AN INVESTIGATION OF THE RELATIONSHIP

OF CERTAIN PREDICTIVE VARIABLES

AND ACADEMIC ACHIEVEMENT OF

SPANISH-AMERICAN AND

ANGLO PUPILS IN

JUNIOR HIGH SCHOOL

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ii

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

In certain geographic regions of the United States,
the importance of obtaining meaningful and pertinent in-
formation relative to the measured intelligence and
achievement of different ethnic student groups in today's
school systems cannot be overemphasized.

In the process of establishing themselves in this
Country, the various immigrant groups have tended to lo-
cate in geographic areas particularly suited to their
economic advantage. This factor, along with their incli-
nation for cultural compatibility, has resulted in sizable
formations of mixed ethnic groups in certain locales.

Since World War II, there has been an increasing dis-
semination throughout the United States of these various
ethnic groups from their original locations, but in one
region, the Southwest, the mobility of the Spanish-
American ethnic group has remained relatively stable,
although there has been a numerical increase of Spanish-
Americans (128, p. 6).

There is an increasing awareness among concerned
educators that the additional number of ethnic student

1

groups in our schools creates a proportionate increase in the problems directly related to this situation. Public schools in America with their heterogeneity of groups have certain obligations to provide the maximum opportunity for educational and social betterment of the individuals composing these groups. The end product of this procedure will be a contributor, productive or otherwise, to America's society.

Investigated research studies indicate that, although there exists a multiplicity of factors involved in the obtaining of valid information on the intelligence and school achievement of varied ethnic groups, the areas of greatest significance concern the cultural, socioeconomic, and language differences.

Cultural factors often account for group isolation and any form of isolation tends to preserve and augment cultural differentiation. The culture in which an individual is reared may influence his behavioral development. The question is perennial as to what extent these cultural factors influence obtained differences on psychological tests.

Persons exposed to the inconsistent and often incompatible mores, goals, and social pressures represented by different cultures are likely to develop maladjustments of varying degrees of severity. It must be realized that these maladjustments interfere with and impair intellectual development and functioning of that individual.

The criterion employed in validating intelligence
tests has nearly always been a success in this Nation's
social system (7, p. 566). Scores on the test are corre-
lated with school achievement or with some more general
measure of success in this society. It would seem,
therefore, that intelligence tests measure the ability to
succeed in this particular culture. Since each culture
selects certain activities as the most significant, there
would be expected differences in test results. DuBois (43,
p. 523) reversed the usual procedure of standardizing a
test on an American culture and did so on Pueblo Indian
children. Anglo children tested in this study obtained an
average I.Q. of 74, or twenty-six points below the normally
expected average of 100. Such research findings seem to
substantiate the proposition that those tests commonly used
in America's educational systems are designed for use with-
in the Anglo culture.

In American culture, membership in a minority group
tends to be associated with low socioeconomic status (7,
p. 554). In view of the relation between socioeconomic
level and intellectual development, the predominance of
lower-class membership in minority groups must be taken
into account in interpreting their test results. Garth
(54, pp. 388-401) found a close relationship between mean
intelligence test scores of children and socioeconomic
level of the group. To a certain extent, these differ-
ences in socioeconomic level also represent degree of

assimilation of the Anglo culture. Such assimilation would provide an advantage in performance on tests developed within that culture.

The bilingual situation is so complicated with linguistic and other factors that results of studies are difficult to interpret and sometimes seem to lead to conflicting conclusions (80, p. 148). When children in American schools are examined with the usual verbal intelligence tests, those from foreign-speaking homes generally make a poorer showing as a group. Goodenough (57, pp. 388-397) found a high correlation between the mean I.Q. of children in various immigrant groups and the proportion of parents in each group who had adapted English as the spoken language at home. Bilingualism is generally encountered in Spanish-American children who speak Spanish in the home and English in school. If this situation contributes to a language handicap, it can be most serious in its effect on test performance, since an individual with a mild or moderate English handicap may lack the facility in the use of English to compete fairly on a verbal test. In research in this particular area, Arsenian and Darcy (39, pp. 21-57) found that the inferiority of bilingual groups is greatly diminished and may disappear entirely when non-language tests are employed.

In the state of New Mexico, the Spanish language is legally and officially recognized along with English; however, in the United States, the language of instruction in

the public school is English. In New Mexico and the entire
Southwest where there is a large segment of Spanish-
Americans, it is likely that Spanish will continue to be
the home language for the compelling reason that this re-
gion is contiguous to Spanish-speaking Mexico (80, p. 148).

There are some obvious implications in this projection.
Bilingualism seems to manifest itself as a handicap when
one language is restricted to one set of situations in the
child's life, and the other language is restricted to an-
other set.

An educational problem of some magnitude currently
exists for the Spanish-American pupil in the Southwestern
United States. Investigations have indicated a probable
worsening of the situation over the next few years (128,
p. 6). Success in our present educational systems is pri-
marily measured by the degree of attained achievement and
this achievement is generally positively correlated with
measured intelligence. It would seem that a determination
of the test or tests currently in use which would provide
the most valid and realistic evaluation of those criteria
which the Anglo culture emphasizes could produce much
needed educational enlightenment and provide a psychologi-
cal boost to those affected by the sometimes erroneous mass
categorizations into which ethnic groups are placed.

Statement of the Problem

This study will be concerned with the relationship

between certain predictive variables and the academic achievement of Spanish-American and Anglo pupils in grade nine in a selected junior high school.

The primary problem of the study is to determine the effectiveness with which certain independent variables can be used to predict academic achievement of two ethnic groups in grade nine of junior high school. These predictive variables are: the Lorge-Thorndike Verbal and Non-verbal Tests, the School and College Ability Test (SCAT), and the Wechsler Intelligence Scale for Children (WISC). The inclusion of non-verbal subtests and the orally administered WISC in the predictive variables may prove to have differential values of prediction for the two ethnic groups.

Academic achievement will be measured by selected subtests of the Metropolitan Achievement Tests Intermediate Battery (including Reading, Language, Arithmetic Problem Solving and Concepts, Social Studies Information and Science), and by grade point averages in English, mathematics, and science earned during the two semesters of an academic year.

In the course of the study, the following information will be derived: (1) zero order r's for all predictive and criterion variables, (2) differences in r between predictive and criteria variables for both ethnic groups, (3) difference in means of the predictive and criteria variables for each ethnic group, (4) multiple regression equations for each ethnic group with each achievement criterion,

(5) multiple regression equations for the combined groups
(Anglo and Spanish-American) with each achievement
criterion.

Hypotheses

Those having done comparative studies of ethnic groups
generally agree that differences on psychological tests and
academic achievement do exist between Spanish-American and
Anglo-American groups. Since this study is primarily one
of prediction, the assumption is made that the independent
variables used (SCAT, WISC, and Lorge-Thorndike) can be
used effectively to predict academic achievement for both
Anglo and Spanish-American students in junior high school.

An analysis of the information gathered from the lit-
erature indicates that the best approach to the stated
problem can be made by developing and testing the following
null hypotheses:

1. There will be no significant correlation
    $[p < .05]$ between the independent variables
    (WISC, SCAT, and Lorge-Thorndike Scores)
    and the achievement measures for the two
    ethnic groups.

2. There will be no significant difference
    $[p < .05]$ between r's of the SCAT scores,
    the WISC scores, and the Lorge-Thorndike
    scores in terms of predicting academic
    achievement of the two ethnic groups as

measured by the Metropolitan Achievement
Tests and the Grade Point Average.

3. There will be no significant difference
[p < .05] in ability between the Spanish-
American and Anglo groups as measured by
the SCAT, the WISC, and the Lorge-Thorndike.

4. There will be no significant difference
[p < .05] in achievement between the Spanish-
American and Anglo groups as measured by the
Metropolitan Achievement Tests and the Grade
Point Average.

Statistical Procedure

These hypotheses will be statistically tested in the
following procedural manner:

1. Intercorrelation matrices will be established
for all predictive with all criterion
variables -- for ethnic groups separately at
grade nine.

2. Tests will be made for significance of dif-
ference between r's obtained between the
predictive variables (SCAT, WISC, and Lorge-
Thorndike Tests) and the Metropolitan Achieve-
ment Tests for the two ethnic groups.

3. Tests will be made for significance of dif-
ference between r's obtained between the
predictive variables (SCAT, WISC, and Lorge-

Thorndike Tests) and the Grade Point Average
for the two ethnic groups.

4. Tests will be made for significance of corre-
lation between the predictive variables and
both measures of academic achievement for the
two ethnic groups.

5. Tests will be made for significant differences
between mean scores yielded by the predictive
variables for the two ethnic groups.

6. Tests will be made for significant differences
between mean scores yielded by the achievement
criteria variables for the two ethnic groups.

7. Regression equations will be developed for
each ethnic group to predict the two measures
of academic achievement.

8. Regression equations will be developed for the
combined groups (Spanish-American and Anglo) to
predict the two measures of academic achievement.

Need for the Study

There seems to be a real need for a study which would
indicate to the junior high school teachers, counselor, or
principal, the degree to which certain aptitude or ability
scores would actually predict academic performance. It is
hoped that the results of this investigation would fill a
need in the area of junior high evaluation. Possible modi-
fications in certain instructional phases and curriculum

changes could result from the information obtained here.

The findings of the study should enable counselors and testing specialists to answer questions concerning student achievement with greater accuracy and more confidence. Questions arising when group test scores are in doubt, when such scores do not agree with teachers' opinions, or when a student's work does not seem in keeping with his ability, should be answered with a greater degree of accuracy and objectivity. Counselors and others should be able to answer specific questions concerning the use of these scores with more explicit answers. The results may provide some assistance to the teaching personnel in making allowances and adjustments in classes having both Spanish-American and Anglo students.

During the last several years, there has been a rapidly growing recognition that guidance cannot begin in the eleventh or twelfth grade, but must begin at least as far back as the seventh, eighth, or ninth grade. It has been discovered that tests administered in junior high school years are about as predictive of future success in college as are tests administered towards the end of senior high school. This conclusion has been supported by many studies (32, p. 305).

The role of prediction and the relevance of predictive studies are of importance in educational guidance in that decisions as to course of action are usually made by the individual in question rather than by the one making the

prediction. The role of the counselor is not primarily to make decisions, but rather to assist the counselee in obtaining a better understanding of his aims and motives as well as his potentialities, so that he can make more satisfying decisions. The counselee is advised as to his strengths and weaknesses relative to other people. The probability of his success in various goals, courses of study, and the like can be explained to him in terms of the percentage of individuals with similar aptitudes and personality traits who have succeeded in the fields under consideration. The counselee can then judge the relative desirability of certain courses of action by considering these facts along with training time involved, monetary considerations, social prestige, and similar factors (19, pp. 145-155).

A study of the relationships and comparisons of ethnic groups would also appear to be pertinent, especially in the geographic regions of the United States where clear-cut ethnic and cultural differences exist and where these groups are homogeneously exposed to the same learning environment in our schools.

Ulibarri (123), in his study of teacher awareness of these socio-cultural differences, discovered that teachers show lack of sensitivity toward these differences although they are aware of their existence.

Clarification of Terms

For the purpose of this study, certain terms which will be regularly used need to be rather explicitly defined. These terms are:

1. Academic Achievement is defined as (a) the composite scores obtained from the Reading, Language, Arithmetic Problem Solving and Concepts, Social Studies Information, and Science subtests of the Metropolitan Achievement Tests Intermediate Battery and (b) the combined grade point average in English, mathematics and science earned during the two semesters of an academic year.

2. Dependent Variable is defined as the variable for which changes are observed. For the purpose of this study, the dependent variables are (a) the composite scores obtained from the selected subtests of the Metropolitan Achievement Intermediate Battery and (b) the grade point average in English, mathematics and science earned during the two semesters of an academic year.

3. Independent Variable is that variable which is introduced into the experimental situation, and which is the primary object of study. For the purpose of this study, the

independent variables referred to are (a) the
scores obtained from the Verbal, Performance,
and Full Scale tests of the Wechsler Intelli-
gence Scale for Children, (b) the Verbal,
Quantitative, and Total scores obtained from
the School and College Ability Tests, and (c)
the Verbal and Non-verbal scores of the Lorge-
Thorndike Verbal and Non-verbal Tests. These
variables will be referred to as the WISC, the
SCAT, and the Lorge-Thorndike, respectively,
throughout the study.

4. Spanish-American is defined by Saunders (101,
   p. 7) as one of those people of the Southwest
   who constitutes a large, readily-identifiable
   segment of the population with cultural and
   demographic characteristics distinguishable
   from those of the population as a whole.
   They are a part of a larger group, numbering
   perhaps three to three and one-half million,
   who are concentrated mainly in the five
   Southwestern states of California, Arizona,
   New Mexico, Colorado, and Texas, but who, in
   recent years, have begun to spread over the
   entire nation and have formed sizable colonies
   in many Midwestern and Eastern states.

5. Anglo is defined by Saunders (101, p. 7) as a
   term referring to the numerically dominant,

natively English-speaking population who are,
broadly speaking, culturally indistinguishable
from the inhabitants of other areas of the
nation.

Scope and Limitations

This investigation will be limited to a study of the
relationship between the ability and intelligence of two
ethnic groups (Spanish-American and Anglo) of ninth grade
students and the scholastic achievement of the same two
groups. Ability and intelligence will be measured by the
Verbal, the Quantitative, and Total scores of the SCAT, the
Verbal and Non-verbal scores of the Lorge-Thorndike Test,
and the Verbal, Performance, and Full Scale scores of the
WISC. Achievement will be expressed by the composite raw
scores on the Reading, Language, Arithmetic Problem Solving
and Concepts, Social Studies Information and Science sub-
tests of the Metropolitan Achievement Tests Intermediate
Battery and by their earned grade point average in English,
science, and mathematics at the end of one academic year.

The study will be further limited to a sample group of
100 ninth grade students, 50 Spanish-American, and 50 Anglo,
each group divided equally by sex and randomly selected.
The assumption is made that the sample group is representa-
tive of the two ethnic groups under investigation.

It is realized that the size of the sample and the
restricted geographic locale prohibits the making of a

broad and conclusive generalization relative to the find-
ings of the study. These results will be limited in their
use to the community from which the data were gathered.

The relationships between the predictive variables and
the criterion variables will be investigated on a statisti-
cal basis deemed appropriate for such a study.

Overview

It has been the purpose of this introductory chapter
to afford some background to the nature of the problem
being investigated. The need for the study, especially in
regional areas directly effected, has been presented and
testable hypotheses have been formulated.

A review of research studies concerning the testing
instruments used in this study and the appropriateness of
their selection for comparing Spanish-American and Anglo
ethnic groups will be presented in the following chapter.
The literature will be reviewed for studies concerning
bilingual testing.

The third section in the presentation will be devoted
to a description of the subjects and procedure, the treat-
ment of the data and interpretation of the results. Con-
clusions and implications of the study will be presented in
the final chapter.

CHAPTER II

REVIEW OF THE LITERATURE

The more extensive and knowledgeable usage of tests
and the increased emphasis placed on the importance of a
well planned and properly functioning testing program has
been one of the important influences bringing about changes
which have taken place in education during the past fifty
years. The value of highly valid and reliable instruments
for measuring intelligence and achievement has had a sig-
nificant influence in the process of educational evolvement.

The broadest classification of intelligence tests is
according to the method of administration; i.e., individual
and group tests. The Stanford-Binet and the Wechsler
Scales are the most widely used of the individual tests.
It would be somewhat difficult to select, with any degree
of accuracy, any one particular group intelligence test
that is more widely used than any other.

The individual test selected for use in this study was
the Wechsler Intelligence Scale for Children (WISC). The
two group tests selected are The School and College Ability
Tests (SCAT), and the Lorge-Thorndike Intelligence Tests.

The Nature of and Relevant Research on

the Independent Variables

The Wechsler Intelligence Scale for Children and Related Studies

The Wechsler Intelligence Scale for Children, an orally administered individual mental assessment, was chosen to be used as one of the independent variables in this study in order to aid in alleviating the possible linguistic and reading problems which might arise in working with ethnic groups.

This test, commonly designated as the WISC, was developed in 1949 by David Wechsler. The WISC consists of twelve tests which are divided into two subgroups identified as Verbal and Performance. Although the tests identified as verbal and performance differ as the labels indicate, they each tap other factors, among them non-intellective ones, which cut across the groups to produce other classifications that are equally important in evaluating the individual's performance. The tests of the scales are grouped as follows: (Verbal) Information, Comprehension, Arithmetic, Similarities, Vocabulary, Digit Span; (Performance) Picture Completion, Picture Arrangement, Block Design, Object Assembly, Coding, and Mazes. All twelve of these tests were used in the standardization, but in the interest of shortening the time for an examination, the WISC has been reduced to ten tests. In this study,

Digit Span was omitted from the Verbal and Mazes were omitted from the Performance.

The WISC was standardized on an all white sample of 100 boys and 100 girls at each age from five through fifteen years. Each child was tested within one and one-half months of his mid year. The sample corresponded as nearly as possible to the population per cent of the United States in (1) Geographic Area, (2) Urban-Rural, and (3) Parental Occupation.

Reliability coefficients were computed by the split-half technique, with appropriate correction for full length of the test by the Spearman-Brown formula. These derived coefficients, using thirteen and one-half years as a representative age range, were: Verbal, .96; Performance, .90; Full Scale, .94. The standard errors of measurement are: Verbal, 3.00; Performance, 4.74; Full Scale, 3.68. The Total, or Full Scale, deviation I.Q.'s are obtained by combining the Verbal and Performance scores. The mean of the WISC is 100 and the standard deviation is 15.

The rationale for the use of the WISC in this study is based on the theory underlying the WISC itself. Briefly, stated, this theory is that intelligence cannot be separated from the rest of the personality, and a deliberate attempt has been made to take into account the other factors which contribute to the total effective intelligence of the individual. This effort is reflected both in the

composition of the Scale and in the impartial weights at-
tached to each test. No attempt has been made to get to-
gether a series of tests that measure "primary abilities"
or to order them into a hierarchy of relative importance.
For depth, detail and elaboration on the Scales, one is re-
ferred to Wechsler's Wechsler Intelligence Scale for
Children (126).

Over ninety studies were found which dealt with the
results of the WISC in school settings. These studies
dealt with a variety of usages, but none were found that
dealt with predicting achievement in junior high school.

Thirty-five of the studies investigated compared the
WISC to other tests. Twenty-four dealt with either prob-
lems of education or special education. Eight dealt with
remedial reading. Ten were concerned with validity, reli-
ability, or other evaluative criteria applied to the WISC.
Eight were involved with the development or evaluation of
short forms. Five concerned cultural or sociological stud-
ies. Sixteen dealt with clinical usages, three dealt with
miscellaneous studies, and ten dealt with the prediction of
achievement, either in elementary school or in special
education.

Of the thirty-five studies found comparing the WISC to
other tests between 1950 and 1963, ten compared it to
either the Stanford-Binet, or to the Binet and other tests.
Results of these studies were similar. A representative

study is that of Frandsen and Higginson (48, pp. 236-238) in 1951. These authors reported the tests to be comparable within two sigmas on either side of the mean with a correlation of .80. Krugman's (73, pp. 475-483) investigation reported that the Stanford-Binet I.Q.'s tend to be higher than WISC I.Q.'s. Triggs and Carter (122, pp. 27-29) reported similar findings. Altus (3, p. 231) in 1952 compared the WISC and California Test of Mental Maturity and found a r of .81. In 1955, he found the verbal and nonverbal portions of the same two tests markedly comparable (4, pp. 143-144). Stemple (115, pp. 257-261) in 1953 and Holloway (68, pp. 253-264) in 1954 reported the Primary Mental Abilities Test to have no high degree of predictability for WISC scores.

The results of those investigations which compared the WISC to either the Wechsler-Bellevue or Wechsler Adult Intelligence Scale were all similar, as is exemplified by the findings of Price and Thorne in 1955 (96, pp. 479-482). They found the WISC and Wechsler-Bellevue, Form I, to be comparable.

Koppitz (72, pp. 413-416), in studying prediction of achievement from the WISC and the Bender-Gestalt Tests in 1958, reported that both instruments seemed to indicate that learning disability, in the primary grades, is basically related to visual-motor perception immaturity. Similar results were found by Rogers and Haworth (99,

pp. 853-859) in using the Goodenough, WISC, and Stanford-Binet in 1962.

Identifiable patterns for mental defectives were found by Newman and Loos (91, p. 16) as were distinctive patterns for the gifted as found by Lucito and Gallagher (52, pp. 479-481).

In his study involving the use of the WISC with be-lingual children, Holland (67, pp. 42-44) in 1960 reported the WISC to predict language barrier as well as to raise the possibility of using it as a direct measure of educa-tional barrier. In a study of the influence of socio-economic status on WISC I.Q. scores, Estes (44, pp. 58-62) found manifest differences in the primary grades.

In the nine studies investigated that dealt with pre-diction of achievement, five concerned prediction of achievement for elementary children and four in areas of general achievement. None found dealt directly with a-chievement on the ninth grade level.

In 1957, Stroud and Blommers (116, pp. 18-26) corre-lated WISC I.Q.'s and scores from the Iowa Test of Basic Skills. The WISC was found to be highly predictive of per-formance in the elementary grades. The study by Koppitz (72, pp. 413-416) revealed implications for predicting a-chievement, in that learning disability in the primary grades is basically related to visual-motor perceptive immaturity. In one of the studies related to achievement

in general, McLean (79, p. 264) pointed out that verbal
I.Q. is related to ability to learn in verbal situations
and performance I.Q. is related to ability to learn in non-
verbal situations.

Campbell (24), in an unpublished study in 1959, stud-
ied high school achievement by correlating Wechsler-Bellevue
I.Q.'s and end-of-year grades. He found the performance
I.Q. to give some indication of subsequent achievement in
shop, r. 69; in home economics, r .49. The verbal I.Q.
gave indication of these subsequent achievements: social
studies, r .48; English, r .46; foreign language, r .42;
science, r .41; and mathematics, r .39. The full scale
gave a Pearson correlation of .50 with grade point average,
while the performance I.Q. showed an r of .32. The verbal
I.Q. showed an r of .50 with grade point average. All re-
lationships were positive and statistically significant,
but not statistically greater than those expected from
group test results.

The eight studies which concerned the use of the WISC
for students with reading problems reported it to be effec-
tive. All showed similar results in that there seemed to
be subtest patterns which relate to reading disability.
Hirst (65, pp. 153-160) reported that patterning would ap-
pear to be valuable in the diagnosis and prediction of
reading difficulty.

Perhaps the most useful studies of the ten studies of

validity, reliability, and stability of the WISC were the factorial analyses by Cohen (36, pp. 31-40) in 1959 and Maxwell (84, pp. 99-101) in 1961. Both found evidence of identifiable factors. Maxwell reported a verbal-intellectual and space-performance factor.

The Cooperative School and College Ability Tests and Related Studies

The Cooperative School and College Ability Tests, commonly designated as SCAT, were developed by the Cooperative Test Division of the Educational Testing Service and came into school use in 1955.

Reviews in the Mental Measurement Yearbook indicate that these tests were designed to aid in estimating the capacity of a student to undertake the academic work of the next higher level of schooling and that they are a measure of school learned abilities which indicate a student's ability to achieve (23).

The SCAT series contains four subtests or parts. Two of these subtests, Parts I and III, are measures of developed ability in skills that are closely related to student success in the verbal kinds of school learning. Part I involves comprehending the "sense" of a sentence read and Part III involves the attached meaning to isolated words. The total number of right answers to these two parts of the test is converted into a Verbal score. The other two subtests, Parts II and IV, are measures of ability in certain

quantitative skills of number manipulation and problem solving. Specifically, Part II concerns manipulating numbers and applying number concepts accurately in a computation situation, and Part IV is the solving of quantitative problems. The two subtests, Parts II and IV, yield a Quantitative score. The Total score is based on all four parts.

Statistically derived conversion scores are obtained from the raw scores, or the number of "rights". These converted scores can then be translated into percentile ranks through the use of norms tables.

In the twelve schools used in the validity study, all but one revealed SCAT scores which were significantly correlated with ratings of the abilities that the tests were purported to measure (102, p. 9).

Using form 3A on 2800 ninth grade examinees, the computed reliabilities were: Verbal, .93; Quantitative, .89; Total, .95. Standard errors of measurement on converted scores were: Verbal, 3.15; Quantitative, 2.92; Total, 4.29 (37, p. 11).

A study of the validity of SCAT over a one year period was undertaken at four grade levels (grades 5, 7, 9, and 11) in 1957. The SCAT-Total score correlated with average end-of-year marks at .59 (102, pp. 5-9).

A second study was undertaken to determine how well SCAT scores predicted academic achievement over a two year

period. The results showed that, in general, they do not predict quite as well as over a one-year period, except at the lower grades. At fall testing of grade nine, the SCAT-Total score correlated with average end-of-year tenth grade marks at .43 as compared with .59 in the one-year testing (102, pp. 5-9). Of the three SCAT scores, the Total score appears to be the best predictor in three subject fields (English, science, and social studies).

In Cassel's (30, pp. 401-402) study of expected a-chievement beta weights on SCAT (Form 1A) for college freshmen, it was found that these weights were no more use-ful in predicting either average achievement-test score or first-semester grade point average than were straightfor-ward SCAT-Total scores.

In Clark's (33, pp. 127-128) study of SCAT validation at the upper division and graduate level, the arrived at correlations, using grade point averages as the criterion, were as follows: Verbal, .44; Quantitative, .27; Total, .35.

Smith (110, pp. 39-42), in a differential prediction study involving the SCAT and the California Test Battery (CTB), found the SCAT scores, Verbal, Quantitative and Total, to be better predictors of success in college fresh-men English; however, the California Test Battery quantita-tive score predicted mathematics grades significantly better than did the SCAT Quantitative and Total scores.

He concluded that if diagnosis or analysis of student weak-
nesses is to be made in subjects such as English and mathe-
matics, and the SCAT is not to be supplemented by the use
of achievement tests, the California Test Battery achieve-
ment tests may be selected over the SCAT.

Davis (40, p. 451) reports that, in grades nine and
eleven, the average correlation of SCAT Verbal scores with
English grades, of SCAT Quantitative scores with mathemat-
ics grades, and SCAT Total scores with grades in social
studies and science are about .50 to .55. Goldman (102,
p. 24) noted correlations between the Wechsler Adult Intel-
ligence Scale and SCAT Verbal halves to be .89; this find-
ing was significant at the .01 level of confidence.

The Lorge-Thorndike Intelligence Tests and Related Studies

The Lorge-Thorndike Intelligence Tests were developed
by Drs. Irving Lorge and Robert L. Thorndike of Columbia
University in 1954. These are a series of tests of ab-
stract intelligence covering the range from kindergarten to
college freshmen. These tests are based on the premise
that most abstract ideas with which the school child deals
are expressed in verbal symbols, so much so that verbal
symbols are the appropriate medium for the testing of ab-
stract intelligence. However, they take into account the
fact that for some -- the poor reader, those unfamiliar
with the language, the poorly educated -- printed words may

constitute an inadequate basis for appraising an individual's abilities. Consequently, a parallel set of nonverbal tests is provided to accompany the basic verbal series. It was this latter characteristic which led to its inclusion in this study since no effort was being made to examine its value in relation to the possible linguistic handicap of the Spanish-American ethnic group.

The tests are available in five levels with each level having two comparable forms. This makes possible the retesting of pupils whose scores on one testing seem questionable. Level 4, form A, covering the grades seven through nine is the test used in this study.

The Verbal Battery is made up of subtests, each of which uses the verbal medium. Of the different subtests, one also involves numerical tasks. The subtests are Word Knowledge, Sentence Completion, Verbal Classification, Verbal Analogies, and Arithmetic Reasoning. Experience has indicated ability to deal with these kinds of tasks is related to academic achievement and provides a good index of scholastic aptitude (117, p. 11).

The Non-Verbal Battery is entirely pictorial, diagrammatic, or numerical. The subtests are Figure Analogies, Figure Classification, and Number Series. These tests permit an appraisal of abstract intelligence which is not influenced by specific disability in reading. The working time for Level 4 Verbal is 34 minutes and 27 minutes is required for the Non-Verbal section.

There were 136,000 children used, from a stratified sample of 44 communities in 22 states, to standardize the Lorge-Thorndike Intelligence Tests. Reliability coefficient for Level 4 Verbal is .92; for Non-Verbal, the coefficient is .80. Standard error of measurement for the Verbal is 4.6 and for the Non-Verbal, 7.1. Four types of norms are given for the tests: (1) I.Q.'s, (2) grade percentiles, (3) grade equivalents, and (4) age equivalent. The tests are primarily power rather than speed tests (113, p. 11).

In a study completed by the Bureau of Educational Research in the Public School System of Cleveland, Ohio, correlations were secured between the Lorge-Thorndike Ingelligence Tests, Level 3, Form A and the Stanford Achievement Test, Intermediate Battery, Form KM on 171 pupils in the sixth grade. The correlations between Lorge-Thorndike I.Q's and Stanford Reading Grade Equivalents and Stanford Average Arithmetic Grade Equivalents were .87 and .76, respectively (117, p. 15). A study conducted in the School District of Lancaster, Pennsylvania, revealed a correlation of .672 between the Lorge-Thorndike Tests (Level 4) and achievement at the end of the ninth grade. This study was based on 214 pupils (117, p. 15). Freeman (23, p. 481) in a review of the Lorge-Thorndike, observes that the major deficiency of the test is the lack of adequate data on predictive and concurrent validity. Pidgeon (23, p. 481) supports this observation.

Studies on Bilingual Testing

For the educator, the most important single implication of research on cultural differences is that group membership cannot provide an adequate guide to the complete understanding of individuals. Even when statistically significant differences are found between groups, they are of little practical value when dealing with specific persons. Mean differences between groups are always smaller than differences within groups. Moreover, because of the extensive overlapping of distributions, individuals can be found in the "inferior" group who not only equal but also surpass individuals in the "superior" group.

There are many research studies in the literature which deal with achievement, I.Q., and social comparisons between white and Negro populations. Many studies have been made comparing the American Indian and white groups. There appears to be, however, very few studies that specifically investigate and compare achievement prediction between Anglo and Spanish-American ethnic groups.

In her summarization of research on bilingualism, Anastasi (7, p. 558) reports that when children in American schools are examined with the usual verbal intelligence tests, those from foreign-speaking homes generally make a poorer showing as a group. She also observes that cultural factors which affect test responses are also likely to influence the broader area of behavior which the test is

designed to sample. Inadequate mastery of English may handicap a child not only on an intelligence test, but also in his school work, contact with associates, play activities, and other situations of daily life. Such a condition would, thus, interfere with the child's subsequent intellectual development.

Goodenough (57, pp. 388-397) found a high correlation between the mean I.Q. of children in various immigrant groups and the proportion of parents in each group who had adopted English as the language spoken at home.

Although Anastasi suggests that an inadequate mastery of English can perhaps be remedied without too much effort, research conducted in heavily concentrated Spanish-American districts in Texas in which an extensive eight-week summer program of English was offered pre-first graders, results show that Spanish-American children averaged only a 400 word English vocabulary as compared to a 4000 word vocabulary for their Anglo classmates (128, p. 6).

In his study, Cline (34) found that in comparing achievement of Spanish-American and Anglos, the Anglos were superior in intelligence quotient and achievement in reading, language, arithmetic, and social studies. However, Starkey (114), in her synthesis and interpretation of research findings pertaining to the teaching of Spanish-American children, cautions against interpreting I.Q's in the same manner and with the same assurance as those for

English-speaking Anglos. She also found the Spanish-American child is retarded by one or more grade levels.

Zintz (132, p. 12), in a New Mexico study, found a representative sample of fifth grade Indian and Spanish-speaking children from one and one-half to two years educationally retarded on a commonly used reading survey test. In addition to this, they were one to two years overage in grade. The same study found that in two of four selected high schools enrolling high percentages of Indian and Spanish-American children, one-half of the eleventh and twelfth grade students were in the bottom decile when compared to norms on a widely used survey high school reading test.

In a study of Spanish-American and Anglo students from the schools of Santa Barbara County, California, Altus (3, p. 231) found a difference of seventeen points on the WISC Verbal Scale in favor of the Anglos, a difference which was highly significant. She found a difference of 2.42 on the Performance Scale to be non-significant, and finally a point difference of 11.76 on the Full Scale which was significant at the .01 level.

In research done in the State of Texas (128), it was shown that this State has made few significant advances in improving the educational level of the Spanish-American minority.

The facts, according to the Texas Education Agency,

are these:

--The average Latin American child repeats the
first grade three times and drops out of
school in the fourth grade.

--Less than two per cent of the eligible
Spanish-American school population of Texas
ever attends college.

--In 1961-62, there were 85,000 migrant school
children in Texas. Not 100 of these migrant
children were in school 180 days anywhere in
1961-62.

Table I

MEDIAN SCHOOL YEARS COMPLETED IN FIVE SOUTHWESTERN STATES
BY SPANISH-AMERICANS AND ANGLOS

State	Spanish-American		Anglo	
	1950	1960	1950	1960
Arizona	6.1	7.0	10.6	11.7
California	7.6	8.6	11.8	12.1
Colorado	6.4	8.1	10.9	12.1
New Mexico	7.4	7.7	9.5	11.5
Texas	3.6	4.7	9.7	10.8

(Data collected in the 1960 Census)

Mitchell (87, pp. 29-37), in an investigation which sought to determine whether an intelligence test administered in English is a fair estimate of a child's I.Q. when a child thinks in a language other than English, studied 236 Spanish-speaking pupils in grades one through three in a public school in Minnesota. The Otis Group Intelligence Test was administered in English and in Spanish to all the subjects. The mean I.Q. which was secured from the Spanish testing was greater in each of the three grades than the mean I.Q. which had been secured from the English testing. For the three grades combined, the mean I.Q. was 9.28 points higher when the test was administered in Spanish.

In a study of bilingual Puerto Rican children using both verbal and non-verbal tests of intelligence, Darcy (39, pp. 21-57) found that the two tests measure the same functions to a fairly large extent, but not to so great an extent as to warrant the substitution of one test for another. She concludes that a more valid picture of the intelligence of a bilingual population could be obtained by using both the verbal and non-verbal tests of intelligence.

A relevant study by Stablein, Willey, and Thomson (111, pp. 73-78), using the Davis Eells (Culture Fair) test, along with the Primary Mental Abilities Test, and a 50 word vocabulary test, on two groups of Anglo and Spanish-American children produced results which indicated that the Davis Eells failed to be less influenced by cultural

differences than the other measures of intelligence and achievement.

There are some studies, however, which have concluded that bilingualism contributes little, if any, to existing mental differences among the ethnic groups. Hirsch (65, pp. 153-160), in an extensive study of 5504 subjects, American born, but of foreign ancestory, and ranging from six to eighteen years of age, concluded that, from an in-spection of the groups by grades, a language handicap in American-born children of foreign parentage is a negligible factor in accounting for the mental difference found to exist among the groups.

In similar findings, Arsenian (39, pp. 21-57) con-cluded from his study of American-born Italian and American-born Jewish children between the ages of nine and fourteen years of age that bilingualism did not influence favorably or unfavorably the mental development of these children.

These researches seem to support the view that bilin-gualism may be only one factor, and perhaps not the most significant one, in basic cultural differences which are reflected in performance on ability scales.

Summary

The problem of determining the most appropriate instru-ments to use in obtaining measures of intelligence of the two ethnic groups (Spanish-American and Anglo-American) for

this study was partially resolved by the selection of those tests which purport to assess the non-verbal aspect of intelligence in addition to the verbal assessment. It was theorized that this procedure may equate the linguistic differential between the two groups.

Some of the studies reported in this review seem to indicate conflicting findings relative to measured intelligence and achievement among the various ethnic groups. This seems especially true with the studies conducted on Negro and white groups, and on American-born Italians and American-born Jews as reported by Arsenian (39, pp. 21-57). However, the studies specifically dealing with Spanish-American and American Indians report significant differences in favor of the Anglo-American population. Of particular relevance in this respect is the New Mexico study by Zintz (132, p. 12).

Anastasi's observation that inadequate mastery of English not only affects a child on an intelligence test, but also in his contact with associates and play activities, seems to be substantiated by Witherspoon's (129, pp. 295-299) report that Spanish-American students have more school-connected problems than do the Anglo-American students.

After a rather careful evaluation of the reported studies which had a pertinent bearing on this research, it was decided to establish a framework which was in keeping

with those particular studies that revealed significant differences between Spanish-Americans and Anglo-Americans in intelligence and achievement. The previously stated hypotheses afford such a suitable approach.

CHAPTER III

PROCEDURE AND RESULTS

Reported research studies support the conclusion that differences do exist in the average intelligence test performance and academic achievement of Spanish-American and Anglo subjects from the same geographic area. Any clue to the reasons which underlie the lowered intelligence and achievement test performance of Spanish-American subjects would be of significance to educational theory and practice.

This study was designed to investigate the relationship of certain predictive variables and academic achievement of Spanish-American and Anglo pupils in junior high school. The predictive variables used were: (1) the Verbal, Performance, and Total scores of the WISC, (2) the Verbal, Quantitative, and Total scores of the SCAT, and (3) the Verbal and Non-Verbal scores of the Lorge-Thorndike Intelligence Test. Achievement criteria were: (1) Grade point average and (2) selected subtest scores of the Metropolitan Achievement Tests Intermediate Battery.

Subjects and Procedure

The purpose of this study was threefold. The first

was to determine the effectiveness of certain test measures
in relation of academic achievement in grade nine of a se-
lected junior high school. The second purpose was to de-
termine significant differences, if any, in the ability and
achievement of two ethnic groups (Spanish-American and
Anglo-American). The third concern was the development of
regression equations for prediction purposes based upon
those measures identified as academic achievement.

Population Description

The population from which this sample was drawn was
assumed to be typically representative of ninth grade stu-
dents from comparably sized schools geographically located
in the Southwestern United States, specifically southern
and western Texas, southern Colorado, Arizona, New Mexico,
and southern California. This school, composed primarily
of children from homes of families in lower-middle to mid-
dle income brackets, is located in a town of 11,000 popula-
tion. The average income for families in this community in
1964 was $6,700.

Although there are several small industries located
here, farming and ranching provide the primary sources of
economic support. The presence of a state university in
the community substantially contributes to the over-all
economy.

The Spanish-American ethnic group comprises

approximately three per cent of the county population; however, the ratio of Anglo-American to Spanish-American in the local public schools is five to one.

The Spanish-American in this community, as in many communities in the Southwest, has been relegated generally to jobs on farms and ranches, factory laborers, and construction crew workers. The lack of job skill and technical training, for whatever reasons, has been the prime contributor to this job relegation. County welfare roles are thirteen per cent Spanish-American.

Selection of the Subjects

The population from which this sample was drawn consisted of 262 ninth grade pupils who were regularly enrolled in a medium sized junior high school of 750 students. The population was divided by sex and ethnic group. By the use of a table of random numbers, a sample of 50 Anglo-American students, 25 males and 25 females, was selected. By the same procedure, 25 males and 25 females were selected from the Spanish-American group.

Procedure for Administering Instruments and Collecting Data

In the period between November, 1963, and February, 1964, individual WISC's were administered to the 100 pupils in the total sample. This process yielded the Verbal,

Performance, and Total scores for each pupil in each ethnic group. In February, the SCAT was administered to the entire ninth grade class and, by machine scoring, the Verbal, Quantitative, and Total scores were obtained for each member of the class. This process yielded the 100 sample scores. In April, the Lorge-Thorndike Intelligence Test was administered to the entire class. Hand scoring of these tests yielded Verbal and Non-Verbal scores for the 100-pupil sample. In May, administration of the Metropolitan Achievement Tests Intermediate Battery yielded scores on the subtests of (1) reading, (2) language, (3) arithmetic problem solving and concepts, (4) social studies information, and (5) science. The obtained standard scores on these subtests were averaged to yield a composite score for each subject in the sample. These composite scores were used as one of the selected measures of achievement.

Grades earned in English, science, and mathematics during the academic year of grade nine were used as the second criterion of achievement. The following numerical values were assigned to letter grades: A, 4 points; B, 3 points; C, 2 points; D, 1 point; F, 0 points. The grades for each student in the sample were averaged to yield the grade point average for that student.

The rationale for using grade point averages as reliable measures of academic achievement is based on the assumption that teachers can evaluate the amount of learning

and assign a letter grade to represent that learning.
Since this measure of academic achievement is of a more
subjective nature than is the Metropolitan Test criterion,
information may be obtained regarding the value of studying
the independent variables in relation to different meanings
of the dependent variables.

Treatment of the Data

In order to determine the relationship between certain
predictive variables and the academic achievement of
Spanish-American and Anglo pupils in grade nine in a se-
lected junior high school and perform the statistical
treatment required, the facilities at the Computing Center
at Oklahoma State University were used in computing coeffi-
cient correlations and beta weights for the regression
equations.

The findings from the statistical treatment of the
data will be presented by grouping them according to the
various hypotheses to which they relate.

Statistical Technique

Problems of multiple correlation which involve more
than four variables demand a more systematic scheme of
solution than is commonly used when only two or three are
to be calculated. Garrett (53, p. 426) states that the
mechanics of calculation become almost prohibitive unless a
system is adopted.

In this study, six variables were involved in prediction; therefore, the Doolittle method was chosen to provide a method of solving these multiple correlation problems. Since R must be solved for two criteria for each ethnic group, four separate calculations were made. The Doolittle method selects the tests of the battery analytically and adds them one at a time until a maximum R is obtained. The method takes into account the relationship of the independent variables with one another, as well as the relationship of each with the dependent variable. By use of this method, one can compute a multiple regression equation from whcih the criterion can be predicted with the highest precision of which the given list of tests is capable.

Since there were rather long series of scores, r's were calculated by the following formula, which is based on raw or obtained scores:

$$r = \frac{\Sigma MY - NM_x \times M_Y}{\sqrt{[\Sigma X^2 - NM_x{}^2][\Sigma Y^2 - NM_Y{}^2]}}.$$

In this formula, X and Y are obtained scores, and M_x and M_Y are the means of the X and Y series, respectively. X^2 and Y^2 are the sums of the squared X and Y values and N is the number of cases.

The significance of the difference between two r's was determined by first converting the r's into Fisher's z function. The significance of the difference between two

z's is calculated. A critical ratio (CR) is then derived
and level of significance determined. The formula is:

$$\sigma_{Z_1 - Z_2} = \sqrt{\frac{1}{N_1 - 3} + \frac{1}{N_2 - 3}} \; .$$

(SE of the difference between two z's)

Tests for differences in means of the two groups were
calculated by using the following formula to obtain the
standard error of the difference between uncorrelated means:

$$\sigma_D = \sqrt{\frac{\sigma_1{}^2}{N_1} + \frac{\sigma_2{}^2}{N_2}} \; .$$

From the SE of difference, a critical ratio (CR) is derived
and from which a level of significance is obtained.

Results of the Study

The results presented on the following pages will
parallel the arranged sequence of the hypotheses to which
they pertain. A summarization of the findings relative to
that hypothesis will conclude each section.

Relationship Between Independent and Dependent Variables

Hypothesis I states that there will be no significant
correlation at the .05 level of confidence between the in-
dependent variables employed in this study and the achieve-
ment measures for the two ethnic groups.

To determine the extent, if any, the independent vari-
ables employed in this study would predict scholastic
achievement of the two ethnic groups, the scores obtained
from the test variables were correlated with each group's
scores on the achievement criteria. These findings are
shown in Tables II and III.

TABLE II

CORRELATION COEFFICIENTS BETWEEN THE INDEPENDENT
VARIABLES AND THE METROPOLITAN ACHIEVEMENT TESTS
FOR THE TWO ETHNIC GROUPS

Independent Variable	Spanish-American	Anglo
	r	r
WISC Verbal	.033	.493**
WISC Performance	.049	.337*
WISC Total	.006	.476**
SCAT Verbal	.531**	.631**
SCAT Quantitative	.441**	.678**
SCAT Total	.545**	.729**
Lorge-Thorndike Verbal	.471**	.601**
Lorge-Thorndike Non-Verbal	.184	.521**

    *Significant at the .05 level
   **Significant at the .01 level

From Table II, significant correlations are observed
for all independent variables and the Metropolitan Test
criterion for the Anglo group. Positive, but insignificant

correlations are obtained for the three WISC subtest vari-
ables and the Lorge-Thorndike Non-Verbal for the Spanish-
American group against the same criterion. These findings
indicate no effectiveness of prediction for these specific
test variables for the standardized, objective measure of
achievement by the Metropolitan Tests for the Spanish-
American group, but a rather high degree of predictability
for the Anglo group on the same achievement criterion. The
SCAT Total subtest showed the single highest correlation
for both ethnic groups, but was somewhat stronger for the
Anglo group.

TABLE III

CORRELATION COEFFICIENTS BETWEEN THE INDEPENDENT
VARIABLES AND THE GRADE POINT AVERAGE
FOR THE TWO ETHNIC GROUPS

Independent Variable	Spanish-American	Anglo
	r	r
WISC Verbal	.398**	.541**
WISC Performance	.346*	.263
WISC Total	.411**	.476**
SCAT Verbal	.681**	.635**
SCAT Quantitative	.572**	.560**
SCAT Total	.675**	.667**
Lorge-Thorndike Verbal	.703**	.615**
Lorge-Thorndike Non-Verbal	.573**	.427**

*Significant at the .05 level
**Significant at the .01 level

From Table III, significance of r at the .01 level is observed for seven of the eight predictive variables for both groups as related to the G.P.A. achievement criterion. No significance of r was obtain between WISC Performance and G.P.A. for the Spanish-American group and significance at the .05 level was obtained between the same two variables by the Anglo group.

Generally lower correlations were observed for both ethnic groups between the WISC subtests and the criterion measurement. The highest correlation for the Anglo group was noted between the SCAT Total with G.P.A. and for the Spanish-American group, correlation was highest between the Lorge-Thorndike Verbal and G.P.A. Verbal tests generally appeared to be better predictors than non-verbal and performance measures for both ethnic groups.

In summary, an examination of the data presented in Tables II and III reveals that support for the stated hypothesis can be seen regarding the predictive value of the three WISC subtests and the Lorge-Thorndike Non-Verbal test for the Spanish-American group. These four variables denote no significant correlation with the Metropolitan Test achievement criterion; however, the three SCAT subtests and the Lorge-Thorndike Verbal test show correlations significant at the .01 level of confidence with the criterion for this group.

With the Anglo group, correlations significant at the

.01 level of confidence were found between all predictive
variables and the criterion, with the exception of the WISC
Performance subtest which showed a correlation significant
at the .05 level of confidence with the Metropolitan test
criterion.

When using G.P.A. as the achievement criterion, the
stated hypothesis is, in general, rejected. With the ex-
ception of the WISC Performance, which failed to reach sig-
nificance for the Spanish-American group, all variables
were correlated at appropriate levels of confidence with
the criterion. Seven of the eight predictors were corre-
lated at the .01 level of confidence for both ethnic groups
and the WISC Performance reached the .05 level of confi-
dence for the Anglo group.

Relationship of Difference Between Independent
and Dependent Variables

Hypothesis II states that there will be no significant
difference at the .05 level of confidence between r's of
the SCAT scores, the WISC scores, and the Lorge-Thorndike
scores in terms of predicting academic achievement of the
two ethnic groups as measured by the Metropolitan Achieve-
ment Tests and the Grade Point Average.

The findings relative to this hypothesis are presented
on the following pages.

Table IV presents data denoting differences between
the r's of each independent variable for the two ethnic
groups.

TABLE IV

DIFFERENCE IN r BETWEEN INDEPENDENT VARIABLES
FOR THE TWO ETHNIC GROUPS

Independent Variables	Spanish		Anglo	Diff.
	r	z	r	z
WISC Verbal and WISC Performance	.664	.76	.552	.62
WISC Verbal and WISC Total	.915	1.56	.899	1.47
WISC Verbal and SCAT Verbal	.364	.38	.644	.76
WISC Verbal and SCAT Quantitative	.373	.39	.364	.38
WISC Verbal and SCAT Total	.391	.41	.555	.62
WISC Verbal and Lorge-Thorndike Verbal	.475	.52	.782	1.05*
WISC Verbal and Lorge-Thorndike Non-Verbal	.416	.45	.558	.66
WISC Performance and WISC Total	.898	1.45	.854	1.26
WISC Performance and SCAT Verbal	.245	.25	.269	.28
WISC Performance and SCAT Quantitative	.237	.24	.264	.27
WISC Performance and SCAT Total	.234	.23	.305	.32
WISC Performance and Lorge-Thorndike Verbal	.320	.33	.421	.45
WISC Performance and Lorge-Thorndike Non-Verbal	.449	.48	.351	.37
WISC Total and SCAT Verbal	.339	.34	.544	.60
WISC Total and SCAT Quantitative	.339	.34	.368	.38
WISC Total and SCAT Total	.349	.37	.508	.56
WISC Total and Lorge-Thorndike Verbal	.442	.47	.700	.87
WISC Total and Lorge-Thorndike Non-Verbal	.476	.52	.615	.72
SCAT Verbal and SCAT Quantitative	.650	.78	.640	.76
SCAT Verbal and SCAT Total	.914	1.56	.903	1.48
SCAT Verbal and Lorge-Thorndike Verbal	.793	1.07	.728	.92
SCAT Verbal and Lorge-Thorndike Non-Verbal	.477	.52	.477	.52

TABLE IV (Continued)

Independent Variables	Spanish		Anglo	Diff.
	r	z	r	z
SCAT Quantitative and SCAT Total	.894	1.44	.902	1.48
SCAT Quantitative and Lorge-Thorndike Verbal	.650	.78	.483	.52
SCAT Quantitative and Lorge-Thorndike Non-Verbal	.583	.66	.325	.34
SCAT Total and Lorge-Thorndike Verbal	.795	1.08	.677	.83
SCAT Total and Lorge-Thorndike Non-Verbal	.566	.64	.442	.47
Lorge-Thorndike Verbal and Non-Verbal	.525	.59	.621	.73

*Significant at the .05 level

Of the twenty-eight comparisons tested as shown in Table IV, only one - the WISC Verbal with the Lorge-Thorndike Verbal - showed a difference significant at the .05 level; however, the WISC Verbal with the SCAT Verbal failed to reach a critical ratio at the .05 level by only .02 of a point. It will be noted that this one obtained significant difference in r and the one near significant difference concerns the relationship of two variables, one of which, in each instance, is heavily saturated in reading comprehension and the other is not. Although both pairs of variables are measures of verbal ability, reading ability,

per se, is a minor contributor to a high score on the WISC
Verbal subtest. This finding seems to indicate a high de-
gree of relationship between group and individual verbal
tests for the Anglo group and a low relationship between
group and individual verbal tests for the Spanish-American
group.

Although all correlations between variables shown in
Table IV are positive, it is of some relevance that the
lowest correlations for both ethnic groups involve those
correlations between WISC Performance and the three SCAT
subtest scores. This finding seems to suggest that possi-
ble different facets of measurement are tapped when this
group test and individual subtest are administered to the
same group.

Little difference in WISC correlations for the two
groups is noted. The same observation is true regarding
the SCAT subscores. Low correlations are observed for WISC
with SCAT for both groups, especially the Spanish-American
group.

The relationships between independent variables and
grade point average are given in Table V.

By converting r's into Fisher's z function and testing
z's for difference, the data in Table V reveals that the
correlations between the independent variables and G.P.A.
do not differ signficantly between the two ethnic groups.

TABLE V

DIFFERENCE IN r BETWEEN INDEPENDENT VARIABLES
AND G.P.A. ACHIEVEMENT CRITERION

Independent Variables and G.P.A.	Spanish-American		Anglo	
	r	z	r	z
WISC Verbal and G.P.A.	.398	.42	.541	.60
WISC Performance and G.P.A.	.345	.36	.263	.27
WISC Total	.411	.44	.476	.52
SCAT Verbal and G.P.A.	.681	.83	.635	.75
SCAT Quantitative and G.P.A.	.575	.65	.560	.63
SCAT Total and G.P.A.	.675	.82	.667	.80
Lorge-Thorndike Verbal and G.P.A.	.703	.87	.615	.72
Lorge-Thorndike Non-Verbal and G.P.A.	.573	.65	.427	.46

An interesting, and perhaps relevant, observation should be noted in Table V. There is a general tendency for the r's between the predictor variables and G.P.A. to be higher for the Spanish-American group. This finding suggests that certain non-intellective factors, such as interest, class behavior, personality, and attitude, enter into the subjective evaluation represented by G.P.A. as opposed to the objective, impersonal measurement of the Metropolitan Achievement Tests.

Garrett (53, p. 242) states that measurement of the significance of the difference between two r's obtained

from the same sample presents certain difficulties, since r's from the same group are presumable correlated. Formulas for computing the correlation between two correlated r's are not entirely satisfactory and there is no method of determining the correlation between two z's directly.

Therefore, by inspection, it is observed from Table V, that the Lorge-Thorndike Verbal, the SCAT Verbal, and the SCAT Total, respectively, correlate most highly with the G.P.A. for the Spanish-American group. The SCAT Total, the SCAT Verbal, and the Lorge-Thorndike Verbal, respectively, show the highest correlations with G.P.A. for the Anglo group. The designated verbal subtest measures clearly overshadow the purported non-verbal measures for both ethnic groups in degree of correlation with G.P.A.

The differences in r between independent variables and the Metropolitan tests achievement criterion are given in Table VI.

In Table VI, significant differences are noted in the WISC Verbal, WISC Total and SCAT Total subscores between the two groups. It would appear that the low correlations existing between all three WISC variables and a standardized, objective measure, such as the Metropolitan Achievement test for the Spanish-American group, is suggestive of norm inadequacy of the WISC for this ethnic group. As was noted in Table V, no significant differences in r existed between the two groups when the more subjective measure of

G.P.A. was the achievement criterion. Since the Lorge-Thorndike Non-Verbal exhibits a similar low correlation with the Metropolitan test, it is further suggested that the non-verbal tests are relatively poor predictors of academic achievement as measured by the Metropolitan Achievement tests for the Spanish-American ethnic group.

TABLE VI

DIFFERENCE IN r BETWEEN INDEPENDENT VARIABLES AND
METROPOLITAN TESTS ACHIEVEMENT CRITERION

Independent Variables and Metropolitan	Spanish		Anglo		Diff.
	r	z	r	z	
WISC and Metropolitan	.033	.033	.493	.54	*
WISC Performance and Metropolitan	.049	.049	.337	.35	
WISC Total and Metropolitan	.006	.006	.477	.52	*
SCAT Verbal and Metropolitan	.531	.59	.631	.74	
SCAT Quantitative and Metropolitan	.441	.47	.678	.82	
SCAT Total and Metropolitan	.545	.48	.728	.92	*
Lorge-Thorndike Verbal and Metropolitan	.471	.51	.602	.69	
Lorge-Thorndike Non-Verbal and Metropolitan	.183	.18	.521	.58	

*Significant at the .05 level

Inspection of the r's in Table VI reveals that the
SCAT Total, the SCAT Verbal, and the Lorge-Thorndike Verbal
sub-tests, respectively, are the best predictors of achieve-
ment as measured by the Metropolitan Achievement test for
the Spanish-American group. The SCAT Total, the SCAT
Quantitative and SCAT Verbal subtests, respectively, are
the best predictors for the Anglo group.

A comparison of r's for each predictor for the crite-
ria measures for the Spanish-American group is presented in
Table VII.

TABLE VII

COMPARISON OF r's FOR EACH PREDICTOR FOR THE CRITERIA
MEASURES FOR THE SPANISH-AMERICAN GROUP

Independent Variable	G.P.A.		Metropolitan		Diff.
	r	z	r	z	
WISC Verbal	.398	.42	.033	.033	*
WISC Peformance	.345	.36	.049	.049	*
WISC Total	.411	.44	.006	.006	**
SCAT Verbal	.681	.83	.531	.59	
SCAT Quantitative	.572	.65	.441	.47	
SCAT Total	.675	.82	.545	.48	*
Lorge-Thorndike Verbal	.703	.87	.471	.51	*
Lorge-Thorndike Non-Verbal	.573	.65	.183	.18	*

*Significant at the .05 level
**Significant at the .01 level

With the exception of two subtests, the SCAT Verbal and the SCAT Quantitative, all independent variables show significant differences in predicting to the achievement criteria for the Spanish-American group. Although the SCAT Verbal and SCAT Quantitative subtests do not, as separate measures, show significant differences in predictive value, the SCAT Total, which is the composite yield of these two subtests, does show a significant difference. These findings seem to further substantiate earlier inferences that reading comprehension is an affecting factor in predicting results of achievement for this ethnic group as measured by the Metropolitan Achievement Tests. The Lorge-Thorndike Verbal is indicated to be the best single predictor for G.P.A. and the SCAT Total shows to be the best single predictor for the Metropolitan Achievement Test.

A comparison of r's for each predictor with the criteria measures for the Anglo group is given in Table VIII. No significant differences are observed between the r's of any of the independent variables in predicting to either achievement criterion for the Anglo group. Inspection of the r's reveal a high degree of comparability for both criteria. The SCAT Total is indicated to be the best single predictor for both measures of achievement and the WISC Performance is the least effective single predictor for both measures of achievement.

TABLE VIII

COMPARISON OF r's FOR EACH PREDICTOR WITH THE CRITERIA
MEASURES FOR THE ANGLO GROUP

Independent Variable	G.P.A.		Metropolitan		Diff.
	r	z	r	z	
WISC Verbal	.541	.60	.493	.54	
WISC Performance	.263	.27	.337	.35	
WISC Total	.476	.52	.477	.52	
SCAT Verbal	.635	.75	.631	.74	
SCAT Quantitative	.560	.63	.678	.82	
SCAT Total	.667	.80	.728	.92	
Lorge-Thorndike Verbal	.615	.72	.602	.69	
Lorge-Thorndike Non-Verbal	.427	.46	.521	.58	

Relationships Between the Independent Variables

In order to determine the relationships between the
independent variables, twenty-eight correlation coeffi-
cients were calculated for all variable combinations for
each ethnic group. These findings are presented in Table
IX.

With few exceptions, Table IX reveals significantly
high r's between the independent variables for both ethnic
groups. The correlations between the WISC Performance with
the SCAT Verbal, SCAT Quantitative, and SCAT Total failed
to reach signficance for the Spanish-American group. In
the Anglo group, the WISC Performance failed to correlate

TABLE IX

CORRELATION COEFFICIENTS BETWEEN INDEPENDENT VARIABLES
FOR THE TWO ETHNIC GROUPS

Independent Variables	Spanish r	Anglo r
WISC Verbal and WISC Performance	.664**	.552**
WISC Verbal and WISC Total	.915**	.899**
WISC Verbal and SCAT Verbal	.364**	.644**
WISC Verbal and SCAT Quantitative	.373**	.364**
WISC Verbal and SCAT Total	.391**	.555**
WISC Verbal and Lorge-Thorndike Verbal	.475**	.782**
WISC Verbal and Lorge-Thorndike Non-Verbal	.416**	.558**
WISC Performance and WISC Total	.898**	.854**
WISC Performance and SCAT Verbal	.245	.269
WISC Performance and SCAT Quantitative	.237	.264
WISC Performance and SCAT Total	.234	.305*
WISC Performance and Lorge-Thorndike Verbal	.320*	.421**
WISC Performance and Lorge-Thorndike Non-Verbal	.449**	.351*
WISC Total and SCAT Verbal	.339*	.544**
WISC Total and SCAT Quantitative	.339*	.368**
WISC Total and SCAT Total	.349*	.508**
WISC Total and Lorge-Thorndike Verbal	.442**	.700**
WISC Total and Lorge-Thorndike Non-Verbal	.476**	.615**
SCAT Verbal and SCAT Quantitative	.650**	.640**
SCAT Verbal and SCAT Total	.914**	.903**
SCAT Verbal and Lorge-Thorndike Verbal	.793**	.728**
SCAT Verbal and Lorge-Thorndike Non-Verbal	.477**	.477**
SCAT Quantitative and SCAT Totsl	.894**	.902**
SCAT Quantitative and Lorge-Thorndike Verbal	.650**	.483**
SCAT Quantitative and Lorge-Thorndike Non-Verbal	.583**	.325**
SCAT Total and Lorge-Thorndike Verbal	.795**	.677**
SCAT Total and Lorge-Thorndike Non-Verbal	.566**	.442**
Lorge-Thorndike Verbal and Non-Verbal	.525**	.621**

*Significant at the .05 level
**Significant at thr .01 level

at a significant level with the SCAT Verbal and SCAT Total.

Relationship Between the Dependent Variables

Table X shows the correlation coefficients and z scores for calcualting differences in r between the two measures of academic achievement for both ethnic groups.

TABLE X

DIFFERENCE IN r BETWEEN DEPENDENT VARIABLES
FOR THE TWO ETHNIC GROUPS

Dependent Variables	Spanish-American		Anglo	
	r	z	r	z
Metropolitan Test and G.P.A.	.543**	.61	.698**	.87
**Significant at the .01 level				

The data from Table X reveals that the correlation co-efficient between the dependent variables for each ethnic group reached the .01 level of significance and did not differ significantly, from each other.

The size of the coefficients indicates that the two measures of achievement relate well with each other, and especially so with the Anglo group.

These findings suggest a considerable similarity in

measured achievement for these two ethnic groups as determined by the Metropolitan Tests and G.P.A.

In summary, a significant difference in r at the .05 level of confidence was found between the WISC Verbal and the Lorge-Thorndike Verbal tests in comparing the two ethnic groups, although near significant difference was found between the WISC Verbal and SCAT Verbal variables.

No significant difference in r was obtained between the independent variables for each ethnic group in relation to achievement as measured by the G.P.A.

In computing difference in r between the independent variables and achievement as measured by the Metropolitan Achievement Test criterion, significant differences at the .05 level of confidence were found between the WISC Verbal, WISC Total, and SCAT Total with the criterion in favor of the Anglo group. The appropriateness of the WISC norms for the Spanish-American group is subjected to question here. The absence of this finding when comparing WISC scores to G.P.A. may possibly be attributed to the subjective nature of earned grades as opposed to the objective nature of the Metropolitan Achievement Test. It is also strongly suggestive that a reading comprehension handicap exists for the Spanish-American group since reading comprehension directly affects scores on the Metropolitan Achievement Tests.

When r's were calculated between the independent variables for both ethnic groups, the WISC Performance subtests

failed to relate satisfactorily with the SCAT subtests for either group.

In general, Hypothesis II was rejected. Only one segment of the hypothesis was verified by the findings. There were no significant difference in r's between the independent variables comparing the two ethnic groups relative to predicting academic achievement as measured by G.P.A.

Differences Between Ethnic Groups in Ability

Hypothesis III states that there will be no significant difference at the .05 level of confidence in ability between the Spanish-American and Anglo groups as measured by the WISC, the SCAT, and the Lorge-Thorndike Tests.

The data pertinent to Hypothesis III is presented in the following section.

The mean differences of the independent variables between the two ethnic groups are given in Table XI.

Analysis of the data in Table XI reveals that highly significant differences (all at the .01 level) exist between the independent variables in the two ethnic groups. Less group variability is noted among the Spanish-Americans in all criteria with the exception of scores on the WISC Performance and the Lorge-Thorndike Non-Verbal tests. These are two specific measures in which little or no reading, per se, is involved. The measure showing the greatest difference in variability between the two groups is the

SCAT Verbal, a measure heavily saturated in verbal or reading comprehension. The rather substantial mean differences between the groups in the subtests of SCAT Verbal and Lorge-Thorndike Verbal are additional indications of reading disabilities on the part of the Spanish-American groups. The Lorge-Thorndike Verbal, along with the SCAT Verbal, concerns itself with the understanding of words and reading comprehension.

TABLE XI

MEAN DIFFERENCES OF THE INDEPENDENT VARIABLES
BETWEEN THE TWO ETHNIC GROUPS

| Independent Variable | Spanish | | Anglo | | Obtained Diff. |
	Mean	SD	Mean	SD	
WISC Verbal	41.62	10.21	52.98	11.90	11.36**
WISC Performance	46.14	10.05	52.80	9.73	6.66**
WISC Total	87.76	18.28	105.66	19.07	17.90**
SCAT Verbal	23.26	7.96	36.74	12.18	13.48**
SCAT Quantitative	19.72	7.65	26.52	10.03	6.80**
SCAT Total	43.18	14.19	63.72	18.21	20.54**
Lorge-Thorndike Verbal	42.24	11.01	57.42	11.57	15.18**
Lorge-Thorndike Non-Verbal	43.04	11.65	55.48	10.07	12.44*

**Significant at the .01 level of confidence

It is of some interest to note that the smallest difference in means, although significantly different, exists

between groups on the WISC Performance subtest. This test, which consists of manipulative and non-verbal skills, may possibly more nearly equate the linguistic factor between the two groups.

The scores on the WISC shown in Table XI are directly comparable to WISC norms since these scores are scaled. The Spanish-American mean WISC Total is shown to be 87.76, which is 12.24 points below the mean, or at the twenty-first percentile. There remains a persistent question relative to the appropriateness of WISC norms for this group.

These findings seem to somewhat confound the proposition that, under normal conditions, an older group of children would attain higher scores on standardized ability measures. This result is possibly best explained by Anastasi (7, p. 234) who states that upward or downward shifts in I.Q. is associated with the cultural milieu. In general, children from underprivileged environments tend to lose with age in relation to test norms.

The above findings reject the null hypothesis of no major differences in ability between the two ethnic groups as measured by the WISC, the SCAT, and the Lorge-Thorndike Tests.

Differences in Ethnic Groups in Achievement

Hypothesis IV states that there will be no significant difference at the .05 level of confidence between the

Spanish-American and Anglo groups as measured by the Metro-
politan Tests and G.P.A. Table XII below presents data
relevant to this hypothesis.

TABLE XII

MEAN DIFFERENCES OF THE DEPENDENT VARIABLES
BETWEEN THE TWO ETHNIC GROUPS

| Dependent Variable | Spanish | | Anglo | | Obtained |
	Mean	SD	Mean	SD	Diff.
Metropolitan Achievement	45.38	6.71	53.28	6.80	7.90**
Grade Point Average	1.70	0.70	2.67	.824	.97**

**Significant at the .01 level of confidence

Data from Table XII indicates that significant mean
differences exist between the two ethnic groups on both
measures of academic achievement. With specific reference
to the G.P.A., it will be noted that almost a full letter
grade difference exists between the groups. Somewhat less
variability is observed in the Spanish-Americans, thus
suggesting a greater degree of homogeneity in the group.
The obtained differences are in the same direction as those
differences obtained in measures of ability (Table XI).

If one assumes that language is a primary factor in

achievement, these differences in achievement seem to indicate that a functional language barrier exists between the Spanish-American and Anglo group. The rational underlying this inference is based on the knowledge that school achievement and ability, as ordinarily measured, correlates highly with reading ability.

These findings reject the null hypothesis that no significant differences in achievement, as measured by the Metropolitan Achievement Test and G.P.A., exists between the Spanish-American and Anglo ethnic groups.

The Regression Equations

In an attempt at greater accuracy, regression equations were developed using the six variables which were determined to be truly independent of each other. It was decided that the WISC Total and SCAT Total score variables be omitted from the calculations since they did represent combinations of scores and were lacking in independence.

Intercorrelations between the six selected predictive variables and the two measures of academic achievement were calculated for both the Anglo and the Spanish-American groups. Table XIII shows the intercorrelations of the predictive variables and their correlation with the Grade Point Average criterion for the Anglo ethnic group.

TABLE XIII

INTERCORRELATIONS OF PREDICTIVE VARIABLES AND THE GRADE
POINT AVERAGE OF THE ANGLO-AMERICAN GROUP

	1	2	3	4	5	6
C	.541	.263	.635	.560	.615	.427
1		.552	.644	.366	.782	.559
2			.269	.264	.421	.535
3				.640	.728	.477
4					.483	.324
5						.621

```
C = Grade Point Average
1 = WISC Verbal
2 = WISC Performance
3 = SCAT Verbal
4 = SCAT Quantitative
5 = Lorge-Thorndike Verbal
6 = Lorge-Thorndike Non-Verbal
```

The calculation of Multiple R resulted in an obtained correlation of .768 which was, as expected, a higher correlation than that obtained from any independent variable with the achievement criterion. Multiple R was calculated by using the formula $R = \sqrt{\frac{R(B)}{\Sigma Y_2}}$ in which R(B) represents the difference between the cumulative sum of squares minus the sum of squares, and where ΣY_2 equals the corrected sum of squares.

Beta weights were derived and their values were as follows: WISC Verbal, .00072; WISC Performance, -.00009;

SCAT Verbal, .00988; SCAT Quantitative, .03732; Lorge-
Thorndike Verbal, .01106; Lorge-Thorndike Non-Verbal,
.01766.

Using X to symbolize the obtained score of the predic-
tive variables, and $\overline{X}_C$ to represent the predicted score,
the regression equation in score form is:

$$\overline{X}_C \text{ equals } b_1 X_1 - b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 - K.$$

Substituting the numerical value of the B weights, the equa-
tion reads:

$$\overline{X}_C \text{ equals } .00072X_1 - .00009X_2 + .00988X_3 +$$
$$.03732X_4 + .01106X_5 + .01766X_6 -$$
$$.33756.$$

The standard error of estimate for the predicted score
is calculated to be .458144. This means that the chances
are 2 in 3 that a predicted score will not miss the earned
score by $\pm$.458144 points.

Table XXII, Appendix C, shows the obtained G.P.A.
scores and the predicted G.P.A. scores using the described
regression equation.

Table XIV, on the following page, shows the intercor-
relations of the predictive variables and their correlations
with the Metropolitan Achievement Test criterion for the
Anglo ethnic group.

TABLE XIV

INTERCORRELATIONS OF PREDICTIVE VARIABLES AND THE
ACHIEVEMENT TEST CRITERION FOR THE
ANGLO-AMERICAN GROUP

	1	2	3	4	5	6
C	.493	.337	.631	.678	.601	.521
1		.552	.643	.364	.782	.559
2			.269	.264	.421	.535
3				.640	.728	.477
4					.483	.325
5						.621

C = Metropolitan Achievement Test
1 = WISC Verbal
2 = WISC Performance
3 = SCAT Verbal
4 = SCAT Quantitative
5 = Lorge-Thorndike Verbal
6 = Lorge-Thorndike Non-Verbal

The calculated Multiple R for the predictive variables with the Metropolitan Achievement Test was .707.

The derived beta weights and their values were: WISC Verbal, .08805; WISC Performance, -.04892; SCAT Verbal, .13434; SCAT Quantitative, .18616; Lorge-Thorndike Verbal, .12176; Lorge-Thorndike Non-Verbal, .04587.

Using X to symbolize the obtained score of the predictive variable, and $\bar{X}_c$ to represent the predicted score, the regression equation in score form is:

$$\bar{X}_c \text{ equals } b_1 X_1 - b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + K.$$

Substituting the numerical value of the B weights, the equation reads:

$$\overline{X}_c \text{ equals } .08805X_1 - .04892X_2 + .13434X_3 +$$
$$.18616X_4 + .12176X_5 + .04587X_6 +$$
$$.31.70002.$$

The standard error of estimate for the predicted score is 4.807. Table XXIII, Appendix C, shows the obtained Metropolitan scores and the predicted scores using the above equation.

Table XV shows the intercorrelations of the predictive variables and their correlations with the G.P.A. criterion for the Spanish-American ethnic group.

Multiple R was calculated as previously described and resulted in a correlation of .842 between the independent variables and the G.P.A. criterion for the Spanish-American group.

Beta weights were derived and their values were as follows: WISC Verbal, -.01143; WISC Performance, -.00684; SCAT Verbal, .03083; SCAT Quantitative, .02007; Lorge-Thorndike Verbal, .01374; Lorge-Thorndike Non-Verbal, -.00658.

Using X to symbolize the obtained score of the predictive variable, and $\overline{X}_c$ to represent the predicted score, the regression equation in score form is:

$$\overline{X}_c \text{ equals } -b_1X_1 - b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 - b_6X_6 - K.$$

TABLE XV

INTERCORRELATIONS OF PREDICTIVE VARIABLES AND THE
GRADE POINT AVERAGE CRITERION OF THE
SPANISH-AMERICAN GROUP

	1	2	3	4	5	6
C	.389	.346	.681	.572	.703	.573
1		.645	.364	.373	.475	.416
2			.245	.237	.320	.449
3				.651	.793	.476
4					.650	.584
5						.525

C = Grade Point Average
1 = WISC Verbal
2 = WISC Performance
3 = SCAT Verbal
4 = SCAT Quantitative
5 = Lorge-Thorndike Verbal
6 = Lorge-Thorndike Non-Verbal

Substituting the numerical value of the B weights, the equation reads:

$$\bar{X}_C \text{ equals } -.00143X_1 - .00684X_2 + .03083X_3 + .02007X_4 + .01374X_5 - .00658X_6 - .1.08068.$$

The standard error of measurement for the predicted score is .3780. Table XXIV, Appendix C, shows the obtained G.P.A. scores and the predicted G.P.A. scores using the described regression equations for the Spanish-American group.

Table XVI shows the intercorrelations of the predictive variables and their correlations with the Metropolitan Achievement Test achievement criterion for the Spanish-American ethnic group.

TABLE XVI

INTERCORRELATIONS OF PREDICTIVE VARIABLES AND THE
ACHIEVEMENT TEST CRITERION FOR THE
SPANISH-AMERICAN GROUP

	1	2	3	4	5	6
C	.033	.049	.531	.441	.471	.184
1		.644	.364	.373	.475	.416
2			.245	.237	.320	.449
3				.651	.793	.476
4					.650	.583
5						.525

C = Metropolitan Achievement Test
1 = WISC Verbal
2 = WISC Performance
3 = SCAT Verbal
4 = SCAT Quantitative
5 = Lorge-Thorndike Verbal
6 = Lorge-Thorndike Non-Verbal

Multiple R was calculated to be .761 between the independent variables and the Metropolitan Achievement Test for the Spanish-American group.

Beta weights were derived and their values were as

follows: WISC Verbal, -.00542; WISC Performance, .05050;
SCAT Verbal, .24100; SCAT Quantitative, .03325; Lorge-
Thorndike, .19352, and Lorge-Thorndike Non-Verbal, .12204.

Using X to symbolize the obtained score of the predic-
tive variable, and $\overline{X}_C$ to represent the predicted score, the
regression equation in score form is:

$$\overline{X}_C \text{ equals } - b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + K.$$

Substituting the numerical value of the B weights, the
equation reads:

$$\overline{X}_C \text{ equals } - .00542X_1 + .05050X_2 + .241000X_3 +$$
$$.03325X_4 + .19352X_5 + .12204X_6 +$$
$$23.44120.$$

The standard error of measurement for the predicted
score is 4.3615. Table XXV, Appendix C, shows the obtained
Metropolitan Achievement scores and the predicted scores
using the given regression equations for the Spanish-
American group.

A comparison of the derived Multiple R's obtained by
correlating the six independent variables with the the a-
chievement criteria is presented in Table XVII on the
following page.

The derived Multiple R's are, in all four calculations,
higher than any single correlation between an independent
variable and the achievement measurements for either ethnic
group.

TABLE XVII

MULTIPLE R's OF THE SPANISH-AMERICAN AND ANGLO ETHNIC
GROUPS WITH THE ACHIEVEMENT CRITERIA

Criteria	Spanish-American R	Anglo R
Metropolitan Achievement Test	.761	.707
G.P.A.	.842	.768

By utilizing all six independent variables, the corre-
lation was increased from an r of .531 (SCAT Verbal) to an
R of .761 for the Spanish-American group with the Metropol-
itan Achievement test and from an r of .703 (Lorge-
Thorndike) to an R of .842 with the G.P.A.

The Anglo group increased an r of .678 (SCAT Quantita-
tive) to an R of .707 with the Metropolitan Achievement
test and from an r of .635 (SCAT Verbal) to an R of .768
with the G.P.A.

These increases represent a substantial improvement in
the efficiency of prediction and more especially so for the
Spanish-American group.

Multiple R's were determined by combining the scores
for both ethnic groups. This statistic would conveniently
enable the making of calculated predictions and avoiding
the separating of students into ethnic divisions.

Table XVIII presents the intercorrelations of the

variables and their correlations with the Metropolitan
Achievement test criterion for the combined ethnic groups.

TABLE XVIII

INTERCORRELATIONS OF PREDICTIVE VARIABLES AND THE
ACHIEVEMENT TEST CRITERION FOR THE
COMBINED ETHNIC GROUPS

	1	2	3	4	5	6
C	.593	.412	.754	.631	.751	.622
1		.649	.649	.466	.725	.592
2			.392	.337	.471	.559
3				.693	.834	.617
4					.625	.528
5						.678

C = Metropolitan Achievement Test
1 = WISC Verbal
2 = WISC Performance
3 = SCAT Verbal
4 = SCAT Quantitative
5 = Lorge-Thorndike Verbal
6 = Lorge-Thorndike Non-Verbal

Multiple R was calculated to be .806 between the inde-
pendent variables and the Metropolitan Achievement Test for
the combined ethnic groups.

Beta weights were derived and their values were as
follows: WISC Verbal, .01943; WISC Performance, .00858;

SCAT Verbal, .20700; SCAT Quantitative, .12674; Lorge-Thorndike Verbal, .16274; Lorge-Thorndike Non-Verbal, .08675.

Using X to symbolize the obtained score of the predictive variable, and $\overline{X}_c$ to represent the predicted score, the regression equation in score form is:

$$\overline{X}_c \text{ equals } - b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + K.$$

Substituting the numerical value of the B weights, the equation reads:

$$\overline{X}_c \text{ equals } .01943X_1 + .00858X_2 + .20700X_3 + .12674X_4 +$$
$$.16274X_5 + .08675X_6 + .26.336.$$

The standard error of measurement for the predicted score is 4.637. Table XXVI, Appendix C, shows the obtained Metropolitan Achievement scores and the predicted scores using the given regression equations for the combined ethnic groups.

Table XIX shows the intercorrelations of the variables and their correlations with the Grade Point Average criterion for the combined ethnic groups.

Multiple R was calculated to be .764 between the independent variables and the G.P.A. achievement criterion for the combined ethnic groups.

TABLE XIX

INTERCORRELATIONS OF PREDICTIVE VARIABLES AND THE
GRADE POINT AVERAGE CRITERION OF THE
COMBINED ETHNIC GROUPS

	1	2	3	4	5	6
C	.466	.302	.724	.652	.677	.513
1		.649	.649	.466	.725	.592
2			.392	.337	.471	.559
3				.693	.834	.617
4					.625	.528
5						.678

C = Grade Point Average
1 = WISC Verbal
2 = WISC Performance
3 = SCAT Verbal
4 = SCAT Quantitative
5 = Lorge-Thorndike Verbal
6 = Lorge-Thorndike Non-Verbal

Beta weights were derived and their values were as
follows: WISC Verbal, -.00705; WISC Performance, -.00054;
SCAT Verbal, .03000; SCAT Quantitative, .020507; Lorge-
Thorndike Verbal, .01640; Lorge-Thorndike Non-Verbal,
.00240.

Using X to symbolize the obtained score of the predic-
tive variable, and $\overline{X}_c$ to represent the predicted score, the
regression equation in score form is:

$$\overline{X}_c \text{ equals } -b_1 X_1 - b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + K.$$

Substituting the numerical value of the B weights, the equation reads:

$$\overline{X}_c \text{ equals } -.00705X_1 - .00054X_2 + .03000X_3 + .020507X_4 + .01640X_5 + .00240X_6 + .11726.$$

The standard error of measurement for the predicted score is .57984. Table XXVII, Appendix C, shows the obtained G.P.A. scores and the predicted scores using the given regression equations for the combined ethnic groups.

The combined ethnic group Multiple R for the predictive variables with the G.P.A. of .764 closely parallels the R of .768 obtained by the Anglo group, but is considerably lower than the R of .842 obtained by the Spanish-Americans.

The R of .806 calculated for the combined groups for the predictive variables with the Metropolitan Achievement test is somewhat larger than that obtained from either the Anglo group (.707) or the Spanish-American group (.761).

Summary and Interpretation of Results

This study was concerned with the relationship between certain predictive variables and the academic achievement of Spanish-American and Anglo pupils in grade nine in a selected junior high school.

The study was based on the testing of four hypotheses and the developing of regression equations for each ethnic group for predictive purposes. The conclusions drawn from

the analysis of data will be presented as they relate to the hypothesis being tested.

The first hypothesis stated that there would be no significant correlation between the independent variables and the achievement measures for the two ethnic groups. Partial affirmation is afforded the hypothesis. In the Spanish-American group, the three WISC variables and the Lorge-Thorndike Non-Verbal test failed to significantly correlate with the Metropolitan Achievement Test. This raises the question of the appropriateness of the WISC norms for this ethnic group in predicting objectively measured achievement. The Lorge-Thorndike Non-Verbal, composed primarily of symbols and designs, also affords little in the way of predicting objectively measured achievement for this group.

For the Anglo group, all variables correlated significantly high. Seven reached the .01 level of significance and one, the WISC Performance, reached the .05 level. These findings indicate a relatively high level of prediction for these variables with the Anglo group.

When using Grade Point Average as the achievement criterion, all variables for both groups were significantly correlated with the criterion at the .01 level, with the exception of the WISC Performance. This subtest failed to reach the confidence limits for the Spanish-American group and reached the .05 level for the Anglo group. These

findings, with the noted exceptions, suggest a high degree
of predictive effectiveness on the part of the independent
variables when G.P.A. is the achievement criterion.

The sum of these findings relative to Hypothesis I indicate that the criteria measures largely determine the
effectiveness of the independent variables as predictors of
achievement.

The second tested hypothesis stated that there would
be no significant differences in the correlations of predictive test variables in terms of predicting achievement
of the two ethnic groups as measured by the achievement
criteria. Findings indicated that a partial affirmation of
the hypothesis can be made. No significant differences in
r between the predictive variables comparing both groups
were found relative to the prediction of achievement as
measured by G.P.A. When using the Metropolitan Test as the
achievement criterion, however, certain differences in r
were observed. The WISC Verbal, WISC Total, and SCAT Total
correlated significantly higher with the criterion for the
Anglo group. It is suggested that since reading ability
and comprehension is a fundamental requirement in the obtaining of high scores on the SCAT Total and since this
factor also permeated the achievement assessment, a basic
inadequacy in English proficiency on the part of the
Spanish-American student is evidenced in this finding.
Further support for this conclusion is found in the observed

significant differences obtained between groups in correlation between the WISC Verbal with the Lorge-Thorndike Verbal and near significant difference between the WISC Verbal and SCAT Verbal subtests. Both SCAT and Lorge-Thorndike Verbal tests are measures heavily saturated in reading ability.

It is also suggested that an objective measurement of achievement, such as the Metropolitan Test, is more directly influenced by language skill and reading ability than is the more subjective G.P.A. This may well account for lack of significant differences between any predictive variables in the two groups when using G.P.A. as the achievement criterion.

The third hypothesis stated that there will be no significant difference in ability between the Spanish-American and Anglo groups as measured by the independent variables, SCAT, WISC, and Lorge-Thorndike Tests.

The findings failed to confirm this hypothesis. Differences in ability in favor of the Anglo group at the .01 level of confidence were found for all variables. It was noted that, excepting the WISC Performance and Lorge-Thorndike Non-Verbal scores, less group variability existed in the Spanish-American group. This finding suggests that, when a reading factor is involved, a more uniform or homogeneous pattern of responses is exhibited by the Spanish-American group. The WISC Performance and Lorge-Thorndike

Non-Verbal Tests consist almost entirely of non-verbal components and, thus, a greater degree of variability from the mean is experienced by this group on these types of measures. Lending additional support to this conclusion is the observation that the measure showing the greatest difference in variability between the two groups is the SCAT Verbal, probably the one measure of the eight that is most heavily saturated with understanding word meanings and reading comprehension.

The fourth hypothesis stated that there will be no significant difference at the .05 level of confidence between the Spanish-American and Anglo groups as measured by the Metropolitan Tests and the Grade Point Average.

The findings failed to confirm this hypothesis. Significant mean differences were obtained on both measures of academic achievement. Reference has already been made suggesting the existence of a functional language barrier in the Spanish-American group and that this barrier directly contributes to the reading inadequacies which are apparently influencing academic achievement. Probable contributors to this difference in achievement are such nonintellective factors as interest, motivation, socio-economic level, and cultural differences. Further studies involving the role of these factors in relation to academic achievement is needed.

For the purpose of developing regression equations

that would best represent truly independent variables, it was decided to omit the WISC Total and SCAT Total scores when deriving these equations. These scores represent combined scores and are, therefore, not completely independent within themselves. Six sets of regression equations were developed; one set for the Spanish-American group for predicting to the Metropolitan Tests achievement measure, and one set for predicting to the G.P.A. Two sets serving the same purpose were developed for the Anglo group. The last two sets of equations were calculated by combining the scores of the ethnic groups and predicting to the achievement criteria. Standard errors of measurement and predicted scores calculated from the regression equations were determined and are presented in the Appendix.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

There has been an increasing awareness and concern
among educators, especially in the past decade, of the many
complex problems pertaining to the opportunities for educa-
tional growth afforded America's minority ethnic groups.
Although the problem is one of national concern, it is more
specifically focused in particular geographic locations for
certain ethnic groups. One of these problems involves the
relationship of measured mental abilities and school
achievement, and it was toward this area that this study
was directed.

Numerous studies related to this problem have been
made concerning the Negro group in the South and various
ethnic groups in the industrial North and Northeast. This
study was specifically concerned with the Spanish-American
ethnic group in the Southwest, and it was limited to the
study of two ethnic groups, composed of Spanish-Americans
and Anglo-American, in a single school within the state of
New Mexico.

Implications of the Study

Implications for Educators

The findings of this study have some rather important implications for those educators working in and involved with an educational situation similar to the environment in which this study was conducted.

The knowledge that a significant difference does exist between these ethnic groups regarding mental abilities, as determined by commonly used measuring instruments, and academic achievement, measured objectively and subjectively, needs to be fully utilized and wisely considered in the over-all approach to the problem of educational development for all the students in the school. The implications, regarding the planning of a curriculum designed purposely to accommodate an educational situation such as this, are simultaneously challenging and somewhat awesome for the director of curriculum. Results from this study have implications for the building principals who are charged with the responsibilities of suitable and effective grouping or tracking of these students.

There are obvious implications for the director of guidance in choosing those measuring instruments which will more effectively yield valid and reliable results for the purposes intended. These findings should substantially aid the school counselor in his knowledge and ability to

interpret test scores and to effectively relate those interpretations in a more meaningful way to his particular counselees.

It has been earlier reported in the literature that teachers have an awareness of these difficulties, yet the implications from these findings should have their greatest relevance with this group of professional workers. The knowledge that a significant difference in aptitute and achievement exists between these ethnic groups should call for possible modifications in classroom methods and techniques. These modifications should be designed with the specific intent of more adequately accommodating the educational development of the minority ethnic group without, in any way, sacrificing the progress of the remaining student population.

Chief school administrators and the local school board have the responsibility of providing the facilities, equipment, and personnel necessary to implement programs suited to meeting the needs of this minority ethnic group.

Implications for Further Research

The findings from this study have shown that significant differences exist in ability and achievement between Spanish-American and Anglo ethnic groups. One conclusion drawn from these findings was that a language handicap was one important factor contributing to this difference;

however, it was suggested that other non-intellective factors, such as interest, motivation, cultural differences, i.e., family ties, values, attitudes, and personality, may be the casual factors contributing to the primary language handicap. Research in these areas may provide information leading to ways of eliminating or, at least alleviating, the problem of language inadequacy on the part of the Spanish-American student.

Studies are needed to investigate the effectiveness of devoting considerable time to the Spanish-American pupil during pre-school and at the beginning of his formal school experience to master the English language by placing major emphasis on an aural-oral approach and relegating formalized grammar to a secondary role until later in the student's school career. This approach would require that children learn to habituate the common speech patterns they are going to use and then develop a broad range of concepts in the new language.

There is a need for planned experimentation to study the effectiveness of the use of language laboratories, tape recorders, and other implemented programs in incorporating English idioms, slang, and multiple meanings of simple words into the child's venacular.

There is a need for more exhaustive research relative to the effectiveness of a functional integration of Spanish-American and Anglo students at the grade school

level. Geographic distribution of a minority ethnic groups within an expansive city system produces an imbalance of ethnic students within certain schools. This forced group homogeneity is probably detrimental to bicultural and bilingual efforts and effects.

Summary

This study was directed to an investigation of the relationship of certain predictive variables and academic achievement of Spanish-American and Anglo pupils in grade nine of a selected junior high school.

A randomly selected sample of fifty Spanish-American and fifty Anglo pupils was administered the WISC, the SCAT, and Lorge-Thorndike Tests, composing a total of eight variables, to be used in predicting achievement as measured by (1) selected subtests composite scores of the Metropolitan Achievement Test Battery and (2) the Grade Point Average earned during the academic year.

The review of literature presented several studies bearing findings pertinent to ethnic group differences, but few studies were found specifically related to Spanish-American and Anglo differences.

The study was based on the testing of four hypotheses which stated, in essence, that (1) there would be no differences, significant at the .05 level of confidence, in correlations between the predictive variables (SCAT, WISC, and

Lorge-Thorndike Tests) and the achievement measures (Metropolitan Tests and G.P.A.) in the two ethnic groups, (2) no significant correlations, at the .05 level of confidence, would be obtained between the predictive and achievement variables for the two groups, (3) no significant differences in abilities as measured by the independent variables would be shown between the two groups, and (4) no significant differences in achievement as measured by the Metropolitan Tests and G.P.A. would be shown between the two groups.

Partial affirmation was afforded the hypothesis that no significant correlations would be obtained between the predictive and achievement variables for the two ethnic groups. The individually administered WISC, with no reading or writing required on the part of the testee, and the symbol-loaded Lorge-Thorndike Non-Verbal failed to significantly correlate with the Metropolitan Achievement Test in the Spanish-American group. For the Anglo group, all variables correlated significantly high.

The second hypothesis was afforded partial affirmation in that no differences of a significant nature were found in variable correlations with achievement when using G.P.A. as the criterion; however, significantly higher correlations appeared for the Anglo group in the predictive variables more directly associated with reading aptitude and word meaning when the Metropolitan Test was the achievement criterion.

The third and fourth hypotheses were rejected since significant differences were found in ability and achievement for all variables for the Anglo group.

Regression equations were derived for both ethnic groups and for the combined groups in terms of predicting from the obtained scores of six of the eight independent variables to achievement as measured by the two criteria measures.

The findings in this study are probably of limited validity outside the setting in which they were obtained, although they provide certain avenues for further investigations and may have values of a generalized nature for schools in similar settings.

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APPENDIXES

APPENDIX A

TABLE XX

RAW SCORES OF THE PREDICTIVE AND CRITERION VARIABLES
OF THE ANGLO-AMERICAN SAMPLE

Subject	Variables									
No.	1	2	3	4	5	6	7	8	9	10
1	37	44	81	25	26	51	45	50	44	2.00
2	66	55	121	45	37	82	69	72	62	2.33
3	38	51	89	21	14	35	40	46	45	2.17
4	51	42	93	35	26	51	45	53	47	2.00
5	43	58	101	33	17	50	53	61	49	2.17
6	42	50	92	25	26	51	45	25	46	1.00
7	45	42	87	33	15	48	52	48	53	2.17
8	37	45	83	13	11	24	47	39	48	1.17
9	59	60	119	52	39	91	76	66	39	3.00
10	59	51	110	40	28	68	47	49	50	1.83
11	66	55	121	55	14	69	67	57	59	2.17
12	63	65	128	44	40	84	64	60	55	3.17
13	68	76	144	51	35	86	70	64	65	3.67
14	58	61	119	53	42	95	64	60	61	3.67
15	52	44	96	35	9	44	56	58	44	0.67
16	59	44	103	45	17	62	58	54	50	2.83
17	70	64	134	50	44	94	75	72	56	4.00
18	79	62	141	31	9	40	76	71	50	2.33
19	66	54	124	44	42	86	71	60	67	3.33
20	51	53	104	35	41	76	56	60	56	3.00
21	54	50	104	21	17	38	45	49	53	2.83
22	50	50	100	35	17	52	42	60	51	2.17
23	57	62	119	31	14	45	56	42	54	2.50
24	68	70	138	38	28	66	67	65	55	2.00
25	42	60	102	35	21	56	52	52	54	1.67
26	34	53	87	27	28	55	52	50	47	2.33
27	68	59	127	52	34	86	66	67	65	3.67
28	47	45	92	40	32	72	52	54	54	3.00
29	49	57	106	20	20	40	42	57	48	3.00
30	44	58	102	35	21	56	53	67	51	2.17
31	48	35	83	31	17	48	65	53	58	2.83
32	41	45	86	30	24	54	50	41	47	1.67
33	45	64	109	35	33	68	64	71	57	3.67
34	37	44	81	33	25	58	39	49	46	2.00
35	52	58	110	33	35	68	47	55	51	3.00

102

TABLE XX (Continued)

Subject No.	1	2	3	4	5	6	7	8	9	10
36	71	62	133	50	37	87	73	48	54	3.33
37	49	52	101	36	30	66	61	65	54	2.67
38	65	54	109	35	27	62	66	64	56	3.17
39	59	68	127	31	14	45	49	52	45	2.50
40	81	64	145	53	40	93	77	68	67	4.00
41	50	44	94	47	28	75	66	62	58	3.83
42	45	55	100	36	20	56	57	66	56	3.00
43	45	65	110	36	22	58	52	58	51	3.17
44	57	40	97	42	22	64	72	53	53	2.83
45	62	45	107	49	37	86	68	58	59	4.00
46	39	45	84	30	28	58	49	52	54	2.83
47	37	34	71	30	21	51	33	34	44	1.67
48	65	55	120	51	43	94	76	52	66	4.00
49	44	37	81	53	42	95	57	47	66	3.83
50	35	33	68	30	17	47	47	38	44	1.50
M	52.98	52.80	105.66	36.74	26.52	63.72	57.42	55.48	53.28	2.67
SD	11.90	9.73	19.07	12.18	10.03	18.21	11.57	10.07	6.80	.824

1 - WISC Verbal
2 - WISC Performance
3 - WISC Total
4 - SCAT Verbal
5 - SCAT Quantitative
6 - SCAT Total
7 - Lorge-Thorndike Verbal
8 - Lorge-Thorndike Non-Verbal
9 - Metropolitan Achievement Test
10 - Grade Point Average

TABLE XXI

RAW SCORES OF THE PREDICTIVE AND CRITERION VARIABLES
OF THE SPANISH–AMERICAN SAMPLE

Subject No.	Variables 1	2	3	4	5	6	7	8	9	10
1	32	41	73	33	17	50	45	43	41	1.50
2	50	53	103	49	37	86	67	56	62	3.33
3	42	43	85	17	9	26	40	10	40	2.67
4	35	43	78	20	20	40	38	32	38	1.33
5	55	59	114	19	24	43	54	46	42	1.67
6	42	48	90	16	14	30	33	42	38	1.00
7	31	46	77	22	13	35	22	21	37	1.33
8	63	49	112	25	26	51	44	48	44	0.83
9	31	25	56	24	14	48	42	30	38	2.17
10	39	42	81	20	13	33	44	49	49	2.00
11	53	61	114	21	9	30	32	33	47	1.50
12	55	50	105	28	27	55	49	52	41	1.67
13	33	31	64	36	28	64	59	46	49	4.00
14	70	58	128	40	26	66	62	59	57	2.17
15	34	47	81	25	19	44	46	55	47	2.67
16	64	61	125	33	30	63	66	64	63	2.50
17	36	38	74	24	22	46	40	47	46	1.50
18	22	32	54	30	17	47	40	28	42	1.67
19	30	25	55	14	18	32	29	36	41	1.83
20	41	45	86	21	25	46	39	49	46	1.17
21	35	39	74	15	14	29	33	34	49	2.50
22	30	44	74	33	25	58	51	56	51	2.67
23	38	39	77	27	18	45	50	38	48	1.50
24	45	40	85	21	14	35	37	42	40	1.33
25	23	35	58	25	26	51	44	42	45	2.17
26	32	55	87	17	19	36	40	29	41	1.67
27	31	35	66	19	14	33	36	40	44	1.67
28	32	50	82	18	14	32	28	46	42	0.83
29	34	47	81	19	18	37	36	48	55	2.83
30	47	52	99	20	18	38	32	30	38	1.67
31	45	39	84	30	20	50	47	33	52	1.00
32	41	50	91	21	15	36	43	51	53	1.17
33	40	34	74	18	26	44	39	42	48	1.67
34	49	53	102	18	9	27	48	50	46	1.33
35	38	54	92	15	13	28	27	49	35	0.67
36	33	43	76	18	20	38	42	60	38	0.83
37	48	38	86	21	22	43	50	45	41	0.83
38	48	59	107	24	14	38	47	57	47	1.33
39	42	56	98	13	7	20	30	41	41	1.33
40	38	36	74	13	18	31	40	29	40	1.50
41	41	37	78	13	14	27	36	26	37	1.33
42	50	64	114	36	22	58	61	58	50	1.50

TABLE XXI (Continued)

Subject No.	Variables 1	2	3	4	5	6	7	8	9	10
43	45	49	94	31	18	49	64	37	53	1.50
44	55	56	111	30	25	55	44	56	47	2.17
45	63	57	120	38	41	79	54	63	58	2.83
46	44	40	84	11	11	22	18	33	34	1.00
47	34	49	83	15	11	26	33	23	40	0.83
48	31	40	71	17	19	36	31	37	48	1.33
49	42	60	102	25	36	61	52	52	54	1.67
50	49	60	109	25	37	62	53	59	46	2.00
M	41.62	46.14	87.76	23.26	19.72	43.18	42.24	43.04	45.38	1.70
SD	10.21	10.05	18.28	7.96	7.65	14.19	11.01	10.65	6.71	0.70

1 - WISC Verbal
2 - WISC Performance
3 - WISC Total
4 - SCAT Verbal
5 - SCAT Quantitative
6 - SCAT Total
7 - Lorge-Thorndike Verbal
8 - Lorge-Thorndike Non-Verbal
9 - Metropolitan Achievement Test
10 - Grade Point Average

APPENDIX B

DEFINITION OF TERMS

<u>Academic Achievement</u> is defined as (a) the composite scores
obtained from the Reading, Language, Arithmetic Prob-
lem Solving and Concepts, Social Studies Information,
and Science subtests of the Metropolitan Achievement
Tests Intermediate Battery and (b) the combined grade
point average in English, mathematics and science
earned during the two semesters of an academic year.

<u>Beta Weights</u> are beta coefficients expressed in sigma
scores, calculated from partial regression coeffi-
cients in terms of partial coefficients of correlation
and standard errors of estimate for n variables.

<u>Dependent Variable</u> is defined as the variable for which
changes are observed. For the purpose of this study,
the dependent variables are (a) the composite scores
obtained from the selected subtests of the Metropoli-
tan achievement Intermediate Battery and (b) the grade
point average in English, mathematics, and science
earned during the two semesters of an academic year.

<u>Independent Variable</u> is that variable which is introduced
into the experimental situation, and which is the

primary object of study. For the purpose of this study, the independent variables referred to are (a) the scores obtained from the Verbal, Performance, and Full Scale tests of the Wechsler Intelligence Scale for Children, (b) the Verbal, Quantitative, and Total scores obtained from the SCAT, and (c) the Verbal and Non-Verbal scores of the Lorge-Thorndike Verbal and Non-Verbal Tests.

Intercorrelations are the correlations which result from multiple correlation analysis, in which each correlation is an index of the relationship between one variable and two or more other variables.

Multiple correlation is a measure which tells the strength and direction of relationship between one variable called the "criterion" and a combination of other variables. It tells how much weight should be given to each of the variables from which the criterion is being predicted. Those correlations which have the highest value are given the greatest weight, but all variables are used together to make a prediction which is better than the prediction which would be made on the basis of one variable alone. A multiple correlation is an expression of this total relationship. Regression analysis is a statistical study of the functional form of the relationship between variables. This is expressed in the form of a

mathematical function in which the dependent variable is set equal to some expression which depends only on the independent variable and certain constants. This allows one to see how closely the two variables are related through establishing the equation of a line which best represents the joint function of the variables, and for which the variance of estimate is the smallest. From the equation of such a line, one can predict the value of one variable for any known value of the other variable.

Regression equations are mathematical expressions of the functional form of the relationship between variables, as defined under regression analysis.

Significance is a mathematical expression of the degree to which a statistic is representative of the parameter based upon the entire population from which the sample was drawn. For the purposes of this study, significance is considered to be present when the derived statistic is established to be at the five per cent level of confidence.

Non-significant, for the purposes of this study, refers to those statistics which fall below the five per cent level of confidence.

SCAT is the accepted, and commonly used, abbreviation for Cooperative School and College Ability Tests developed by the Cooperative Test Division of the Educational Testing Service in Princeton, New Jersey.

Subtests are defined as single, or individual tests, which make up a general test, or a test battery.

APPENDIX C

TABLE XXII

OBTAINED AND PREDICTED G.P.A. SCORES FOR THE ANGLO-AMERICAN GROUP

Subject	Obtained Score	Predicted Score	Difference
1	2.00	2.28	− .28
2	2.33	3.56	−1.23
3	2.17	1.67	.49
4	2.00	2.44	− .44
5	2.17	2.31	− .14
6	1.00	1.84	− .84
7	2.17	2.00	.16
8	1.17	1.43	− .26
9	3.00	3.67	− .67
10	1.83	2.52	− .69
11	2.17	2.51	− .34
12	3.17	3.39	− .22
13	3.67	3.41	.25
14	2.67	3.55	.11
15	.67	2.02	−1.35
16	2.83	2.37	.45
17	4.00	3.94	.05
18	2.33	2.45	− .12
19	3.33	3.55	− .22
20	3.00	3.24	− .24
21	2.83	1.90	.92
22	2.17	2.19	− .02
23	2.50	1.88	.61
24	2.00	3.01	−1.01
25	1.67	2.31	− .64
26	2.33	2.45	− .12
27	3.67	3.40	.26
28	3.00	2.81	.18
29	3.00	2.10	.89
30	2.17	2.58	− .41
31	2.83	2.28	.54
32	1.67	2.15	− .48
33	3.67	3.22	.44

TABLE XXII (Continued)

Subject	Obtained Score	Predicted Score	Difference
34	2.00	2.24	− .24
35	3.00	2.81	.18
36	3.33	3.23	.09
37	2.67	2.99	− .32
38	3.17	2.91	.25
39	2.50	1.98	.51
40	4.00	3.78	.21
41	3.83	3.02	.80
42	3.00	2.58	.41
43	3.17	2.46	.70
44	2.83	2.66	.16
45	4.00	3.34	.65
46	2.83	2.48	.34
47	1.67	1.73	− .06
48	4.00	3.57	.42
49	3.83	3.24	.58
50	1.50	1.80	− .30

TABLE XXIII

OBTAINED AND PREDICTED METROPOLITAN ACHIEVEMENT TEST
SCORES FOR THE ANGLO-AMERICAN GROUP

Subject	Obtained Score	Predicted Score	Difference
1	44.00	48.77	- 4.77
2	62.00	59.45	2.54
3	45.00	44.95	.04
4	47.00	51.58	- 4.58
5	49.00	49.49	- 0.49
6	46.00	47.77	- 1.77
7	53.00	59.36	3.63
8	48.00	44.01	3.98
9	39.00	60.48	-21.48
10	50.00	52.95	- 2.95
11	59.00	55.58	3.41
12	55.00	57.97	- 2.97
13	65.00	58.79	6.20
14	61.00	59.30	1.69
15	44.00	49.98	- 5.98
16	50.00	53.49	- 3.49
17	56.00	62.07	- 6.07
18	50.00	53.97	- 3.97
19	67.00	59.99	7.00
20	56.00	55.50	0.49
21	53.00	47.72	5.27
22	51.00	49.38	1.61
23	54.00	49.20	4.79
24	55.00	55.72	- 0.72
25	54.00	49.79	4.20
26	47.00	49.56	- 2.56
27	65.00	59.22	5.77
28	54.00	53.77	0.22
29	48.00	47.36	0.63
30	51.00	50.87	0.12
31	58.00	51.88	6.11
32	47.00	49.57	- 2.57
33	57.00	54.42	2.57
34	46.00	48.88	- 2.88
35	51.00	52.63	- 1.63
36	54.00	59.61	- 5.61
37	54.00	54.30	- 0.30
38	56.00	55.48	0.51
39	45.00	48.69	- 3.69
40	67.00	62.76	4.23
41	58.00	56.35	1.64
42	56.00	51.49	4.50

TABLE XXIII (Continued)

Subject	Obtained Score	Predicted Score	Difference
43	51.00	50.40	0.59
44	53.00	55.69	− 2.69
45	59.00	59.36	− 0.36
46	54.00	50.52	3.47
47	44.00	46.81	− 2.81
48	66.00	61.22	4.77
49	66.00	57.79	8.20
50	44.00	47.82	− 3.82

TABLE XXIV

OBTAINED AND PREDICTED G.P.A. SCORES FOR
THE SPANISH-AMERICAN GROUP

Subject	Obtained Score	Predicted Score	Difference
1	1.50	2.12	− .62
2	3.33	2.95	.37
3	2.67	1.49	1.17
4	1.33	1.71	− .38
5	1.67	1.55	.11
6	1.00	1.22	− .22
7	1.33	1.51	− .18
8	.83	1.60	− .77
9	2.17	1.95	.21
10	2.00	1.50	.49
11	1.50	1.10	.39
12	1.67	1.84	− .17
13	4.00	2.67	1.32
14	2.17	2.10	.06
15	2.67	1.79	.87
16	2.50	2.03	.46
17	1.50	1.83	− .33
18	1.67	2.24	− .57
19	1.83	1.52	.30
20	1.17	1.66	− .49
21	2.50	1.38	1.11
22	2.67	2.28	.38
23	1.50	2.01	− .51
24	1.33	1.45	− .12
25	2.17	2.19	− .02
26	1.67	1.60	.06
27	1.67	1.58	.08
28	.83	1.29	− .46
29	2.83	1.49	1.33
30	1.67	1.40	.26
31	1.00	2.05	−1.05
32	1.17	1.47	− .30
33	1.67	1.72	− .05
34	1.33	1.22	.10
35	.67	1.04	− .37
36	.83	1.54	− .71
37	.83	1.75	− .92
38	1.33	1.41	− .08
39	1.33	.90	.42
40	1.50	1.52	− .02
41	1.33	1.36	− .03
42	1.50	2.07	− .57

TABLE XXIV (Continued)

Subject	Obtained Score	Predicted Score	Difference
43	1.50	2.18	− .68
44	2.17	1.73	.43
45	2.83	2.29	.53
46	1.00	.89	.10
47	.83	1.34	− .51
48	1.33	1.40	− .07
49	1.67	2.05	− .38
50	2.00	1.96	.03

TABLE XXV

OBTAINED AND PREDICTED METROPOLITAN ACHIEVEMENT TEST
SCORES FOR THE SPANISH-AMERICAN GROUP

Subject	Obtained Score	Predicted Score	Difference
1	41.00	47.81	− 6.81
2	62.00	58.68	3.31
3	40.00	38.74	1.25
4	38.00	42.16	− 4.16
5	42.00	47.56	− 5.56
6	38.00	41.47	− 3.47
7	37.00	38.15	− 1.15
8	44.00	46.83	− 2.83
9	38.00	42.57	− 4.57
10	49.00	45.09	3.90
11	47.00	41.81	5.18
12	41.00	49.14	− 8.14
13	49.00	51.46	− 2.46
14	57.00	55.69	1.30
15	47.00	47.90	− 0.90
16	63.00	55.70	7.29
17	46.00	45.15	0.84
18	42.00	43.89	− 1.89
19	41.00	38.51	2.48
20	46.00	44.91	1.08
21	49.00	39.83	9.16
22	51.00	50.98	0.01
23	48.00	46.62	1.37
24	40.00	43.03	− 3.03
25	45.00	45.61	− 0.61
26	41.00	42.05	− 1.05
27	44.00	41.93	2.06
28	42.00	41.62	0.37
29	55.00	43.63	11.36
30	38.00	41.08	− 3.08
31	52.00	46.18	5.81
32	53.00	45.84	7.15
33	48.00	42.81	5.18
34	46.00	45.88	0.11
35	35.00	41.21	− 6.21
36	38.00	45.88	− 7.88
37	41.00	46.06	− 5.06
38	47.00	48.46	− 1.46
39	41.00	40.21	0.78
40	40.00	40.06	− 0.06
41	37.00	38.82	− 1.82
42	50.00	54.69	− 4.69

TABLE XXV (Continued)

Subject	Obtained Score	Predicted Score	Difference
43	53.00	50.64	2.35
44	47.00	49.38	- 2.38
45	58.00	54.63	3.36
46	34.00	35.75	- 1.75
47	40.00	38.90	1.09
48	48.00	42.97	5.02
49	54.00	49.87	4.12
50	46.00	50.91	- 4.91

TABLE XXVI

OBTAINED AND PREDICTED METROPOLITAN ACHIEVEMENT TEST
SCORES FOR THE COMBINED ETHNIC GROUPS

Subject	Obtained Score	Predicted Score	Difference
1	44.00	47.56	- 3.56
2	62.00	59.57	2.42
3	45.00	44.13	.86
4	47.00	50.14	- 3.14
5	49.00	50.57	- 1.57
6	46.00	45.54	.45
7	53.00	48.93	4.06
8	48.00	42.56	5.43
9	39.00	61.79	-22.79
10	50.00	51.64	- 1.64
11	59.00	57.09	1.90
12	55.00	57.91	- 2.91
13	65.00	60.24	4.75
14	61.00	59.90	1.09
15	44.00	50.25	- 6.25
16	50.00	53.45	- 3.45
17	56.00	62.62	- 6.62
18	50.00	54.48	- 4.48
19	67.00	59.27	7.72
20	56.00	54.54	1.45
21	53.00	45.89	7.10
22	51.00	49.17	1.82
23	54.00	48.92	5.07
24	55.00	56.21	- 1.21
25	54.00	50.54	3.45
26	47.00	49.39	- 2.39
27	65.00	59.79	5.20
28	54.00	53.11	.88
29	48.00	46.23	1.76
30	51.00	52.03	- 1.03
31	58.00	51.31	6.68
32	47.00	48.46	- 1.46
33	57.00	55.76	1.23
34	46.00	48.03	- 2.03
35	51.00	51.53	- .53
36	54.00	59.33	- 5.33
37	54.00	54.55	- .55
38	56.00	55.02	.97
39	45.00	48.74	- 3.74
40	67.00	62.93	4.06
41	58.00	57.08	.91
42	56.00	52.67	3.32

TABLE XXVI (Continued)

Subject	Obtained Score	Predicted Score	Difference
43	51.00	51.50	- .50
44	53.00	55.58	- 2.58
45	59.00	58.85	.14
46	54.00	49.72	4.27
47	44.00	44.53	- .53
48	66.00	60.95	5.04
49	66.00	57.15	8.84
50	44.00	46.61	- 2.61
51	41.00	47.34	- 6.34
52	62.00	58.35	3.64
53	40.00	37.55	.44
54	38.00	43.02	- 5.02
55	42.00	47.66	- 5.66
56	38.00	41.66	- 3.66
57	37.00	38.93	- 1.93
58	44.00	47.77	- 3.77
59	38.00	43.33	- 5.33
60	49.00	44.65	4.38
61	47.00	41.44	5.55
62	41.00	49.53	- 8.53
63	49.00	51.83	- 2.83
64	57.00	54.97	2.02
65	47.00	47.24	- 0.24
66	63.00	55.03	7.96
67	46.00	45.70	0.29
68	42.00	44.34	- 2.34
69	41.00	40.15	0.84
70	46.00	45.63	0.36
71	49.00	40.55	8.44
72	51.00	50.45	0.54
73	48.00	46.71	1.28
74	40.00	43.34	- 3.34
75	45.00	46.35	- 1.35
76	41.00	42.38	- 1.38
77	44.00	42.27	1.72
78	42.00	41.43	0.56
79	55.00	43.63	11.36
80	38.00	41.92	- 3.92
81	52.00	46.80	5.19
82	53.00	45.23	7.76
83	48.00	44.41	3.58
84	46.00	44.75	1.24
85	35.00	40.93	- 5.93
86	38.00	45.64	- 7.64

TABLE XXVI (Continued)

Subject	Obtained Score	Predicted Score	Difference
87	41.00	46.77	− 5.77
88	47.00	47.11	− 0.11
89	41.00	49.65	1.34
90	40.00	41.38	− 1.38
91	37.00	40.03	− 3.03
92	50.00	53.05	− 3.05
93	53.00	49.95	3.04
94	47.00	49.28	− 2.28
95	58.00	55.36	2.63
96	34.00	36.99	− 2.99
97	40.00	39.23	0.71
98	48.00	43.19	4.80
99	54.00	50.37	3.62
100	46.00	51.41	− 5.41

TABLE XXVII

OBTAINED AND PREDICTED GRADE POINT AVERAGE ACHIEVEMENT
SCORES FOR THE COMBINED ETHNIC GROUP

Subject	Obtained Score	Predicted Score	Difference
1	2.00	2.09	- .09
2	2.33	3.20	- .87
3	2.17	1.56	.60
4	2.00	2.30	- .30
5	2.17	2.21	- .04
6	1.00	1.99	- .99
7	2.17	2.11	.05
8	1.17	1.36	- .19
9	3.00	3.61	- .61
10	1.83	2.46	- .63
11	2.17	2.85	- .68
12	3.17	3.15	.01
13	3.67	3.30	.36
14	3.67	3.51	.15
15	0.67	2.06	-1.39
16	2.83	2.53	.29
17	4.00	3.59	.40
18	2.33	2.09	.23
19	3.33	3.30	.02
20	3.00	2.86	.13
21	2.83	1.62	1.20
22	2.17	2.04	.12
23	2.50	1.98	.51
24	2.00	2.69	- .69
25	1.67	2.34	- .67
26	2.33	2.33	- .00
27	3.67	3.26	.40
28	3.00	2.74	.25
29	3.00	1.66	1.33
30	3.17	2.38	- .21
31	2.83	2.30	.52
32	1.67	2.22	- .55
33	3.67	2.86	.80
34	2.00	2.20	- .20
35	3.00	2.38	.51
36	3.33	3.32	.00
37	2.67	2.73	- .06
38	3.17	2.58	.57
39	2.50	1.87	.62
40	4.00	3.53	.46
41	3.83	3.08	.74
42	3.00	2.44	.55

TABLE XXVII (Continued)

Subject	Obtained Score	Predicted Score	Difference
43	3.17	2.38	.78
44	2.83	2.81	.01
45	4.00	2.30	.69
46	2.83	2.34	.48
47	1.67	1.88	— .21
48	4.00	3.60	.39
49	3.83	3.47	.35
50	1.50	2.04	— .54
51	1.50	2.12	— .62
52	3.33	3.36	— .03
53	2.67	1.21	1.45
54	1.33	1.64	— .31
55	1.67	1.86	— .19
56	1.00	1.26	— .26
57	1.33	1.27	.05
58	.83	1.88	—1.05
59	2.17	1.71	.45
60	2.00	1.58	.41
61	1.50	1.17	.32
62	1.67	2.14	— .47
63	4.00	2.72	1.27
64	2.17	2.60	— .43
65	2.67	1.96	.70
66	2.50	2.61	— .11
67	1.50	1.88	— .38
68	1.67	1.99	— .32
69	1.83	1.32	.50
70	1.17	1.81	— .64
71	2.50	1.27	1.22
72	2.67	2.47	.19
73	1.50	2.00	— .50
74	1.33	1.46	— .13
75	2.17	2.16	.00
76	1.67	1.57	.09
77	1.67	1.48	.18
78	.83	1.32	— .49
79	2.83	1.57	1.25
80	1.67	1.40	.26
81	1.00	2.03	—1.03
82	1.17	1.63	— .46
83	1.67	1.74	— .07
84	1.33	1.41	— .08
85	.67	1.15	— .48
86	.83	1.73	— .90
87	.83	1.86	—1.03

TABLE XXVIII (Continued)

Subject	Obtained Score	Predicted Score	Difference
88	1.33	1.72	− .39
89	1.33	.94	.38
90	1.50	1.39	.10
91	1.33	1.20	.12
92	1.50	2.50	−1.00
93	1.50	2.29	− .79
94	2.17	2.08	.08
95	2.83	2.84	− .01
96	1.00	.76	.23
97	.83	1.17	− .34
98	1.33	1.50	− .17
99	1.67	2.41	− .74
100	2.00	2.42	− .42

VITA

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