently able to complete their particular groups' test administration schedule. The GATB/R-NATB data collection began in November of 1984 and was completed in October, 1987.

Descriptive Profile of the Borderline and Mildly Retarded Groups

Table IV shows the descriptive statistics of borderline, mildly, and combined retarded subjects' demographical and academic development data.

TABLE IV

Description of the Borderline and Mildly Retarded Groups

	Borderline Retarded								
	Borderline Retarded			Mildly Retarded			Combined Retarded		
Descriptive Item	N	$\bar{X}$	S.Dev.	N	$\bar{X}$	S.Dev.	N	$\bar{X}$	S.Dev.
Age	80	17.28	1.90	80	17.81	2.36	160	17.55	2.15
IQ	80	75.19	3.90	80	61.88	5.56	160	68.53	8.22
Caucasian	53	xxxxx	xxxx	52	xxxxx	xxxx	105	xxxxx	xxxx
Black	27	xxxxx	xxxx	28	xxxxx	xxxx	55	xxxxx	xxxx
Male	50	xxxxx	xxxx	43	xxxxx	xxxx	93	xxxxx	xxxx
Female	30	xxxxx	xxxx	37	xxxxx	xxxx	67	xxxxx	xxxx
WRS Vocabulary Scores	80	3.63	1.46	80	3.59	1.58	160	3.61	1.52
WRS Arithmetic Scores	80	4.74	1.83	80	4.13	1.78	160	4.43	1.82
WRAT-R Reading (Standard Scores)	80	72.65	19.44	80	67.66	12.08	160	70.16	11.09
WRAT-R Spelling (Standard Scores)	80	73.35	8.83	80	70.15	9.95	160	71.75	9.51
WRAT-R Arithmetic (Standard Scores)	80	73.89	6.16	80	69.26	8.42	160	71.58	7.71

Basically the study's mildly retarded and borderline retarded Southwest Virginia subjects were still of high school age -- approximately 17.5 years old. Only two ethnic elements, Caucasian (65.7%) and Black (34.3%) were represented throughout all the subjects. The mean I.Q. for the mildly retarded subjects was 61.88 and for the borderline subjects it was 75.19. Thus, the subjects' mean I.Q. fell at the mid-point of their respective retardation groups' I.Q. range and, as expected, borderline retarded subjects performed generally higher on the WRS, WRAT-R, GATB, and NATB than did the mildly retarded subjects.

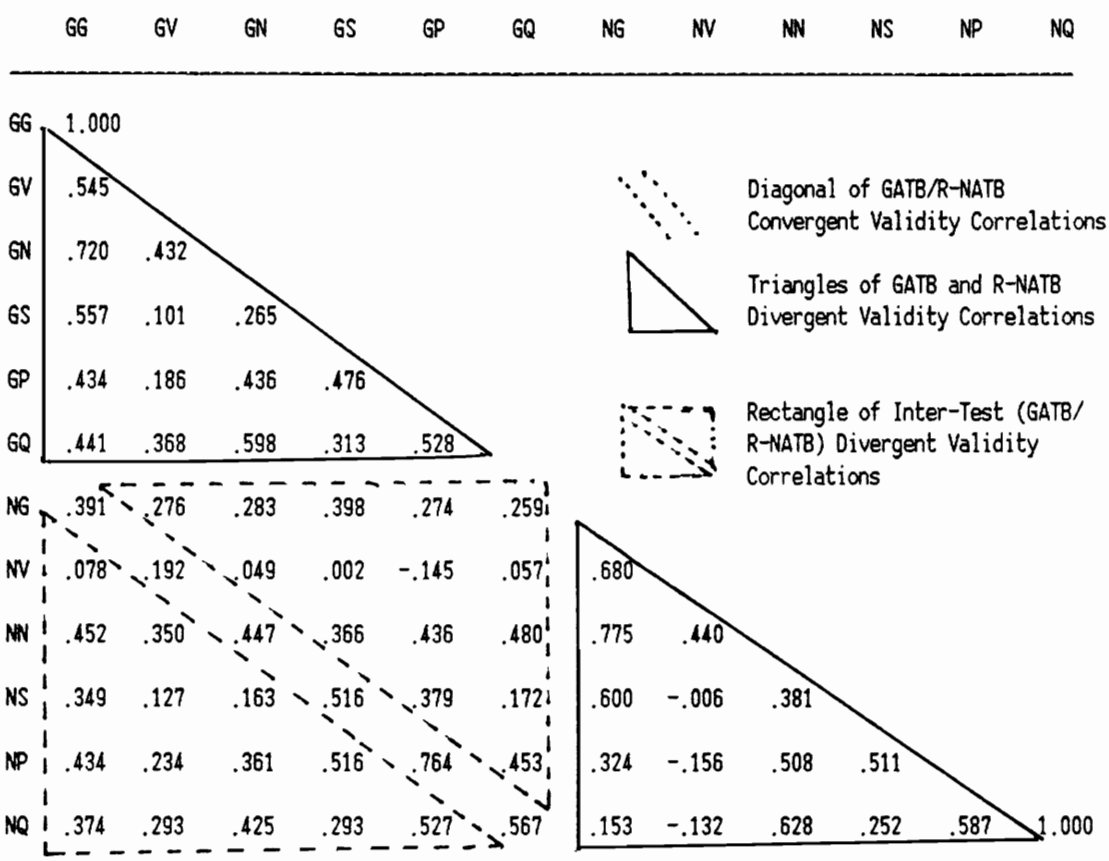
When examining the academic development of the two groups, the borderline group performed similarly to the mildly retarded group on all the WRS and WRAT-R subtests, although the mean performances of the borderline group were higher. Also, the mildly retarded group displayed WRAT-R mean (standard score) achievement scores which were above their mean level of intellectual functioning (I.Q. = 61.88). The borderline retardates mean standard scores on the WRAT-R Reading, Spelling, and Arithmetic subtests were just below their mean I.Q. of 75.19. Thus, it could be generalized that both retardation groups' achievement was aligned with their assessed levels of mental development.

Construct Validity of the GATB and R-NATB

Since the present study offered an opportunity to examine the convergent and discriminant validity of the aptitude subtests using subjects with sub-normal intelligence, the intercorrelation matrix of the GATB and R-NATB aptitudes is shown in Table V.

TABLE V

GATB/R-NATB Correlation Matrix



There are several observations regarding GATB/R-NATB convergent and discriminant validity evidenced in Table V. Aptitude "G" is theorized as being more of a "general ability" factor and is dependent upon the subtest scores of aptitudes V, N, and S as its contributing components. Thus, "G" scores should correlate significantly with these three aptitude scores -- whatever the method of measurement. As expected, G scores correlated moderately high with its predictor aptitude scores -- GATB "G" with GV (.545), GN (.720), GS (.557), and R-NATB "G" with NV (.680), NN (.775), and NS (.600). Yet, the correlation of .391 between GATB and R-NATB does not support its convergent validity. Both GG and NG's discriminant validity was modestly supported since their correlations with the non-contributing aptitudes of P (Form Perception) and Q (Clerical Speed) were much lower than with their contributing aptitudes -- GATB G with GP (.434), GQ (.441), and R-NATB G with NP (.324) and NQ (.153).

When examining heterotrait/heteromethod correlations of aptitude scores on V, N, S, P, and Q (diagonal of convergent validity), one does not find much support for GATB/R-NATB validity. Only aptitudes P (.764) approached a respectable level and aptitudes Q (.567) and S (.516) were bordering respectable levels. Aptitudes V (.192) and N (.447) as well as G (.391 discussed above) were non-supportive of GATB/R-NATB convergent validity. Furthermore, in several instances, the heterotrait/heteromethod correlations between other aptitude scores were higher than the inter-test correlations between corresponding aptitude scores.

GATB/R-NATB divergent validity was also not encouraging since there were many high subtest score correlations in both the GATB and R-NATB besides those subtests (V, N, and S) which were expected to correlate highly with "G". However, because of the restrictiveness in the range of subjects' ability level used in this study, one might expect such intra-test subtest correlations from a more intellectually homogeneous group.

In summary, the present study provided an excellent opportunity to examine the GATB and R-NATB convergent and discriminant validity using mildly retarded and borderline individuals. The GATB/R-NATB convergent validity was generally not supported due to only moderate or low heterotrait/heteromethod score correlations with aptitudes G, V, N, and S. Furthermore, because of the presence of several relatively high intra-test aptitude score correlations, the GATB and R-NATB's divergent validity was questionable even though the study used a restrictive range of intellectually subnormal subjects.

Preliminary Comparisons Regarding the Control Variables of I.Q. Reading Level and Order of Aptitude Test Administration

The present study's experimental design called for selecting subjects who were functioning intellectually in either a borderline or mildly retarded I.Q. range and who possessed either high or low reading skills as defined by the Wide Range Scale. Also, in anticipation of

administering the R-NATB and GATB to the subjects selected for the study, another control variable was implemented when one-half of the borderline and mildly retarded subjects were given the R-NATB before the GATB and one-half of the subjects were given the GATB before receiving the R-NATB. The effects of the three control variables on subjects' aptitude performances were examined before determining whether intellectually subnormal individuals truly performed differently on the R-NATB vs. GATB. Table VI displays the descriptive statistics regarding these control variables.

TABLE VI

GATB and R-NATB Aptitude Mean Performances
Regarding the Study's Control Variables

Aptitude/Variables	R-NATB PERFORMANCES N	Borderline Retarded $\bar{X}$	Mildly Retarded $\bar{X}$	$\bar{X}$ Dif.	GATB PERFORMANCES N	Borderline Retarded $\bar{X}$	Mildly Retarded $\bar{X}$	$\bar{X}$ Dif.
"G" Aptitude (Total Group)	80	62.89	54.81	8.08	80	66.55	61.65	4.90
Test Admin. Schedule "X"	40	63.35	56.42	6.93	40	64.77	62.42	2.35
Test Admin. Schedule "O"	40	62.42	53.20	9.22	40	68.32	60.88	7.44
Low Readers "L"	40	60.90	52.60	8.30	40	63.70	59.77	3.93
High Readers "H"	40	64.88	57.02	7.86	40	69.40	63.52	5.88
"V" Aptitude (Total Group)	80	66.45	64.34	2.11	80	72.55	71.41	1.14
Test Admin. Schedule "X"	40	66.30	65.60	.80	40	72.63	72.70	-.07
Test Admin. Schedule "O"	40	66.60	63.17	3.43	40	72.47	70.13	2.34
Low Readers "L"	40	64.88	62.10	2.78	40	70.99	69.90	1.09
High Readers "H"	40	68.02	66.57	1.45	40	74.17	72.92	1.25
"N" Aptitude (Total Group)	80	62.35	53.63	8.72	80	65.97	59.70	6.27
Test Admin. Schedule "X"	40	60.38	54.38	6.00	40	64.07	60.47	3.60
Test Admin. Schedule "O"	40	64.32	52.88	11.44	40	67.88	58.92	8.56
Low Readers "L"	40	59.32	51.55	7.77	40	62.97	56.70	6.27
High Readers "H"	40	65.38	55.70	9.68	40	68.97	62.70	6.27
"S" Aptitude (Total Group)	80	82.89	71.30	11.59	80	80.50	69.99	10.51
Test Admin. Schedule "X"	40	84.88	74.42	10.46	40	80.13	70.30	9.83
Test Admin. Schedule "O"	40	80.90	68.17	12.73	40	80.88	69.69	11.19
Low Readers "L"	40	80.92	71.35	9.57	40	79.65	69.07	10.58
High Readers "H"	40	84.85	71.25	13.60	40	81.35	70.90	10.45
"P" Aptitude (Total Group)	80	88.81	68.80	20.01	80	81.96	67.10	14.86
Test Admin. Schedule "X"	40	86.20	70.72	15.48	40	78.92	66.90	12.02
Test Admin. Schedule "O"	40	91.42	66.88	24.54	40	85.00	67.30	17.70
Low Readers "L"	40	86.10	68.42	17.68	40	79.17	65.42	13.75
High Readers "H"	40	91.52	69.17	22.35	40	84.75	68.77	15.98
"Q" Aptitude (Total Group)	80	91.04	84.02	7.02	80	86.52	81.85	4.67
Test Admin. Schedule "X"	40	87.00	84.40	2.60	40	87.10	82.17	4.93
Test Admin. Schedule "O"	40	95.07	83.65	11.42	40	85.95	81.52	4.43
Low Readers "L"	40	88.07	82.57	5.50	40	84.95	80.63	4.32
High Readers "H"	40	94.00	85.47	8.53	40	88.10	83.07	5.03

A 3-Way ANOVA was undertaken in order to examine the aptitude performances of the two independently drawn samples of borderline vs. mildly retarded subjects in relation to the other two control variables -- test administration schedule and level of reading skills. The ANOVA summaries for the 12 R-NATB and GATB subtests are provided in Table VII.

TABLE VII

3-Way ANOVA's of GATB and R-NATB Performances Considering Subjects' Testing Administration Schedule, Severity of Retardation and Reading Level

Source of Variation	R-NATB "G" APTITUDE Sum of Squares	DF	Mean Square	F	Signif. of F	GATB "G" APTITUDE Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects										
XO-"X" vs. "O" Test Schedule	172.225	1	172.225	2.117	0.148	40.000	1	40.000	0.677	0.412
Low vs. High Reader	705.600	1	705.600	8.673	0.004**	893.025	1	893.025	15.123	0.000**
RB-Mildly Retard. vs. Borderline	2608.225	1	2608.225	32.060	0.000**	960.400	1	960.400	16.264	0.000**
2-Way Interactions										
XO . LH	24.025	1	24.025	0.295	0.588	11.025	1	11.025	0.187	0.666
XO . RB	52.900	1	52.900	0.650	0.421	260.100	1	260.100	4.405	0.037*
RB . LH	2.025	1	2.025	0.025	0.875	38.025	1	38.025	0.644	0.424
3-Way Interactions										
XO . RB . LH	1.600	1	1.600	0.020	0.889	2.025	1	2.025	0.034	0.853
Residual	12365.800	152	81.354			8975.800	152	59.051		
TOTAL	15932.400	159	100.204			11180.400	159	70.317		

Source of Variation	R-NATB "V" APTITUDE Sum of Squares	DF	Mean Square	F	Signif. of F	GATB "V" APTITUDE Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects										
XO-"X" vs. "O" Test Schedule	41.006	1	41.006	0.448	0.504	74.256	1	74.256	1.246	0.266
Low vs. High Reader	581.406	1	581.406	6.355	0.013**	393.756	1	393.756	6.610	0.011**
RB-Mildly Retard. vs. Borderline	178.506	1	178.506	1.951	0.164	51.756	1	51.756	0.869	0.353
2-Way Interactions										
XO . LH	39.006	1	39.006	0.426	0.515	61.256	1	61.256	1.028	0.312
XO . RB	68.906	1	68.906	0.753	0.387	58.806	1	58.806	0.987	0.322
RB . LH	17.556	1	17.556	0.192	0.662	0.506	1	0.506	0.008	0.927
3-Way Interactions										
XO . RB . LH	2.256	1	2.256	0.025	0.875	7.656	1	7.656	0.129	0.720
Residual	13905.550	152	91.484			9054.950	152	59.572		
TOTAL	14834.194	159	93.297			9702.944	159	61.025		

TABLE VII
(continued)

3-Way ANOVA's of GATB and R-NATB Performances Considering Subjects' Testing Administration Schedule, Severity of Retardation and Reading Level

	R-NATB "N" APTITUDE					GATB "N" APTITUDE				
Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects										
XO-"X" vs. "O" Test Schedule	60.025	1	60.025	0.510	0.476	50.625	1	50.625	0.333	0.565
Low vs. High Reader	1040.400	1	1040.400	8.846	0.003**	1550.000	1	1440.000	9.474	0.002**
RB-Mildly Retard. vs. Borderline	3045.025	1	3045.025	25.890	0.000**	1575.025	1	1575.025	10.362	0.002**
2-Way Interactions										
XO . LH	129.600	1	129.600	1.102	0.296	0.900	1	0.900	0.006	0.939
XO . RB	297.025	1	297.025	2.525	0.114	286.225	1	286.225	1.883	0.172
RB . LH	36.100	1	36.100	0.307	0.580	0.000	1	0.000	0.000	1.000
3-Way Interactions										
XO . RB . LH	102.400	1	102.400	0.871	0.352	115.600	1	115.600	0.761	0.385
Residual	17877.400	152	117.614			23103.400	152	151.996		
TOTAL	22587.975	159	142.053			26571.775	159	167.118		

	R-NATB "S" APTITUDE					GATB "S" APTITUDE				
Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects										
XO-"X" vs. "O" Test Schedule	1045.506	1	1045.506	6.396	0.012**	0.156	1	0.156	0.001	0.971
Low vs. High Reader	146.306	1	146.306	0.895	0.346	124.256	1	124.256	1.027	0.312
RB-Mildly Retard. vs. Borderline	5370.806	1	5370.806	32.858	0.000**	4420.506	1	4420.506	36.539	0.000**
2-Way Interactions										
XO . LH	438.906	1	438.906	2.685	0.103	823.556	1	823.556	6.807	0.010**
XO . RB	51.756	1	51.756	0.317	0.574	18.906	1	18.906	0.156	0.693
RB . LH	162.006	1	162.006	0.991	0.321	0.156	1	0.156	0.001	0.971
3-Way Interactions										
XO . RB . LH	37.056	1	37.056	0.227	0.635	77.006	1	77.006	0.637	0.426
Residual	24845.250	152	163.456			18388.950	152	120.980		
TOTAL	32097.594	159	201.872			23853.494	159	150.022		

TABLE VII
(continued)

3-Way ANOVA's of GATB and R-NATB Performances Considering Subjects' Testing Administration Schedule, Severity of Retardation and Reading Level

	R-NATB "P" APTITUDE					GATB "P" APTITUDE				
Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects										
XO-"X" vs. "O" Test Schedule	18.906	1	18.906	0.046	0.831	419.256	1	419.256	1.311	0.256
Low vs. High Reader	381.306	1	381.306	0.922	0.339	796.556	1	796.556	2.490	0.117
RB-Mildly Retard. vs. Borderline	16020.006	1	16020.006	38.719	0.000**	8835.756	1	8835.756	27.609	0.000**
2-Way Interactions										
XO . LH	339.306	1	339.306	0.820	0.367	191.406	1	191.406	0.598	0.440
XO . RB	823.556	1	823.556	1.990	0.160	322.056	1	322.056	1.007	0.317
RB . LH	218.556	1	218.556	0.528	0.468	49.506	1	49.506	0.155	0.695
3-Way Interactions										
XO . RB . LH	1293.906	1	1293.906	3.127	0.079	1519.056	1	1519.056	4.748	0.031*
Residual	62889.450	152	413.746			48626.250	152	319.910		
TOTAL	81984.994	159	515.629			60759.844	159	382.137		

	R-NATB "Q" APTITUDE					GATB "Q" APTITUDE				
Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects										
XO-"X" vs. "O" Test Schedule	536.556	1	536.556	1.625	0.204	32.400	1	32.400	0.251	0.617
Low vs. High Reader	778.806	1	778.806	2.359	0.127	313.600	1	313.600	2.427	0.121
RB-Mildly Retard. vs. Borderline	1967.006	1	1967.006	5.958	0.016**	874.225	1	874.225	6.767	0.010**
2-Way Interactions										
XO . LH	305.256	1	305.256	0.925	0.338	11.025	1	11.025	0.085	0.771
XO . RB	778.806	1	778.806	2.359	0.127	2.500	1	2.500	0.019	0.890
RB . LH	91.506	1	91.506	0.277	0.599	4.900	1	4.900	0.038	0.846
3-Way Interactions										
XO . RB . LH	1458.056	1	1458.056	4.416	0.037	416.025	1	416.025	3.220	0.075
Residual	50183.850	152	330.157			19637.700	152	129.195		
TOTAL	56099.844	159	352.829			21292.375	159	133.914		

The main effects for the two control variables were largely as expected. There were generally no significant differences found in the aptitude performances of the subjects tested according to test administration schedule "X" vs. those which were tested according to schedule "O". The only exception was noted when the study's participants took the R-NATB's Three-Dimensional Space subtest which measures Spatial Aptitude. The subjects obtained significantly higher S Aptitude scores ($F = .012$) when the following "X" test administration schedule - R-NATB was given before GATB.

It was found that there were significant mean differences between high and low readers on those aptitude subtests which emphasize verbal skills. Significant R-NATB and GATB main effects ($p < .01$) were only found on the aptitudes G, V, and N favoring high readers. There were no significant differences found between low and high readers when examining subjects performances on aptitudes S, P, and Q of the GATB and the R-NATB. This finding suggests further investigation into the dynamics of reading skills, reading measures, and aptitude performances. The results of such analyses will be discussed later in this section when the results of Research Question II are discussed.

As expected, the results indicated that borderline subjects' aptitude performances were significantly better (>.001 level) than those of the mildly retarded in every aptitude area with exception of the Verbal Aptitude which was not significant ($F = .266$).

Research Question I:
"Are There Aptitude Performance Differences on the R-NATB vs. GATB of Borderline and/or Mildly Retarded Individuals?"

The first research question asked if there were significant differences between subjects' GATB vs. R-NATB performances. Table VIII presents the descriptive statistics and dependent t-test results that address this question. Surprisingly, the results indicate that borderline and mildly retarded subjects (as individual groups and collectively) performed significantly higher ($p < .01$) on aptitudes G, V, and N when taking the GATB. These results are perplexing since it is these GATB aptitude subtests that require reading. When examining the mean performance differences on the aptitudes which do not require reading (S, P, and Q), it was found that only the borderline subjects (as well as the study's total combined retarded group) performed significantly higher ($p < .01$) on the R-NATB's aptitudes P and Q. The mildly retarded groups performed higher on the R-NATB's aptitudes P and Q, but these differences were not statistically significant at the .05 probability level.

Aptitude S (Spatial) was the only aptitude in which no significant GATB vs. R-NATB performance differences were found for either retardation groups. For the combined retarded group, the mean performance favored the R-NATB; but the probability value associated with this test was only

TABLE VIII

Aptitude Performance on GATB vs. R-NATB
of Retarded Subjects

		R-NATB		GATB		R-NATB/GATB Dif.					
Aptitude/Group	N	$\bar{X}$	Stand. Dev.	$\bar{X}$	Stand. Dev.	$\bar{X}$	Stand. Dev.	Stand. Error	t Value	DF	2-Tail Prob.
"G" Borderline	80	62.888	9.775	66.550	8.300	3.663	11.036	1.234	2.97	79	0.004**
Mild. Retard.	80	54.813	8.551	61.650	7.777	6.838	9.174	1.026	6.67	79	0.000**
Combined	160	58.850	10.010	64.100	8.386	5.250	10.241	0.810	6.48	159	0.000**
"V" Borderline	80	66.450	9.328	72.550	7.959	6.100	10.350	1.157	5.27	79	0.000**
Mild. Retard.	80	64.338	9.925	71.413	7.670	7.0750	12.031	1.345	5.26	79	0.000**
Combined	160	65.394	9.659	71.981	7.812	6.588	11.198	0.885	7.44	159	0.000**
"N" Borderline	80	62.350	10.936	65.875	12.643	3.625	13.152	1.470	2.47	79	0.016*
Mild. Retard.	80	53.625	11.304	59.700	12.513	6.0750	12.007	1.454	4.18	79	0.000**
Combined	160	57.988	11.919	62.838	12.927	4.850	13.096	1.035	4.68	159	0.000**
"S" Borderline	80	82.888	14.857	80.500	11.236	-2.388	12.945	1.559	-1.53	79	0.130
Mild. Retard.	80	71.300	10.843	69.988	10.942	-1.313	12.325	1.378	-0.95	79	0.344
Combined	160	77.094	14.208	75.244	12.248	-1.850	13.130	1.038	-1.78	159	0.077
"P" Borderline	80	88.813	18.027	81.963	18.588	-6.850	14.526	1.624	-4.22	79	0.000**
Mild. Retard.	80	68.800	22.584	67.100	17.656	-1.700	14.774	1.652	-1.03	79	0.367
Combined	160	78.806	22.707	74.531	19.548	-4.275	14.831	1.173	-3.65	159	0.000**
"Q" Borderline	80	91.038	17.009	86.525	10.596	-4.513	13.330	1.490	-3.03	79	0.003**
Mild. Retard.	80	84.025	19.898	81.850	12.090	-2.175	17.445	1.950	-1.12	79	0.026
Combined	160	87.531	18.784	84.188	11.572	-3.344	15.520	1.227	-2.73	159	0.007**

In view of the above significant R-NATB vs. GATB aptitude performance differences, Research Question I must be answered in the affirmative. All of the study's subjects scored significantly higher on aptitudes G, V, and N on the GATB and all of the participants scored generally higher on aptitudes S, P, and Q on the R-NATB. With such distinct R-NATB vs. GATB aptitude performance differences being observed in this research, employment and vocational assessment specialists would use the GATB's subtests for measuring aptitudes G, V, and N and use the R-NATB's subtests for measuring aptitudes S, P, and Q in order to obtain the highest aptitude test performances of borderline and mildly retarded individuals.

Research Question II: "Is the Wide Range Achievement Test-Revised a Better Predictor Than the Wide Range Scale of GATB and/or R-NATB Aptitude Performance in Borderline and/or Mildly Retarded Individuals?"

Research Question II was originally included in the present study's research design in order to explore the effectiveness of two brief screening instruments in being able to predict the anticipated aptitude performance differences. In view of the above unexpected but clear-cut findings, determining whether the Wide Range Scale or Wide Range Achievement Test-Revised is better at predicting such aptitude performance differences seems rather impractical. However, the statistical procedures necessary for answering Research Question II were implemented in order to address several questions which surfaced as a result of Question I's surprising results:

#1: "Were the GATB/R-NATB aptitude mean differences (in arithmetic sign and magnitude) consistent throughout various assessed levels of the academic skill distributions on the WRS and the WRAT-R?"

#2: "If not, which academic screener was more effective in predicting these GATB/R-NATB mean difference sign changes and/or magnitudes observed in answering question #1 above?"

In attempting to answer this research question, one of the first analyses to be undertaken would be to examine the relationships that existed between subjects' scores on the WRS and WRAT-R subtests and the various aptitude scores on the GATB and R-NATB. Table IX shows the intercorrelations among these subtests.

TABLE IX

The Relationship Between Subjects' Performance on the WRS and WRAT-R With Their Aptitude Performances on the GATB and R-NATB

GATB Aptitudes - Combined Retarded Group

Academic Screener	GG	GV	GN	GS	GP	GQ
WRS Vocabulary	.323**	.272**	.283**	.078	.104	.129
WRS Arithmetic	.297**	.329**	.440**	.122	.365**	.345**
WRAT-R Reading	.270**	.431**	.327**	.082	.173*	.229**
WRAT-R Spelling	.260**	.414**	.322**	.043	.134	.276**
WRAT-R Arithmetic	.374**	.339**	.481**	.195*	.366**	.380**

R-NATB Aptitudes - Combined Retarded Group

Academic Screener	NG	NV	NN	NS	NP	NQ
WRS Vocabulary	.271**	.281**	.243*	.086	.071	.123
WRS Arithmetic	.281**	.027	.343**	.229**	.292**	.259**
WRAT-R Reading	.258**	.200**	.287**	.078	.151	.130
WRAT-R Spelling	.222**	.162*	.261**	.084	.082	.161
WRAT-R Arithmetic	.327**	.048	.397**	.236**	.330**	.260**

* - p significant at the .05 level
** - p significant at the .01 level

In examining the Pearson-product correlation coefficients, it is clear that most of the coefficients were quite modest. However, scores from all five academic screener subtests had positive and statistically significant correlations ($P \geq .01$) with the GATB's General, Verbal, and Numerical aptitude scores. Also, all achievement subtest scores correlated positively and at the .01 significance level with the R-NATB's General and Numerical aptitude scores. Only the Arithmetic subtests of the Wide Range Scale (r=.027) and the Wide Range Achievement Test-Revised (r=.048) did not have a statistically significant (.05) correlation with the R-NATB's Verbal aptitude scores. Thus, both screening instruments correlated significantly with the aptitude areas which measure verbal abilities. This particularly applies to the GATB where language arts skills are required of examinees.

On aptitudes S, P, and Q, which measure spatial/form perception and perceptual-motor speed, the reading and spelling subtest scores did not correlate at statistically significant levels. However, both WRS and WRAT-R Arithmetic subtest scores correlated at statistically significant levels ($P \geq .01$) with these GATB and R-NATB aptitude scores.

If one asks which academic screener subtest correlates most consistently at statistically significant levels with the various GATB and R-NATB aptitudes, both arithmetic subtests lead the list. The WRAT-R Arithmetic subtest correlated significantly at the $P = \geq .01$ with 11 of

12 (91%) of the GATB and R-NATB aptitudes; the WRS Arithmetic subtest scores correlated significantly with 10 of 12 (83%) aptitude scores. The WRAT-R's reading and spelling subtest scores correlated significantly with 8 of 12 (67%) GATB and R-NATB aptitude scores.

Since several of the academic subtest scores were significantly correlated with many of the aptitudes measured on the GATB and R-NATB, there was a justification for examining the GATB vs. R-NATB performances at various score levels on the WRS and WRAT-R subtests. To accomplish this, the frequency distributions of five academic screener subtests were examined and various WRS score levels and WRAT-R standard score levels were established.

Next, the GATB vs. R-NATB aptitude mean differences were compared using dependent t-tests (for repeated measures) at each score level of the Vocabulary and Arithmetic subtests of the Wide Range Scale and then at the standard score levels of the Reading, Spelling, and Arithmetic subtests of the Wide Range Achievement Test-Revised (Appendix D). This endeavor was undertaken in order to determine whether the significant GATB vs. R-NATB mean aptitude performance differences reported in Table VIII were consistent in magnitude and in arithmetic sign direction throughout the various distributions of WRS scores and WRAT-R standard score intervals. If it were found that the GATB/R-NATB mean difference arithmetic signs changed from positive to negative (or vice versa)

throughout one or more of the WRS and/or WRAT-R subtest distributions, then one or more "cut-off" WRS scores or WRAT-R standard score intervals could be identified. The cut-off scores could then be used to recommend which test would a retarded subject most likely earn the higher score. Tables X and XI summarize Appendix D's GATB vs. R-NATB aptitude performance means and t-values at various WRS score levels and WRAT-R standard score intervals.

TABLE X

GATB vs. R-NATB Aptitude Performances

at Various WRS Score Levels

WRS Vocabulary Scores	No. of Cases	"G" APTITUDE GATB $\bar{X}$	"G" APTITUDE R-NATB $\bar{X}$	"G" APTITUDE t Value	"V" APTITUDE GATB $\bar{X}$	"V" APTITUDE R-NATB $\bar{X}$	"V" APTITUDE t Value	"N" APTITUDE GATB $\bar{X}$	"N" APTITUDE R-NATB $\bar{X}$	"N" APTITUDE t Value	"S" APTITUDE GATB $\bar{X}$	"S" APTITUDE R-NATB $\bar{X}$	"S" APTITUDE t Value	"P" APTITUDE GATB $\bar{X}$	"P" APTITUDE R-NATB $\bar{X}$	"P" APTITUDE t Value	"Q" APTITUDE GATB $\bar{X}$	"Q" APTITUDE R-NATB $\bar{X}$	"Q" APTITUDE t Value
0 - 1	9	56.78	51.56	2.27*	68.00	59.33	3.89**	53.89	48.11	3.05*	66.67	75.67	-2.31*	59.22	65.89	-1.09	75.00	79.89	-0.93
2	33	62.03	57.52	2.19*	67.30	63.54	1.64	59.00	56.36	1.25	77.73	75.91	0.75	74.64	79.37	-2.07*	83.58	84.10	-0.17
3	38	62.66	57.32	3.55**	73.68	64.34	5.27**	61.97	56.37	2.92**	73.26	76.45	-2.05*	73.37	78.13	2.01*	83.94	87.68	-1.37
4	30	65.07	59.20	3.21**	72.90	64.80	4.56**	64.67	60.83	1.46	73.33	77.37	-0.44	82.40	84.03	-0.51	88.10	91.97	-1.22
5	32	66.38	60.31	3.21**	73.81	67.34	3.11**	65.25	58.94	2.32*	74.31	76.00	-0.68	71.63	76.25	-1.75	83.28	87.16	-1.92
6 - 8	18	68.94	65.00	1.50	74.17	71.39	1.11	68.83	62.89	1.74	79.00	82.83	-0.96	76.50	81.50	-1.71	85.50	90.61	-1.59

WRS Arithmetic Scores	No. of Cases	"G" APTITUDE GATB $\bar{X}$	"G" APTITUDE R-NATB $\bar{X}$	"G" APTITUDE t Value	"V" APTITUDE GATB $\bar{X}$	"V" APTITUDE R-NATB $\bar{X}$	"V" APTITUDE t Value	"N" APTITUDE GATB $\bar{X}$	"N" APTITUDE R-NATB $\bar{X}$	"N" APTITUDE t Value	"S" APTITUDE GATB $\bar{X}$	"S" APTITUDE R-NATB $\bar{X}$	"S" APTITUDE t Value	"P" APTITUDE GATB $\bar{X}$	"P" APTITUDE R-NATB $\bar{X}$	"P" APTITUDE t Value	"Q" APTITUDE GATB $\bar{X}$	"Q" APTITUDE R-NATB $\bar{X}$	"Q" APTITUDE t Value
0 - 1	10	61.50	55.40	3.08**	64.00	67.70	-0.96	57.10	49.30	1.97	70.80	72.00	-0.26	55.80	57.60	-0.32	76.60	72.20	0.90
2	15	60.87	55.13	2.19	68.67	66.07	.85	56.27	52.73	1.64	73.73	70.80	0.80	68.20	71.33	-0.94	81.67	81.40	-0.07
3	29	60.79	56.38	2.12	70.07	63.72	3.28**	54.86	55.38	-0.18	74.21	76.48	-0.92	70.59	76.00	-2.01*	78.10	85.45	-1.90
4	21	63.48	54.81	4.46**	74.19	63.38	4.49**	62.14	53.95	3.08**	74.00	72.00	0.59	70.29	74.00	-1.09	84.52	85.33	-0.30
5	34	65.08	59.68	3.02**	73.50	65.15	4.95**	64.85	60.71	1.92	75.91	78.06	-1.03	77.58	85.09	-2.63**	86.06	93.41	-3.13**
6	31	66.00	63.94	0.97	72.48	67.19	2.55**	65.61	62.42	1.39	77.97	83.10	-2.27*	79.61	84.13	-1.96	87.55	89.68	-0.77
7-8	20	68.65	61.90	3.60**	75.55	65.90	4.29**	75.20	62.80	4.99**	76.05	79.65	-1.48	84.75	85.20	0.17	89.95	91.80	-0.73

* - significant at the .05 confidence level

** - significant at the .01 confidence level

TABLE XI

GATB vs. R-NATB Aptitude Performances
at Various WRAT-R Standard Score Levels

WRAT-R Reading Standard Score Levels	No. of Cases	"G" APTITUDE GATB $\bar{X}$	"G" APTITUDE R-NATB $\bar{X}$	"G" APTITUDE t Value	"V" APTITUDE GATB $\bar{X}$	"V" APTITUDE R-NATB $\bar{X}$	"V" APTITUDE t Value	"N" APTITUDE GATB $\bar{X}$	"N" APTITUDE R-NATB $\bar{X}$	"N" APTITUDE t Value	"S" APTITUDE GATB $\bar{X}$	"S" APTITUDE R-NATB $\bar{X}$	"S" APTITUDE t Value	"P" APTITUDE GATB $\bar{X}$	"P" APTITUDE R-NATB $\bar{X}$	"P" APTITUDE t Value	"Q" APTITUDE GATB $\bar{X}$	"Q" APTITUDE R-NATB $\bar{X}$	"Q" APTITUDE t Value
45 - 55	16	59.69	51.75	4.62**	65.38	63.19	0.90	54.69	50.63	1.70	69.81	70.31	-0.12	64.38	64.44	-0.02	77.00	85.59	-1.33
56 - 60	18	61.16	57.61	1.73	68.33	65.94	0.85	56.33	52.72	1.24	73.67	77.33	-1.18	68.06	72.00	-1.17	79.56	79.44	0.04
61 - 65	21	64.29	58.67	2.29*	71.29	54.14	3.12**	60.52	57.38	1.14	78.95	99.38	0.19	76.67	83.81	-2.16*	81.95	87.67	-1.42
66 - 70	27	63.33	58.11	2.70**	71.33	63.63	3.63**	62.18	57.48	2.17*	75.07	75.37	-0.12	75.63	79.52	-1.40	85.00	84.85	0.06
71 - 75	28	62.39	59.50	1.32	70.89	64.04	3.72**	62.68	60.29	0.97	75.75	79.72	-1.77	75.32	84.64	-2.97**	85.75	89.71	-1.54
76 - 80	21	67.76	62.43	1.81	75.24	66.43	3.19**	70.54	61.76	2.40*	75.76	80.67	-1.55	81.76	83.67	-0.55	91.24	91.67	-0.16
81 - 85	15	69.00	56.90	4.21**	76.13	68.13	2.29*	69.20	60.67	2.39*	74.47	76.40	-0.54	70.00	69.53	0.11	86.09	93.20	-2.09
86 -110	14	66.86	62.79	2.19**	77.88	70.71	3.56**	67.14	61.93	2.12*	77.29	76.07	0.59	81.57	86.07	-2.61*	84.43	88.36	-1.03*

WRAT-R Spelling Standard Score Levels	No. of Cases	"G" APTITUDE GATB $\bar{X}$	"G" APTITUDE R-NATB $\bar{X}$	"G" APTITUDE t Value	"V" APTITUDE GATB $\bar{X}$	"V" APTITUDE R-NATB $\bar{X}$	"V" APTITUDE t Value	"N" APTITUDE GATB $\bar{X}$	"N" APTITUDE R-NATB $\bar{X}$	"N" APTITUDE t Value	"S" APTITUDE GATB $\bar{X}$	"S" APTITUDE R-NATB $\bar{X}$	"S" APTITUDE t Value	"P" APTITUDE GATB $\bar{X}$	"P" APTITUDE R-NATB $\bar{X}$	"P" APTITUDE t Value	"Q" APTITUDE GATB $\bar{X}$	"Q" APTITUDE R-NATB $\bar{X}$	"Q" APTITUDE t Value
45 - 60	13	62.15	53.92	4.67**	66.85	63.23	1.60	56.77	53.69	0.77	73.96	73.15	0.07	67.85	73.77	-1.44	77.08	89.77	-1.91
61 - 65	21	63.19	55.33	4.18**	68.90	63.14	2.07*	63.29	51.95	6.96**	71.71	75.57	-1.45	67.90	69.00	-0.36	80.24	80.14	0.03
66 - 70	44	61.18	58.20	2.29*	69.70	63.69	3.73**	57.75	55.57	1.21	76.30	78.89	-1.37	76.36	84.41	-3.57**	82.80	84.59	-0.78
71 - 75	36	63.00	59.44	1.69	71.11	67.11	1.93	60.22	58.28	0.89	75.06	74.89	0.08	72.44	74.83	-0.98	82.92	83.61	-0.31
76 - 80	20	70.80	63.40	2.84**	76.90	68.00	3.64**	73.25	67.15	1.60	79.85	79.95	-0.03	81.05	85.20	-1.02	92.80	99.51	-1.76
81 -110	25	66.84	60.72	3.26**	78.48	66.40	6.47**	69.28	61.48	3.02**	73.52	78.12	2.62*	77.28	79.60	-0.91	88.52	93.80	-1.84

* - significant at the .05 confidence level
** - significant at the .01 confidence level

TABLE XI
(continued)

GATB vs. R-NATB Aptitude Performances
at Various WRAT-R Standard Score Levels

WRAT-R Arithmetic Standard Score Levels	No. of Cases	"G" APTITUDE GATB $\bar{X}$	"G" APTITUDE R-NATB $\bar{X}$	"G" APTITUDE t Value	"V" APTITUDE GATB $\bar{X}$	"V" APTITUDE R-NATB $\bar{X}$	"V" APTITUDE t Value	"N" APTITUDE GATB $\bar{X}$	"N" APTITUDE R-NATB $\bar{X}$	"N" APTITUDE t Value	"S" APTITUDE GATB $\bar{X}$	"S" APTITUDE R-NATB $\bar{X}$	"S" APTITUDE t Value	"P" APTITUDE GATB $\bar{X}$	"P" APTITUDE R-NATB $\bar{X}$	"P" APTITUDE t Value	"Q" APTITUDE GATB $\bar{X}$	"Q" APTITUDE R-NATB $\bar{X}$	"Q" APTITUDE t Value
45 - 60	11	61.36	54.45	2.68**	69.54	66.91	0.90	54.09	52.73	0.26	73.00	90.09	0.68	67.91	66.94	0.31	80.18	90.18	-1.25
61 - 65	19	59.79	55.84	1.99	69.42	67.47	0.68	55.74	50.58	2.48*	71.42	73.00	-0.39	58.00	63.05	-1.28	75.95	71.63	1.29
66 - 70	38	61.68	55.87	3.91**	68.21	62.61	3.04**	58.61	54.68	2.19*	73.55	76.25	-1.42	69.45	74.03	-2.11*	80.55	83.55	-1.20
71 - 75	42	63.79	58.05	3.17**	72.62	64.26	4.45**	62.00	57.33	2.01*	75.05	77.00	-1.09	77.76	84.52	-3.69**	85.19	88.31	-1.39
76 - 80	32	67.25	64.22	1.69	76.56	68.13	5.36**	69.44	65.13	2.18*	78.56	80.94	-0.98	81.41	87.72	-2.09*	89.63	95.00	-2.06
81 -110	18	70.56	63.33	2.59*	74.50	65.94	3.38**	74.83	64.83	2.64*	78.78	80.83	-0.65	87.00	83.78	0.84	91.00	96.00	-2.10

* - significant at the .05 confidence level
** - significant at the .01 confidence level

The results in Tables X and XI suggest that generally the anticipated sign direction and magnitude of the GATB/R-NATB mean differences was not realized. As one inspects the arithmetic signs of the t-values for all aptitudes throughout each of the WRS and WRAT-R subtest distributions, there was an absence of the subjects performing higher on either the GATB or R-NATB at lower WRS or WRAT-R subtest performance levels and then scoring higher on the other aptitude test at higher academic functioning levels. On aptitudes G, V, and N, the GATB mean performances were higher than the R-NATB mean performances on 97% of the WRS distribution score levels and WRAT-R distribution standard score intervals. On aptitudes S, P, and Q the mildly retarded and borderline subjects' mean performances on the R-NATB were higher than their GATB mean performances on 79.8% of the WRS and WRAT-R distribution measurement levels/intervals. Thus, contrary to what was anticipated, the possibility of establishing one or a series of WRS and/or WRAT-R academic subtest "cut-off" scores for predicting higher GATB or R-NATB aptitude performances were not confirmed.

In view of the findings above, the same analyses reported in Tables IX-XI were undertaken using GATB aptitude "residual scores"[1] which were used in the U.S. Department of Labor's NATB screener study of 1973 and for the R-NATB study of 1979 (Appendix E). Using GATB aptitude residual

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[1]GATB aptitude residual score = GATB aptitude score - predicted GATB aptitude score. If the GATB aptitude residual score is positive then the GATB yields the higher score; if it is negative then the R-NATB yields the higher score.

scores rather than actual GATB and R-NATB aptitude scores, the results were almost identical to those reported in Tables IX-XI above in that:

A) There were many modest significant correlations found between GATB aptitude residual scores and subjects academic scores on the WRS and WRAT-R (Appendix E, Table II). These correlations were very similar to Table IX's correlations between various GATB and R-NATB aptitude scores and WRS and WRAT-R academic scores.

B) Research Question I was affirmed since there were significantly more positive GATB residual scores obtained when measuring aptitudes G, V, and N and generally negative GATB residual scores when testing aptitudes S, P, and Q (Appendix E, Tables V and VI). However, the direction (sign) of the GATB aptitude residual scores were not as expected and similar to the pattern of GATB/R-NATB aptitude mean differences found in Table VIII above.

C) Research Question II was not affirmed since all WRS and WRAT-R academic performance "cut-off" scores were ineffective in consistently delineating positive and negative GATB aptitude residual scores in borderline and mildly retarded subjects (Appendix E, Table VII). This was very similar to the pattern of GATB/R-NATB mean performance differences at various WRS and WRAT-R subject distribution levels found in Table XI.

In response to the above results, one may wonder why were the WRS and WRAT-R subtests were so inconsistent in predicting GATB/R-NATB aptitude mean differences across score levels when there were so many significant positive correlations reported in Table IX regarding the relationship between GATB/R-NATB aptitude scores and WRS and WRAT-R subtest performances. To further explore this issue, a series of Pearson correlation coefficients were calculated in order to examine the relationship between WRS and WRAT-R subtest performances and the actual GATB vs. R-NATB aptitude difference scores (Table XII).

TABLE XII

Pearson Correlation Coefficients of GATB vs. R-NATB Aptitude Difference Scores With Academic Performances on the WRS and WRAT-R Subtests

GATB vs. R-NATB Aptitude Difference Score Area

Academic Performance Subtest	G	V	N	S	P	Q
WRS Vocabulary	.011	-.043	.060	-.022	.022	-.059
WRS Arithmetic	-.041	.192**	.119	-.128*	.022	-.045
WRAT-R Reading	-.005	.160*	.093	-.016	.001	.016
WRAT-R Spelling	.018	-.020	.066	.043	.017	-.029
WRAT-R Arithmetic	-.012	.192**	.106	-.055	.019	-.061

* - significant at the .05 confidence level
** - significant at the .01 confidence level

In viewing the results contained in Table XII, there were only three academic screener subtests which had at least one significant correlation with any of the GATB vs. R-NATB aptitude difference score areas -- WRS Arithmetic, WRAT-R Reading and WRAT-R Arithmetic. All three of these academic subtests correlated significantly with the mean difference scores of the Verbal aptitude. Furthermore, the WRS Arithmetic scores correlated significantly with the Spatial aptitude mean difference scores. The small number of significant correlations substantiates the poor ability of the WRS and WRAT-R subtest cut-off scores to predict higher GATB vs. R-NATB aptitude performances if aptitude mean difference scores were used instead of mean aptitude scores or residual scores (Appendix E). These findings argue against using any GATB/R-NATB screening device to predict aptitude performance differences between GATB and R-NATB scores in disadvantaged and/or mentally handicapped individuals.

In conclusion, the present study found that mildly and borderline retarded subjects performed significantly better using the GATB when measuring aptitudes G, V, and N; also, these subjects generally (but not significantly) performed better when using the R-NATB when measuring aptitudes S, P, and Q. Thus, Research Question I was answered affirmatively -- there were significant differences in how these subjects performed on the GATB vs. R-NATB. Research Question II was not affirmed since it was found that: 1) the WRAT-R was no better than the WRS in

accurately predicting GATB vs. R-NATB aptitude performances and 2) both the WRS and WRAT-R were found ineffective in distinguishing academic skill performance levels which were associated with higher or lower GATB or R-NATB aptitude performances. Contrary to what was expected, these aptitude performance differences did not generally change from a negative value (higher R-NATB score) to a positive value (higher GATB score) as one progressed up each of the academic subtest score (WRS) or standard score (WRAT-R) distributions.

CHAPTER V

SUMMARY, DISCUSSION, CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS FOR FURTHER RESEARCH

Summary

Over the last quarter of a century with the enactment of legislation such as the Civil Rights Act (1964), Rehabilitation Act (1973), Education of All Handicapped Children's Act (1975), and the Carl Perkins Act (1984), public education as well as other state and federal human service agencies have been mandated to provide more appropriate, non-discriminatory vocational testing and assessment techniques for our nation's handicapped youth and adults. From 1947 to the present, the General Aptitude Test Battery (GATB) has been the most reliable, extensively validated and widely accepted vocational aptitude test for America's youth and adults. Since reading was required in order to take this very popular aptitude test, it became apparent to its developer, the U.S. Training and Employment Service (USTES) that many disadvantaged and handicapped students and adults were being "discriminated against" in their attempts to score their highest on this vocational ability test. In response to the above, USTES published the Nonreading Aptitude Test Battery (NATB) in 1970 which was designed to measure the same aptitudes as the GATB but required no reading skills. It was particularly targeted for disadvantaged hard-core unemployed and/or handicapped individuals as well as for immigrants and other individuals where English and their

language arts skills were considered to be very limited. Also, along with the NATB, USTES introduced the Wide Range Scale (WRS). This was a brief "academic screener" of reading and mathematics skills and was designed to assist test administrators, counselors, etc. in determining whether an individual had sufficient English, reading and mathematics skills to enable him/her to score higher on the GATB vs. the NATB.

In 1973, the USTES conducted a survey of employment counselors, test administrators, etc. and found that many were displeased with the NATB because it took too long to administer and several of the nonreading subtests were very difficult to administer. Based on these responses from field practictioners, it was decided to develop a Revised-NATB (R-NATB) which would more appropriately and efficiently measure aptitudes G, V, N, and Q thus making the R-NATB's total test administration time less than that of the GATB.

After approximately six years of extensive test development activities on the R-NATB, USTES completed a national standardization study in 1979 on a "disadvantaged" sample and found that the sample examinees scored about the same on the GATB as they did on the R-NATB. Furthermore, the Wide Range Scale (WRS) -- which earlier had been determined to be an effective screener for determining who would score higher on the GATB vs. R-NATB, was found unable to predict such aptitude performances. These results, raised many questions regarding the utility

of the GATB vs. R-NATB with a variety of special populations and whether there were any other academic screeners which were more effective in predicting which test (GATB or R-NATB) would yield higher aptitude scores for an individual. Subsequently, in early 1980, USTES issued a call for additional research on: 1) GATB vs. R-NATB performances in the retarded or other handicapped populations having poor reading skills, and 2) the ability of other academic achievement tests to predict higher GATB vs. R-NATB performances of individuals with limited English language arts skills.

In response to the USTES' call for further research, the present study was undertaken to answer the following two research questions:

#1: Are there performance differences between the GATB vs. R-NATB of borderline and/or mildly retarded individuals?

#2: Is the Wide Range Achievement Test-Revised or the Wide Range Scale a better predictor of Wide Range Scale of higher GATB or R-NATB aptitude scores in borderline and mildly retarded individuals?

The research was performed on two groups of limited intellectual functioning -- 80 borderline retarded subjects (I.Q.s 71-84) and 80 mildly retarded subjects (I.Q.s 50-70). Most of the subjects used in the present study were primarily attending public high schools in a variety of settings throughout Southwest Virginia. Fifty percent (40) of the borderline and 50% of the mildly retarded groups were given the GATB first followed by the R-NATB and the remaining 50% of each group was given the R-NATB first followed by the GATB. Furthermore, within each of

the four "test administration groups," 50% (20) were classified by the Wide Range Scale to possess a "high" reading skill level and 50% (20) were classified as possessing a "low" reading skill level. The present research took from November 1984 - October 1987 to find and test 160 borderline and mildly retarded subjects who satisfied the above research design. Each subject was given the Wide Range Scale, Wide Range Achievement Test-Revised, General Aptitude Test Battery, and the Revised-Nonreading Aptitude Test Battery according to a predetermined "test administration schedule."

The subjects were predominantly high school students who averaged 17.5 years in age and the percentages of Caucasian and Black subjects were approximately 66% to 34% respectively. The mean I.Q. of the borderline group (75.19) and the mildly retarded group (61.88) generally fell at the mid-points of their respective groups' I.Q. range. As expected, the borderline subjects performed statistically higher than the mildly retarded subjects on both the GATB as well as the R-NATB. Only on the GATB and the R-NATB's Verbal subtest were the performance differences between these two groups not large enough to be statistically significant at the .05 level of confidence.

A major control variable in the study's design was the administration order of the subjects taking the six-hour battery of tests and its effects on their performances. It was found that administering

the GATB before the R-NATB did not yield any statistically different performances than when the subjects had been administered the R-NATB before the GATB. Only on the R-NATB's Spatial test did Test Administration Schedule "O" yield a significantly higher mean aptitude score (79.65) than did Test Administration Schedule "X" (74.54).

Since subjects' reading skills were felt to be an important dynamic which could affect their aptitude test performances, this variable was carefully controlled in the present study. To accomplish this, one-half of the mildly retarded and borderline subjects were selected because of having low reading skills and the remaining half were selected because they had high reading skills as measured by the Wide Range Scale.

As expected, it was found that only on Aptitudes G, V, and N did reading skills have any significant affect on mildly retarded and borderline subjects' aptitude performances. On both the GATB and R-NATB aptitude tests, higher ability readers performed statistically better than lower ability readers at or beyond the .01 level of significance. However, mean aptitude performance on Aptitudes S, P, and Q, did not differ significantly between high vs. low readers.

The present study offered an excellent opportunity to examine the GATB and R-NATB's construct validities using the convergent/divergent validation set forth by Campbell and Fiske (1959). According to the works of Campbell and Fiske (1959), two measures of the same human trait

would have acceptable "convergent validity" if they correlated at a statistically significant level of confidence. Furthermore, they stated that two tests which were designed to measure the same human trait, ability, etc. would have adequate "discriminant validity" if they did not correlate significantly with other tests that measured other human traits or abilities.

On both the GATB and R-NATB, Aptitude "G" is theorized as being a general ability factor and is calculated by linear equation using Aptitudes V, N, and S as its predictor variables. The GATB and R-NATB's G aptitude's correlation coefficient was a modest .391 and unsupportive of its convergent validity. Also, as expected, both GATB G and R-NATB G had highly significant intra- and inter-test correlations with the other aptitudes -- particularly aptitudes V, N, and S. Thus G's discriminant validity was understandably not supported because of its multi-aptitude composition.

The convergent validity of the other aptitudes were not generally supported either. Only aptitude "P's" cross form correlation of .764 approached a respectable level while the GATB/R-NATB correlations for aptitudes S (.516) and Q (.567) only bordered levels for respectable convergent validity. Aptitudes V (.192), N (.447), as well as G (.391), inter-test correlations did not support GATB/R-NATB convergent validity. Furthermore, many of the heterotrait/heteromethod correlations between

other aptitudes were higher than those between corresponding GATB/R-NATB aptitudes.

The discriminant validities of the two aptitude tests were not encouraging since there were many high intra-test aptitude correlations in both the GATB and R-NATB besides V, N, and S which were expected to correlate highly with aptitude G. However, because of the restricted range of intellectual functioning of the study's subjects, such intra-test aptitude correlations could be expected from a more mentally homogeneous group.

The results regarding Research Question I -- the GATB vs. R-NATB aptitude performances of borderline and mildly retarded subjects were a surprise. It was found that the study's retarded groups -- both borderline and mildly retarded -- had significantly higher GATB performances on the cognitive aptitudes G, V, and N than on the R-NATB. This is surprising because these aptitude performance differences were significant at a probability level of .01 or greater for each aptitude area.

The GATB vs. R-NATB performance differences on the perceptual aptitudes (S, P, and Q), were found to be significantly higher on the R-NATB for aptitudes P and Q for the study's borderline subjects and the "combined groups." The mildly retarded group also performed higher on aptitudes P and Q using the R-NATB, but, these differences were not statistically significant. Aptitude S was the only aptitude in which no

significant GATB vs. R-NATB performance differences were found for both the mildly retarded and borderline groups; although, the "combined retarded group" had a higher aptitude S performance on the R-NATB at the

Since there were significant GATB vs. R-NATB aptitude performance differences favoring the GATB on the cognitive aptitudes (G, V, and N) and favoring the R-NATB on the perceptual aptitudes (S, P, and Q), the second research question was investigated. This question dealt with whether the USTES' Wide Range Scale (WRS) or the newly released 1984 edition of the Wide Range Achievement Test-Revised (WRAT-R) was a more efficient predictor of higher GATB vs. R-NATB aptitude performances. Correlation coefficients were obtained between the various academic screener subtests of the WRS and WRAT-R. Surprisingly, the arithmetic subtests of both the WRS and the WRAT-R Arithmetic subtests had the most significant correlations with the GATB and R-NATB aptitude performances. Furthermore, 93% of the WRS and WRAT-R subtests correlated at significant levels with the "cognitive" GATB and R-NATB aptitudes G, V, and N which tax one's verbal as well as language arts abilities, particularly when taking the GATB.

Since several of the WRS and WRAT-R subtests correlated significantly with so many of the GATB and R-NATB aptitudes, there was a justification for examining the relationship between GATB and R-NATB

aptitude score performances to the various subtest performances of the WRS and WRAT-R. All five WRS and WRAT-R academic subtests correlated at highly significant levels with GATB and R-NATB aptitudes G, V, and N. The only exceptions were the WRS and WRAT-R Arithmetic subtests having non-significant correlations with the R-NATB's Verbal aptitude performances.

Regarding aptitudes S, P, and Q which measure the perceptual-motor functions, the Reading and Spelling subtests of the WRS and WRAT-R generally did not correlate at statistically significant levels. However, both the WRS and WRAT-R Arithmetic subtests correlated higher with these GATB and R-NATB aptitude performances. In general, arithmetic subtests of the WRS and WRAT-R had more statistically significant correlations with GATB and R-NATB aptitudes than did the Vocabulary (WRS), Reading, and Spelling (WRAT-R) subtests.

Next, a comparison of GATB and R-NATB means calculated at various subtest score levels of the WRS and at various standard score levels of the WRAT-R were tested via a dependent t-test. This was done in order to determine whether the significantly higher GATB performances on aptitudes G, V, and N as well as higher R-NATB performances on aptitudes S, P, and Q were consistent in magnitude and in arithmetic sign direction throughout the various WRS and WRAT-R subtest distributions. As in previous research (Department of Labor, 1973 and 1979), if it were found

that the arithmetic signs of the GATB/-R-NATB mean differences changed from positive to negative (or vice versa) throughout one or more of the WRS and/or WRAT-R subtest distributions then one or more "cut-off" WRS scores or WRAT-R standard score intervals could be identified which would serve as the basis for predicting higher GATB vs. R-NATB aptitude performances. Contrary to what was anticipated, the GATB mean performances on aptitudes G, V, and N were higher than the R-NATB aptitude mean performances on 99% of the WRS and WRAT-R subtest score levels/intervals; and, the R-NATB's S, P, and Q aptitude mean performances were higher than the GATB's aptitude mean performances on 79.8% of the various WRS and WRAT-R subtest score levels/intervals. Because of the overwhelming consistency in direction (arithmetic sign) of GATB/R-NATB mean differences favoring higher GATB G, V, and N aptitude performances and favoring higher R-NATB S, P, and Q aptitude performances, "cut-off" scores could not be established for deciding at what score level the GATB vs. the R-NATB should be administered. It was concluded that neither was a good predictor of aptitude performances in borderline and mildly retarded individuals.

In view of the WRS and WRAT-R's lack of predictive accuracy, one would have expected many very low, insignificant correlations between the study's academic screeners and GATB vs. R-NATB performance differences. When a series of correlation coefficients were calculated between the WRS

and WRAT-R subtest performances and the actual GATB/R-NATB aptitude score differences, there were only four statistically significant correlations out of the 30 coefficients examined. The above results argue against the feasibility of using any GATB/R-NATB screening device in order to predict GATB vs. R-NATB aptitude performance differences in disadvantaged and/or mentally handicapped individuals.

Discussion

The present study was an attempt to examine the GATB vs. R-NATB aptitude performances in 80 borderline and 80 mildly retarded adolescents and young adults, ages 16-25 throughout several locations in Southwest Virginia. Furthermore, one-half of these individuals possessed very poor reading skills and the other half possessed good reading skills relative to that which is typically expected of these individuals. It is this author's opinion that the subjects selected were very representative of intellectually and academically subnormal population of individuals residing in Southwest Virginia. Not only did the study's subjects come from a very diverse set of socioeconomic situations -- small town, urban, rural, small city, as well as suburban; but also, their level of intellectual functioning (full scale I.Q.) was determined by approximately one dozen clinical and school psychologists. Thus, the

subjects represent a cross-section of the professional psychological diagnosticians who practice in Southwest Virginia.

Although the present sample of subjects seem to represent the mildly retarded and borderline individuals in Southwest Virginia, the variable of racial composition was felt to be poorly represented if one were to make a generalization that the present study's sample was representative of the borderline and mildly retarded national population. The present sample's racial composition was 66% Caucasian, 34% Black, 0% Asian-speaking, and 0% Spanish-speaking. Thus, according to the 1980 U.S. census, the present study's sample lacked having 6% Spanish-speaking, 1/2% American Indians, and 3 1/2% Asian-speaking subjects.

In the USTES R-NATB's standardization study of 1979, the racial composition of the 614 disadvantaged individuals used in this sample was 52% Caucasian, 33% Black, 9% Hispanics, 5% American Indians, and 1% Other Minorities. Thus, the present study used approximately 14% more Caucasian and approximately the same number of Black subjects.

In view of the present results, one may wonder if current GATB and R-NATB aptitude performances are similar to those obtained in previous studies which used the GATB and R-NATB on mildly retarded and/or borderline retarded subjects. Unfortunately, there are no studies using mildly retarded nor borderline retarded individuals who were tested on the R-NATB. One study by Hull and Halloran (1976) used 140 borderline

and mildly retarded subjects which were randomly selected from a public school population. Their combined samples' GATB aptitude mean standard scores did not vary more than $\pm$ 5 standard score units from the GATB aptitude mean standard scores in the present study. However, Hull and Halloran's results of the original NATB yielded aptitude mean standard scores of approximately 13.3 standard score units higher than the present study's R-NATB aptitude mean standard scores. Thus, it appears that the 1979 streamlining revision of the NATB (R-NATB) yielded obviously lower performances in all six aptitude areas when comparing the present study's R-NATB scores with the same NATB scores obtained in 1976 on similar subjects.

There has been only one research endeavor using the R-NATB and GATB up to the present; this was on 617 "disadvantaged" individuals as a part of the USTES' standardization of the GATB/R-NATB (U.S. Department of Labor, 1982). Since these individuals were not classified by intellectual level of functioning, it is difficult to compare their aptitude performances to those in the present study. A comparison of the "disadvantaged" examinee's average aptitude performances to those in the present study's borderline and mildly retarded groups is presented in Table XIII and the differences are quite apparent.

TABLE XIII

Comparison of Subjects' GATB and R-NATB Aptitude Performances Between the Present and 1979 Standardization Studies

	1979 Standardization Study			Present Study					
				Borderline Group			Mildly Retarded Group		
Aptitude Test	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
"G" - GATB	310	87.4	18.0	80	66.55	8.30	80	61.65	7.78
"G" - R-NATB	303	87.3	18.6	80	62.89	9.77	80	54.81	8.55
"V" - GATB	310	89.9	15.7	80	72.55	7.96	80	71.41	7.67
"V" - R-NATB	303	89.2	15.9	80	66.45	9.33	80	64.34	9.93
"N" - GATB	310	86.5	18.7	80	65.98	12.64	80	59.70	12.51
"N" - R-NATB	303	86.5	19.6	80	62.35	10.94	80	53.63	11.30
"S" - GATB	310	96.3	19.5	80	80.50	11.24	80	69.99	10.94
"S" - R-NATB	303	96.7	18.9	80	82.89	14.86	80	71.30	10.84
"P" - GATB	310	102.3	22.7	80	81.96	18.59	80	67.10	17.66
"P" - R-NATB	303	103.7	21.5	80	88.81	18.03	80	66.80	22.59
"Q" - GATB	310	104.4	18.1	80	86.53	10.60	80	81.50	12.09
"Q" - R-NATB	303	104.3	19.0	80	91.04	17.01	80	84.03	19.90

In examining Table XIII it appears that the 1979 examinee's GATB and R-NATB mean aptitude performances were much higher than the mean aptitude performances of both the borderline and the mildly retarded individuals who participated in the present study.

If one were to classify the 1979 study's "disadvantaged" examinees' mean aptitude performances according to the DSM-III (1980) descriptors of intellectual (ability) functioning, the GATB and R-NATB means for aptitudes "G", "V", and "N" would be considered "low normal functioning and the aptitude means for aptitudes "S", "P", and "Q" would be considered in the "normal" functioning range. When applying the DSM-III descriptors to the present study's GATB and R-NATB mean aptitude performances of the borderline and mildly retarded participants, both groups performed in the "mildly retarded" range of functioning on aptitude G, V, and N with the exception of "borderline" functioning on the GATB's "V" with both groups. On aptitudes "S" and "P", the present study's borderline group performed at a "borderline" level of functioning and on aptitude "Q" they performed generally at a "low normal" descriptive level of functioning. The mildly retarded group's mean performances on aptitudes "S" and "P" could be described as "mildly retarded" functioning while their mean aptitude Q scores are at a "borderline" level.

Of further interest is the higher GATB and R-NATB aptitude standard deviations found in the 1979 standardization study as compared to the GATB and R-NATB aptitude standard deviations found in the present study -- particularly in aptitudes "G", "V", "N", and "S". Since these are the aptitude areas which correlate most highly with estimates of intelligence, it may be concluded that the 1979 standardization study's examinees were much more diverse as a group regarding their intellectual endowment.

An examination of the GATB/R-NATB's aptitude intercorrelation matrix yielded results which suggested that the two tests generally did not satisfy the criteria for adequate convergent validity. However, five of the six aptitude heterotrait/heteromethod correlations were in the moderate range -- GG/NG (.391), GN/NN (.447), GS/NS (.516), GP/NP (.764), and GQ/NQ (.567). The only aptitude that did not yield at least a moderate multi-trait/multi-method correlation was aptitude "V" -- thus, low convergent validity. Although the R-NATB's Oral Vocabulary subtest asks an examinee to listen to two words pronounced and determine whether they were basically the same or different, the GATB Vocabulary subtest asks much more from an examinee. Not only does GV ask a person to be able to read four words; but also to determine which two of the four are either the same or different in meaning. Thus, GV demands much more careful concentration and comparative thought than that demanded by NV.

This could account for their low inter-method (GV/NV) correlation in comparison with other aptitudes' (N and G) "cognitive" factor in both instruments.

The present study is the only research that has attempted to control for an individual's reading ability by actually selecting as many subjects who were at least functional in their reading decoding and comprehension as subjects selected who were extremely weak in their reading proficiencies. The Three-Way ANOVAs reported in Table VII show that the subjects with the higher reading skills did score significantly better on aptitudes G, V, and N of both tests than those with lower reading skills regardless of their level of intellectual functioning. Furthermore, Table VI shows that the borderline and mildly retarded groups with low and high reading skills generally scored higher on aptitudes G, V, and N when taking the GATB and generally scored higher on S, P, and Q when taking the R-NATB.

When comparing the present study's findings to those of the 1979 standardization study, one must consider that the reading skills of the 1979 study's 617 participants were generally much higher (WRS Vocabulary X= 6.045) than the general level of reading skills of the present study's borderline and mildly retarded subjects (WRS Vocabulary X=3.63 and X=3.59 respectively). Furthermore, since the GATB vs. R-NATB performances were approximately the same on all aptitudes' performance areas in the 1979 standardization study, one wonders if this pattern was consistent above and below the WRS vocabulary subtests' mean of 6.045.

TABLE XIV

1979 Standardization Study's Mean GATB and R-NATB Aptitude Performances Below and At/Above the Mean WRS Vocabulary Score of 6.045

	APTITUDES											
	"G"		"V"		"N"		"S"		"P"		"Q"	
	$\bar{X}$ R-NATB	$\bar{X}$ GATB	$\bar{X}$ R-NATB	$\bar{X}$ GATB	$\bar{X}$ R-NATB	$\bar{X}$ GATB	$\bar{X}$ R-NATB	$\bar{X}$ GATB	$\bar{X}$ R-NATB	$\bar{X}$ GATB	$\bar{X}$ R-NATB	$\bar{X}$ GATB
WRS Vocabulary Score of 5 and Below	74.72	75.09	76.04	78.86	71.03	75.88	88.08	86.17	93.22	90.15	95.53	96.79
	dif.= (-.037)		dif.= (-2.82)		dif.= (-4.85)		dif.= (1.91)		dif.= (3.07)		dif.= (-1.26)	
	N=100	N=90	N=100	N=96	N=100	N=96	N=101	N=96	N=101	N=96	N=101	N=96
WRS Vocabulary Score of 6 and Above	94.52	92.90	95.70	90.04	94.49	86.49	100.94	98.29	108.91	102.58	108.75	104.36
	dif.= (1.62)		dif.= (5.66)		dif.= (8.00)		dif.= (2.65)		dif.= (6.33)		dif.= (4.39)	
	N=203	N=214	N=203	N=214	N=203	N=214	N=206	N=214	N=206	N=214	N=206	N=214

In examining the results above in Table XV and being cognizant of the present study's results, the 1979 study's subjects (whose I.Q.'s were not defined but displayed lower WRS reading scores of 5 and below) actually performed better on the GATB's aptitudes "G", "V", "N", and "Q" as compared to their R-NATB performances. These results are similar to the present study's higher GATB scores on aptitudes G, V, and N across both high and low reading skill groups with the exception of aptitude Q. Thus, for subjects with lower reading skills (WRS vocabulary score $\leq$ 5) the two studies found that they performed surprisingly better on the aptitudes "G", "V", and "N" (which have been found to correlate with one's reading abilities) via an aptitude test that demands reading (GATB) versus one that does not (R-NATB).

For the 1979 subjects scoring at or above the mean WRS vocabulary score (6.045), Table XIV shows that these more proficient readers amazingly performed higher on aptitudes G, V, and N when tested by the R-NATB. These findings were contrary to what was found in the present study where the borderline and mildly retarded subjects with higher reading skills scored higher when taking the GATB on these aptitudes. These findings are rather baffling in view of the original intent for revising the NATB - to assist the disadvantaged with assumed poor literary skills to maximize their aptitude test score by not taxing their reading ability.

In view of the above, it appears that if one is functioning at a subnormal intellectual level and possesses at least minimal skills in reading (as defined by the WRS Vocabulary subtest) he/she will perform better on the GATB aptitudes G, V, and N than by taking the R-NATB. Being mindful that a majority of the present study's 160 subjects were enrolled in a secondary special education program when tested, one possible interpretation of the results favoring the GATB is that the continual process of taking daily, objective tests, quizzes, exams, etc. makes the GATB's Verbal and Numerical subtests written question/multiple choice answer sheet response format similar to many standardized tests that these students take throughout their school year. The R-NATB Verbal and Numerical aptitudes have many visual comparison and discrimination subtests involving number and letter sequences as well as an orally administered verbal aptitude tests with stimuli cards for visual reinforcement. The R-NATB's subtests appear to tax ones concentration, freedom from distractibility and listening attention more in its attempt to measure the cognitive factor (aptitudes G, V, and N). Thus, for many borderline and mildly retarded individuals attempting to take an aptitude test that is heavily loaded with these demands, it is understandable that many of these subtests present much frustration, failure to these individuals.

When one notes the higher mean R-NATB aptitude performances on aptitudes S, P, and Q, it is felt that these differences can be attributed to the type of response format used on the R-NATB. Throughout this test, subjects were to answer in the test booklets not on a separate answer sheet as on the GATB. Because of this, subjects can respond in a more efficient manner without running the risk of making errors in recording their intended response on the separate answer sheet. The subjects in the present and in the 1979 standardization study indicated that the R-NATB's "mark-in-the-test-booklet" format was most pleasing to them during testing. Furthermore, since the GATB and R-NATB's subtests for aptitudes S, P, and Q are the same with exception of the way that one's item responses are recorded, then the performance differences following the R-NATB are likely attributed to this variable. At the conclusion of the 1979 standardization study, it was recommended as a possible alternative to future aptitude testing to "discontinue" the NATB testing and install the B-1001 edition of the GATB in its place. The B-1001 does not require a separate answer sheet; the answers are marked directly in the booklet as in the NATB. (U.S. Department of Labor, 1983, p. 31).

Conclusions, Recommendations, and Implications for Further Research

The present study was an attempt to replicate the 1979 standardization study conducted by the U.S. Training and Employment Service on the aptitude performance differences when subjects were tested by the GATB vs. the R-NATB and examined the ability of the Wide Range Scale vs. the Wide Range Achievement Test-Revised to predict a subject performing higher on the GATB vs. the R-NATB. The present study carefully controlled four variables which differed from, or was not controlled in, the 1979 standardization study: 1) ages of the subjects limited to the 15-25 year interval; 2) order of GATB/R-NATB test administration; 3) level of intellectual development; and 4) level of reading skills was defined as high or low according to the Wide Range Scale. After testing 160 borderline and mildly retarded subjects between the ages of 15-25 who possessed varying levels of reading proficiency, the following are the conclusions of this study:

1. The order of administering the GATB and R-NATB to individuals possessing subnormal intelligence had no significant affect on their aptitude testing performance.
2. Borderline and mildly retarded individuals with higher reading skills as measured by the WRS performed significantly higher on the General Intelligence (G), Verbal (V), and Numerical (N) aptitude on both the GATB and R-NATB than those with lower reading skills.

3. In general, the GATB and R-NATB did not meet the established criteria for tests known to have acceptable levels of convergent and discriminant validity. Of the six aptitude areas examined in the present research, only the Form Perception (P) aptitude satisfied the standards for acceptable convergent and discriminant validity.
4. Borderline and mildly retarded subjects performed higher on the General Intelligence (G), Verbal (V), and Numerical (N) aptitudes when taking the GATB in comparison to the R-NATB.
5. Borderline and mildly retarded subjects performed higher on the Spatial (S), Form Perception (P), and Clerical Perception (Q) when taking the R-NATB in comparison to the GATB.
6. Neither the Wide Range Scale nor the Wide Range Achievement Test-Revised proved to be effective predictors of higher GATB vs. R-NATB aptitude performances in intellectually subnormal individuals.

In view of the above general conclusions of the present research the following are recommendations for using the GATB and R-NATB with borderline and mildly retarded individuals in order for them to obtain their optimal aptitude performances:

1. In light of the construct validity evidence presented in Table III, one must question whether either the GATB or R-NATB yield valid aptitude scores for borderline or mildly retarded

individuals. Whether predictive validity can be established for either test on these groups is a question in need of further research.

2. If one of these aptitude tests is to be used with borderline and mildly retarded individuals between the ages of 15-25 years, it is recommended that the B-1001 version of the GATB be given. This form is recommended because examinees mark their answers in the test booklet instead of having to put their responses on a separate answer sheet.
3. Neither the Wide Range Scale nor the Wide Range Achievement Test-Revised should be used as an "academic screener" for predicting higher GATB vs. R-NATB performances in borderline and/or mildly retarded individuals between the ages of 15-25 years.

The author realizes that this research is limited in scope relative to the U.S. Employment Service's GATB and R-NATB testing and, more recently its "Validity Generalization" (V-G) programs that are currently being implemented nationally regarding five general job families and 66 occupational aptitude profile groups which encompass over 12,000 individual jobs in the United States work force listed in the 1977 Dictionary of Occupational Titles. However, in view of the findings and recommendations cited in this document, the following suggestions for additional research are offered:

1. Perform a replicative study to the present one or the 1979 GATB/R-NATB "standardization study" which would more adequately sample the U.S. borderline and mildly retarded population regarding the following variables:
   a) Sample size, socioeconomic and racial composition for the sample size - consider a sample size that exceeds 1,000 and would more closely reflect the socioeconomic and majority/minority percentages currently known to compose the U.S. population of borderline and mildly retarded individuals.
   b) Age of the subjects - include subjects from the other working age intervals known for borderline and mildly retarded individuals.
   c) Use other handicapped sub-populations such as severely handicapped/dyslexic readers of the Learning Disabled population, in a similar study to that of the present research.
   d) Use non-English speaking immigrants such as newly arrived Vietnamese, Cambodians, Cubans, Koreans, etc., in order to examine the utility of, particularly the R-NATB with these non-English speaking/reading individuals.
2. Instead of comparing individual GATB vs. R-NATB aptitude performances of borderline, mildly retarded, disabled readers,

immigrants, etc., replicate the present study using the U.S. Department of Labor's "validity generalization" research-based, generalized factors -- "cognitive" (aptitudes G, V, and N), "perceptual" (aptitudes S, P, and Q), and psychomotor (aptitudes K, F, and M).

3. Investigate the ability of the Wide Range Scale, Wide Range Achievement Test-Revised or even the newly released 1988 Peabody Individual Achievement Test-Revised to predict higher aptitude performances in mildly retarded, borderline, or learning disabled individuals without the variable of reading skill development being controlled as in the present study.
4. As noted in the discussion of Table XII and Appendix E's results, investigate the appropriateness of using aptitude difference scores vs. "residual scores" vs. other measures of GATB vs. R-NATB aptitude performance as well as their relationship to an "academic screener's" ability to predict higher GATB vs. R-NATB aptitude or generalized factor performances in various types of disabled/handicapped reader populations.
5. If it is decided by the U.S. Department of Labor to disband the R-NATB testing program, research could be done as to the effectiveness of the B-1001 version of the GATB with many of the aforementioned special populations regarding its "generalized

validity" relative to job performance, training efficiency, job satisfaction, etc.

6. Criterion-related validity studies of the GATB and R-NATB need to be conducted with mentally retarded populations if the construct validity concern raised by this research is to be addressed.

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APPENDIX A

Occupational Aptitude Patterns (OAPs) and Their Nonsupervisory Occupational Coverage in Work Groups of the "Guide for Occupational Exploration"

		Guide for Occupational Exploration Work Group		Limits of Dot Occupations Coverage: Applicable Occupations in Work Groups — Data Codes*	OAP		
OAP	Adult GATB Norms	Code	Title		Total	Applies	%
1	G100 V100 Q100	01.01	Literary Arts	0	18	16	89
2	G100 S100 P85	01.02	Visual Arts	all	45	45	100
3	G100 V100	01.03	Performing Arts:Drama	0-2	25	23	92
4	G100 V100 Q100	01.04	Performing Arts Music	0	13	13	100
5	G100 S95	01.05	Performing Arts:Dance	all	4	4	100
6	S90 P85 M85	01.06	Craft Arts	2-6	169	163	96
7	G115 V105 N110 S110	02.01	Physical Sciences	all	28	28	100
8	G115 V105 N110 S110	02.02	Life Sciences	all	50	50	100
9	G115 V105 N110 S110	03.03	Medical Sciences	0-1	47	44	90
10	G105 N100	02.04	Laboratory Technology	2-3	82	66	80
11	G100 N90	03.01	Managerial Work: Plants & Animals	1-3	50	49	98
12	G95 M85	03.03	Animal Training and Service	2	14	5	36
13	K85 M85	03.03	Animal Training and Service	3-6	14	5	64
14	K85 M80	03.04	Elemental Work: Plants & Animals	all	154	154	100
15	G100 Q95	04.01	Safety and Law Enforcement				
16	G95	04.02	Security Services	1-3	55	25	45
17	G115 N105 S100	05.01	Engineering	0-1	161	152	94
18	G105 V100 N100 S95	05.02	Mangagerial Work: Mechanical	all	67	67	100
19	G105 N100 S100	05.03	Engineering Technology	1-2	139	111	80
20	G105 N100 S100	05.04	Air and Water Vehicle Operation				
21	S90 P85 M85	05.05	Craft Technology	2-6	590	582	99
22	N90 S90 P85	05.07	Quality Control	1-2	68	28	99
23	S85 P80 M85	05.08	Land and Motor Vehicle Operation	all	38	38	100

APPENDIX A
(continued)

OAP	Adult GATB Norms	Code	Title	OAP Total	OAP Applies	%
24	G95 N85 Q90	05.09	Materials Control	1-4	147	87	59
25	Q85 K85	05.09	Materials Control	5	147	34	23
26	S85 P80 M85	05.01	Crafts	1-5	383	246	64
27	P80 K85 M85	05.01	Crafts	5-6	383	137	36
28	S85 P80 M85	05.11	Equipment Operation	all	128	128	100
29	K85 M80	05.12	Elemental Work: Mechanical	all	417	417	100
30	N85 S90 P85	06.01	Production Technology	1-2	368	92	25
31	S85 P85 M85	06.01	Production Technology	3-6	368	276	75
32	P80 K85 M85	06.02	Production Work	all	1,565	1,565	100
33	P80 K85 M85	06.03	Quality Control	all	552	552	100
34	K85 F80 M80	06.04	Elemental Work: Industrial	all	3,894	3,894	100
35	G100 N95 Q100	07.01	Administrative Detail	all	60	60	100
36	G95 N90 Q100	07.02	Mathematical Detail	all	99	99	100
37	G95 N90 Q100	07.02	Mathematical Detail	all	25	25	100
38	G95 Q95	07.04	Oral Communications	all	99	99	100
39	G95 Q95	07.05	Records Processing	all	146	146	100
40	G95 Q100 K95	07.06	Clerical Machine Operation	all	38	38	100
41	Q90 K85	07.07	Clerical Handling	all	35	35	100
42	G100 V100 N95 Q100	08.01	Sales Technology	all	60	60	100
43	G95 N90 Q90	08.02	General Sales	all	141	141	100
44	K85 M80	08.03	Vending	all	7	7	100
45	G95	09.01	Hospitality Services	all	32	32	100
46	S85 P85 K90 M85	09.02	Barber and Beauty Services	all	6	6	100
47	S85 M85	09.03	Passenger Services	all	9	9	100
48	K85 M80	09.05	Attendant Services	4-6	64	56	85
49	G105 V100 N100 Q95	10.01	Social Services	all	29	29	100
50	G105 V100	10.02	Nursing, Therapy, and Specialized Teaching Services	all	48	48	100
51	G95	10.03	Child and Adult Care	all	32	32	100
52	G115 V100 N100 Q100	11.01	Mathematics and Statistics	0-1	21	19	90
53	G100 V100 N95 Q100	11.02	Educational & Library Services	1-2	48	36	75

APPENDIX A
(continued)

OAP	Adult GATB Norms	Code	Title		Total	OAP Applies	%
54	G95 Q95	11.02	Educational & Library Services	3	48	12	25
55	G110 V100 N105	11.03	Social Research	0-1	33	26	79
56	G100 V100 N95 Q100	11.03	Social Research	2-3	33	7	21
57	G110 V100 N105	11.04	Law	1	27	21	78
58	G100 V100 N95 Q100	11.04	Law	2	27	6	22
59	G105 V95 N100 Q100	11.05	Business Administration	all	115	115	100
60	G110 V95 N105 Q100	11.06	Finance	0-1	52	37	71
61	G105 V95 N100 Q100	11.07	Services Administration	all	66	66	100
62	G100 V100 N95 Q100	11.08	Communications	all	19	19	100
63	G105 V95 N100 Q100	11.09	Promotion	all	20	20	100
64	G105 N95 Q95	11.10	Regulations Enforcement	1-2	48	45	94
65	G100 V95 N95 Q100	11.11	Business Management	all	72	72	100
66	G100 V95 N95 Q100	11.12	Contract & Claims	all	34	34	100

*This refers to the 4th digit of the 9-digit DOT code shown for each occupation in the "Guide for Occupational Exploration Work Group" listings of occupations. The OAP applies to all of the nonsupervisory occupations with the 4th digit DOT codes indicated.

APPENDIX B

Summary of USTES' GATB Realibility Research

Aptitude	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
G - Intelligence	.89	.94	.94	.85	.89	.94	.94	.87	.87	.92	.90	M.94 F.91	M.92 F.92	M.93 F.90	M.90 F.91	M.94 F.94	M.88 F.88	M.80 F.84	M.91 F.86
V - Verbal	.90	.94	.94	.86	.86	.91	.93	.89	.89	.93	.89	M.88 F.85	M.88 F.90	M.90 F.87	M.86 F.87	M.90 F.89	M.84 F.85	M.85 F.87	M.90 F.80
N - Numerical	.93	.93	.87	.82	.86	.91	.92	.87	.85	.92	.90	M.94 F.92	M.92 F.94	M.95 F.90	M.93 F.91	M.94 F.92	M.84 F.82	M.87 F.86	M.90 F.84
S - Spatial	.87	.88	.83	.81	.80	.89	.88	.81	.87	.80	.78	M.86 F.81	M.84 F.73	M.88 F.78	M.81 F.83	M.87 F.82	M.80 F.82	M.75 F.75	M.85 F.79
P - Form Perception	.82	.88	.86	.72	.74	.86	.84	.70	.72	.84	.84	M.86 F.84	M.84 F.86	M.84 F.80	M.83 F.77	M.81 F.84	M.85 F.73	M.70 F.78	M.76 F.75
Q - Clerical Perception	.91	.86	.89	.74	.77	.86	.85	.76	.77	.85	.81	M.84 F.85	M.83 F.77	M.87 F.84	M.86 F.80	M.76 F.82	M.78 F.71	M.76 F.77	M.76 F.73
K - Motor Coordination	.91	.90	.88	.76	.86	.91	.89	.69	.51	NA	NA	M.90 F.89	M.94 F.83	M.88 F.88	M.80 F.92	M.90 F.91	M.88 F.84	M.82 F.88	M.89 F.88
F - Finger Dexterity	.81	*	*	.65	.69	*	*	*	*	NA	NA	M.79 F.75	M.72 F.80	M.73 F.67	M.65 F.72	M.69 F.71	M.79 F.74	M.64 F.71	M.79 F.68
M - Manual Dexterity	.86	*	*	.73	.72	*	*	*	*	NA	NA	M.81 F.88	M.73 F.84	M.84 F.72	M.79 F.80	M.75 F.70	M.80 F.73	M.70 F.73	M.82 F.75

Study Descriptors

(1) Two-week interval r_{yy}'s on version B-1001 for 156 local Pennsylvania Employment Office applicants in 1950
(2) Two-week interval r_{yy}'s on B-1002, Form A, for 276 male local Employment Office applicants in 1954
(3) Two-week interval r_{yy}'s on B-1002, Form A, for 246 female local Employmnt Office applicants in 1954

*Not administered in the study
NA - Not applicable to the equivalency of GATB reliability research

Study Descriptors (continued)

(4) Two-week interval r_{yy}'s on B-1002, Form A, for 605 male high school seniors during schol year 1953-54
(5) Two-week interval r_{yy}'s on B-1002, Form A, for 554 female high school seniors during school year 1953-54
(6) Two-week interval r_{yy}'s on B-1002, Form B, for 168 male local Employment Office applicants, 1956-58
(7) Two-week interval r_{yy}'s on B-1002, Form B, for 155 female local Emloyment Office applicants, 1956-58
(8) Three-week interval r_{yy}'s on B-1002, Form B, for 212 male high school seniors during school year 1956-57
(9) Three-week interval r_{yy}'s on B-1002, Form B, for 231 female high school seniors during school year 1956-57
(10) Coefficients of Equivalence r_{A-B}'s using B-1002 on 95 male local Employment Office applicants in 1954
(11) Coefficients of Equivalence r_{A-B}'s using B-1002 on 85 female local Employment Office applicants in 1954
(12) One-day interval test-retest r_{A-B}'s using B-1002, Form A then Form B, in a 1965-1966 U.S.T.E.S. Study of the GATB's Short Range Realiability and Practice Effects (listed for males and females separately)
(13) Two-week interval test-retest r_{A-B}'s using B-1002, Form A then Form B, in a 1965-1966 U.S.T.E.S. Study of the GATB's Short Range Realiability and Practice Effects (listed for males and females separately)
(14) Six-week interval test-retest r_{A-B}'s using B-1002, Form A then Form B, in a 1965-1966 U.S.T.E.S. Study of the GATB's Short Range Realiability and Practice Effects (listed for males and females separately)
(15) Thirteen-week interval test-retest r_{A-B}'s using B-1002, Form A then Form B, in a 1965-1966 U.S.T.E.S. Study of the GATB's Short Range Reliability and Practice Effects (listed for males and females separately)
(16) Twenty-six-week interval test-retest r_{A-B}'s using B-1002, Form A then Form B, in a 1965-1966 U.S.T.E.S. Study of the GATB's Short Range Reliability and Practice Effects (listed for males and females separately)
(17) One-year interval test-retest r_{A-B}'s using B-1002, Form B then Form A, in a 1952-1962 U.S.T.E.S. Study of the GATB's Long Range Reliability and Practice Effects (listed for age 25-34 males and females separately)
(18) Two-year interval test-retest r_{A-B}'s using B-1002, Form B then Form A, in a 1952-1962 U.S.T.E.S. Study of the GATB's Long Range Reliability and Practice Effects (listed for age 25-34 males and females separately)
(19) Three-year interval test-retest r_{A-B}'s using B-1002, Form B then Form A, in a 1952-1962 U.S.T.E.S. Study of the GATB's Long Range Reliability and Practice Effects (listed for age 25-34 males and females separately)

APPENDIX C

WIDE-RANGE SCALE

U.S. Department of Labor Manpower Administration Washington, D.C. 20210

SAMPLE **Part 1**

Someone who takes care of sick people is a _____.

- ○ MAID
- ○ CHIEF
- ● NURSE
- ○ LEADER
- ○ PAINTER

NAME
FIRST MIDDLE INITIAL LAST

ADDRESS
NUMBER STREET

CITY STATE ZIP CODE

DATE OF BIRTH
MONTH DAY YEAR

TODAY'S DATE
MONTH DAY YEAR

1. The sides of a house are its _____.

- ○ SKIN
- ○ ROOF
- ○ TREES
- ○ PAINT
- ○ WALLS

2. You can tell who is winning if you know the _____.

- ○ WIDE
- ○ DATE
- ○ PRICE
- ○ SCORE
- ○ WEIGHT

3. A chase is _____.

- ○ a PURSUIT
- ○ a TREATMENT
- ○ an INJECTION
- ○ an OCCUPATION
- ○ an INVITATION

4. A stop sign should be placed so that it is _____.

- ○ OBVIOUS
- ○ UNUSUAL
- ○ CONCEALED
- ○ OVERLOOKED
- ○ DISORGANIZED

5 To be determined is to be _____.

- ○ SOMBER
- ○ HESITANT
- ○ RESOLUTE
- ○ HUMOROUS
- ○ BARBAROUS

6. A peculiar or mysterious object is said to be _____.

- ○ COMMONPLACE
- ○ TRANSPARENT
- ○ ADMIRABLE
- ○ LOATH
- ○ WEIRD

7. A baby cutting teeth may be _____.

- ○ GENIAL
- ○ CUNNING
- ○ RESTFUL
- ○ FRETFUL
- ○ OBLIVIOUS

8. The unexpected death of a young person is said to be _____.

- ○ STEALTHY
- ○ UNTIMELY
- ○ CREDIBLE
- ○ UNAVENGED
- ○ UNAVOIDABLE

APPENDIX C
(continued)

Part 2

1.

ADD (+)

752
330
79
+ 648

- ○ 1709
- ○ 1719
- ○ 1809
- ○ 1819
- ○ Right answer not shown

2.

SUBTRACT (—)

265
— 41

- ○ 224
- ○ 234
- ○ 236
- ○ 246
- ○ Right answer not shown

3.

ADD (+)

4733
3937
6648
+ 6598

- ○ 22,016
- ○ 21,916
- ○ 20,806
- ○ 19,796
- ○ Right answer not shown

4.

MULTIPLY (×)

896
× 647

- ○ 559,712
- ○ 578,712
- ○ 579,712
- ○ 580,712
- ○ Right answer not shown

5.

SUBTRACT (—)

8544
— 6898

- ○ 1542
- ○ 1646
- ○ 1656
- ○ 1742
- ○ Right answer not shown

6.

ADD (+)

995286
528957
864739
+ 349687

- ○ 2,709,669
- ○ 2,718,669
- ○ 2,736,669
- ○ 2,738,669
- ○ Right answer not shown

7.

DIVIDE (÷)

$439\overline{)18438}$

- ○ 32
- ○ 39, remainder 6
- ○ 41, remainder 9
- ○ 43
- ○ Right answer not shown

8.

SUBTRACT (—)

374255
— 195678

- ○ 178,577
- ○ 178,587
- ○ 178,687
- ○ 188,577
- ○ Right answer not shown

STOP

APPENDIX C
(continued)

JASTAK ASSESSMENT SYSTEMS 1984 REVISED EDITION

WRAT-R²

WIDE RANGE ACHIEVEMENT TEST • LEVEL 2

by Sarah Jastak and Gary S. Wilkinson

Name _____ Sex: M. F.

Date _____ Birth Date _____ Age _____

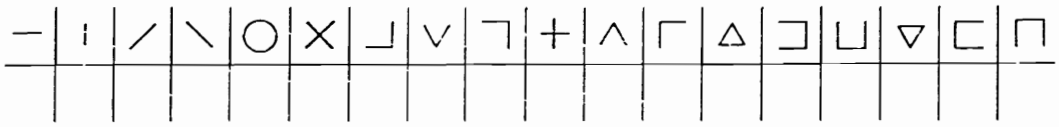
School _____ Grade _____

Referred by _____ Examiner _____

Ages 12 yrs. 0 mo. to 75 yrs. **Spelling, Level 2**

Test Results:	Raw Score	Standard Score	Percentile	Grade Equivalents
Reading				
Spelling				
Arithmetic				

Use only standard scores for comparisons



Name _____

(cumulative score: 1 letter = 4, 2 letters = 5)

cumulative score copying: score 4-9 = 1 point
score 10-17 = 2 pts. score all 18 = 3 pts.

1.	16.	31.
2.	17.	32.
3.	18.	33.
4.	19.	34.
5.	20.	35.
6.	21.	36.
7.	22.	37.
8.	23.	38.
9.	24.	39.
10.	25.	40.
11.	26.	41.
12.	27.	42.
13.	28.	43
14.	29.	44.
15. (20)	30. (35)	45
		46

APPENDIX C
(continued)

WIDE RANGE ACHIEVEMENT TEST • REVISED LEVEL 2

Page 2 — **Arithmetic, Oral Part**

1. Counts 1-5
2. Counts 6-15
3. Reads 3
4. Reads 5
5. Reads 6
6. Reads 17
7. Reads 41
8. Pennies 3-1
9. Apples 3 + 4
10. Marbles 9-3

10

Arithmetic, Written Part

$2 + 7 =$ _____

$8 - 4 =$ _____

$43 + 6$

$73 + 9$

$36 - 15$

$94 - 64$

$3 \times 4 =$ _____

$18 \div 6 =$ _____

512×3

15

$\$4.95 \times 3$

$726 - 349$

$4\frac{1}{3} + 3 =$ _____

$2\frac{1}{2} + 1\frac{1}{2} =$ _____

$\frac{1}{2}$ of 18 = _____

$\frac{1}{6}$ of 30 = _____

$229 + 5048 + 63 + 1381$

25

$5\overline{)215}$

$9\overline{)4527}$

$1\frac{1}{3}$ ft. = _____ in.

$2 -$ _____ $= \frac{1}{4}$

Add: $6\frac{1}{4} + 1\frac{5}{8} + 4\frac{1}{2}$

809×47

32

Write as percent:

.42 = _____%

Subtract: $10\frac{1}{4} - 7\frac{2}{3}$

Multiply: 6.23×12.7

Find average:

34, 16, 45, 39, 27

Ans. _____

Write as decimal:

$52\frac{1}{2}\%$ = _____

Write as percent:

$\frac{3}{8}$ = _____%

38

$2.9\overline{)308.85}$

Add: 3 ft. 6 in.
5 ft. 5 in.
8 ft. 11 in.

M + 2 = 5

M = _____

2x = 3

x = _____

$6 \times 3\frac{7}{8} =$ _____

15% of 175 = _____

Go to Next Page

APPENDIX C
(continued)

WIDE RANGE ACHIEVEMENT TEST • REVISED LEVEL 2

Arithmetic, Written Part Continued **Page 3**

Write as common fraction in lowest terms: .075 = _____

The complement of an angle of 30° = _____ 46

4^3 = _____

$.25 \div 1\frac{1}{5}$ = _____

If a = 7, b = 3;

$a^2 + 3b$ = _____

$\frac{1}{4}$% of 60 = _____

66 sq. ft. = _____sq. yd.

Solve:

$\frac{7 - (6 + 8)}{2}$ = _____ 52

Add:

$-x - y - 23$

$x - y + 22$

Ans. _____

Factor:

$r^2 + 25 - 10r$

Ans. _____

$\frac{r^2 - 5r - 6}{r + 1}$

Ans. _____

Change to familiar numerals:

M D C X C I = _____

Find interest on $1,200 at 6% for 70 days. Ans. _____ 57

$3p - q = 10$

$2p - q = 7$

p = _____

q = _____

$\sqrt{2ax} = 6$

x = _____

$\frac{7}{17} = \frac{6}{x}$

x = _____.

Find square root:

$\sqrt{67081}$ 62

$\log_{10}\left(\frac{1}{100}\right)$

Ans. _____

$\log_5 5\sqrt{5}$

Ans. _____

Reduce:

$\frac{k^2 + k}{k^2} \cdot \frac{3k - 3}{k^2 - 1}$

Ans. _____

Find root:

$2x^2 - 36x = 162$

Ans. _____ 66

APPENDIX C
(continued)

WIDE RANGE ACHIEVEMENT TEST • REVISED LEVEL 2

Page 4 **Reading, Level 2**

Two letters in name (2)	A	B	O	S	E	R	T	H	P	I	U	Z	Q	(13) 15
milk	city	in	tree	animal	himself	between	chin	split						24
form	grunt	stretch	theory	contagious	grieve	toughen	aboard							32
triumph	contemporary	escape	eliminate	tranquillity	conspiracy									36
image	ethics	deny	rancid	humiliate	bibliography	unanimous								43
predatory	alcove	scald	mosaic	municipal	decisive	contemptuous								52
deteriorate	stratagem	benign	desolate	protuberance	prevalence									56
regime	irascible	peculiarity	pugilist	enigmatic	predilection									64
covetousness	soliloquize	longevity	abysmal	ingratiating	oligarchy									72
coercion	vehemence	sepulcher	emaciated	evanescence	centrifugal									78
subtlety	beatify	succinct	regicidal	schism	ebullience	misogyny								83
beneficent	desuetude	egregious	heinous	internecine	synecdoche									89

WRAT-R² Raw Score to Grade Equivalents

RS	READING 1-30			35		40		45		50		55		60												65-89
GE	Below 3	3B	3E	4B	4E	5B	5E	6B	6E	7B	7E	8B	8E	9B	9E	10B	10E	11B	11E	12B	12E	Above 12				
																							SEM = 2			
RS	SPELLING 1-10			15		20		25				30						35								36-51
GE	Below 3	3B	3E	4B	4E	5B	5E	6B	6E	7B	7E	8B	8E	9B	9E	10B	10E	11B	11E	12B	12E	Above 12				
																							SEM = 2			
RS	ARITHMETIC 1-14		15			20			25			30					35									40-66
GE	Below 3	3B	3E	4B	4E	5B	5E	6B	6E	7B	7E	8B	8E	9B	9E	10B	10E	11B	11E	12B	12E	Above 12				
																							SEM = 2			

APPENDIX D

GATB vs. R-NATB Aptitude Performances
at various WRS Vocabulary Score Levels

For All Borderline and Mildly Retarded Subjects

"G" APTITUDE

WRS Vocabulary Scores	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
0 - 1	9	56.78	51.56	5.22	6.89	2.27	8	.053*
2	33	62.03	57.52	4.52	11.83	2.19	32	.036*
3	38	62.66	57.32	5.34	9.28	3.55	37	.001**
4	30	65.07	59.20	5.87	10.00	3.21	29	.003**
5	32	66.38	60.31	6.06	10.68	3.21	31	.003**
6 - 8	18	68.94	65.00	3.94	11.15	1.50	17	.152

"V" APTITUDE

WRS Vocabulary Scores	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
0 - 1	9	68.00	59.33	8.67	6.69	3.89	8	.005**
2	33	67.30	63.64	3.67	12.82	1.64	32	.110
3	38	73.68	64.34	9.34	10.94	5.27	37	.000**
4	30	72.90	64.80	8.10	9.73	4.56	29	.000**
5	32	73.81	67.34	6.47	11.78	3.11	31	.004**
6 - 8	18	74.17	71.39	2.78	10.62	1.11	17	.283

APPENDIX D
(continued)

GATB vs. R-NATB Aptitude Performances
at various WRS Vocabulary Score Levels

For All Borderline and Mildly Retarded Subjects

"N" APTITUDE

WRS Vocabulary Scores	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
0 - 1	9	53.89	48.11	5.78	5.67	3.05	8	.016*
2	33	59.00	56.36	2.64	12.07	1.25	32	.219
3	38	61.97	56.37	5.61	11.82	2.92	37	.006**
4	30	64.67	60.83	3.83	14.38	1.46	29	.155
5	32	65.25	58.94	6.31	15.36	2.32	31	.027*
6 - 8	18	68.83	62.89	5.94	14.47	1.74	17	.099

"S" APTITUDE

WRS Vocabulary Scores	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
0 - 1	9	66.67	75.67	-9.00	11.69	-2.31	8	.050*
2	33	77.73	75.91	1.82	13.86	0.75	32	.457
3	38	73.26	76.45	-3.18	9.59	-2.05	37	.048*
4	30	76.33	77.37	-1.03	12.81	-0.44	29	.662
5	32	74.31	76.00	-1.69	13.99	-0.68	31	.500
6 - 8	18	79.00	82.83	-3.83	16.94	-0.96	17	.350

APPENDIX D
(continued)

GATB vs. R-NATB Aptitude Performances
at various WRS Vocabulary Score Levels

For All Borderline and Mildly Retarded Subjects

"P" APTITUDE

WRS Vocabulary Scores	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
0 - 1	9	59.22	65.89	-6.67	18.30	-1.09	8	.306
2	33	74.64	79.37	-4.73	13.11	-2.07	32	.046*
3	38	73.37	78.13	-4.76	14.62	-2.01	37	.052*
4	30	82.40	84.03	-1.63	17.65	-0.51	29	.616
5	32	71.63	76.25	-4.63	14.98	-1.75	31	.091
6 - 8	18	76.50	81.50	-5.00	12.41	-1.71	17	.106

"Q" APTITUDE

WRS Vocabulary Scores	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
0 - 1	9	75.00	79.89	-4.89	15.82	-0.93	8	.381
2	33	83.58	84.10	-0.52	17.31	-0.17	32	.865
3	38	83.94	87.68	-3.74	16.79	-1.37	37	.178
4	30	88.10	91.97	-3.87	17.33	-1.22	29	.231
5	32	83.28	87.16	-3.88	11.41	-1.92	31	.064
6 - 8	18	85.50	90.61	-5.11	13.66	-1.59	17	.131

APPENDIX D
(continued)

GATB vs. R-NATB Aptitude Performances
at various WRS Arithmetic Score Levels

For All Borderline and Mildly Retarded Subjects

"G" APTITUDE

WRS Arithmetic Scores	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
0 - 1	10	61.50	55.40	6.10	6.26	3.08	9	.013**
2	15	60.87	55.13	5.73	10.13	2.19	14	.046
3	29	60.79	56.38	4.41	11.20	2.12	28	.043
4	21	63.48	54.81	8.67	8.90	4.46	20	.000**
5	34	65.08	59.68	5.41	10.44	3.02	33	.005**
6	31	66.00	63.94	2.06	11.85	0.97	30	.340
7 - 8	20	68.65	61.90	6.75	8.39	3.60	19	.002**

"V" APTITUDE

WRS Arithmetic Scores	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
0 - 1	10	64.00	67.70	-3.70	12.25	-0.96	9	.364
2	15	68.67	66.07	2.60	11.86	0.85	14	.410
3	29	70.07	63.72	6.34	10.41	3.28	28	.003**
4	21	74.19	63.38	10.81	11.04	4.49	20	.000**
5	34	73.50	65.15	8.35	9.83	4.95	33	.000**
6	31	72.48	67.19	5.29	11.59	2.55	30	.016**
7 - 8	20	75.55	65.90	9.65	10.06	4.29	19	.000**

APPENDIX D
(continued)

GATB vs. R-NATB Aptitude Performances
at various WRS Arithmetic Score Levels

"N" APTITUDE

WRS Arithmetic Scores	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
0 - 1	10	57.10	49.30	7.80	12.53	1.97	9	.081
2	15	56.27	52.73	3.53	8.36	1.64	14	.124
3	29	54.86	55.38	-0.52	15.78	-0.18	28	.861
4	21	62.14	53.95	8.19	12.19	3.08	20	.006**
5	34	64.85	60.71	4.15	12.59	1.92	33	.060
6	31	65.61	62.42	3.19	12.82	1.39	30	.176
7 - 8	20	75.20	62800	12.40	11.11	4.99	19	.000**

"S" APTITUDE

WRS Arithmetic Scores	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
0 - 1	10	70.80	72.00	-1.20	14.47	-0.26	9	.799
2	15	73.73	70.80	2.93	14.26	0.80	14	.439
3	29	74.21	76.48	-2.28	13.27	-0.92	28	.364
4	21	74.00	72.00	2.00	15.57	0.59	20	.563
5	34	75.91	78.06	-2.15	12.12	-1.03	33	.309
6	31	77.97	83.10	-5.13	12.60	-2.27	30	.031*
7 - 8	20	76.05	79.65	-3.60	10.85	-1.48	19	.154

APPENDIX D
(continued)

GATB vs. R-NATB Aptitude Performances
at various WRS Arithmetic Score Levels

"P" APTITUDE

WRS Arithmetic Scores	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
0 - 1	10	55.80	57.60	-1.80	17.58	-0.32	9	.754
2	15	68.20	71.33	-3.13	12.97	-0.94	14	.365
3	29	70.59	76.00	-5.41	14.50	-2.01	28	.054*
4	21	70.29	74.00	-3.71	15.61	-1.09	20	.289
5	34	77.58	85.09	-7.50	16.62	-2.63	33	.013**
6	31	79.61	84.13	-4.52	12.82	-1.96	30	.059
7 - 8	20	85.75	85.20	0.55	14.66	0.17	19	.869

"Q" APTITUDE

WRS Arithmetic Scores	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
0 - 1	10	76.60	72.20	4.40	15.48	0.90	9	.390
2	15	81.67	81.40	2.67	14.89	0.07	14	.946
3	29	78.10	85.45	-7.34	20.84	-1.90	28	.068
4	21	84.52	85.33	-0.81	12.38	-0.30	20	.768
5	34	86.06	93.41	-7.35	13.70	-3.13	33	.004**
6	31	87.55	89.68	-2.13	15.49	-0.77	30	.450
7 - 8	20	89.95	91.80	-1.85	11.26	-0.73	19	.472

APPENDIX D
(continued)
GATB vs. R-NATB Aptitude Performances
at various WRAT-R Reading Standard Score Levels
For All Borderline and Mildly Retarded Subjects
"G" APTITUDE

WRAT-R Reading Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 55	16	59.69	51.75	7.94	6.87	4.62	15	.000**
56 - 60	18	61.16	57.61	3.56	8.70	1.73	17	.101
61 - 65	21	64.29	58.67	5.57	11.13	2.29	20	.033*
66 - 70	27	63.33	58.11	5.22	10.04	2.70	26	.012**
71 - 75	28	62.39	59.50	2.89	11.64	1.32	27	.199
76 - 80	21	67.76	62.43	5.33	13.50	1.81	20	.085
81 - 85	15	69.00	59.60	9.40	8.65	4.21	14	.001**
86 -110	14	66.86	62.79	4.07	6.97	2.19	13	.048**

"V" APTITUDE

WRAT-R Reading Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 55	16	65.38	63.19	2.19	9.747	0.90	15	.383
56 - 60	18	68.33	65.94	2.39	11.92	0.85	17	.467
61 - 65	21	71.29	64.14	7.14	10.48	3.12	20	.005**
66 - 70	27	71.33	63.63	7.70	11.01	3.63	26	.001**
71 - 75	28	70.89	64.04	6.86	9.74	3.72	27	.001**
76 - 80	21	76.24	66.43	9.81	14.10	3.19	20	.005**
81 - 85	15	76.13	68.13	8.00	13.51	2.29	14	.038*
86 -110	14	77.88	70.71	7.14	7.50	3.56	13	.003**

APPENDIX D
(continued)
GATB vs. R-NATB Aptitude Performances
at various WRAT-R Reading Standard Score Levels
For All Borderline and Mildly Retarded Subjects
"N" APTITUDE

WRAT-R Reading Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 55	16	54.69	50.63	4.06	14.81	1.70	15	.290
56 - 60	18	56.33	52.72	3.61	12.39	1.24	17	.233
61 - 65	21	60.52	57.38	3.14	12.60	1.14	20	.266
66 - 70	26	62.18	57.48	4.70	11.26	2.17	26	.039*
71 - 75	28	62.68	60.29	2.39	13.12	0.97	27	.340
76 - 80	21	70.54	61.76	8.81	16.83	2.40	20	.026*
81 - 85	15	69.20	60.67	8.53	13.86	2.39	14	.032*
86 -110	14	67.14	61.93	5.21	9.19	2.12	13	.054*

"S" APTITUDE

WRAT-R Reading Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 55	16	69.81	70.31	-0.50	16.38	-0.12	15	.904
56 - 60	18	73.67	77.33	-3.67	13.23	-1.18	17	.256
61 - 65	21	78.95	79.38	0.57	14.09	0.19	20	.854
66 - 70	27	75.07	75.37	-0.30	12.79	-0.12	26	.905
71 - 75	28	75.75	79.72	-3.96	11.88	-1.77	27	.089
76 - 80	21	75.76	80.67	-4.90	14.51	-1.55	20	.137
81 - 85	15	74.47	76.40	-1.93	13.80	-0.54	14	.596
86 -110	14	77.29	76.07	1.21	7.69	0.59	13	.057

APPENDIX D
(continued)
GATB vs. R-NATB Aptitude Performances
at various WRAT-R Reading Standard Score Levels
For All Borderline and Mildly Retarded Subjects
"P" APTITUDE

WRAT-R Reading Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 55	16	64.38	64.44	-0.06	14.72	-0.02	15	.987
56 - 60	18	68.06	72.00	-3.94	14.35	-1.17	17	.260
61 - 65	21	76.67	83.81	-7.14	15.14	-2.16	20	.043*
66 - 70	27	75.63	79.52	-3.89	14.46	-1.40	26	.174
71 - 75	28	75.32	84.64	-9.32	16.80	-2.97	27	.006**
76 - 80	21	81.76	83.67	-1.90	15.79	-0.55	20	.587
81 - 85	15	70.00	69.53	0.47	16.06	0.11	14	.912
86 -110	14	81.57	86.07	-4.50	6.45	-2.61	13	.022*

"Q" APTITUDE

WRAT-R Reading Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 55	16	77.00	85.69	-8.69	26.16	-1.33	15	.204
56 - 60	18	79.56	79.44	0.11	12.89	0.04	17	.971
61 - 65	21	81.95	87.67	-5.71	18.42	-1.42	20	.170
66 - 70	27	85.00	84.85	0.15	11.94	0.06	26	.949
71 - 75	28	85.75	89.71	-3.96	13.63	-1.54	27	.135
76 - 80	21	91.24	91.67	-0.43	12.41	-0.16	20	.876
81 - 85	15	86.09	93.20	-7.13	13.23	-2.09	14	.056
86 -110	14	84.43	88.36	-3.93	14.26	-1.03	13	.032*

APPENDIX D
(continued)

GATB vs. R-NATB Aptitude Performances
at various WRAT-R Spelling Standard Score Levels

For All Borderline and Mildly Retarded Subjects

"G" APTITUDE

WRAT-R Spelling Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 60	13	62.15	53.92	8.23	6.35	4.67	12	.001**
61 - 65	21	63.19	55.33	7.86	8.62	4.18	20	.000**
66 - 70	44	61.18	58.20	2.98	9.30	2.29	43	.040*
71 - 75	36	63.00	59.44	3.56	12.63	1.69	35	.100
76 - 80	20	70.80	63.40	7.40	11.85	2.84	19	.010**
81 -110	25	66.84	60.72	6.12	9.39	3.26	24	.003**

"V" APTITUDE

WRAT-R Spelling Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 60	13	66.85	63.23	3.62	8.15	1.60	12	.136
61 - 65	21	68.90	63.14	5.76	12.74	2.07	20	.051*
66 - 70	44	69.70	63.68	6.02	10.76	3.73	43	.001**
71 - 75	36	71.11	67.17	3.94	12.29	1.93	35	.062
76 - 80	20	76.90	68.00	8.90	10.94	3.64	19	.002**
81 -110	25	78.48	66.40	12.08	9.34	6.47	24	.000**

APPENDIX D
(continued)

GATB vs. R-NATB Aptitude Performances
at various WRAT-R Spelling Standard Score Levels

For All Borderline and Mildly Retarded Subjects

"N" APTITUDE

WRAT-R Spelling Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 60	13	56.77	53.69	3.08	14.49	0.77	12	.459
61 - 65	21	63.29	51.95	11.33	7.47	6.96	20	.000**
66 - 70	44	57.75	55.57	2.18	11.99	1.21	43	.234
71 - 75	36	60.22	58.28	1.94	13.11	0.89	35	.380
76 - 80	20	73.25	67.15	6.10	17.07	1.60	19	.127
81 -110	25	69.28	61.48	17.80	12.92	3.02	24	.006**

"S" APTITUDE

WRAT-R Spelling Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 60	13	73.46	73.15	0.31	16.07	0.07	12	.946
61 - 65	21	71.71	75.57	-3.86	12.23	-1.45	20	.164
66 - 70	44	76.30	78.89	-2.59	12.56	-1.37	43	.178
71 - 75	36	75.06	74.89	0.17	12.74	0.08	35	.938
76 - 80	20	79.85	79.95	-0.10	16.58	-0.03	19	.979
81 -110	25	73.52	78.12	-4.60	11.19	-2062	24	.051*

APPENDIX D
(continued)

GATB vs. R-NATB Aptitude Performances
at various WRAT-R Spelling Standard Score Levels

For All Borderline and Mildly Retarded Subjects

"P" APTITUDE

WRAT-R Spelling Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 60	13	67.85	73.77	-5.92	14.86	-1.44	12	.176
61 - 65	21	67.90	69.00	-1.10	14.00	-0.36	20	.724
66 - 70	44	76.36	84.41	-8.05	14.96	-3.57	43	.001**
71 - 75	36	72.44	74.83	-2.39	14.60	-0.98	35	.333
76 - 80	20	81.05	85.20	-4.15	18.27	-1.02	19	.320
81 -110	25	77.28	79.60	-2.32	12.76	-0.91	24	.372

"Q" APTITUDE

WRAT-R Spelling Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 60	13	77.08	89.77	-12.69	23.93	-1.91	12	.080
61 - 65	21	80.24	80.14	0.10	12.85	0.03	20	.973
66 - 70	44	82.80	84.59	-1.80	15.22	-0.78	43	.438
71 - 75	36	82.92	83.61	-0.69	13.38	-0.31	35	.757
76 - 80	20	92.80	99.15	-6.35	16.12	-1.76	19	.094
81 -110	25	88.52	93.80	-5.28	14.32	-1.84	24	.078

APPENDIX D
(continued)

GATB vs. R-NATB Aptitude Performances
at various WRAT-R Arithmetic Standard Score Levels

For All Borderline and Mildly Retarded Subjects

"G" APTITUDE

WRAT-R Arithmetic Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 60	11	61.36	54.45	6.91	8.54	2.68	10	.002**
61 - 65	19	59.79	55.84	3.95	8.64	1.99	18	.062
66 - 70	38	61.68	55.87	5.82	9.16	3.91	37	.000**
71 - 75	42	63.79	58.05	5.74	11.72	3.17	41	.003**
76 - 80	32	67.25	64.22	3.03	10.12	1.69	31	.100
80 -110	18	70.56	63.33	7.22	11.82	2.59	17	.019*

"V" APTITUDE

WRAT-R Arithmetic Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 60	11	69.54	66.91	2.64	9.71	0.90	10	.389
61 - 65	19	69.42	67.47	1.95	12.45	0.68	18	.504
66 - 70	38	68.21	62.61	5.61	11.36	3.04	37	.004**
71 - 75	42	72.62	64.26	8.36	12.18	4.45	41	.000**
76 - 80	32	76.56	68.13	8.44	8.90	5.36	31	.000**
80 -110	18	74.50	65.94	8.56	10.75	3.38	17	.004**

APPENDIX D
(continued)

GATB vs. R-NATB Aptitude Performances
at various WRAT-R Arithmetic Standard Score Levels

For All Borderline and Mildly Retarded Subjects

"N" APTITUDE

WRAT-R Arithmetic Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 60	11	54.09	52.73	1.36	17.51	0.26	10	.801
61 - 65	19	55.74	50.58	5.16	9.06	2.48	18	.023*
66 - 70	38	58.61	54.68	3.92	11.04	2.19	37	.035*
71 - 75	42	62.00	57.33	4.67	15.05	2.01	41	.051*
76 - 80	32	69.44	65.13	4.31	11.18	2.18	31	.037*
80 -110	18	74.83	64.83	10.00	16.08	2.64	17	.017*

"S" APTITUDE

WRAT-R Arithmetic Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 60	11	73.00	70.09	2.91	14.29	0.68	10	.520
61 - 65	19	71.42	73.00	-1.58	17.50	-0.39	18	.699
66 - 70	38	73.55	76.26	-2.71	11.80	-1.42	37	.165
71 - 75	42	75.05	77.00	-1.95	11.66	-1.09	41	.284
76 - 80	32	78.56	80.94	-2.38	13.70	-0.98	31	.334
80 -110	18	78.78	80.83	-2.06	13.34	-0.65	17	.520

APPENDIX D
(continued)

GATB vs. R-NATB Aptitude Performances
at various WRAT-R Arithmetic Standard Score Levels

For All Borderline and Mildly Retarded Subjects

"P" APTITUDE

WRAT-R Arithmetic Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 60	11	67.91	66.64	1.27	13.62	0.31	10	.763
61 - 65	19	58.00	63.05	-5.05	17.26	-1.28	18	.218
66 - 70	38	69.45	74.03	-4.58	13.38	-2.11	37	.042*
71 - 75	42	77.76	84.52	-6.76	11.89	-3.69	41	.001**
76 - 80	32	81.41	87.72	-6.31	17.08	-2.09	31	.045*
80 -110	18	87.00	83.78	3.22	16.34	0.84	17	.415

"Q" APTITUDE

WRAT-R Arithmetic Standard Score Levels	No. of Cases	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB/R-NATB $\bar{X}$ Difference	$\bar{X}$ Dif. S.Dev	t Value	DF	2-Tail Prob.
45 - 60	11	80.18	90.18	-10.00	25.83	-1.25	10	.228
61 - 65	19	75.95	71.63	4.32	14.53	1.29	18	.212
66 - 70	38	80.55	83.55	-3.00	15.43	-1.20	37	.238
71 - 75	42	85.19	88.31	-3.12	14.59	-1.39	41	.173
76 - 80	32	89.63	95.00	-5.38	14.76	-2.06	31	.048*
80 -110	18	91.00	96.00	-5.00	10.12	-2.10	17	.051*

APPENDIX E

GATB RESIDUAL SCORES AND WRS AND WRAT-R PERFORMANCES

Since it was found in Tables IX - XI that the WRS and WRAT-R were not able to predict GATB nor R-NATB aptitude scores to any degree of statistical confidence, the same series of statistical analyses were undertaken using GATB "residual score" instead of GATB vs. R-NATB difference scores. As a brief review to the reader, the U.S. Department of Labor used GATB residual scores rather than GATB/R-NATB difference scores in their 1973 NATB "screener" and 1979 NATB "revision" studies. In definition "...an individual's GATB aptitude residual score may be interpreted as that portion of ones GATB (aptitude) score not predicted from his/her R-NATB (aptitude) score, i.e., GATB Residual Score for Aptitude 'S' = GATB 'S' score - predicted GATB 'S' score. When this residual score is positive (GATB score is higher), the GATB measure is defined as the more appropriate; when it is negative (GATB score is lower), the R-NATB is defined as the more appropriate." (U.S. Department of Labor, 1973)

In anticipation of computing a series of GATB aptitude residual scores (GATB - 'GATB), R-NATB regression coefficients and beta weights were computed for each aptitude and various GATB predictive equations were established.

APPENDIX E
(continued)

GATB Residual Score Predictive Equations
From R-NATB Aptitude Performances

GATB Aptitude Residual Score	Residual Score Equation
General Residual Score = GATB "G" Score	(.327597 R-NATB "G" Score + 44.820940)
Verbal Residual Score = GATB "V" Score	(.155059 R-NATB "V" Score + 61.841334)
Numerical Residual Score = GATB "N" Score	(.484535 R-NATB "N" Score + 34.740500)
Spatial Residual Score = GATB "S" Score	(.444592 R-NATB "S" Score + 40.968461)
Form Perception Residual Score = GATB "P" Score	(.657260 R-NATB "P" Score + 22.735043)
Clerical Residual Score = GATB "Q" Score	(.348433 R-NATB "Q" Score + 53.688684)

After the GATB aptitude residual scores were established via the predictive equations, Pearson correlation coefficients were computed in order to examine the relationship of subjects GATB residual scores and their academic performances on the various subtests of the WRS and WRAT-R.

APPENDIX E
(continued)

Pearson Correlation Coefficients of GATB Aptitude Residual Scores With Academic Performances on the WRS and WRAT-R Subtests

GATB Residual Score Aptitude Area

Academic Screener	GG	GV	GN	GS	GP	GQ
WRS Vocabulary	.247**	.226**	.192**	.045	.068	.061
WRS Arithmetic	.199**	.317**	.318**	.014	.207**	.243**
WRAT-R Reading	.209**	.414**	.257**	.048	.099	.216**
WRAT-R Spelling	.109	.084	.132*	.067	.073	.039
WRAT-R Arithmetic	.263**	.322**	.333**	.094	.225**	.276**

* - significant at the .05 confidence level
** - significant at the .01 confidence level

Since there were many low yet statistically significant correlations between subjects' GATB aptitude residual scores and their performances on various WRS and WRAT-R subtests, a series of GATB aptitude residual score means were calculated at the various subtest score levels of the WRS and then at the various subtest standard score levels of the WRAT-R.

APPENDIX E
(continued)

GATB Aptitude Mean Residual Score Performances at Various WRS Score Levels

GATB Aptitude Mean Residual Scores

WRS Vocab. Score Levels	N	"G" $\bar{X}$	"V" $\bar{X}$	"N" $\bar{X}$	"S" $\bar{X}$	"P" $\bar{X}$	"Q" $\bar{X}$
1	9	-4.93	-3.04	-4.16	-7.94	-6.82	-6.52
2	33	-1.63	-4.41	-3.05	3.01	- .26	.59
3	38	- .94	1.87	- .08	-1.69	- .72	- .29
Cut-Off Score							
4	30	.85	1.01	.45	.97	4.43	2.37
5	32	1.80	1.53	1.95	- .45	-1.23	- .78
6-8	18	2.83	1.26	3.62	1.20	.20	.24
Total	160	.00	.00	.00	.00	.00	.00

GATB Aptitude Mean Residual Scores

WRS Arith. Score Levels	N	"G" $\bar{X}$	"V" $\bar{X}$	"N" $\bar{X}$	"S" $\bar{X}$	"P" $\bar{X}$	"Q" $\bar{X}$
1	10	-1.47	-8.34	-1.53	-2.18	-4.79	-2.25
2	15	-2.02	-3.42	-4.03	1.29	-1.42	- .38
3	29	-2.50	-1.65	-6.71	- .77	-2.10	-5.36
Cut-Off Score							
4	21	.70	2.52	1.26	1.02	-1.09	1.10
5	34	.72	1.56	.70	.24	-1.07	- .18
6	31	.23	.22	.63	.06	1.58	2.61
7-8	20	3.55	3.49	10.03	- .33	7.02	4.28
Total	160	.00	.00	.00	.00	.00	.00

APPENDIX E
(continued)

GATB Aptitude Mean Residual Score Performances at Various WRAT-R Standard Score Levels

GATB Aptitude Mean Residual Scores

WRAT-R Reading Standard Score Levels	N	"G" $\bar{X}$	"V" $\bar{X}$	"N" $\bar{X}$	"S" $\bar{X}$	"P" $\bar{X}$	"Q" $\bar{X}$
45- 55	16	-2.09	-6.26	-4.58	-2.42	- .71	-6.55
56- 60	18	-2.53	-3.37	-3.95	-1.68	-2.00	-1.81
61- 65	21	.20	- .50	-2.02	3.14	-1.15	-2.28
66- 70	27	- .52	- .37	- .41	.60	.63	1.75
71- 75	28	-1.92	- .88	-1.27	- .66	-3.05	.80
Cut-Off Score							
76- 80	21	2.49	4.10	5.91	-1.07	4.04	5.61
81- 85	15	4.65	3.73	5.06	- .47	1.56	- .10
86-110	14	1.47	5.06	2.40	2.50	2.27	- .05
Total	160	.00	.00	.00	.00	.00	.00

GATB Aptitude Mean Residual Scores

WRAT-R Spelling Standard Score Levels	N	"G" $\bar{X}$	"V" $\bar{X}$	"N" $\bar{X}$	"S" $\bar{X}$	"P" $\bar{X}$	"Q" $\bar{X}$
45- 60	13	- .33	-4.80	-3.99	- .03	-3.37	-7.89
61- 65	22	.24	-2.73	3.37	-2.85	- .18	-1.38
66- 70	44	-2.71	-2.01	-.392	.25	-1.85	- .37
71- 75	36	-1.29	-1.15	-2.76	.79	.52	.10
Cut-Off Score							
76- 80	20	5.21	4.51	5.97	3.34	2.32	4.56
81-110	25	2.13	6.34	4.75	-2.18	2.23	2.15
Total	160	.00	.00	.00	.00	.00	.00

APPENDIX E
(continued)

GATB Aptitude Mean Residual Scores

WRAT-R Arithmetic Standard Score Levels	N	"G" $\bar{X}$	"V" $\bar{X}$	"N" $\bar{X}$	"S" $\bar{X}$	"P" $\bar{X}$	"Q" $\bar{X}$
45- 60	11	-1.30	-2.67	-6.20	.87	1.38	*
61- 65	19	-3.33	-2.88	-3.51	-2.00	-6.18	*
66- 70	38	-1.44	-3.34	-2.63	-1.32	-1.94	*
Cut-Off Score							
71- 75	42	- .05	.81	- .52	- .15	- .53	*
76- 80	32	1.39	4.16	3.14	1.61	1.02	*
81-110	18	4.99	2.43	8.68	1.87	9.20	*
Total	160	.00	.00	.00	.00	.00	.00

*Data not available

As a result of making a visual analyses of the above aptitude residual score means and, particularly, their algebraic sign dynamics according to the various score/standard score levels of the WRS and WRAT-R, the following academic screener "cut-off scores" were proposed for further investigation as to their ability to predict higher GATB vs. R-NATB aptitude performances:

APPENDIX E
(continued)

Academic Screener Cut-Off Score Criteria	Predicted GATB vs. R-NATB Performances
WRS - Vocabulary $\leq$ 3	Higher R-NATB scores
WRS - Vocabulary $\geq$ 4	Higher GATB scores
WRS - Arithmetic $\leq$ 3	Higher R-NATB scores
WRS - Arithmetic $\leq$ 3	Higher GATB scores
WRAT-R - Reading $\leq$ 75	Higher R-NATB scores
WRAT-R - Reading $\geq$ 76	Higher GATB scores
WRAT-R - Spelling $\leq$ 70	Higher R-NATB scores
WRAT-R - Spelling $\geq$ 71	Higher GATB scores
WRAT-R - Arithmetic $\leq$ 70	Higher R-NATB scores
WRAT-R - Arithmetic $\geq$ 71	Higher GATB scores

In being mindful of the above academic screener "cut-off score" criteria, a series of GATB vs. R-NATB t-tests (for repeated measurements) were calculated for each subtest of the Wide Range Scale as well as for the Wide Range Achievement Test-Revised.

APPENDIX E
(continued)

GATB vs. R-NATB t-Tests at Various WRS Subtest "Cut-Off" Score Levels

	Vocabulary $\leq$ 3					Vocabulary $\geq$ 4					Arithmetic $\leq$ 3					Arithmetic $\geq$ 4				
Aptitude	N	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB R-NATB Diff	t-Value	N	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB R-NATB Diff	t-Value	N	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB R-NATB Diff	t-Value	N	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB R-NATB Diff	t-Value
G	80	61.74	56.75	4.99	4.42**	80	66.46	60.95	5.51	4.73**	54	60.94	55.85	5.09	3.73**	106	65.71	60.38	5.33	5.28**
V	80	70.41	63.49	6.93	5.34**	80	73.55	67.00	6.25	5.16**	54	68.56	65.11	3.44	2.18*	106	73.73	65.54	8.19	7.88**
N	80	59.84	55.44	4.40	3.45**	80	65.84	60.54	5.30	3.23**	54	55.67	53.52	2.15	1.15	106	66.49	60.26	6.23	5.07**
S	80	74.36	76.14	-1.78	-1.31	80	76.13	78.05	-1.93	1.22	54	73.44	74.07	-0.63	-0.34	106	76.16	78.63	-2.47	-1.98*
P	80	72.30	77.26	-4.96	-3.11**	80	76.76	80.35	-3.59	2.08*	54	67.19	71.30	-4.11	-2.08*	106	78.27	82.63	-4.36	-2.98**
Q	80	82.79	85.33	-2.54	-1.35	80	89.74	85.59	-4.15	2.61**	54	78.81	81.87	-3.06	-1.20	106	86.92	90.42	-3.49	2.63**

* - significant at the .05 confidence level
** - significant at the .01 confidence level

APPENDIX E
(continued)

GATB vs. R-NATB T-Tests at Various WRAT-R Subtest "Cut-Off" Score Levels

	Reading ≤ 75					Reading ≥ 76					Spelling ≤ 70					Spelling ≥ 71					Arithmetic ≤ 70					Arithmetic ≥ 71				
Aptitude	N	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB R-NATB Diff	t-Value	N	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB R-NATB Diff	t-Value	N	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB R-NATB Diff	t-Value	N	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB R-NATB Diff	t-Value	N	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB R-NATB Diff	t-Value	N	GATB $\bar{X}$	R-NATB $\bar{X}$	GATB R-NATB Diff	t-Value
G	110	62.38	57.56	4.81	5.02**	50	67.88	61.68	6.20	4.12**	78	61.88	56.72	5.17	5.09**	82	66.11	60.81	5.30	4.16**	68	61.10	55.63	5.47	5.10**	92	66.32	61.23	5.09	4.36**
V	110	69.85	64.15	5.71	5.63**	50	76.66	68.14	8.52	4.92**	78	69.01	63.46	5.55	4.53**	82	74.81	67.14	7.68	5.98**	68	68.76	64.66	4.10	2.97**	92	74.36	65.93	8.42	7.52**
N	110	59.95	56.40	3.55	2.97**	50	69.20	61.48	7.72	3.91**	78	59.08	54.28	4.79	3.53**	82	66.23	61.46	4.78	3.30**	68	57.07	53.22	3.58	2.72**	92	67.10	61.51	5.59	8.81**
S	110	74.99	76.04	-1.65	-1.29	50	75.80	78.10	-2.30	1.28	78	74.59	77.07	-2.45	-1.66	82	75.77	77.14	-1.37	- .92	68	72.87	74.35	-1.49	-0.88	92	77.00	79.12	-2.12	-1.62
P	110	72.87	78.22	-5.35	-3.68**	50	78.18	80.10	-1.92	-0.98	78	72.67	78.49	-5.82	-3.47**	82	76.06	78.86	-2.80	-1.69	68	66.00	69.76	-3.76	-2.13*	92	80.84	85.49	-4.65	-2.95**
Q	110	82.55	85.86	-3.31	-2.10*	50	87.78	91.20	-3.42	-1.83	78	81.15	84.26	-3.10	-1.64	82	87.09	90.59	-3.51	-2.19*	68	79.21	81.29	-2.09	-0.98	92	87.87	92.14	-4.27	-2.97**

* - significant at the .05 confidence level
** - significant at the .01 confidence level

APPENDIX E
(continued)

In summarizing t-test results regarding the degree to which GATB vs. R-NATB aptitude performances were accurately predicted by the proposed Wide Range Scale and Wide Range Achievement Test-Revised subtest "cut-off" score criteria, the following was found.

The Proficiency of Various WRS and WRAT-R "Cut-Off" Score Criteria to Predict Higher GATB vs. R-NATB Aptitude Performances

Academic Screener Cut-Off Score Criteria	Predicted Higher GATB vs. R-NATB Aptitude Scores	Higher GATB vs. R-NATB Aptitude Performances					
		G	V	N	S	P	Q
WRS - Vocabulary $\leq$ 3	Higher R-NATB scores	GATB**	GATB**	GATB**	R-NATB	R-NATB*	R-NATB
WRS - Vocabulary $\geq$ 4	Higher GATB scores	GATB**	GATB**	GATB**	R-NATB	R-NATB*	R-NATB**
WRS - Arithmetic $\leq$ 3	Higher R-NATB scores	GATB**	GATB*	GATB	R-NATB	R-NATB*	R-NATB
WRS - Arithmetic $\geq$ 4	Higher GATB scores	GATB**	GATB**	GATB**	R-NATB*	R-NATB**	R-NATB**
WRAT-R - Reading $\leq$ 75	Higher R-NATB scores	GATB**	GATB**	GATB**	R-NATB	R-NATB**	R-NATB*
WRAT-R - Reading $\geq$ 76	Higher GATB scores	GATB**	GATB**	GATB**	R-NATB	R-NATB	R-NATB
WRAT-R - Spelling $\leq$ 70	Higher R-NATB scores	GATB**	GATB**	GATB**	R-NATB	R-NATB**	R-NATB
WRAT-R - Spelling $\geq$ 71	Higher GATB scores	GATB**	GATB**	GATB**	R-NATB	R-NATB	R-NATB*
WRAT-R - Arithmetic $\leq$ 70	Higher R-NATB scores	GATB**	GATB**	GATB**	R-NATB	R-NATB*	R-NATB
WRAT-R - Arithmetic $\geq$ 71	Higher GATB scores	GATB**	GATB**	GATB**	R-NATB	R-NATB**	R-NATB**

* - significant at the .05 confidence level
** - significant at the .01 confidence level

APPENDIX E
(continued)

As one can see, the various WRS and WRAT-R subtest "cut-off" score criteria (derived from GATB residual scores) were not able to consistently predict higher GATB vs. R-NATB aptitude performances. The major dynamic which was apparent was that borderline and mildly retarded subjects performed consistently higher on aptitudes G, V, and N of the GATB and scored higher on aptitudes S, P, and Q of the R-NATB, regardless of various WRS and/or WRAT-R subject "cut-off" score criteria. These results suggest that, since the established WRS and WRAT-R subtest "cut-off" score criteria predicted higher GATB vs. R-NATB aptitude performances correctly only 50 percent of the time, the feasibility of using such an inaccurate predictive screener for this purpose would be ill advised. Thus, in answer to the present study's Research Question #2 which asks whether the WRAT-R is a better predictor than the WRS of GATB vs. R-NATB aptitude performances, it must be said that both do so with about the same poor efficiency using the borderline and mildly retarded individuals in this study. Based on these results, neither the Wide Range Scale nor the Wide Range Achievement Test-Revised is a good predictor of GATB and R-NATB aptitude performances.

ATTACHMENT I

U.S. Department of Labor

Employment and Training Administration
601 D Street, N.W.
Washington, D.C. 20213

APR 3 1981

Mr. R. M. Barber
P.O. Box 93
Galax, Virginia 24333

Dear Mr. Barber:

This refers to your letter of March 16, 1981, regarding your research proposal "The Utility of the Revised Nonreading Aptitude Test Battery vs. the General Aptitude Test Battery with the Mentally Retarded".

I read your proposal and was very favorably impressed. The questions it addresses are important and the approaches you outline are appropriate ones for obtaining the data necessary to answer these questions. As we discussed on the telephone, my only suggestions are that (1) you provide for collecting in some systematic way the observations of test administrators regarding any problems in testing the samples (both NATB and GATB) and analyzing this information as it relates to improved test administration practices and identification of individuals for whom the test results are likely to be invalid, and (2) the GATB be administered even to those scoring two or below on both of the Wide Range Scale subtests so that there will be data on which to make conclusions as to applicability of GATB testing at this very low level of literacy.

As we discussed, I will contact Mr. Herb Campbell, Chief of the Southern Test Development Field Center regarding possibilities of computer assistance in data processing.

Sincerely,

Robert C Droege

ROBERT C. DROEGE
Personnel Research Psychologist
Division of Testing

ATTACHMENT II

UNIVERSITY OF SOUTH CAROLINA

COLUMBIA, S. C. 29208

COLLEGE OF EDUCATION

April 5, 1982

Mr. R. M. Barber
P. O. Box 93
Galax, VA 24333

Dear Mr. Barber:

Mr. Droege has informed me that you are using the revised Non-reading Aptitude Test Battery for your dissertation. In 1976, I used the NATB for my dissertation looking at the subtests and how they relate to the curriculum which was being used in various settings.

Please let me know what you are doing concerning the NATB. I am interested in doing a follow-up study to examine the areas that I found to be significant.

I look forward to hearing from you in the near future.

Sincerely,

Robert G. Monahan

Robert G. Monahan, Ed.D.
Coordinator
Orthopedically Handicapped

lg

ATTACHMENT III

COMMONWEALTH of VIRGINIA

Department of Rehabilitative Services
2728 Colonial Avenue, S. W.
Roanoke, Virginia 24015

April 8, 1982

Mr. Robert M. "Tommy" Barber
P. O. Box 93
Galax, Virginia 24333

Dear Tommy:

Your request for our assistance in your dissertation research project has been approved.

Our primary concern is that we continue to ensure the confidentiality of our clients' records. This would mean essentially that the client's identity remain anonymous or that their permission be obtained if specific client information is used.

Mr. Charles H. Merritt, our Assistant Commissioner, would like to have a copy of your research results.

I am sending a copy of this letter to Mrs. Alice Barker, Program Supervisor of our Wytheville Office, and to Miss Michelle Guy, Vocational Evaluator in Wytheville, as notice of this approval.

If I can assist you in any way with this project, please let me know.

Sincerely,

Lanny M. Harris

Lanny M. Harris,
Roanoke Regional Office

LMH
h

cc: Mr. James V. Snow
Mrs. Alice B. Barker
Miss Michelle M. Guy

ATTACHMENT IV

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CORRECTIONS
DIVISION OF INSTITUTIONAL SERVICES
MARION CORRECTIONAL TREATMENT CENTER

Morris
~~ANGLEONE~~
en

Marion, Va. 2435

August 10, 1982

Robert M. Barber
P.O. Box 93
Galax, VA 24333

RE: Research Proposal

I have reviewed your proposed research involving the Revised NATB and the GATB tests from the Department of Labor. I understand from discussing this research project with Mr. Barlow that you require only access to the institution and inmates assigned here and that you are to provide all testing materials. It appears that your project will be of benefit to the department. I have recommended to Mr. R.A. Young our regional manager that this project be approved and have forwarded your research proposal to Mr. Michael Jones, Research Analyst, for the Division of Program Development and Evaluation, Research and Reporting Unit. Mr. Jones will arrange for review by the Assistant Director of the Division of Institutional Services and by the Research and Reporting Unit.

I hope that the final reviews will be favorable to your conducting your research at this institution and look forward to working with you.

Cordially,

E.C. Morris, Warden

ECM/RDB/lgw

CC: Michael Jones, Research Analyst
R.A. Young

VITA

ROBERT MERLE "TOMMY" BARBER

Born: Christiansburg, Virginia April 1, 1946

FAMILY:

Wife:	Shelia G. Barber, formerly of Chilhowie, Virginia
Daughters:	Brandon Kay "Brandi" Barber, Born March 31, 1976
	Aimee Laurin Barber, Born July 12, 1981

PRESENT ADDRESS:

4648 Garth Drive, Salem, VA 24153

EDUCATION:

Graduate - Christiansburg High School
B.A. Degree from Emory & Henry College, 1968
Major - Psychology Minor - Geography
M.S. Degree from Virginia Commonwealth University
Major - Industrial-Applied Psychology

Attended University of Virginia (Summer 1972) and Virginia Commonwealth University (Evening Class, Fall 1972) to become a certified Virginia School Psychologist

MILIARY EXPERIENCE:

1968 - 1974	U.S. Army Reserve

WORK EXPERIENCE:

Professional

1983 - Present	School Psychologist, City of Salem Public Schools Part-Time VASAP Instructor for the Roanoke Valley Alcohol Safety Action Program (A Rehabilitative Approach to the Drinking Driver)
1975 - 1983	Galax City Public Schools as School Psychologist/Supervisor of Special Education, Football Coach
1973 - 1975	Carrol County-Galax City Schools as School Psychologist for Project Score (Title VI-B)/ Football Coach
1972 - 1973	Hanover County Schools as School Psychologist Statistician

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1971 - 1972	Hanover County Schools as Assistant Principal at Mechanicsville Elementary School (1/2 Time)
1970 - 1972	Hanover County Schools as Teacher and Coach at Lee-Davis High School

Industrial - Government

1969 - 1970	Virginia Department of Labor and Industry -

Summers

1968	Hercules Powder Company - Industrial Engineer's Assistant
1966	Hercules Powder Company - Quality Control Inspector
1964	Virginia Department of Highways - Highway Inspector Assistant

Community Recreation

1967	Christiansburg Recreation Department - Director of Summer Recreation Department
1965	Christiansburg Recreation Department - Assistant Director of Summer Recreation Department

MEMBERSHIPS:

Professional Organizations

Virginia Education Association (1970-Present)
Virginia Association for Children with Learning Disabilities (1973-1982)
American Psychological Association (1975-1984)
Council of Exceptional Children (1978-1986)
Virginia Association of Special Education Administrators (1978-1983)
Southwest Virginia School Psychologist Association (Chairman, 1976-1978)
National Association of School Psychologists (1987-Present)
Virginia Association of School Psychologists (1984-Present)
Roanoke Valley School Psychologist Association (Chairman, 1987-1989)

Honorary Societies

Who's Who in American Colleges and Universities
Blue Key Honorary Society
Psy Chi Honorary Fraternity (Psychology)

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R.M. Tommy Barber

Community, Church, Fraternal, etc.
First United Methodist Church of Salem (Present)
Phi Gamma Phi (Emory & Henry, 1965-1968)

PUBLICATIONS:

Article accepted for publication in the British Journal of Social and Clinical Psychology entitled "Varied Instructions of the Choice-Dilemmas Questionnaire and Their Effects on Risk-Taking Behavior" by R.M. Barber and J.J. Harnett, 1974, Vol. 13, pp. 125-129.

Article accepted for publication in the Journal of Behavioral Analysis entitled "Modification of an Entire School Populations' Attendance" by R.M. Barber and R. Kagey, 1977, Vol. 10, pp. 41-48.

Same article published in Therapies for Behavior Problems, editors H.L. Millman, C.E. Schaefer, and J.J. Cohen, Jossey-Bass Publishing, Inc., San Francisco, CA, 1980, pp. 29-32.

Article accepted for publication in the Crystalist entitled "A Linguistic, Total Language Arts Approach is Successful with Galax City's Handicapped" by R.M. Barber, 1981, Summer Edition.

Co-Author of text entitled "Individual Vocational Projects", Associates of Industrial Training Systems, Roanoke, VA, 1983.

Article accepted for publication in the Response entitled "Job Readiness for Battered Women: One Shelter's Experience by M. Caudill, B. Cline and R.M. Barber, Center of Women Policy Studies, Washington, D.C., Fall 1985.

MAJOR CONFERENCE PRESENTATIONS:

"Model Kindergarten Screening System", 1976 Virginia Testing Conference, Charlottesville, VA, July 1976.

"Applied Psychology in High School Football", 1977 New River Coaches' Association Clinic, Blacksburg, VA, March 1977.

"A Consistent Approach to Job Analysis, Vocational Assessment and Individual Vocational Training for the Handicapped", 1979 Conference for Career Education for the Handicapped, VPI & SU, Blacksburg, VA, April 1979.

VITA
R.M. "Tommy" Barber

"Creating Cultural Enrichment Trips for the Handicapped", 1981 Council of Exceptional Children's National Convention, New York, NY, April 1981.

"Vocational Assessment of Mentally Handicapped -- A Generic Approach", 1981 1st Annual Vocational School Psychology Conference, VPI & SU, Blacksburg, VA, May 1981.

"The Use of the GATB and Revised NATB in Vocational Assessment of the Handicapped", 1982 2nd Annual Vocational School Psychologist Conference, VPI & SU, Blacksburg, VA, May 1982.

"Galax's Generic Vocational Model", 1983 Virginia Model Secondary Special Education Programs Conference, Virginia Department of Education, Lynchburg, VA, June 1983.

"Salem's Athletic Drug Intervention Program", Tidewater Rotarians, "War Against Drugs" Conference, Newport News, VA, May 1987.

"Salem's Athletic Drug Intervention Program", Virginia High School Coaches Association Annual Clinic, Lynchburg, VA, July 1987.

"The Psychologist of the Middle-Aged Child in the Classroom", Virginia D.A.R.E. Training Conference, Longwood College, August 1987.

"Salem's Athletic Drug Intervention Program," Annual Conference of Virginia Athletic Directors, Richmond, VA, April 1988.

"Salem's Pledge Program", Annual Pupil Personnel Conference, Virginia Beach, VA, April 1990.

Signature: Robert Merle "Tommy" Barber