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ABSTRACT

Evaluated were the diagnostic and identification implications of the Primary Mental Abilities Test (PMAT) with 241 educable retarded, learning disabled, slow learning, and normal children (mean ages 8 to 9 years). Correlations between PMAT scores and Stanford Achievement Test scores were significant for the low IQ Ss, but not for the normal IQ Ss. Cluster analysis indicated a clear distinction between low and normal IQ Ss with no other distinguishable variables (such as sex or score patterns). Data suggested that while the PMAT was not useful for early identification of learning disabled or underachieving children, it was an efficient diagnostic test for children with lower intellectual ability. (CL)

Diagnostic and Identification Implications of the Primary Mental Abilities Test for Educationally Deficient Children

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Mental testers have attempted to discern particular patterns on standardized test instruments for the purpose of classifying children on the basis of a profile or pattern which is typically produced by one exceptionality. Clements (1966) has identified three patterns on the Wechsler Intelligence Scales which are indicative of children who have been identified as having a learning disability. Pattern One would show vast variability of subtest scores on both the verbal and performance scales. Pattern Two would be depressed performance and high verbal scale scores. Pattern Three would depict a suppressed verbal scale score and a high performance subtest score. Other researchers have identified patterns of performance which may slightly differ from Clements' (Bannatyne, 1971).

The use of test scores for identification and classification has been stretched to include diagnostic implications as well. Kirk and McCarthy (1961) have suggested educational strategies for children who have particular patterns on the Illinois Test of Psycholinguistic Abilities (ITPA). Kirk and Kirk (1971) also stress educational procedures for children who exhibit particular ITPA patterns.

Even with the recent criticism by Ysseldyke and Salvia (1974) of diagnostic-prescriptive strategies advocated by Kirk (1971) and Bush and Giles (1969) programs utilizing a basic process strategy persist.

The first implication of the use of standardized instruments seems to be the most effective, that is, classification, which is an outstanding contribution of such instruments. David Wechsler (personal appearance, 1975) stated, "What other instruments, medical or behavioral, for such a small price, has the ability to predict for such a long period of time."

If particular tests can exhibit patterns which would predict homogeneous grouping of children, then the task of the educator would be greatly lessened.

Recent early identification studies have attempted to predict that, at a younger age, certain children are more or less likely to have learning difficulties. The idea being that the earlier a child is identified, the easier it will be to help him overcome his deficit. The idea that early identification should be based on defining educational deficits in relation to specific skills needed for adequate performance is expounded by Rubin and Balow (1971). By giving teachers four criteria for analyzing educational handicaps, it was found that 41.1% of the subjects (Ss) analyzed met at least one of the criteria and that 24.3% had either been placed in a special class, retained, or received special services. Since both of these figures are well over the medical-categorical estimate of 12.7% for all types of exceptionalities, an alternative to the medical-categorical prediction is indicated. Keogh and Becker (1973) advocate the use of early identification procedures to remediate problems of the child rather than as predictors of long-term educational success. In addition, they state that remediation should be based upon behavioral observations rather than on standardized tests. Haring and Ridgeway (1967)

also found that teachers, given specific criteria for prediction, could accurately identify children with developmental retardation. The only common factor for predicting learning disabilities was found to be a general language factor.

Novack, et al., (1973) devised the Rhode Island Pupil Identification Inventory as an early means for identification of children with learning difficulties. The device was found to be a fairly good predictor. A group screening device developed by Hartlage and Lucas (1973) was also found to be a fairly good predictor for grouping children into appropriate teaching methods categories according to the needs of the child in learning to read.

The implication that identification can be used to begin remediation of immediate learning problems and that certain learning problems can be identified by the pattern that they exhibit in a diagnostic instrument holds certain educational value. The present study of the Primary Mental Abilities Test (PMAT) in regard to these two areas was undertaken to discern the validity of using the PMAT as such a screening device. The PMAT was selected as the diagnostic instrument for five reasons. First is the ease with which the PMAT may be given as opposed to individual tests of intelligence since it is a group test that may be given by a classroom teacher. Secondly, a test given in a classroom more closely associates the true learning situation in which the child as a learner is placed. Third, the PMAT offers both raw scores (for use in studying patterns) and deviational IQs. Fourth, the PMAT is an outgrowth of Thurstone's construct that certain mental activities have a common factor that separates these mental activities from groups of mental activities, and that each of these other groups had its own primary factor. In regard to

identification of learning difficulties, then, the PMAT should give an indication of where the child's strengths and weaknesses lie in relation to the four subtests. Finally, the PMAT would fit easily into the first stage of the diagnostic-remedial approach advocated by Bateman (1965), who advocates five stages, wherein the first stage determines a significant discrepancy between ability level and present performance. Following this step is a behavioral analysis and description of performance as is also advocated by Keogh and Becker (1973), and Haring and Ridgeway (1967).

Research on the PMAT's validity for use with children who have developmental disabilities has been centered in two areas. The first being the concurrent validity of the PMAT to individual tests of intelligence, and the second being the predictive validity of the PMAT as compared to standardized tests.

Mueller (1965) tested the concurrent validity of the five tests of ability and found a significant correlation between the Stanford-Binet and the PMAT. Mueller (1969) states that the PMAT should be considered as a legitimate alternative for testing large groups of children. The point is also made that a group test is much more analogous to the school setting than is the individualized test. Others who have found significant correlations between group or easily administered tests of ability and individualized intelligence tests are Houston and Otto (1968), and Pikulski (1973).

As part of two larger studies, Mueller (1965, 1969) also found that the PMAT is a good predictor of achievement as tested by standardized achievement

tests. In both the 1965 and 1969 studies, Mueller also tested the significance of the PMAT as a predictor of success on tests which required learning during the tests (e.g., a Paired Associate Task). Once again the results were found to be significant.

The PMAT was found to be superior to the Slossen Intelligence Test (SIT) by MacKinnon and Elliot (1969). Although the difference between the PMAT and SIT correlations with a standardized achievement test was not significant, the authors point out that where six or more children are to be tested, the the PMAT is considered to be more efficient and less time consuming with no loss in validity.

Another investigation has compared the mean IQs of normal and retarded Ss (Clausen, 1970). As would be expected, there is a large difference in the elevation of the scores as plotted on a frequency polygon. Poteet (1970) found that the PMAT total IQ and some subtests are able to indicate children with specific learning disabilities.

Purpose

The purpose of this study is to investigate the following:

1. Is the PMAT an accurate predictor of achievement as shown on a standardized achievement test?
2. Can the PMAT be a useful instrument for the early identification of LD youngsters when a cluster analysis (Q sort) technique of numerical taxonomy is applied to the scores?
3. Can the use of the cluster analysis technique of numerical taxonomy when applied to the scores be helpful in identifying unique groups of children?

Method

Subjects. Subjects for this study were selected from a larger study in which the PMAT 2-4, and Stanford Achievement Test (SAT) Primary Battery, Form W, were given. The sample of 241 students was made up of students in grades one through four and in special education classes for the educable mentally retarded (EMR), learning disabled (LD), and slow learner (SL). In addition, some students in the regular classes took part in special reading classes since they were, in some cases, over one year behind in reading ability.

This sample contains 1) children normal in ability and achievement, 2) children low in ability and achievement, and 3) children normal in ability but low in achievement. This final group is either identified LD or children with high risks of being LD.

Four groups of children were devised for the study:

Group	Sample Six	Average CA (mos.)
Normal IQ, male	[illegible]	106
Low IQ, male	79	108
Normal IQ, female	37	104
Low IQ, female	47	105

Two analyses were done on the data obtained from the above Ss. The first analysis was the Pearson product moment correlation between PMAT scores and attained achievement as measured by the Stanford Achievement Test.

Due to the limitations of the data anlysis system, it was necessary to reduce the number of individuals in each group for the second analysis, cluster analysis (Q sort Technique). Twenty-five (25) Ss were drawn at random from

each of the four groups to facilitate the analysis. Since the observations were drawn at random, this should have no effect on the validity of the analysis.

Procedure. The PMAT and the SAT were both given to the Ss on the same day as part of the regular school routine. The tests were administered to entire classes by professional educators, graduate students and seniors in undergraduate Special Education curricula. Instructions for administration of the tests were followed exactly from the test manual.

In order to answer the first question, correlation coefficients were obtained between five raw scores from the PMAT and five raw scores from the SAT. The raw scores for the PMAT were from the Verbal Meaning, Spatial Relations, Number Facility, and Perceptual Speed subtests and the PMAT total raw score. The scores for the SAT were from the Word Reading, Paragraph Meaning, Vocabulary, Arithmetic subtests and the SAT raw scores.

In an attempt to answer the second and third questions, Q technique (Cattell, Coulter, Tsujioka, 1966) was applied to the PMAT and SAT raw scores. This cluster analysis groups individuals according to the similarity of their scores. An unweighted averaging of scores was used in this cluster analysis since it produces less distortion of the phenogram when it is compared to the original similarity matrices (Sneath & Sokol, 1973).

Results

The PMAT total raw score correlated significantly with the SAT total raw score for both of the low IQ groups, males $r = .87$, females $r = .79$, $p < .0001$. Little significance was found for the normal IQ groups. The Number

Facility subtest of the PMAT correlated significantly with all SAT subtests and with the total SAT raw score for all four groups. Table 1 presents these correlation coefficients.

Insert Table 1 about here

The Number Facility subtest produced the highest correlation coefficients with SAT total raw scores. The second highest prediction score, by IQ group, was obtained with the total PMAT score. The only discernable patterns observed were in relation to group membership. Total PMAT scores were observed to correlate much less with normal IQ Ss than with low IQ Ss. A notable exception was that the Number Facility subtest predicted well for normal IQ female Ss, but not nearly as well for male counterparts.

The unweighted averaging cluster analysis produced a phenogram which revealed two major groups of individuals with several smaller but less distinct subgroups in each. Table 2 shows the percentage of individuals from each of the four groups which fell into two groups of similar individuals.

Insert Table 2 about here

The analyses indicate a clear dichotomy between low and normal IQ groups regardless of group gender. No distinguishable variables such as sex, pattern of scores, or IQ-achievement discrepancies were discernable from the phenogram.

Discussion

From the results, a number of conclusions can be drawn regarding the usefulness of the PMAT as an instrument for early identification. The first of these conclusions is that the PMAT is a much better predictor for academic achievement of low IQ youngsters. The correlation coefficient for the PMAT total compared to the SAT total were significant for both low IQ groups, while the same correlation for normal IQ groups hardly approaches significance.

The cluster analysis gives additional information about the usefulness of the PMAT. A closer look at Table 2 reveals that 72% of Group I of the cluster analysis consists of individuals from the two normal IQ groups while Group II of the cluster analysis consists of 80% individuals from the two low IQ groups. In essence, the similarities cluster reveals that there are two large groups of individuals, one high IQ, the other low IQ. If the PMAT and SAT combined score differentiated LD youngsters, then there should have been a third major group of individuals. The cluster analysis of similarities did not identify as similar any of the individuals from the LD classes or from special reading classes. These individuals do not have similar scores on these two tests.

The data presented in this study suggests that the PMAT is not useful for early identification of educationally deficient youngsters for two reasons. First, it is not a good predictor of achievement for normal IQ youngsters as measured on a standard achievement test. Secondly, similarity clustering does not reveal a unique group of LD or underachieving youngsters.

Another implication for early identification is that the PMAT and SAT cluster analysis did not differentiate a male-female contrast. Even though males make up the greater percentage of the educationally deficient category, according to Mumpower (1970), the cluster analysis did not reveal this group either. Male and female educationally deficient youngsters did not present uniquely similar scores on the PMAT.

The PMAT does offer an early identification screening device for children with lower intellectual ability. It should, of course, not be considered as a replacement for an individual intelligence test, but as Mueller (1969) suggests it could be an efficient, time conserving instrument for basing referral for further evaluation. The classroom teacher could use the results of the PMAT as part of the basis for recommendation of a child for a special education evaluation. This would increase the efficiency of the diagnostic remedial process by reducing the number of unnecessary evaluations.

The consistency of the PMAT Number Facility subtest, high correlation with all raw scores and total SAT for all four groups, suggests that this particular test must be measuring a general level of ability for all of the individuals. If this is the case, then this single subtest could be a useful part of a pre-evaluation battery for administration by classroom teachers. This subtest would be of use for early identification of both learning disabled and mentally retarded youngsters. A high score on the Number Facility test together with lack of achievement, either observed in class or as measured by a standard achievement test, would give the child's teacher a basis for further observation for possible referral for a complete evaluation.

Finally, as Keogh and Becker (1973) suggest for the purpose of early identification, the PMAT can be used for implementation of remedial programs rather than for long-term prediction of success in school. The findings of this study indicate that the efficacy of using results from the PMAT for the educational planning of the mentally retarded group is justified, but the efficacy of the use of the PMAT in the evaluational planning of the learning disabled group or children of average intellectual functioning is questionable.

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Table 1

Correlation Coefficients for PMAT to SAT Total

IQ Groups on SAT-Total

Raw Score

PMAT Score	Group 1	Group 2	Group 3	Group 4
	Normal IQ	Low IQ	Normal IQ	Low IQ
	Male	Male	Female	Female
Total	0.27	0.87	0.08	0.79
Probability	0.01	0.0001	0.62	0.0001
Number Facility	0.79	0.89	0.87	0.85
Probability	0.0001	0.0001	0.0001	0.0001

Table 2

Percentage of Individuals within the Two Groups of the Cluster Analysis

Cluster Analysis	IQ Groups			
	1	2	3	4
	Normal IQ	Low IQ	Normal IQ	Low IQ
	Male	Male	Female	Female
Cluster Group I	41%	20%	31%	8%
Cluster Group II	3%	32%	17%	48%