8-1-1997

Group Achievement Tests as Predictors of Support Services in a Low Socioeconomic and Ethnically Diverse Population

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GROUP ACHIEVEMENT TESTS AS PREDICTORS

OF SUPPORT SERVICES IN A LOW

SOCIOECONOMIC AND ETHNICALLY DIVERSE POPULATION

An Education Specialist Field Project

Presented to the

Department of Psychology

and the

Faculty of the Graduate College

University of Nebraska

In Partial Fulfillment

of the Requirements for the Degree

Specialist in Education

University of Nebraska at Omaha

by

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August 1997

UMI Number: EP74187

UMI®

Dissertation Publishing

UMI EP74187

ProQuest®

Ed.S FIELD PROJECT ACCEPTANCE

Acceptance for the faculty of the Graduate College,
University of Nebraska, in partial fulfillment of the
requirements for the degree Specialist in Education,
University of Nebraska at Omaha.

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Date _6/25/97_

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Acknowledgments

I would like to thank Dr. Lisa Kelly-Vance for her guidance and encouragement throughout this process. Her positive attitude and energy gave me the inspiration to complete this project. My gratitude is extended to Dr. Joseph LaVoie and Dr. John Hill for serving as committee members and to Dr. Robert Woody for his support throughout my graduate school career. A special note of thanks to Deb White for her collaboration and cooperation in completing this endeavor.

Sincere appreciation is offered to my parents, sisters, and friends who provided words of encouragement during the past year. Specifically, I would like to thank Vern Davis-Showell, Doug Showell, Stephanie Rittmiller, and Durell Johnson for their friendship, support, and many acts of kindness. Finally, I would like to thank Marie Lee for her assistance in completing this paper.

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Abstract

Students' performance on a group administered test of
academic achievement, the <u>California Achievement Test-Fifth
Edition</u> (CAT/5) was compared to their participation or
nonparticipation in support services beyond the classroom.
The sample population was composed of second and fourth
graders from various socioeconomic and ethnic backgrounds.
Results indicated that a student's performance on the CAT/5
significantly discriminated between the Participation and
Nonparticipation Groups, regardless of race or socioeconomic
status. The Total Reading, Total Math, Total Language Arts,
and Battery Composite scores significantly contributed to
the total variance for group membership (Participation and
Nonparticipation Groups). Separate analyses were conducted
for each ethnic group including European-American, African-
American, Hispanic-American, Native-American and a group
composed primarily of Asian-American students with overall
classification accuracies of 74%, 72%, 70%, 63% and 84%
respectively. Results indicated that the national
percentile scores of the CAT/5 accounted for 23% of the
variance in the European-American sample, 26% in the
African-American sample, 22% in the Hispanic-American
sample, 22% in the Native-American sample, and 34% in the

primarily Asian-American sample. Ethnic and socioeconomic
status each contributed less than 1% of the total variance
for group membership. A chi-square analysis indicated that
no combination of CAT/5 domain scores at or below one
standard deviation of the mean increased the likelihood of
participation in support services. Results of the
investigation indicate that group administered test data may
be used as a component of an early identification procedure
for students who are at-risk academically. Implications for
practitioners and suggestions for future research are
discussed.

Chapter 1

Introduction and Statement of the Problem

Developing appropriate educational programs to meet the diverse needs of students in today's changing political climate while attempting to restrict and/or reduce spending in public education poses a dilemma for educational professionals. With the publication of Goals 2000: The Educate America Act in 1994, great emphasis is placed on helping students at-risk for academic failure achieve to their greatest potential while state and community legislatures continue to ask public school districts to do more with less funding. As educators approach the 21st century, they are faced with the task of helping an increasingly complex population of students achieve to higher standards.

According to Legters and Slavin (1992), the elementary school population of the 1990's is growing and becoming increasingly diverse. The number of children living in poverty is expected to rise from 12.4 million in 1987 to 16.5 million in 2020. Jones (1995) reported that since the late 1960's, the percentage of children living in poverty increased from 15.6% in 1969 to 21.8% in 1991. Approximately 45% of African-American children and 38% of Hispanic-American children live in poverty compared to 15%

of European-American children. Of specific concern is the number of single-parent households, most commonly headed by women, who live in poverty. According to the most recent census data, 60% of poor families with children under 18 years of age resided in female-headed households (Starrels, Bould, & Nicholas, 1994). Specifically, when living in female-headed households, 56.1% of African-American and 58.2% of Hispanic-American children live in poverty compared to 37.9% of European-American children.

Pungello, Kupersmidt, Burchinal, and Patterson (1996) found that low family income and minority ethnic status are significant risk factors for children's academic achievement. Ross, Smith, Casey, and Slavin (1995) pointed out that the number of students fitting the profile of "at-risk" is steadily increasing and is characterized by children from economically disadvantaged home environments. The authors added that creating early identification and intervention programs for children at-risk for school failure should be a priority for school districts because placing these students in special education programs is extremely costly.

When students' grades and/or classroom performance are significantly lower than their peers in the classroom, they are typically identified by their classroom teacher and

referred to some type of problem-solving or intervention team before a referral for special education is made (Salvia & Ysseldyke, 1995). Students with significant learning and/or cognitive impairments are typically identified in the primary grades; however, few studies have addressed the need to identify and provide intervention for students who may be at-risk for failure that are not performing significantly below their peers. For example, students with a learning disability in a specific domain (e.g., reading comprehension) may not be readily identified by classroom teachers because they are performing adequately in other areas. Although these students' needs may not be significant in comparison to their lower performing peers, over time the gap between their achievement and curriculum expectations gradually widens, creating a population of struggling students. According to White (1996) there is a population of students which is not readily distinguishable in the regular classroom environment who are performing somewhere between the norm and the lower end of the learning continuum, and therefore at risk for academic failure. These students are often overlooked by classroom teachers who may not identify a need for additional support services until the child has fallen significantly below grade level. Currently there are few objective, standardized methods of

screening all students in an attempt to identify those at-risk for academic failure.

Salvia & Ysseldyke (1995) stated that although traditional assessment procedures and decision-making processes have recently been questioned, "[p]rofessionals and the public alike believe that if we set high standards, test students, and hold them responsible, then students will get better" (p. xiv). However, it is clear that this teach-test method of instruction is not appropriate for all learners. Traditional assessment strategies have moved toward more ecological approaches, including portfolio and performance assessments. In addition, many states currently require some type of pre-assessment problem solving to identify areas of need and provide intervention for students in the regular education environment prior to referral for special education placement (Ross, 1995). Thus, the challenge facing educators as we move to the next century is to provide an appropriate education and to improve achievement for all students, especially those at risk for school failure, while continuing to face economic restrictions. Modifying screening and assessment procedures already in place versus creating new ways to identify and serve children in need of academic support services would be

a logical solution to the growing demands placed on public schools.

The use of standardized group achievement tests in the United States is a widely accepted method of measuring students' progress in the classroom. Test publishers as well as the assessment literature often support the use of group administered standardized tests of academic achievement as a valid screen that may be used to identify students' academic strengths and needs (Salvia & Ysseldyke, 1995). Group achievement testing has become standard practice throughout the country (Mitchell, 1992); however, results are not often used to make intervention decisions for individual students.

In recent years, standardized test results have been used for a variety of policy-related purposes including evidence of school and program effectiveness, school accreditation, and assessment of teacher effectiveness (Airasian & Madaus, 1983). This shift takes the focus of assessment away from the individual student's performance to the performance of groups of students ranging from classrooms to school districts. Although this shift provides policy makers and administrators with valuable data related to mass performance, useful information regarding individual performance may be lost in the group analysis of

test scores. Stone (1994) stated that the use of standardized group achievement scores to evaluate teachers' performance is a misuse of results. In addition, using results to judge a district's performance is not efficient, because assessing a random sample of students would be more cost effective and an equally reliable method of determining district progress. Similarly, Salvia and Ysseldyke (1995) state that "[a]ssessment is the process of collecting data for the purpose of making decisions about students" (p. 5).

Although school districts spend millions of dollars and commit valuable instructional time to administer groups achievement tests to compile annual assessment statistics, it appears that the information is rarely used to make educational decisions regarding individual student's school achievement (Airasian & Madaus, 1983). In an era where demands on public education are increasing while funds are diminishing, creating effective screening and intervention programs during the early elementary years to promote student achievement and decrease districts' reliance on expensive special education services is a prudent endeavor.

Using group administered achievement test data to identify students in need of additional support services appears to be a logical, yet rarely used, comprehensive screening method. There is a paucity of research (e.g.,

Lloyd, 1978; Payne & Payne, 1991; Stone et al., 1988; White, 1996) examining the relationship between students' performance on group administered achievement tests and their participation in support services beyond the regular classroom. In addition, minimal efforts have been made to explore socioeconomic and ethnic factors as they relate students' performance on group administered tests of academic achievement and participation in support services. The purpose of this study is to determine whether group achievement test data can accurately identify students in need of additional support services beyond the classroom in a population of economically disadvantaged students.

<div align="center">Review of the Relevant Literature</div>

<u>Students At-Risk for Academic Failure</u>

Factors that may contribute to academic failure include student characteristics and environmental factors such as ability level, motivation, socioeconomic status, and family structure. Pallas, Natriello, and McDill (1989) define educationally disadvantaged students as children who have not received adequate educational experiences in either the school, family, or community domain. The authors identified five key indicators typically associated with educationally disadvantaged children including; poverty, race, single-parent households, poorly educated mothers, and a non-

English speaking background. Hill (1989) explained that poverty, neglect, special education diagnosis, and racial minority status are conditions associated with at-risk status, while student behaviors related to school failure include poor attitude towards school, failure to complete assignments, and truancy.

In addition, Payne and Payne (1991) found that 84% of the students identified by teachers as at-risk for academic failure participated in a free lunch program. Rumberger (1983) found that family background, including socioeconomic status, is a powerful predictor of academic failure and school dropout behavior. It is clear that these factors are correlated with each other as well as poor school achievement, however, it is beyond the scope of this project to address each factor individually.

Poverty and low socioeconomic status are often defined as risk factors when discussing children's school performance; however, this factor is difficult to identify and measure precisely. Ricketts and Sawhill (1988) attempted to define the underclass and they determined that individuals living in socioeconomically deprived environments tend to perpetuate their poverty, transmitting it intergenerationally through their behaviors. Factors most highly correlated with the underclass included (a)high

school drop outs, (b) unemployment, (c) public assistance recipients, and (d) female headed households. Entwisle and Astone (1994) suggested that an accurate and complete measurement of socioeconomic status should include a student's financial capital (e.g., family income), human capital (e.g., parental education), and social capital (e.g., family structure). Using free and reduced lunch programs as a measure of socioeconomic status is convenient; however, school records may not be accurate and not all eligible students apply for meal subsidies, especially as they grow older. In addition, using free and reduced lunch as a poverty measurement fails to account for factors such as family composition and parental education.

However, it is often difficult to consistently measure these variables when working with large numbers of students in the public school systems. The most accessible measure of low socioeconomic status for school-age children is their participation in free and reduced meal programs. Pungello et al. (1996) found that students' participation in free and reduced lunch programs is highly consistent over time. Seventy-six percent of their sample of 1253 students remained in the same income category over the course of their four year longitudinal study. Thus, it appears that students' participation in public assistance programs such

as free and reduced meals is a reliable and valid measure of low socioeconomic status.

Legters and Slavin (1992) reviewed the trends and risk factors in the 1990's that contribute to academic failure in young students. They stated that once children move beyond the early grades, their performance in school (including grades, retention, and attendance) is the best predictor of school success or failure. However, because young students do not have significant learning histories, socioeconomic characteristics become more valid predictors of school performance in the early grades. The authors suggested that intervention strategies for early elementary students be geared toward those from disadvantaged environments with a shift of focus to individual performance and behavior occurring at approximately third- or fourth-grade when these factors become better predictors of academic success and failure. Using students' performance on group administered tests of achievement as a screen for those in need of academic intervention would provide a cost effective way to identify those at risk for failure.

Knoff and Batsche (1995) discussed a number of incentives, including the 1994 Congressional passage of Goals 2000: The Educate America Act, which were created to address the growing demands placed on the nation's

educational system. In summary, the authors determined
that (a) school districts are often not prepared to
effectively meet the needs of economically deprived
children, (b) evaluation procedures and intervention
strategies vary greatly among schools, and (c) parents
and students feel that schools have low expectations for
children at-risk for academic failure. Clearly, a uniform,
objective screening procedure is needed to meet the needs of
today's changing and increasingly needy public school
population.

Group Achievement Tests as Screening Tools

     Using standardized group achievement test scores to
assist in making recommendations for individualized
instruction appears to be a logical use for assessment data.
However, few studies have analyzed the use of group
assessment data as a tool to improve student achievement.
White (1996) found that third and fourth grade students'
performance on the Metropolitan Achievement Test-Seventh
Edition (MAT/7) significantly discriminated between those
students who received additional academic support services
and those who did not. The results indicated that composite
scores on the MAT/7 at or below one standard deviation of
the mean significantly predicted the likelihood that
students participated in some type of intervention service.

Intervention services included Chapter 1, Student Assistance Team Meetings (SAT), referral for special education services resulting in a multidisciplinary team meeting (MDT), and special education placement. These findings suggest that standardized group achievement tests may be a valid tool that can be used to screen for elementary students at-risk for academic failure. However, these results are limited because the sample was relatively homogeneous with only 5% of the total student population receiving free or reduced lunches.

An extensive review of the literature revealed only one other study that examined the use of standardized group achievement tests as a screening measure to identify students potentially in need of special education services. Stone, Cundick, and Swanson (1988) found that when the 5th percentile was used as a criteria cutoff score on group achievement tests, approximately half the special education population was identified while only a small minority of students in regular education fell at or below the cutoff point. Clearly, further investigation regarding the use of group achievement tests is needed to determine the most effective use for this type of assessment results. Because group achievement tests are used extensively by the majority of public school districts in the country, it would be

prudent to use the information they provide to its greatest potential.

Rush and Vitale (1994) found that the majority of research involving potential school dropouts has been viewed from a high school perspective, while identification and intervention strategies would be most beneficial in the early elementary grades. The authors stressed the need for more comprehensive and empirically based investigations of at-risk elementary school factors because the basic skills required for academic success are typically mastered in the early elementary grades. Ross, et al. (1995) state the following:

> Although effective programs for at-risk learners
> are needed at all educational levels, from
> preschool to high school, it is reasonable to
> assume that the earlier a program starts, the
> greater its potential impact. That is, if early
> learning deficits are prevented, there is less
> chance that failure will occur and that additional
> special interventions will be needed in higher
> grades. (p. 774)

At-Risk Students and Performance on Achievement Tests

It is widely accepted that children raised in deprived environments may be at-risk for poor academic achievement;

however, few attempts have been made to examine the relationship between low SES and students' performance on group achievement tests. A comprehensive report generated by a metropolitan school district in the South attempted to determine the relationship between specific student characteristics and students' performance on the California Achievement Test (CAT/5) ("Norm-Referenced Test Results," 1993). One of the variables identified in the study was low socioeconomic status as determined by students' participation in free lunch programs. The vast majority of students receiving free lunch services were identified as at-risk for school failure. When the at-risk population's scores on the CAT/5 were compared to the low risk students' scores (i.e., students not participating in the free lunch program), the results indicated that the low risk group performed consistently better on the CAT/5 at all grade levels.

Pungello et al. (1996) found that low socioeconomic status and minority ethnic status are important predictors of children's academic achievement as measured on the Science Research Associates Academic Achievement Test (SRA; Naslund, Thorpe, & Lefever, 1987) and the Iowa Tests of Basic Skills (ITBS; Hieronymous & Hoover, 1989). Ethnicity and low socioeconomic status were negatively correlated with

math and reading achievement as measured on the group administered tests of achievement. Regression analyses revealed significant main effects for low socioeconomic status and race, indicating that children from economically disadvantaged backgrounds and African-American students regardless of socioeconomic status obtained significantly lower reading and math scores on group administered tests of achievement.

There is conflicting evidence regarding the effect of race on students' performance on standardized measures of intelligence and achievement. Several studies (Cole, 1981; Schmidt & Hunter, 1981) support the hypothesis that standardized tests measure similar constructs in both African-American and European-American populations, regardless of socioeconomic background. However, Payne and Payne (1991) found that 81% of African-American students were identified as at-risk, while only 48% of European-American students were viewed as at-risk by their classroom teachers. Other investigators support the theory that standardized assessment tools are biased, resulting in over representation of minority students in special education services. This point of view was supported by litigation in the Larry P. v. Riles (1979) case that resulted in a ban on

the use of intelligence tests with minority students in the state of California.

Gleaves (1994) noted that African-American students as a group tend to perform poorly on standardized tests when compared to their European-American peers. The author suggested that standardized tests fail to reflect the competencies of African-American students because they do not measure students' personal skills, attributes, and knowledge outside of domains measured by the specific test. Because the majority of standardized tests are based on European-American values and culture, testing situations may create opportunities for failure for minority students. Because school districts routinely use standardized tests as a measure of students' academic competencies, minority students may see themselves as failures in educational environments, thus leading to poor school performance and high drop out rates.

Jones-Wilson (1986) explained that educational professionals are aware of the economic, social, environmental, and educational disadvantages that minority students endure, yet they continue to assess all students with standardized assessment tools that are designed around European-American culture and values. The author explained that standardized tests results "should be diagnostic and

prescriptive, with follow-up instruction, not punitive instruments for eliminating people from jobs or access to educational options" (p. 37). In reality, group administered test results are rarely used to design individualized intervention plans for students at-risk for academic failure.

Zigler (1995) reviewed a number of studies that addressed the relationship between low socioeconomic status and individuals diagnosed with mild mental retardation. The author found that children born to mothers with less than 12 years of formal education (i.e., high school drop outs) were more likely to be identified with mild mental retardation. Low maternal education was the strongest risk factor, independent of all other factors including race. Most likely, women with less than a high school education live near or below the poverty line, thus raising their children in economically disadvantaged environments. Zigler (1995) stressed the need for early identification and intervention services for children living in impoverished environments because low maternal education crosses racial and ethnic boundaries.

Taylor (1990) stated that the focus of assessment should move away from searching for bias-free standardized tests and toward nondiscriminatory evaluation as a process

that includes using tests with adequate norms and
standardization. Poor performance on group achievement
tests may be the result of factors such as a deprived
environment, test anxiety, distractibility, and emotional
stressors (Stone, 1994). Using significantly low
achievement test results as a red flag for further
investigation by educational professionals may provide
opportunities to appropriately serve students with a variety
of educational, behavioral, and emotional problems. The
goal of this study is not to determine if standardized group
achievement tests are biased towards a particular group of
students. Rather, the focus of this study is to determine
if a specific cut-off criteria is useful in identifying
those students who are in need of academic intervention and
if so, if the criteria is consistent for all students,
regardless of race or socioeconomic background.

Support Services for Children At-Risk for School Failure

Intervention assistance programs in public school
systems are widely used strategies designed to identify and
provide help to children in need of academic and/or
behavioral support in the regular education classroom.
Pre-referral strategies were designed to reduce the number
of students referred and placed into special education under
the creation of PL 94-142, The Education for All Handicapped

Children Act of 1975. Too often students in need of academic assistance are referred for a special education evaluation before appropriate screening and interventions take place (Ross, 1995). Intervention programs may have a variety of names including mainstream assistance teams, teacher assistance teams, student assistance teams, or instructional consultation teams. Whatever the name, their purpose is generally to bring together a multidisciplinary group of educational professionals to create problem solving strategies to assist children at-risk for failure.

Initial assessment and evaluation of students' skills is a critical component of any successful intervention program (Ross, 1995). However, effective screening procedures are difficult to create, and they often rely on classroom teacher referrals. In the state of Nebraska, students in need of additional academic support may be referred to Student Assistance Teams (SAT) or other problem solving groups by teachers, parents, administrators, or other school personnel (NDE Rule 51). Teachers are the most common and logical referral agents for children demonstrating academic difficulties because they spend the most time with students and they have daily exposure to students' academic performance. Several studies have reviewed classroom teachers' accuracy in identifying

students in need of special education services (Gresham, Reschly, & Carely, 1987; Hoge & Coladarci, 1989; Payne & Payne, 1991; Pedulla, Airasian, & Madaus, 1980; Stone, Cundick, & Swanson, 1988). In summary, the studies reviewed suggest that teachers are moderately to highly effective judges when they identify children who are at-risk for academic failure.

Fletcher and Satz (1984) compared Kindergarten teachers' predictions of their students' academic success with norm-referenced screening measures. The results of their outcome based study indicated that teachers and tests had similar validity in terms of overall hit rates. Teachers' predictions were highly accurate when made; however, they were characterized by low false positive rates and high false negative rates which resulted in missing 87% of students with severe reading difficulties when children were assessed in the second grade. Conversely, test predictions yielded higher false positive rates and lower false negative rates which missed only 32% of students with significant reading delays. Although teachers are typically correct when they identify children at-risk for school failure, combining their judgments with standardized screening procedures may improve their hit rates and reduce

the number of students that may be overlooked by more subjective methods of identification.

Payne and Payne (1991) point out that teachers may harbor stereotypes against students which can inhibit their ability to identify and teach at-risk students effectively. Teachers identified students as at-risk based on unsupportive home factors, attention problems, and poor attitude towards school, while neglecting to use the students' performance on standardized tests of achievement as an indicator. In addition, teachers may unintentionally or intentionally discriminate against students who are at-risk by not providing them with adequate corrective feedback, thus limiting their opportunities to learn (Bay & Bryan, 1992). Although teachers are fairly effective referral agents, it is critical to determine salient characteristics that lead to low academic achievement and to define a more objective, reliable process to identify those students in need of additional support services.

School districts typically have a variety of services available to students in need of academic support and remediation. Services range from structured programs such as special education and Title I to support via less formal methods. Support services may include curriculum modification, peer tutoring, behavioral and academic

contracts between the teacher and student, or school-wide interventions such as ability-based reading groups. Decisions made regarding students' educational performance using subjective and objective assessment data include pre-referral classroom decisions, entitlement decisions, post-entitlement classroom decisions, and accountability decisions (Salvia & Ysseldyke, 1995).

Student assistance teams. Students' access to support services are typically controlled by the classroom teacher who refers students to Student Assistance Teams (SAT). As previously stated, the SAT is a regular education function mandated by the Nebraska Department of Education Rule 51 that may include, but is not limited to, teachers, administrators, psychologists, student personnel assistants, and parents. The SAT:

- is a process of reviewing individual student problems.

- is a method of planning alternative strategies for regular classrooms.

- informs and involves parents in problem solving attempts and results throughout the SAT process.

- may lead to referral for testing and possible special education placement.

Most states require some form of pre-referral intervention and informal assessment phase before students are formally evaluated for special education services. Because group achievement tests are administered to all students, they provide educators with easily accessible, objective data regarding students' academic performance. Results could be used at the pre-referral stage to determine which children may require compensation or remediation in the regular education environment before they are officially referred to problem solving teams or formally assessed with individual measures of academic achievement.

Formally funded intervention programs. The goal of Title I programs is to help children in socioeconomically deprived schools succeed in regular education classrooms, attain grade level proficiency in reading and math, and improve academic achievement (U. S. Department of Education, 1983). Title I is the largest federal program designed to provide remediation services to disadvantaged students. During the 1991-92 school year, Title I served approximately 5 million children nationwide in over 90% of the nation's public school districts (LeTendre, 1991).

Students who continue to demonstrate academic difficulties despite classroom interventions and modified instruction may be referred for a special education

evaluation by a multidisciplinary team (MDT). Since the passage of Public Law 94-142 in 1975, school districts have provided special education services to children with a wide range of physical and mental disabilities. Eligibility for special education services is determined by a group of educational professionals including teachers, administrators, school psychologists, parents, and other educational professionals. Legters and Slavin (1992) point out that special education services for students with academic handicaps such as specific learning disabilities have increased by 250% from 1976 to 1989. They add that educational professionals are attempting to use costly special education services to meet the needs of children at-risk for school failure rather than creating effective screening and intervention procedures that may be used in the regular education environment. Creating a reliable and valid screening system in the early grades for at-risk students may enable educators, including school psychologists, to create interventions that may boost academic performance and decrease the number of students placed in special education.

Standardized Achievement Tests

The four most widely used group administered, standardized tests of academic achievement are the

California Achievement Test (CAT/5), the Iowa Tests of Basic Skill (ITBS), the Metropolitan Achievement Tests (MAT/7), and the Stanford Achievement Test Series. All provide various scores including percentiles, stanines, and grade equivalents for the test composite as well as specific academic domains (Salvia & Ysseldyke, 1995).

Rationale for the use of group achievement tests. Since the creation of the first standardized achievement test designed for use by schools, the Stanford Achievement Test (SAT) (Kelley, Ruch & Terman, 1922) in 1923, the group achievement test industry has created curriculum-based programs to teach the content of their tests (Haertel & Calfee, 1983). These "curriculum management systems" have facilitated the organization and fine tuning of classroom organization, objectives, and teaching procedures. Because standardized tests are generally linked to classroom instruction and objectives, students' performance on the tests provide useful information that may be used by school personnel to identify those in need of additional support services.

Airasian and Madaus (1983) stated that students' performance on standardized tests are important insofar as they permit the user to draw inferences and make useful decisions regarding a larger scope of interest. Because an

estimated $24 million is spent on academic achievement testing in the United States (Mitchell,1992), it is financially prudent to use results to their greatest potential. Achievement testing is conducted at various points across a student's educational career, thus it provides an opportunity to monitor educational progress over time. In addition, test results may effectively discriminate between students who are in need of additional support and remediation services versus those who are succeeding in the classroom without modified instruction. Standardized scores derived from group administered tests of academic achievement may be used as effective screening devices for children in need of additional support in the classroom because they provide a global estimate of academic skill development as well as an assessment of competency in specific domains such as reading and mathematics. Group assessment test scores coupled with behavioral data collected by school personnel may be an effective method of identifying children at-risk for school failure (Salvia & Ysseldyke, 1995).

Standardized achievement tests as screening devices. There is a paucity of research examining the relationship between students' performance on group achievement tests and their participation in support services such as SATs, Title

I, or special education. School psychologists spend approximately 50% of their time performing individualized assessment activities (Benson & Hughes, 1985); therefore, creating a more effective screening method for at-risk students may eliminate the need for unnecessary testing, enabling school psychologists to devote more time to individual and classroom interventions. As stated previously, Stone et al. (1988) found that the <u>Stanford Achievement Test</u> (SAT) series effectively discriminated between students in regular and special education programs at the fifth percentile. White (1996) determined the <u>Metropolitan Achievement Test-Seventh Edition</u> (MAT/7) significantly discriminated between those students receiving remedial and support services and those receiving no additional assistance. In addition, the CAT reading achievement scores of students in the third grade have been found to significantly correlate ($r=.37$) with later high school failure (Lloyd, 1978). Mantzicopoulos and Morrison (1994) provided further support for the use of standardized group achievement data. They identified students with reading achievement test scores below the 33rd national percentile in the second grade as poor readers, thus at-risk for academic failure.

Purpose of the Study

The purpose of this study is to determine the usefulness of standardized scores derived from a group administered achievement test as predictors for additional support services in elementary schools serving economically deprived populations. The focus of this investigation will be on students from economically disadvantaged environments because this factor appears to permeate the others, and to have a detrimental effect on families' ability to provide educationally stimulating environments and support for their children. It is clear that although several mechanisms are in place to identify and provide support to students in need of academic assistance, no objective, comprehensive system exists to screen all students, especially those from disadvantaged environments. White (1996) found that the Total Reading, Total Math, and Basic Battery percentile scores on the Metropolitan Achievement Test-Seventh Edition (MAT/7) collectively discriminated between participation and nonparticipation in educational support services such as Chapter I, Student Assistance Teams (SAT), Individual Assistance Teams (IAT), and Multidisciplinary Teams (MDT). According to the results, students' performance on the MAT/7 reliably predicted participation or nonparticipation in support services with a classification accuracy of 78% for

national percentile scores. However, interpretation of this study is limited by the homogeneity of the sample population. The majority of the participants were European-American students from middle to upper class families with only 5% receiving free or reduced lunches. Thus the primary research question of this study becomes:

Does a student's performance on a group administered test of a academic achievement significantly predict participation or nonparticipation in academic support services beyond the regular education classroom in elementary schools serving students from economically deprived backgrounds?

A criteria of one standard deviation below the mean is typically used to distinguish between average and low average performance on standardized tests with a mean of 100 and a standard deviation of 15. The 16th percentile corresponds with one standard deviation below the mean and will be used as the cutoff point for determining at-risk status.

Because this study attempts to replicate White's (1996) results with a population of economically disadvantaged students, with a different test of academic achievement, the following research questions will also be addressed:

1. Will students' performances on group administered tests of academic achievement discriminate between participation and nonparticipation groups less effectively in a sample of students from diverse racial backgrounds?

2. Will students' performing one standard deviation or more below the mean in either two or three areas (e.g., combinations of the composite scores and the total score) significantly increase the likelihood of participation or nonparticipation in a support program beyond the classroom?

Chapter 2

Method

Participants

A large sample (3340) of students from 38 Title I elementary schools in a large Midwestern metropolitan school district were included in this investigation. During the 1995-96 school year, the CAT/5 was administered to all students in the second and fourth grades. Students previously verified with a disability and receiving special education services before the 1995-96 school year were excluded from the investigation because this study examines the referral of students in need of support services in a regular education environment.

The sample consisted of 2076 second graders (1023 males, 1053 females) and 1264 fourth graders (614 males and 650 females). Table 1 presents the racial demographics by grade level of the sample population according to poverty level. Schools were ranked either high poverty or low poverty based on the percentage of students receiving free or reduced lunch. The median percentage of students in each building receiving free or reduced lunch was 63%, thus the school at or below 63% were identified as low poverty level and those above 63% were identified as high poverty level.

Table 1

Population Demographics by Race, Gender, and Poverty Level

	Grade		EA	AA	HA	NA	OA	Totals
		Male	605	337	54	16	11	1023
	2							
		Female	590	379	50	26	8	1053
All Participants		Male	373	174	54	10	3	614
	4							
		Female	399	193	41	7	10	650
		Male	308	111	17	1	6	443
	2							
		Female	293	134	11	7	4	449
Low Poverty		Male	155	49	10	2	2	218
	4							
		Female	185	47	11	0	4	247
		Male	297	226	37	15	5	580
	2							
		Female	297	245	39	19	4	604
High Poverty		Male	218	125	44	8	1	396
	4							
		Female	214	146	30	7	6	403

Note. EA=European-Americans, AA=African-Americans, HA=Hispanic-Americans, NA=Native-Americans, OA=Other Americans (Primarily Asian-Americans)

<u>Materials</u>

The California Achievement Test, Fifth Edition (CAT/5) is a group administered, standardized test designed to measure achievement in the classroom (CTB Macmillan/McGraw-Hill, 1992). Subject areas assessed are reading, language, spelling, mathematics, study skills, science, and social studies, and the items are organized in content areas by level. The CAT/5 is divided into 13 overlapping levels that range from Kindergarten through the 12th grade. The complete test battery provides both norm-referenced and curriculum-referenced information, and it is available in two parallel forms. The CAT/5 is designed to measure broad concepts taught by all curricula as well as measuring students' ability to apply information.

The CAT/5's technical bulletin reported Kuder-Richardson Formula 20 (KR20) coefficients and standard error of measurements for each subtest and group composite scores for the complete battery at all grade levels. Results based on second grade data indicated adequate internal consistency: Total Reading (r=.94); Total Mathematics (r=.93); Total Language (r=.93) with standard error of measurements of 3.13, 3.32, and 3.14 respectively. Results based on fourth grade data revealed similar results: Total Reading (r=.94); Total Mathematics (r=.94); and Total

Language(r=.93) with standard error of measurements of 3.78,
4.01, and 3.82 respectively. Although the CAT/5
demonstrates adequate internal consistency, information in
the test's construct and criterion-related validity is
limited.

Four procedures were used during the construction of
the CAT/5 to eliminate content bias. Initially, special
consideration was given to the content validity of each
item. In addition, the Guidelines for Bias-Free Publishing
(1982), which is designed to reduce test bias, were used by
all item writers. Each item was reviewed independently by
the content editor, the project director, a style editor,
and a proofreader. After items were approved, the test
items were reviewed by a panel of educational professionals
who represented various ethnic backgrounds. Items were
judged on various factors including the appropriateness of
language, subject matter, and representation of people.
Finally, empirically-based item bias studies were conducted
to eliminate items overlooked by subjective reviewers.

Independent and Dependent Variables

The independent variables were the Total Reading, Total
Mathematics, Total Language, and Battery Composite
percentile scores based on national norms on the CAT/5.
White (1996) found that national percentile scores accounted

for 5% more variance in group membership than local percentile scores. The dependent variable was dichotomous (i.e., yes/no) that a student participated in academic support services or did not receive support services.

The support services within the school district were uniform across the elementary schools included in the investigation. A total of 1203 students received some type of support beyond the regular education classroom. Some students received more than one type of support service; however, participants were coded in the participation group if they participated in at least one support service, regardless of the number of services they received. Table 2 presents the support programs and the percentage of participants who received each service by race.

Procedure

Approximately 20 school psychologists employed by the school district collected data from each of their assigned Title I elementary schools. Title I elementary schools were selected to provide consistent intervention services across buildings. In addition, schools that did not receive Title I funding were excluded because the focus of this study was on students from economically disadvantaged environments. Coding forms were provided to collect data and included the

Table 2

<u>Percent of Participants by Race in Each Support Program</u>

Support Service	European American (n=1967)	African American (n=1083)	Hispanic American (n=199)	Native American (n=59)	Other American (n=32)
SAT	10.2	20.7	14.1	23.7	6.3
Title I	24.1	44.2	30.7	52.5	9.4
Referral	2.6	5.9	4.0	8.5	3.2
Placement	1.9	3.3	2.0	6.8	3.2

<u>Note</u>. SAT = Student Assistance Team Meeting; Referral = Referral for Special Education Evaluation; Placement = Placement in the Special Education Program. n=Number of Students

following information: student name; student identification number; grade; gender; percentile scores on the Total Reading, Total Math, Total Language Arts, and Battery Composite of the CAT/5; and categorical scoring (yes = 1; no = 2) for Title I, SAT (Student Assistance Team Meeting), MDT (Multidisciplinary Team Meeting), and SPED (Special Education) placement. The name column was used only to facilitate data collection and was removed before data was entered for analysis.

<u>Analyses</u>

A series of discriminant function analyses were used to determine the degree of accuracy of the CAT/5 percentile

scores as reliable predictors of participation in educational support programs. As noted by Tabachnick and Fidell (1989), the discriminant function analysis (DISCRIM) is the preferred method of analysis due to DISCRIM's classification procedures and predictive ability. A discriminant function analysis was run for the national percentile scores to determine whether the two groups (participation and nonparticipation in support services) could be reliably separated on the basis of the predictor variables (CAT/5 Total Reading, Total Math, Total Language, and Test Composite percentile scores). Separate analyses were conducted to determine the utility of test scores as predictors of support services for European-American, African-American, Hispanic-American, Native-American, and Other (Primarily Asian-American) students. The discriminant analyses were performed by SPSS-X (SPSS Inc, 1990).

The purpose of data analysis was to determine the degree of relationship between group membership and the predictive value of the CAT/5 scores by how well they discriminated the subjects into Participation and Nonparticipation groups. A canonical correlation and univariate statistics were used to examine the relationships between variables. Once significant predictors were identified, a chi-square test was performed to investigate

the relationship between group membership and combinations of CAT/5 scores.

Chapter 3

Results

Table 3 presents the means and standard deviations of the <u>California Achievement Test/5</u> (CAT/5) percentile scores for the Reading Composites, Math Composites, Language Arts Composites, and Total Battery Composites at the national level for the sample population as a whole and separately for each ethnic group. The means for the European-American and Other (primarily Asian-American) participants' scores at the national level were higher in each composite area than all other ethnic groups, indicating consistently higher test performance by these sample populations.

Table 4 shows the percent of participants by race who (a) are standard deviation or more below the mean, (b) within one standard deviation above or below the mean, (c) one standard deviation or more above the mean for each of the CAT/5 sections.

> <u>Question #1</u>: Does a student's performance on a group administered test of academic achievement significantly predict participation or nonparticipation in academic support services beyond the regular education classroom in elementary schools serving students from economically deprived backgrounds?

Table 3

Means and Standard Deviations by CAT/5 Sections

	Reading		Math		Language		Composite	
	$\underline{M}$	SD	$\underline{M}$	SD	$\underline{M}$	SD	$\underline{M}$	SD
TL	54.0	29.2	59.6	30.9	59.4	30.2	58.1	30.5
EA	62.7	26.9	70.0	27.9	68.2	27.3	67.7	27.5
AA	39.6	27.2	43.6	29.4	44.8	29.1	41.9	28.6
HA	47.2	27.8	54.8	31.0	54.1	31.0	52.0	29.9
NA	43.9	28.0	51.0	30.5	46.1	28.0	46.7	29.9
OA	65.2	27.9	75.3	26.1	72.4	25.4	72.1	27.0

Note. The means and standard deviations are derived from the CAT/5 national percentile scores. TL=Total Sample; EA=European-Americans; AA=African Americans; HA=Hispanic-Americans; NA=Native-Americans; and OA=Other Americans (primarily Asian-Americans).

Table 4

Distribution of CAT/5 Scores by Race

CAT/5		Below	Average	Above
Reading	EA	13	46	41
	AA	37	49	14
	HA	27	55	19
	NA	36	47	17
	OA	16	41	44
Math	EA	11	36	53
	AA	34	47	19
	HA	24	41	35
	NA	22	51	27
	OA	9	25	66
Language Arts	EA	11	40	49
	AA	33	47	20
	HA	24	44	32
	NA	29	54	17
	OA	6	34	59
Composite	EA	12	40	49
	AA	37	48	15
	HA	25	49	26
	NA	31	42	27
	OA	9	34	56

Note. Number represent percentages. EA=European-Americans; AA=African Americans; HA=Hispanic-Americans; NA=Native-Americans; and OA=Other Americans (primarily Asian-Americans)

Question 1 was evaluated with a series of discriminant function analyses using the CAT/5 national percentile scores. The Reading Composite, Math Composite, Language Arts Composite, and Battery Composite were the independent variables and group membership (participation and nonparticipation in support services) was the dependent variable. The Participation Group consisted of students who received assistance from one or more support programs including the Student Assistance Team (SAT), Title I Reading or Math Program, Special Education Referral, or Special Education Placement. Students in the Participation Group received a variety of services ranging from a single program to all four support programs.

Discriminant function analysis using the SPSS-X (SPSS Inc., 1990) computer program were generated separately for each ethnic group, as well as for the sample population as a whole, using the national percentile scores. All Discriminant analyses specified a minimum tolerance level of .001, which was calculated from the determinant of the within-cell correlation matrix to detect singularity and multicollinearity. All predictor variables passed the minimum tolerance level test at the .001 level.

Table 5 presents the group means and standard deviations for participants in a support program and

Table 5

Group Means and Standard Deviations of the National

Percentile Scores by Group Membership

Sample	Group Membership		National			
			Read	Math	Lang	Comp
Total	Support (n=1203)	$\underline{M}$	34.8	41.5	39.3	37.3
		SD	26.1	30.0	27.7	27.8
	No Support (n=2137)	$\underline{M}$	64.8	69.9	70.8	69.7
		SD	24.9	26.4	25.1	25.3
EA	Support (n=552)	$\underline{M}$	43.2	51.8	48.0	47.2
		SD	27.2	30.5	28.4	28.6
	No Support (n=1415)	$\underline{M}$	70.3	75.6	76.1	75.7
		SD	22.6	23.7	22.3	22.4
AA	Support (n=540)	$\underline{M}$	26.3	31.0	30.6	27.4
		SD	21.9	25.4	24.1	23.0
	No Support (n=543)	$\underline{M}$	52.9	56.2	59.0	56.3
		SD	25.3	27.6	26.7	26.2
HA	Support (n=71)	$\underline{M}$	32.6	29.7	37.3	35.5
		SD	25.4	30.8	27.6	27.4
	No Support (n=128)	$\underline{M}$	55.4	63.2	63.4	61.1
		SD	25.8	27.8	28.9	27.2
NA	Support (n=35)	$\underline{M}$	37.0	43.9	39.1	39.3
		SD	27.9	32.0	27.5	30.0
	No Support (n=24)	$\underline{M}$	53.8	61.4	56.1	57.4
		SD	25.8	25.4	26.3	26.8

Table Continued

Sample	Group Membership		National			
			Read	Math	Lang	Comp
OA	Support (n=5)	M	36.8	42.6	45.6	40.8
		SD	30.0	31.6	36.4	33.3
	No Support (n=27)	M	70.4	81.3	77.3	77.9
		SD	24.6	20.4	20.1	21.8

Note: n=Number of Participants. EA=European-Americans; AA=African Americans; HA=Hispanic-Americans; NA=Native-Americans; and OA=Other Americans (primarily Asian-Americans)

participants not in a support program in this investigation. Results are presented for the sample as a whole and separately by ethnic groups.

A direct discriminant function analysis using the National Reading Composite, National Math Composite, National Language Arts Composite, and the Battery Composite scores of the CAT/5 as the predictor variables and group membership as the criterion variable for the entire sample population revealed a significant discrimination between the groups $[X^2(4,N=3340)=1046.09, p<.0001]$, where 4 represents the degrees of freedom, N is the number of participants, and 1046.09 is the chi-square calculation. The canonical correlation between the four predictor variables and group membership was .52, accounting for 27% of the variance

(lambda=.73). Lambda is the proportion of variance of the
independent variable that is not accounted for by the
predictor variables (i.e., error variance).

The standardized discriminant equation for Reading
(X^1), Math (X^2), Language Arts (X^3), and Battery Composite
(X^4) derived from this procedure is as follows:

$$D=0.74287(X^1)+0.48418(X^2)+0.75665(X^3)-0.83265(X^4)$$

where D is the discriminant function score calculated for
each participant, 0.74287 is the standardized raw score for
Reading, 0.48418 is the standardized raw score for Math,
0.75664 is the standardized raw score for Language Arts, and
-083265 is the standardized raw score for the Battery
Composite. The mean of D is zero and the standard deviation
is 1 since SPSS-X standardizes the discriminant function
coefficients by default (Marascuilo & Levin, 1983).

The group centroid for the Nonparticipation Group
(Group 1) was 0.45520 and the group centroid for the
Participation Group (Group 2) was -0.80862. The centroid
represents the mean of the discriminant function scores
within each group (Tabachnick & Fidell, 1989). The
discriminant function scores were used to classify the
participants into either the Nonparticipation Group (Group
1) or the Participation Group (Group 2). If a D score was
greater than zero, the case was classified into Group 1.

Conversely, if the D score was less than zero, it was classified in Group 2. The greater the distance between the participants score and the mean of zero, the greater the likelihood that the participant was classified in the correct criterion group (Marascuilo & Levin, 1983).

The classification results for the entire sample population are represented in Table 6. Results indicated that 74% of the Nonparticipation Group and 71% of the Participation Group were correctly classified with an overall hit rate of 73%.

Table 6

Classification Accuracy of the Entire Sample

Group	Number of cases	Predicted Group Membership	
		Group 1	Group 2
Nonparticipation (Group 1)	2137	1587	550
		74.3%	25.7%
Participation (Group 2)	1203	346	857
		28.8%	71.2%

Note. The hit rate for the Nonparticipation group is in the Group 1 column and the miss rate is in the Group 2 column. The hit rate for the Participation group is in the Group 2 column and the miss rate is in the Group 1 column.

Based on the discriminant function analysis, 875 participants receiving some type of support service beyond the regular classroom were correctly classified based on their performance on the CAT/5. However, 346 students did not receive services even though their performance on the CAT/5 suggested a probable need for additional support. Conversely, 1587 participants in the Nonparticipation Group were correctly classified while 550 received some type of support service even though their performance on the CAT/5 predicted no need for additional services.

A second discriminant analysis was generated with race (European-American, African-American, Hispanic-American, Other, and Native-American) and degree of poverty (high poverty or low poverty) added as predictor variables. Results indicated a significant discrimination between Participation and Nonparticipation groups [X^2(6,$\underline{N}$=3340)=1046.587, $\underline{p}$<.0001], where 6 is the degrees of freedom, $\underline{N}$ is the number of participants, and 1046.587 is the chi-square calculation. The canonical correlation between the six predictor variables and group membership was .52, accounting for 27% of the variance($\underline{lambda}$ =.73). The standardized discriminant equation for Reading (X^1), Math (X^2), Language Arts (X^3), Battery Composite (X^4), Race (X^5), and Poverty (X^6) derived from the discriminant analysis is:

$$D=0.73900(X^1)+0.48209(X^2)+0.75877(X^3)-0.83585(X^4)-$$

$$0.01414(X^5)-0.02529(X^6)$$

where D is the discriminant function score calculated for each participant, 0.73900 is the standardized raw score for Reading, 0.48209 is the standardized raw score for Math, 0.75877 is the standardized raw score for Language Arts, -0.83585 is the standardized raw score for Battery Composite, -0.01414 is the standardized raw score for Race, and -0.02529 is the standardized raw score for Poverty. The group centroid for the Nonparticipation Group (Group 1) was 0.45541 and the group centroid for the Participation Group (Group 2) was -0.80899.

Classification results for the entire sample population with race and degree of poverty added as predictor variables are presented in Table 7. Results indicated that race and degree of poverty each accounted for less than 1% of the variance.

Question #2: Will students' performance on group administered tests of academic achievement discriminate between participation and nonparticipation groups less effectively in a sample of students with diverse racial and economic backgrounds?

Table 7

Classification Accuracy Sample with Race and Degree of

Poverty as Additional Predictor Variables

Groups	Number of Cases	Predicted Group Membership	
		Group 1	Group 2
Nonparticipation (Group 1)	2137	1591 74.5%	546 25.5%
Participation (Group 2)	1203	344 28.6%	859 71.4%

Note. The hit rate for the Nonparticipation group is in the Group 1 column and the miss rate is in the Group 2 column. The hit rate for the Participation group is in the Group 2 column and the miss rate is in the Group 1 column.

Discriminant function analyses were created to analyze the individual hit and miss rates for the European-American population, the African-American population, the Hispanic-American population, the Native-American population, and the Other population consisting primarily of Asian-Americans. Classification results for each ethnic group are presented in Table 8.

Table 8

Classification Accuracy of the Sample by Race

Sample	Groups	Number of Cases	Predicted Group Membership	
			Group 1	Group 2
EA	Nonparticipation (Group 1)	1415	1082 76.5%	333 23.5%
	Participation (Group 2)	552	178 32.2%	374 67.8%
AA	Nonparticipation (Group 1)	543	386 71.1%	157 28.9%
	Participation (Group 2)	540	147 27.2%	393 72.8%
HA	Nonparticipation (Group 1)	128	91 71.1%	37 28.9%
	Participation (Group 2)	71	22 31.0%	49 69.0%
NA	Nonparticipation (Group 1)	24	17 70.8%	7 29.2%
	Participation (Group 2)	35	15 42.9%	20 57.1%

Sample	Groups	Number of Cases	Predicted Group Membership	
			Group 1	Group 2
OA	Nonparticipation (Group 1)	27	23 85.2%	4 14.8%
	Participation (Group 2)	5	1 20.0%	4 80.0%

Note. The hit rate for the Nonparticipation group is in the Group 1 column and the miss rate is in the Group 2 column. The hit rate for the Participation group is in Group 2 column and the miss rate is in the Group 1 column.

The first discriminant function analysis, analyzing the European-American data, resulted in a significant separation of the Participation and Nonparticipation groups [$X^2(4,\underline{N}=1967)= 512.16$, $p<.0001$]. The canonical correlation of .48 between the four CAT/5 percentile scores and group membership accounted for 23% of the variance (lambda =.77). The standardized discriminant function created for the European-American population using the CAT/5 Reading Composite (X^1), Math Composite (X^2), Language Arts Composite (X^3), and Battery Composite (X^4) is:

$$D=0.67771(X^1)+0.38377(X^2)+0.77424(X^3)-0.68969(X^4)$$

where D is the discriminant function score calculated for each participant, 0.67771 is the standardized raw score for

Reading Composite, 0.38377 is the standardized raw score for Math Composite, 0.77424 is the standardized raw score for Language Arts Composite, and -0.68969 is the standardized raw score for the Battery Composite. The group centroid for the Nonparticipation Group (Group 1) was 0.34084 and the group centroid for the Participation Group (Group 2) was -0.87372.

Results of the second discriminant function analysis for the African American population also revealed significant results [X^2(4,N=1083)=329.28, p<.0001]. The canonical correlation of .51 between the four CAT/5 scores and group membership accounted for 26% of the variance (lambda=.74). The standardized discriminant function derived from the percentile scores of the CAT/5 Reading Composite (X^1), Math Composite (X^2), Language Arts Composite (X^3), and Battery Composite (X^4) for the African American population is:

$$D=0.82748(X^1)+0.51609(X^2)+0.66607(X^3)-0.82967(X^4)$$

where D is the discriminant function score calculated for each participant, 0.82748 is the standardized raw score for Reading Composite, 0.51609 is the standardized raw score for Math Composite, 0.66607 is the standardized raw score for Language Arts Composite, and -0.82967 is the standardized raw score for Battery Composite. The group centroid for the

Nonparticipation Group (Group 1) was 0.59517 and the group centroid for the Participation Group (Group 2) was -0.59848.

The discriminant analysis that was generated for the Hispanic-American population revealed a significant separation of Participation and Nonparticipation groups [$X^2(4,\underline{N}-198)=39.441$, $\underline{p}<.0001$]. The canonical correlation between the four predictor variables and group membership was .43, accounting for 22 percent of the variance (lambda =.88). The standard discriminate equation created from the CAT/5 Reading (X^1), Math (X^2), Language Arts (X^3), and Battery Composite (X^4) scores derived from the Hispanic-American population is:

D=1.07124(X^1)+1.07839(X^2)+1.17612(X^3)+-2.04301(X^4) where D is the discriminate function score calculated for each participant, 1.07124 is the standard raw score for Reading, 1.07839 is the standardized raw score for Math, 1.17612 is the standardized raw score for Language Arts, and -2,04301 is the standardized raw score for the Battery Composite. The group centroids were 0.35085 and -0.63251 respectively for the Nonparticipation (Group 1) and the Participation (Group 2) groups.

A fourth discriminant analysis analyzed the Native-American population and results indicated a significant separation of the Participation and Nonparticipation groups

$[X^2 4, \underline{N}=57)=7.011, \underline{p} < .05]$. The centroid correlation between the four predictor variables and group membership was .35, accounting for 22 percent of the variance (<u>lambda</u> =.88). The standardized discriminate equation created from the CAT/5 Reading (X^1), Math (X^2), Language Arts (X^3), and Battery Composite (X^4) scores derived from the Native-American population was:

$D=2.92858(X^1)+2.60605(X^2)+2.29025(X^3)+-6,47849(X^4)$

where D is the discriminate function score calculated for each participant, 2.92858 is the standardized raw score for Reading, 2.60605 is the standardized raw score for Math, 2.29025 is the standardized raw score for Language Arts, and -6.47849 is the standardized raw score for Battery Composite. The group centroids were 0.043766 and -0.30011 respectively for the Nonparticipation (Group 1) and Participation (Group 2) groups.

A final discriminant analysis was generated to analyze the Other population, composed primarily of Asian-American participants. Results indicated a significant separation of the Participation and Nonparticipation groups $[X^2 4, \underline{N}=30)=11.638, p<.05]$. The canonical correlation between the four predictor variables and group membership was .58, accounting for 34 percent of the variance (<u>lambda</u> =.66). The standardized discriminate equation created form

the CAT/5 Reading (X^1), Math (X^2), Language Arts (X^3), and

Battery Composite (X^4) scores derived from the Other

population was:

$$D=1.22813(X^1)+1.62867(X^2)+1.22630(X^3)+-2.71241(X^4)$$

where D is the discriminant function score calculated for

each participant, 1.22813 is the standardized raw score for

Reading, 1.62867 is the standardized raw score for Math,

1.22630 is the standardized raw score the Language Arts, and

-2.71241 is the standardized raw score for the Battery

Composite. The group centroids were 0.29912 and -1.61525

respectively for the Nonparticipation (Group 1) and

Participation (Group 2) groups.

Question #3: Will students' performing one

standard deviation or more below the mean in

either two or three areas (e.g., combinations

of the composite scores and the total score)

significantly increase the likelihood of

participation or nonparticipation in a support

program beyond the classroom?

A chi-square test for the CAT/5 national percentile

scores was generated by the SPSS-X (SPSS Inc., 1990)

computer program to determine the relationship between

combinations of percentile scores and the students

participation in support services beyond the classroom.

Cases were placed into Group 1 if two composite scores were one standard deviation or more below the mean, Group 2 if three composite scores were one standard deviation or more below the mean, or Group 3 if all four composite scores were one standard deviation or more below the mean. The groups were mutually exclusive and students with no scores one standard deviation or more below the mean were excluded from the analysis. Table 9 displays the results of the analyses.

Table 9

Contingency Table for CAT/5 Score

CAT/5 Combinations	Participation in A Support Program	Nonparticipation in a Support Program
Two Scores	154	41
Three Scores	73	22
Four Scores	176	27

Note. Two Scores = Cases with two scores of the CAT/5 Reading, Math, Language Arts, or Battery Composite that were 1 SD or more below the mean; Three Scores = Cases with three of the CAT/5 scores 1 SD or more below the mean; Four Scores = Cases with all four of the CAT/5 scores 1 SD or more below the mean.

The chi-square test did not reveal a significant relationship between group membership and combinations of CAT/5 scores one or more standard deviations below the mean $[X^2(2, N = 493) = 17.343, p = .05306]$, where 2 equals the degrees of freedom, N is the number of participants, and 17.343 is

the chi-square calculation. Results indicated that no

specific combination of CAT/5 test scores at or below the

16th percentile increased the likelihood of participation in

support services beyond the classroom.

Chapter 4

Discussion

The purpose of this investigation was to determine whether a group administered test of academic achievement significantly discriminated between students' participation in support services beyond the regular classroom in an economically disadvantaged population. White (1996) previously found that the Metropolitan Achievement Test-Seventh Edition's (MAT/7) Total Reading, Total Math, and Basic Battery percentile scores collectively revealed a significant discrimination between students' participation and nonparticipation in support services at the National and Local Levels in a population composed primarily of European-American students from middle to upper socioeconomic environments (i.e., only 5% of the population participated in free and reduced lunch programs). White also found that the percentile scores at the national level accounted for 25% of the variance for group membership.

This study attempted to replicate previous findings in an ethnically diverse population from primarily low socioeconomic backgrounds using the California Achievement Test-Fifth-Edition's (CAT/5) Total Reading, Total Math, Total Language Arts and Battery Composite National percentile scores. Results indicated that the CAT/5 scores

significantly discriminated between participation and
nonparticipation in support services, accounting for 27% of
the variance for group membership. This replicated White's
(1996) findings suggesting that group administered tests of
academic achievement predict group membership equally well
in low and high socioeconomic populations regardless of
race. Other environmental factors and intrapersonal factors
such as single-parent household, poorly educated mothers,
poor motivation and classroom behavior, and intellectual
ability (Bay & Bryan, 1992; Lloyd, 1978; Pallus et al.,
1989; Payne & Payne, 1991) may also contribute to the total
variance for group membership.

A discriminant analysis used to classify cases into
Participation and Nonparticipation groups revealed an
overall classification accuracy of approximately 73% which
is similar to White's (1996) overall accuracy rate of 78%
when using the MAT/7 national percentile scores. The 5%
difference in overall accuracy rates may be attributed to
the different tests (MAT/7 versus CAT/5) or to the ethnic or
socioeconomic differences between the sample populations.

A second discriminant analysis that added race
(European-American, African-American, Hispanic-American,
Native-American, and Other) and poverty (high poverty versus
low poverty) to the discriminant equation indicated that

each accounted for less than 1% of the explained variance with an overall accuracy rate of 73%. These results suggest that students' performance on group administered tests of academic achievement are significantly better predictors of support services than race or socioeconomic status. Although characteristics such as race and poverty are significant risk factors when predicting students' academic success (Pungello et al., 1996), educators should access and use standardized test data when making recommendations for support services because these factors account for a greater percent of variance in group membership than race or poverty status. These results contribute to previous findings (Lloyd, 1978; Payne & Payne, 1991; Stone et al., 1988; White, 1996) that support the use of standardized achievement data as valid tools that may be used to plan interventions for students' academic success.

Once the predictive value of group achievement test data was established for the population as a whole, the second goal was to determine if students' performance on group administered tests of academic achievement discriminated between participation and nonparticipation in support services differently in groups of students from diverse racial backgrounds. Separate discriminate analyses for European-Americans, African-Americans, Hispanic-

Americans, Native-Americans, and Other (consisting primarily of Asian-Americans) indicated overall accuracy rates of 74%, 72%, 70%, 63% and 84% respectively. The results suggest that students' performance on the CAT/5 predict group membership in support services equally well, regardless of race; however, caution should be used when interpreting results for the Hispanic-American, Native-American, and Other categories because these ethnic group samples were significantly smaller. The European-American and African-American sample populations are larger, thus they produced more reliable results.

Hit rates for the Participation Groups were approximately 68% for European-Americans, 73% for African-Americans, 69% for Hispanic-Americans, 57% for Native-Americans, and 80% for the Other category. These hit rates, with the exception of the Native-American population, are similar to the 73% hit rate for teacher referrals for special education services alone (Salvia & Ysseldyke, 1995), suggesting that students' performance on group administered tests of academic achievement predict participation in support services as accurately as teachers' referrals for special education services. Combining teachers' subjective referral practices with objective data such as standardized group achievement scores may create a more effective

screening procedure for identifying students at-risk for academic failure. Adding test data as a predictor variable may reduce the occurrence of low false positive rates and high false negative rates that characterize teachers' predictions of students' academic success (Fletcher & Satz, 1984).

A factor contributing to the significant hit rates for the Participation Group is the high proportion of African-American and Native-American students receiving support services beyond the regular classroom. Approximately 50% of the African-American and 59% of the Native-American populations received some type of additional support services during the school year compared to 28% of the European-American population. In addition, ethnic minority students that received some type of additional support service performed worse than the European-American students who also received academic intervention. In general, African-American students in the Participation Group performed approximately 18 percentile points lower on each composite score than the European-American students in the Participation Group. Hispanic-American students performed approximately 11 percentile points lower on each composite score than the European-Americans and Native-Americans performed approximately 8 percentile points lower on each

composite score than their European-American peers. When using standardized test data to predict participation in support services, ethnic minority students that received some form of academic intervention consistently performed worse on the CAT/5 than their European-American peers, even though a disproportionate amount of ethnic minority students received some type of support services beyond the classroom.

Of particular concern are the miss rates for the Nonparticipation Groups in each ethnic category. These students received additional support services beyond the classroom even though their performance on the CAT/5 did not indicate skills at least one standard deviation below the mean. The miss rates ranged form 14.8% for the Other sample to 29.2% for the Native-American sample with an overall miss rate of 25.7% which is similar to White's (1996) overall miss rate of 22% when using the MAT/7. These students possessed average academic skills as measured by the CAT/5; however, they were referred for some type of intervention despite their abilities. Students may not be performing at a level commensurate with their ability for a variety of reasons including poor work-related skills (e.g., motivation or test anxiety) or high expectations of classroom teachers (i.e., low tolerance levels) (Slavia & Ysseldyke, 1995). These students may benefit from less formal intervention

strategies such as peer tutoring, reteaching strategies, and incentive programs, thus reserving formal types of support (i.e., Title I programs and special education services) for students who actually demonstrate academic deficits. Using standardized group achievement test scores as a post hoc screening procedure for students already receiving additional support may assist in identifying those individuals in need of motivational or behavioral interventions instead of academic-based strategies.

The miss rates for the Participation group ranged from 20.0% for the Other population to 42.9% for the Native-American population with an overall miss rate for the entire population of 28.8% which is approximately 5% higher than White's (1996) overall miss rate of 22.5%. Although these students' performance on the CAT/5 suggested a need for additional academic intervention, they were not referred for support services. White (1996) hypothesized that these individuals may be overachieving in the classroom or they may not be referred for support services due to teacher bias or high tolerance levels. Of particular concern is the 42.9% miss rate for the Native-American population. This indicates that nearly half of the Native-American students in the school district performed below average on the CAT/5 but were not referred for support services beyond the

classroom. Overall, nearly one-third of the second and fourth graders (363 students) that did not receive support services in this investigation appeared to be in need of some type of academic intervention based on CAT/5 data. Although this appears to be a significant number of students, White (1996) noted that it is more difficult to perform well than to perform poorly, thus a portion of the miss rate for the Participation Group may be attributed to extraneous variables such as poor test taking behavior or test anxiety. However, in general, results are consistent with previous findings suggesting that poor performance on a group administered test of academic achievement is a valid predictor of at-risk status in the early elementary years (Lloyd, 1978; Payne & Payne, 1991; Stone et al., 1988; White, 1996).

Once the predictive value of a group administered test of academic achievement was established for all ethnic groups, the final goal was to determine the relationship between combinations of percentile scores (i.e., Total Reading, Total Math, Total Language and Battery Composite) that were one standard deviation or more below the mean and group membership. White (1996) found that students were more likely to participate in support services beyond the regular classroom when all three percentile scores on the

MAT/7 (i.e., Total Reading, Total Math, and Basic Battery) were one standard deviation or more below the mean. However, an analysis of combinations of CAT/5 scores indicated no significant relationship with group membership.

Results were inconsistent and suggested that, although not statistically significant, a student was more likely to receive support services if they performed poorly on either two scores (Group 1) or all four scores (Group 3). Students in Group 1 may perform significantly worse on a single group of subtests (e.g., reading skills), producing a low Total Reading score which in turn results in a Battery Composite score that is at least one standard deviation below the mean. This may be characteristic of a student with a specific learning disability in the area of basic reading skills. Students in Group 3 demonstrated below average skills in all four areas. This population may represent underachieving students with poor motivation and/or students with more serious learning difficulties or mental handicaps. In general, results suggested that although poor performance on the CAT/5 is a valid predictor of participation in support services, specific combinations of composite scores on the CAT/5 do not significantly improve prediction.

<u>Implications for Practitioners</u>

It is important to note that many students who may be at-risk for academic failure are performing within the average range when compared to their peers, especially during the early elementary years. Although they are learning and they are not failing in school, over time they may lose motivation to succeed in school because they do not perceive themselves as valuable members of their school community where educational professionals' time and attention may be focused on high achieving, college-bound students. School districts that educate large proportions of high achieving students, as is common in the Midwest, need to devote instructional time and energy to their average students who may be at-risk academically in an attempt to keep them motivated to complete school (Hill, 1989). Creating methods to identify students at-risk for academic failure in the early grades may enable educators to develop individualized support programs for students that will provide them with opportunities to experience success in an educational environment.

The results of this investigation may assist educators in creating efficient and cost effective methods for screening students in need of academic intervention in the early elementary grades. White (1996) indicated that school

districts need to determine if their school's mean

performance on the achievement test differs from the

national mean (50th percentile). The author found that when

the means differ, local percentile scores are more accurate

in discriminating between participation and nonparticipation

in support services. If the means are similar, national

percentile scores should be used because they enable

educators to make comparisons with a larger representative

norm group. Once initial test data is available to

educators, student assistance teams at the building level

can identify those students falling below the specific

percentile cut-off points and refer them to the school's

problem-solving teams. Specific academic and/or behavioral

interventions can be generated and implemented with

referrals to more formalized support services (e.g., Title I

services or special education) if deemed necessary.

School psychologists can play a critical role as a

member of their buildings' problem-solving teams and as

consultants to classroom teachers when developing

interventions that may be used within the regular classroom.

This strategy would provide buildings with a standardized,

objective screening method to identify and monitor students

experiencing academic difficulties. Identification and

classroom intervention at the elementary level may provide

students with the support they need to remediate their beginning reading and math skills, thus reducing the likelihood of future placement into costly special education services.

However, once the initial identification procedure is completed, educational professionals should take a disconfirmatory approach in evaluating each student's needs (White, 1996). This approach guards against the potentially negative influence of labeling and self-fulfilling prophesies and enables educators to examine possible hypotheses for students' poor performance on tests of academic achievement. A disconfirmatory approach maintains that students are achieving at their potential and that an intervention plan can be created to alleviate academic problems before they have an opportunity to impair students' success within the classroom.

Additionally, given the significant discrepancy between European-American students' and ethnic minority students' performance on the CAT/5, separate norms could be generated for each ethic group at the local level to accurately reflect classroom teachers' comparisons between peers. If separate norms are not generated, significantly more minority students would be referred for academic interventions, adding to their over representation in these

support services. This approach creates a dilemma for educators because creating separate norms for each ethnic groups would create a situation that potentially can deny academic intervention services to minority students performing significantly lower than European-American students on tests of academic achievement, but not significantly lower than peers in their ethnic group. These findings suggest the existence of a population of ethnic minority students that are "falling through the cracks" in our educational system. Teachers and school psychologists may feel pressure from administration to reduce the number of ethnic minority students in formalized interventions such as special education. This discriminatory practice is unethical and denies valuable resources to at-risk students in an attempt to reduce their over representation in these support services. School districts need to be cognizant of these differences and develop strategies to improve minority students' academic achievement.

<u>Limitations</u>

The purpose of this study was to determine whether a student's performance on a group administered test was predictive of support services beyond the classroom in a diverse population from economically disadvantaged environments. This investigation was an attempt to

replicate previous research that supported the use of a group administered tests to predict support services in a population consisting primarily of European-American students from middle to upper class socioeconomic backgrounds (i.e., 5% participated in free or reduced lunch programs) (White, 1996). Although this investigation attempted to sample an ethnically and socioeconomically diverse population, the sample varied from a random population sample in the following ways: a) students previously receiving special education services were excluded from the study; b) the participation sample was restricted to second and fourth graders; and c) the mean scores at the National level were slightly different from the norm group (58th percentile versus 50th percentile).

Secondly, the support programs used in the investigation were primarily dependent on teacher referrals. As White (1996) noted, it is not clear whether results merely confirm teacher referral practices or support the use of standardized tests as an initial screen for children experiencing academic difficulties. At the very least, the results supported the predictive validity of group administered tests of academic achievement for additional support services beyond the classroom.

In addition, teachers' use of test data and/or test data's influence on teachers' current referral practices were not measured. Evaluating teacher's current referral practices would enable investigators to identify those who: a) based their initial referral on students' test performance; b) based their initial referral solely on student performance in the classroom; c) used test data as collaborative evidence for an initial referral; or d) did not use test data at all when making an initial referral (White, 1996). Also, program coordinators for the Title I program may have used CAT/5 data to identify students in need of the Title I math or reading services. It is unclear to what extent this identification procedure affected the predictability of test scores.

Finally, research examining the relationship between the MAT/7 to the CAT/5 is limited, thus it is not clear how well these two measures of academic achievement correlate with each other.

Future Research

As noted by White (1996), future research in this area needs to address the students who were misclassified by the discriminant function equations. Research needs to focus on those students in the Nonparticipation Group who received services even though their performance on the CAT/5

suggested no need for academic intervention. Determining why these students were referred, which programs served them, and how long they participated in services would enable educators to identify those students actually in need of academic intervention versus those students who were merely trapped in services they no longer require to experience success in the classroom. Conversely, what factors contributed to the students who were misclassified in the Participation Group? Are these students overlooked by educators or was their performance influenced by poor test-taking behaviors or test anxiety? Conversely, schools may have adopted an inclusive educational philosophy, thus identifying and serving academically at-risk students in their regular education classroom and reducing the likelihood of referrals for formalized interventions such as Title I services or special education. Answers to these questions may be provided by studies focused on teacher referral practices.

Finally, school districts need to conduct research to examine the inequity in test scores between ethnic groups. Are the tests inherently biased, resulting in suppressed test scores for minority populations or are schools failing to educate students from diverse ethnic backgrounds? Do group administered tests of academic achievement adequately

measure all children's strengths and needs regardless of race or socioeconomic background? Continuing to examine the effects of environmental variable such as poverty may help educators develop strategies to serve families from disadvantaged environments.

Conclusion

In summary, the findings from this study suggest that group administered tests of academic achievement can be used as effective screening procedures to identify children in need of academic intervention, regardless of ethnic background or socioeconomic status. Educators must work together to develop successful strategies that may be implemented as soon as students with special educational needs are identified as identification procedures are not useful without a plan for intervention. The results of this investigation support the use of group achievement test data for the initial identification of students who are at-risk for academic failure. However, further research must address the discrepancies among the test scores between ethnic populations before the predictive value of a group administered test can be confirmed.

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