

A CORRELATIONAL STUDY OF THE
METROPOLITAN ACHIEVEMENT TEST
ADMINISTERED IN THE THIRD GRADE
AND THE TENNESSEE STATE
CRITERION-REFERENCED TEST
ADMINISTERED IN THE EIGHTH GRADE

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by
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To the Graduate Council:

I am submitting herewith a Research Paper written by Karen Shahan Calnan entitled "A Correlation Study of the Metropolitan Achievement Test Administered in the Third Grade and the Tennessee State Criterion-Referenced Test Administered in the Eighth Grade". I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Psychology.

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CHAPTER I

INTRODUCTION TO THE PROBLEM

Parents, employers and educators are mandating their schoolboards, boards of education and legislators for minimum competency requirements for the student in public education.

Minimum competency tests are perceived by the public to require the student to demonstrate his mastery of acquired basic skills before he is able to receive a high school diploma. This dissatisfaction with education evolves from parents' concern with the decrease of scores on nationally administered tests, like the Scholastic Aptitude Test (SAT), and the rise of educational costs while enrollment is declining. Employers are concerned because high school graduates are entering the job market with difficulties in filling out forms, reading schedules and understanding simple computations. Educators are disheartened by college students needing remediation before starting core curriculum classes (Cawelti, 1978; Pipho, 1977; Wise, 1978).

As early as 1958, a survey carried out by the city of Denver, Colorado, showed that area businessmen considered a high school diploma to indicate attendance in school for 12 years, with no guarantee of acquired skills (Minter,

1978). A Gallup Poll shows that 65% of the voters favor a nationwide examination for high school students (Gallup, 1976). Evidence of the depth of this public feeling for assessment and accountability is found in the fact that all 50 states report some legislative or stateboard activity (study, planning, discussion, drafting, implementation) in the area of setting standards for schools or students (Miller, 1978).

The Tennessee State Board of Education initiated legislation to implement a Student Evaluation Program on November 10, 1977. This program includes a requirement that by 1982, all candidates for high school graduation must pass a proficiency test in basic skills as a prerequisite for receiving a diploma (Tennessee State Department of Education, 1977).

The test developed for this requirement is the Tennessee State Criterion-Referenced Test. It is currently being administered to all eighth grade students in the Tennessee Public School System. The arbitrary cutoff score is 70% in any of the four achievement areas (math, spelling, language, reading). If the scored test is below 70% in a subject area, the student is recommended for a remediation class.

Initially, the requirement and the implementation of the Tennessee State Criterion-Referenced Test and the

passing of an established cutoff score of 70% seems uncomplicated. If the student passes 70% of the questions on the Tennessee State Criterion-Referenced Test, he will receive a diploma and if he does not meet the cutoff score, he will obtain a certificate of attendance. This would place a meaning of achievement upon the high school diploma. The diploma would then signify that the student has acquired skills and competencies to face society and life as a constructive citizen. The diploma would also represent that the twelve years of time, money and teaching has been a valuable undertaking by taxpayers, educators and parents.

A closer appraisal of the requirement and the implementation of a state-wide competency test raises questions that need to be answered (Brickell, 1978; Kosecoff, 1976; Marlowe, 1976). Is it feasible to use a criterion-referenced test for large-scale evaluation? Is it the most appropriate and practical instrument for large-scale assessment of competencies for graduating students from high school? Is the minimum competency test cutoff score on the Tennessee Criterion-Referenced Test a "fair" one? Who determines what the cutoff score will be? Are new students (transfers) to the district subject to the same requirements, even though they have already completed much of their high school work elsewhere? What about students in special education programs who speak English

as a secondary language, come from deprived backgrounds, and are a minority or ethnic group? Are they subject to the same requirements? How are students to be identified as having passed or failed the proficiency examination after remediation? Will they have another chance to take the test? Will students receive the same diploma, or certificate of attendance, even though some students pass the requirement and other students may be exempt from them?

When introducing a new educational program into the public school system, many financial, logistical, and curriculum related problems must be solved. For example, it becomes apparent that more personnel are needed to administer, monitor, and score test results (once a good criterion-referenced measurement is developed). Administration schedules must be set and instructional materials developed. Parents, teachers and students must be informed of the requirements and how they are to be met by the public school system. Remedial teachers, testing materials and classrooms must be provided.

STATEMENT OF THE PROBLEM

The purpose of this study is to examine the arbitrary cutoff score of 70% on the Tennessee State Criterion-Referenced Test as compared to the percentiles of an established norm-referenced test, the Metropolitan Achievement Test.

This correlation will be accomplished by comparing third grade Metropolitan Achievement Test scores to eighth grade Tennessee State Criterion-Referenced Test scores using the same subjects.

Limitations of the Study

1. The study was confined to students presently enrolled in the Montgomery County Public School System, Clarksville, Tennessee.

2. The students utilized in this study had taken both the Metropolitan Achievement Test in the third grade and the Tennessee State Criterion-Referenced Test in the eighth grade.

CHAPTER II

REVIEW OF THE LITERATURE

Assessment measurements are designed to indicate the quantity of a particular characteristic a student can demonstrate. To ascertain and index "how much" the individual has exhibited on a test requires a quantitative scale. Tests used in pass-fail decisions inevitably use a quantitative scale on which a critical "passing" or "cutoff" score has been placed. These quantitative scales are not easy to establish because the individual abilities and characteristics being assessed are complex and often abstract.

Glaser (1963) maintains that it is difficult to assess existing levels of competence, style of instruction and achievement through any type of test. He cautions against any use of a test score as absolute in education. Many studies in education and psychometrics support Glaser's argument against the use of a single test score as a determinate in education (Bunda, 1978; Cawelti, 1978; Crambert, 1976; Haladyna, 1976; Hills, 1977; Howell, 1978; Kosecoff, 1976; Meskauskas, 1976; Miller, 1978; Millman, 1973; Pipho, 1977). However, these arguments do not eliminate the need for some type of assessment instruments.

The two predominant types of assessment measurements

are the norm-referenced test and the criterion-referenced test. The essential difference between these two constructs is in test interpretation and scoring. The norm-referenced test uses a quantitative scale in which a score is formulated in relationship to other individuals taking the test. This score expresses "how much" the student knows relative to the other members of his group. The criterion-referenced test uses a quantitative scale on which a score is derived in relationship to the specified performance standards from defined objectives. The criterion-referenced test is constructed by using either instructional or educational objectives and the measurement is not influenced by the number of people who take the test.

The norm-referenced construct has been employed for centuries. In ancient China, male students were given a culture and knowledge examinations (in relationship to others of their age) and the highest ranking students were permitted to continue in higher education (Anastasi, 1976). During World War I, tests were developed by the Army of the United States to screen out military draftees with mental handicaps and to identify the intellectually superior candidates for officer training. These norm-referenced tests were the Army Alpha and the Army Beta (Shertzer & Stone, 1974).

The criterion-referenced test is a newer construct.

It was derived from the need by educators to develop another type of measurement to ascertain the individual student's competencies, in relation to a specific curriculum united with the appeal in using educational and instructional objectives in teaching and testing. Distinctions between these two types of assessment measurements were pioneered by Flanagan (1951) and Ebel (1962); but, it was Glaser (1963) who first used the term "criterion-referenced" when explaining a test based on objectives and not on a specific group of individuals (Ebel, 1962; Glaser, 1963; Glaser & Nitko, 1971; Haladyna, 1976; Meskauskas, 1976; Nitko, 1974).

The quantitative measure on a norm-referenced test is usually an interval state based on the average level of performance for a particular group of individuals being tested. The quantitative scale on a criterion-referenced test is usually concerned with the extremes. The top of the scale indicates complete or perfect mastery of a specific competency and the bottom of the scale indicates a complete absence of the skill (Bernknopf, 1979; Crambert, 1976; Ebel, 1971; Nitko, 1974).

There appears to be two basic approaches to the use of criterion-referenced tests in education. The first approach is based on an "all or none" philosophy. Either the student has mastered the specific objective or he has

not. The criterion-referenced test is founded upon an educational or instructional objective (domain) and mastery is only achieved when that objective is totally reached. This philosophy is based on the educational theory that learning is developmental and sequential. The individual student cannot progress until he has mastered a basic skill or competency (Anderson, 1972; Bloom, Hastings & Madaus, 1971; Nedelsky, 1954).

This "all or none" approach to criterion-referenced testing is called a "state-model" by Meskauskas (1976). He evaluated two current models used for this type of errorless mastery and concluded that the "state-model" based criterion-referenced tests should only be used for diagnostic purposes, pretests or posttests, in conjunction with a single learning unit situation and not used for cumulative skill assessment. He stresses that the "state-model" assessment techniques are incomplete and possess a danger of misapplication by educators. He suggests further research is needed before employing a "state-model" technique to criterion-referenced tests for student assessment.

The second approach is that criterion-referenced scoring is not absolute, but on a continuum. The quantitative scale has equal segments (units) between a perfect master of some competency to a total absence of that

competency (Ebel, 1971). This paper will deal exclusively with this aspect of criterion-referenced scoring and the establishment of a cutoff score used to show minimum competency of a skill for high school graduation.

Psychometricians and educators are at variance about the designs and statistics to be used in validating norm-referenced and criterion-referenced competency-based tests. Empirical studies have been and are being conducted in the major areas of test application, reliability, validity, item analysis, useability, guessing, achievement, and risk-taking behaviors between these two types of assessment measurements. From these studies evolved one conclusion: the major difference between the norm-referenced and the criterion-referenced competency-based tests is the use of a cutoff score by the criterion-referenced test and where it is placed on the quantitative scale (Benson & Crocker, 1976; Lovett, 1977; Millman, 1973; Mills & Hambleton, 1979).

Anderson (1972) and Crambert (1974) analyzed the relationship between norm-referenced tests and criterion-referenced tests. They concluded that norm-referenced tests are applicable for selecting a few students from many who are to receive honors or are to gain an exclusive college admission from a particular group of individuals. In all other educational purposes, the norm-referenced and the criterion-referenced tests have the same limits

except for the dependence on a cutoff score by the criterion-referenced test.

Haladyna (1976) investigated the philosophical and the psychological descriptions of norm-referenced and criterion-referenced tests and compared both instruments. He found that both instruments have the same characteristics during testing. The differences occur prior to and following testing; namely, in the writing of the test items and the interpretation of the scores.

Bernknopf (1979) expanded the definition of criterion-referenced scoring by observing that it is not the desire of the school system to discriminate between the students by their degree of competency. It is the intent of the educators to discriminate only between those students who have reached the required minimal level of competency and those who have not. The crux of using a criterion-referenced test for large-scale assessment is the requirement that a minimum competency cutoff score must be established for student evaluation. Literature implies that this cutoff score and its placement on a quantitative scale is both arbitrary and subjective.

Crambert (1976) reviewed various empirical methods pertaining to the establishment of criterion-referenced test cutoff scores. He concluded that in educational situations, there is seldom a clear basis for the

establishment of a single minimal competency cutoff score. He observed that little research has been conducted to confirm the value of a cutoff score in criterion-referenced testing and the score that is used has been determined only on a subjective basis.

Gronlund (1973) developed a trial-and-error procedure for the establishment of a cutoff score. This procedure directs that an initial arbitrary standard be established. Then the cutoff score is adjusted upward or downward by the educator, upon the basis of his experience and judgment.

Other articles stress the need for additional research in criterion-referenced testing and the establishment of cutoff scores for large-scale assessment. These articles express a necessity of precise empirical evaluations of criterion-referenced scoring; yet, they fail to explain how these studies should be conducted (Elford, 1977; Fink, 1976; Haladyna, 1976; Kosecoff, 1976; Miller, 1978; Mills, 1979; Mione, 1977; National Education Association, 1975).

Cutoff scores or criterion levels can be established by the federal government, the state government, or by local school districts. The evaluation and placement of the minimal competency cutoff score can be determined by five general methods:

1. Cutoff scores can be determined through the use of a panel of experts in the specific curriculum being

critiqued. The panel estimates the percentage of students that could be expected to answer the criterion-referenced questions on the test correctly without guessing. From these figures, the cutoff score is established. There seems to be a high correlation of the panel's estimates of competency difficulty correlated to the scores on competency-based tests when this method is applied (Angoff, 1971; Bernknopf, 1979; Millman, 1973; Nedelsky, 1954).

2. Cutoff scores can be determined through the use of established scores from the past performances of high school graduates. This data can be used by schoolboards on the local level, by boards of education at the state or national level, and by professional psychometricians employed to develop tests under contracts for education. The scores and its data are used to establish criterion-referenced constructs containing the competencies needed for the student to function well in the job market, society, and for a productive life. In using the data from a group of past high school students and by ranking their performances, this method can be applied to both criterion-referenced and norm-referenced scoring; yet, in criterion-referenced testing it is only applicable when an established number of students are able to "pass" the minimal competency cutoff score (Block, 1971; Kosecoff, 1976; Millman, 1973).

3. Cutoff scores can be determined on the basis of

educational funding available for testing and remediation. If the school system has little money for testing and the expenditures are high for program implementation, the school system may establish a low cutoff score on its criterion-referenced test requirements for a high school diploma. When the cutoff score is set low on the quantitative scale, it allows the average and below average students to graduate with a diploma without the costs that remediation and retesting would involve if that student had failed the cutoff score (Brickell, 1978; Crambert, 1976; Millman, 1973).

4. Cutoff scores can be established to decrease the number of eligible candidates for graduation from high school with a diploma. This is an arbitrary method that is applied to criterion-referenced competency-based assessment programs due to social or political influence which is objectively applied for a specific outcome. If the cutoff score is established too high, it reinforces the poor student that he has no hope for graduation with a diploma. This frustration may be shown by apathy with school and ultimately end by the student dropping out of high school as soon as the law will allow. If the cutoff score is established too low, in order to improve the performance of the marginal student, it could lull the average and the above average student into complacency.

This would cause the minimum cutoff score to be viewed as the maximum required in knowledge and effort.

Opponents of minimal competency-based programs for high school graduation have charged that social, racial, and exceptional student testing bias is occurring because of the established single cutoff score in criterion-referenced testing (Cawelti, 1978; Crambert, 1976; Fisk, 1977; Hills, 1977; Jennings & Nathan, 1978; Millman, 1973; Wise, 1978).

Bunda (1978) discussed the political and the social problems of a flooded job market for high school graduates. She presented a description of a process used by educators and legislators, in some locations of the country, that systematically controls the job market by raising their cutoff score standards to cut down on the qualified students with a high school diploma seeking employment.

Bonham (1977) contends that when a state imposes a single cutoff score for the graduation of high school seniors with a diploma, it is effectively denying young people (many of whom are minority students) a "basic entry card" into an already competitive job market. He states that the real issue is not the push for minimal competency standards, but discrimination against minority youth.

Jennings and Nathan (1978) believe there is a real danger that exceptional students with special needs and

talents will suffer because schools will not have the funds for both competency-based testing programs with remediation classes and programs that support foreign languages, music, art, vocational studies and special education programs.

Bernknopf (1979) cites several court decisions that have ruled in the favor of the state by having the right to determine the minimum level of competency, but ruled that the specific cutoff scores were chosen arbitrarily (U.S. v State of North Carolina, 1975; Georgia Association of Educators v J. Nix, 1975; Armstead v Starkville Municipal Separate School District, 1975).

4. The final method is used in conjunction with the proceeding four methods, a refinement of the criterion-referenced cutoff score. It is the establishment of the cutoff score with an allowance made for error due to guessing or for poor test performance due to sickness, stress or distractions (Benson & Crocker, 1976; Lovett, 1977; Millman, 1973).

Additional systematic approaches to the problem of establishing criterion-referenced cutoff scores have been proposed in the attempt to make placement of the score on the quantitative scale more objective. Two methods proposed are the establishment of confidence bands around the passing score or by having the cutoff score on a sliding scale. This would minimize the misclassification

of a student who is right on the borderline of receiving a diploma or an attendance certificate (American Friends Service Committee, 1978; Brickell, 1978, Millman, 1973; Nitko, 1974).

In the state of Tennessee, the Tennessee State Board of Education determines the arbitrary cutoff score on the Tennessee State Criterion-Referenced Test. The Tennessee State Board of Education contracted a professional testing service to develop, validate, publish, and recommend the scoring procedures for the State School System. When the Tennessee State Board of Education was considering legislation to require all candidates for high school graduation to pass a proficiency test in basic skills as a prerequisite for a diploma, it reviewed other school systems that already had minimal competency programs in practice. The model that was implemented for Tennessee came from Denver, Colorado. Denver's program has been in use for the longest time and data from their testing can be scrutinized. This 19 year old plan was reviewed by Beal (1978). He outlined the present procedure employed by the Denver program, yet he did not discuss the cutoff score or how it was established. The proficiency tests are administered in the ninth grade during December and April. Make-up tests are given twice a year in the tenth and eleventh grades. The students in the twelfth grade are given

several opportunities to take the test, if they have not passed all competency sections. Parents are notified twice a year, on the report card, of the student's standing in each of the four competency areas. The students who have failed a competency area are given skill analysis reports and these reports serve as the basis for remedial classes. Special summer classes are given to twelfth grade students, who have not passed a skill area on the proficiency test. In this plan, a pupil who receives a certificate of attendance may return to the Denver Board of Education, at any time, and take the subtests the student had not passed. If the student is successful, he receives his high school diploma. According to Beal (1978), the main goal of the Denver, Colorado's competency-based program is the growth and education of the student. The student will always be able to obtain help of their school board and their educators.

This section has cited some articles and studies evolving the topic of criterion-referenced testing and the importance of the valid, empirically substantiated, cutoff scores being used for graduation from high school with a diploma. Many of the articles reviewed did not discuss the true importance of the establishment of a cutoff score in criterion-referenced testing. The cutoff score is the real determinate on which the whole program is

established. A closer look at the determination and the application of the cutoff score in criterion-referenced testing is genuinely needed (Bunda, 1978; Fink & Kosecoff, 1976; Miller, 1978; Nitko, 1974; Pipho, 1978).

Kosecoff (1976) concludes that there is no currently available criterion-referenced test that is feasible for use in large-scale evaluations. The available minimal competency-based criterion-referenced tests are not documented or the reliability and validity are simply not known. Therefore, the cutoff score interpretations are not meaningful for student assessment. He maintains that both norm-referenced and criterion-referenced measures can be used for decisions concerning the competency of students. Criterion measures indicate the level of performance of students on certain objectives, while the norm-referenced measure indicates the proportion of individuals who have met given criteria. This present study compares a competency-based measure and a norm-referenced test taken five years earlier and examines their implications of educational decision making and remediation.

CHAPTER III

PRESENTATION AND INTERPRETATION OF DATA

Subjects

This study compared the performance of eighth graders on the Tennessee State Criterion-Referenced Test (TSCRT) with their performance on an established norm-referenced test, the Metropolitan Achievement Test (MAT), taken when they were in the third grade. The data collected came from the cumulative records of 100 students from the Montgomery County School System, Montgomery County, Tennessee.

Procedures

Scores were taken from the Tennessee State Criterion-Referenced Test containing four subtests: Math (MA), Spelling (SP), Language (LG), Total Reading (RD), and correlated to scores taken from the Metropolitan Achievement Test containing nine subtests: Word Knowledge (WK), Word Association (WA), Total Reading (TR), Language (LG), Spelling (SP), Math Computation (MCom), Math Concepts (MCon), Math Problem Solving (MPS), Total Math (TM). Means, standard deviations, and zero-order correlations were computed for all 13 variables. These correlations are given in Table I. All correlations were significant beyond the .05 level.

Regression equations were computed between the TSCRT subtest and the MAT subtest with which it correlated most highly to determine the probability of passing the TSCRT for students at each stanine on the MAT. These data are summarized on Tables 2 through 5.

Although the MAT is a good predictor of the TSCRT, it is evident that most of the students who are identified by the eighth grade test as needing remediation are not classified as poor students in the third grade. It appears that the 70% cutoff score on the TSCRT is a higher-than-average performance when compared with a nationally normed measure.

CHAPTER IV

CONCLUSION

Criterion-referenced tests for large-scale assessment of students in high school requires the use of a cutoff score that designates "passing" with a high school diploma or "failure" with a certificate of attendance. The data presented in this paper shows that the "average" student by established national standards would be required to take a remediation class in the areas of Reading (30%), Math (35%), Spelling (39%) and Language (56%). If the "average" student has not been able to meet the Tennessee state standard of 70% on the required measure used for graduation, what happens to the students from the lower portion of the quantitative scale? If the students with an average stanine of 5 are now required to attend remediation classes in Tennessee, how will the Tennessee Public School System afford to pay the added expenses of materials, classroom space, educators and record keeping? What of the students that really need remediation--will they be lost in the over crowded facilities?

These data indicate that the arbitrary cutoff score on the Tennessee State Criterion-Referenced Test is too high. Further research is needed for the establishment

of a realistic cutoff score on the Tennessee Criterion-Referenced Test before the test is a requisite for graduating from high school with a State approved diploma.

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APPENDIX

Table 1

Correlations between the MAT and the TSCRT

8 and 3

[illegible]

Table 2

Predicted Scores on the TSCRT		
MAT Stanine Language	Predicted TSCRT Score Reading	Probability of Achieving Minimum Standard (70%)
1	32	.002
2	40	.013
3	48	.051
4	56	.147
5	63	.302
6	71	.528
7	79	.749
8	87	.898
9	95	.969
Standard error = 13.39		

Table 3

Predicted Scores on the TSCRT		
MAT Stanine Language	Predicted TSCRT Score Math	Probability of Achieving Minimum Standard (70%)
1	44	.024
2	49	.055
3	55	.127
4	60	.224
5	65	.352
6	71	.532
7	76	.677
8	81	.799
9	87	.902

Standard error - 13.14

Table 4

Predicted Scores on the TSCRT		
MAT Stanine Spelling	Predicted TSCRT Score Spelling	Probability of Achieving Minimum Standard (70%)
1	48	.055
2	53	.108
3	57	.171
4	62	.281
5	66	.386
6	71	.528
7	75	.641
8	79	.745
9	84	.846
Standard error - 13.74		

Table 5

Predicted Scores on the TSCRT		
MAT Stanine Language	Predicted TSCRT Score Language	Probability of Achieving Minimum Standard (70%)
1	42	.022
2	50	.075
3	57	.174
4	65	.359
5	72	.556
6	79	.742
7	87	.891
8	94	.958
9	101	.987

Standard error = 13.87