

THE RELATIONSHIP BETWEEN TYPE-PREFERENCE
SCORES AND READING COMPREHENSION
ACHIEVEMENT SCORES

THESIS

Submitted to the Graduate Committee of the
Department of Curriculum and Instruction
Faculty of Education
State University College at Brockport
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Education

by

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May, 1984

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Acknowledgements

Sincere thanks and appreciation is given to the following persons:

To Dr. Frances Moroney-Whited, Dr. Gerald Begy, and Dr. Morris Beers for their time, guidance and support.

To Dr. Paul Kazmierski for his inspiration, expertise, and continued counsel.

To Irene Payne for her patience, support, and understanding.

To my typists, Barbara Young and Elaine LaDue, for their dedication to perfection and highly professional work in preparing for and completing this document.

Abstract

The purpose of this study was to ascertain whether or not cognitive preferences, as measured by an indicator of psychological type, have a significant relationship to performance on standardized reading comprehension tests.

The subjects of this study were a group of one hundred college freshmen randomly selected from an incoming population at a mid-sized technical institution.

All students were administered both the Myers-Briggs Type Indicator (Myers, 1962) and the Nelson-Denny Reading Comprehension Subtest (Brown, Bennett, & Hanna, 1981). The scoring of the Myers-Briggs Type Indicator resulted in a four-letter type composite made up of two attitude preference scores and two function preference scores for each student. The Nelson-Denny scores were broken down into percent correct on the literal questions, percent correct on the inferential questions, percent correct of those attempted, and a percentile ranking. Chi-square tests of independence were done to see if significant relationships existed at the .05 level.

The results indicated that a significant relationship did exist between S/N type-preferences and scores on the inferential questions. Also, there was a significant relationship between J/P type-preferences and percentile rankings.

Recommendations for future research in this area, as well as implications for the findings of this study, were discussed.

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Chapter I

Statement of the Problem

Purpose

The purpose of this study was to investigate the relationship between type preference and reading comprehension achievement scores.

The following questions regarding this relationship were posed:

1. Is there a significant relationship between each type preference score and the percent correct on literal questions of a standardized reading comprehension test?
2. Is there a significant relationship between each type preference score and the percent correct on inferential questions of a standardized reading comprehension test?
3. Is there a significant relationship between each type preference score and the percent correct out of the number attempted on a standardized reading comprehension test?
4. Is there a significant relationship between each type preference score and the percentile rank in which they fall on a standardized reading comprehension test?
5. Is there a significant relationship between composite type preferences and the percentile rank in which they

fall on a standardized reading comprehension test?

Need for the Study

Since 1914, when Edward Thorndike devised the first two standardized tests in reading comprehension, hundreds of standardized tests have been created for and administered in our schools. In the 1980's the use of standardized tests and the publication of their results is common for rating and comparing educators, methodologies, and our nation's students. This role of tests in the maintenance of and comparison to national standards seems to have increased during the past decade, particularly in government funded programs.

The advocates of standardized testing have sound arguments to support the continued use of standardized testing to assess our students when referring to the validity and reliability of these tests. Ebel (1975a) and Ysseldyke and Marston (1982) agree that standardized tests are scrutinized extensively for validity and reliability and believe that "group administered reading tests often possess excellent technical adequacy" (Ysseldyke & Marston, 1982, p. 261).

Some researchers (Otto, 1973; Perrone, 1977) disagree, however, on the importance and accuracy of the claimed statistical validity and reliability of standardized tests. These researchers and others (Ebel, 1975a; Ebel, 1975b; Harmon, 1977; Laughland &

Corbett, 1977; Lazarus, 1977) believe that standardized tests can be criticized on the basis of many other factors along with validity and reliability. Some of these include the personal nature of the testee himself, cultural differences, cognitive preferences, time restraints, and the type of task the testee is required to perform.

In speaking particularly of reading achievement tests, Wallace and Larsen (cited in Ysseldyke & Marston, 1982, p. 261) believe that

the task of assessing reading comprehension is influenced by several factors that should be considered by the examiner. The nature of the reader obviously affects performance. The examiner must consider the student's motivation, background, and experience...type of material obviously affects the reader's performance and should be considered during assessment.

Laughland (Laughland & Corbett, 1977, p. 332) agrees that "a standardized test is impersonal. It makes no allowance for individual peculiarities. It cries out for a kind of gamesmanship, and perhaps that is what it tests best." Lazarus (1977, p. 194) concurs that "people are different; they have different kinds of skills, abilities, and styles. It is foolish to pretend otherwise, yet the concept of norm-referenced tests assumes that people are

very similar in certain kinds of ways."

These opinions lead to the question of whether or not standardized reading achievement tests take into consideration all the factors that influence the resulting scores, particularly individual cognitive and personality traits.

Recent researchers have become more interested in the relationship between a person's cognitive style and his aptitudes and abilities (Cross, 1977; Kogan, 1972; Kogan, 1979). Kogan (1972, pp. 245-246) calls researchers to the task of determining "whether cognitive styles and strategies contribute to variability in school achievement beyond what is predicted by traditional ability or aptitude tests."

In support of the idea that "people see and make sense of the world in different ways...give their attention to different aspects of the environment...approach problems with different methods for solution;...construct relationships in distinctive patterns;...process information in different, but personally consistent ways" (Cross, 1977, p. 115), this study hopes to show that these differences are important factors which may not be accounted for when evaluating the results of standardized tests.

Definition of Terms

Terms used in this study include the following:

Cognitive style: "Those human preferences, attitudes, or

approach strategies that characterize an individual's manner of perceiving, remembering, thinking, and problem-solving" (Kazmierski, 1979, p. 1).

Type-preference scores: The four separate attitude and function scores obtained on the Myers-Briggs Type Indicator (either E/J, Extraversion/Introversion; S/N, Sensing/Intuition; T/F, Thinking/Feeling; or J/P, Judgment/Perception).

Type composite: The combination of the four scores obtained on the Myers-Briggs Type Indicator (e.g., ENFP).

Preference-type: "That portion of the personality which people create in themselves by their exercise of the four [cognitive process] preferences" (Myers, 1962, p. 63).

Attitude scores: The two scores obtained on the Myers-Briggs Type Indicator which relate to the focus of the cognitive processes preferred (E/I) and the preferred process for dealing with the outer world (J/P).

Function scores: The two scores obtained on the Myers-Briggs Type Indicator which indicate which of the four cognitive processes are preferred for perception (S/N) and judgment (T/F).

Literal questions: Those questions on the Nelson-Denny Comprehension Subtest which have been classified as primarily literal (Table 6, Brown, Bennett, & Hanna, 1981, p. 10).

Inferential questions: Those questions on the Nelson-Denny Reading Comprehension Subtest which have been classified as

primarily inferential (interpretive) (Table 6, Brown, Bennett, & Hanna, 1981, p. 10).

Limitations of the Study

The limitations of this study can be related to the following:

1. The sample size is seemingly small when looking at the percentile ranks in which the composite scores fall. There may not be an adequate number represented in each category to ensure that valid conclusions can be drawn.
2. The reliability and validity of the Myers-Briggs Type Indicator is not clearly substantiated. This is due to the influences of a "self-report" format on the reliability and validity of responses.
3. No account was made for the degree of preference strength. Those scores close to the median may reflect a lack of crystallization of a clear preference or a high degree of flexibility in strategies, neither of which was accounted for.

Summary

The research examined showed that there is no clear indication of the impact of personality, cognitive style, culture, time restraints, and type of task on standardized test scores. Although standardized tests appear to be sufficiently valid and reliable in what they test, the question remains whether or not they take into account all that they need to when assessing ability and aptitude.

Recent researchers have concerned themselves with the effects of these factors on standardized test performance. This study hopes to determine whether or not these factors, particularly those of personality preferences as related to cognitive functioning, are important ones to be considered when assessing students' reading achievement through the use of standardized tests.

Chapter II

Review of Related Literature

Purpose

This study was done for the purpose of ascertaining whether or not cognitive preferences, as measured by an indicator of psychological type, have a significant impact on performance on standardized reading tests.

In reviewing the related literature, the areas of cognitive style, typology, Jungian personality theory, and the findings of studies using the Myers-Briggs Type Indicator will be discussed.

Cognitive Style as a Concept

Kazmierski (1979, p. 1) defines cognitive learning styles as "those human preferences, attitudes, or approach strategies that characterize an individual's manner of perceiving, remembering, thinking, and problem-solving." He maintains that "these information-processing habits are developed with underlying personality characteristics and appear as relatively stable constructs." Cognitive style is a collection of several individual differences which affect performance on cognitive tasks.

Kogan (1972) elaborates on that definition through a comparison of modes of perception, memory, thought, and abilities. He contents that there is "a difference in emphasis....Abilities

concern level of skill--the more and less of performance--whereas cognitive styles give greater weight to the manner and form of cognition" (p. 244).

Messick (1970, pp. 188 - 189) identifies nine of the most commonly studied cognitive dimensions as (a) field-dependent vs. field-independent (b) scanning (c) breadth of categorization (d) conceptualizing styles (e) cognitive complexity vs. simplicity (f) reflectiveness vs. impulsivity (g) leveling vs. sharpening (h) constricted vs. flexible control and (i) tolerance for incongruous or unrealistic experiences. Nearly twenty-two different cognitive dimensions have been identified through research. These behaviors, however, are considered on a continuum rather than as a hierarchy.

Kogan (1979) feels that of the nine dimensions of cognitive style which Messick (1970) names, three have clear-cut implications for education; field-dependence/field-independence, reflectiveness/impulsivity, and cognitive complexity/simplicity.

Much research has been done in the area of field-dependence/field independence (FD/FI). Witkin has been most closely associated with this field of study. His original work on FD/FI evolved from work he was doing in the area of perception in 1942. Much of this research (Witkin, Dyke, Faterson, Goodenough, & Kays, 1962; Withkin, Moore, Goodenough & Cox, 1975; Witkin & Goodenough, 1976) revolved around the idea that FD/FI was of a perceptual nature. However, recently the "Witkin group views FD/FI

as the cognitive aspect of a deeply ingrained personality syndrome" (Kogan, 1972, p. 252) and "the perceptual aspect of a more pervasive analytic-global style" (Kogan, 1972, p. 250).

Kogan (1972, p. 266) states that "the reflection/impulsivity dimension has the most direct implication for the educational process....Correlations between reflection/impulsivity and ability measures tend to be positive for response time and negative for number of errors, though the magnitude of the coefficients often falls short of significance." Impulsiveness appears to have a negative affect on inductive reasoning ability, much as field-dependence negatively affects analytic abilities.

In the area of cognitive complicity/simplicity, "one of the major educational implications of research on cognitive complexity/simplicity...[is] to instill in students a differentiated view of the world in which they live" (Kogan, 1972, p. 274). He suggests that this dimension may offer a greater educational advantage if it is regarded as an educational outcome measure rather than as a cognitive style.

The area of cognitive style and the educational implications of each dimension are increasingly important factors to be considered when assessing students, and continued research is needed in all areas. Based on research completed at this time, it appears that an analytical field approach, reflectiveness, and cognitive complexity are to be positively valued in education

(Kogan, 1972).

Typology and Cognitive Style

"Stable, enduring, cutting across all of a person's cognitive functioning..." is the description given to personality by Moursund (1976, p. 264). She further elaborates by saying that:

Personality is a sort of stalagmite that is constantly being built up over the years out of the interactive processes of perception and reaction to perception. As such, it must be affected by one's cognitive style since that style determines the way one perceives things. But even more important, one's cognitive style is part of one's personality; it is one of those enduring characteristics that define the nature of the self (Moursund, 1976, p. 264).

Paul R. Kazmierski (personal communication, September 21, 1983) describes personality as being made up of one's cognitive style, the knowledge that one possesses, and one's ability and potential. It appears that all of these factors are interrelated and affected by the others. Thus, it seems reasonable to suggest that one's abilities and potential are affected by one's cognitive style, as personality is affected by them.

Jungian Typology

In Jung's essay on psychological types (1923) he presented one of the most comprehensive current theories to explain human personality. His theory is based on observation of patterns in the way that people prefer to perceive and make judgments. As Lawrence (1982, p. 6) describes in People Types and Tiger Stripes;

in Jung's theory all conscious mental activity can be classified into four mental processes -- two perception processes (sensing and intuition) and two judgment processes (thinking and feeling). What comes into consciousness,...comes either through the senses or through intuition.... They [sensing information] are used, sorted, weighed, analyzed, and evaluated by the judgment processes, thinking and feeling. Along with these four mental processes, Jung distinguishes two major attitudes or orientations of personality, the attitude of extraversion and the attitude of introversion. The extraverted attitude orients the person toward the external objective world; the introverted attitude orients the person toward the inner, subjective world. These two opposing attitudes are both present in the personality, but ordinarily one of them is dominant

and conscious while the other is subordinate and unconscious. (Hall & Lindzey, 1970, p. 88)

Jung separated the four mental processes into two categories: irrational functions (sensing and intuition) and rational functions (thinking and feeling). The irrational functions are based upon concrete, particular, and accidental perceptions. The rational functions make use of reason, judgment, abstraction and generalization to evaluate those perceptions (Hall & Lindzey, 1970). Although all people possess all four function capabilities, the four are not necessarily equally developed.

Jung (Hall & Lindzey, 1970) analyzed the development of each of the functions by reasoning that each person has a superior (dominant) function, an auxiliary function, and an inferior function. The superior function is the most highly differentiated and plays a predominant role in consciousness. The inferior function is the least differentiated of the four functions, often repressed and unconscious, and is incidentally the polar opposite of the dominant function. The auxiliary function is not discussed at length by Jung, but in brief notations he describes it as a secondary function which takes over when the superior function is prevented from operating. This is an area which is more extensively researched in the work on the Myers-Briggs Type Indicator.

Myers-Briggs Type Indicator (MBTI)

In 1962, the Educational Testing Service published the first form of the Myers-Briggs Type Indicator (MBTI) which was developed by Isabel Briggs Myers and Katherine Briggs after a twenty year period of research and revision. In 1975 the Consulting Psychologists Press published it for more wide-spread circulation. The instrument was developed to put Carl Jung's theory of type (Jung, 1923) into practical application. As presented in the MBTI Manual, the authors state that:

The merit of the personality theory presented here is that it accounts for many of the differences which other theoretical frameworks leave to random variation; yet, the theory has the merit of unusual simplicity, and, indeed, is not incompatible with most other approaches (Myers, 1962, p. 51).

The basis of Jungian theory and the extension of that theory for the development of the MBTI is that "much apparently random variation in human behavior is actually quite orderly and consistent, being covered by certain basic differences in mental functioning" (Myers, 1962, p. 51). Behavior is directly affected by the processes of perception and judgment that people prefer to use. Furthermore, "a person may reasonably be expected to develop most skill with the processes he prefers to use and in the areas where he prefers to use them" (Lawrence, 1982, p. 2).

There is clearly a strong representation of Jung's theory in the construction of the MBTI. It includes the four mental functions of sensing (S), intuition (N), thinking (T), and feeling (F), as well as Jung's third dimension of focus for the mental functions, extraversion (E) and introversion (I).

However, Briggs and Myers add a fourth dimension which characterizes a person's attitude when dealing with the outer world, judgment (J) and perception (P). "In practice the J/P preference is a by-product of the choice as to which process, of the two liked best, shall govern one's life" (Myers, 1962, p. 50).

Everyone uses all four of the mental processes discussed and described by Jung (1923), but they differ in how much and how well they use them. The balance is found in the development of both a dominant (superior) and an auxiliary process. Thus, both a perceptual and judging process can be used reliably. Below is listed some of the general characteristics of each MBTI preference letter:

- E - interest turns mostly outward to the world of action, people and things.
- I - interest turns more often to the inner world of ideas and private things.
- S - pays more attention to the facts that come from personal experiences; can see the details more easily.

N - can see the "big picture" more easily;
pays more attention to the meanings
behind facts.

T - makes decisions by examining data,
staying impersonal, and remaining cool.

F - makes decisions by paying attention to
personal values and feelings.

J - shows to others their T or F judgment
more easily than their S or N perception.

P - shows their S or N perception rather than
their T or F judgment in dealing with the
world outside themselves.

(Lawrence, 1982)

Dominant and Auxiliary Processes

Myers and Myers, in Gifts Differing (1982, p. 10), state that "people need some governing force in their make-up. They need to develop their best process to the point where it dominates and unifies their lives. In the natural course of events, each person does just that." This function is called the dominant function, and it is essentially the superior function that Jung (1923) referred to. It is believed that the development of all four processes equally would be detrimental in that "such impartiality,...keeps all of the processes relatively undeveloped and produces a primitive mentality, because opposite ways of doing

the same thing interfere with each other if neither has priority" (Myers & Myers, 1982, p. 12).

The auxiliary process is considered quite important in the theoretical base of Myers' and Briggs' research. Myers and Myers (1982, p. 12) contend that "for people to be balanced they need adequate (but by no means equal) development of a second process, not as a rival to the dominant process, but as a welcome auxiliary." The auxiliary process also has the role of supplying an adequate balance between extraversion and introversion, because individuals develop relatively effective processes for dealing with both the inner and outer worlds.

Preference as Measured by MBTI

As discussed, one's preference type is a product of his conscious orientation to life, his habitual ways of perceiving and judging and the ways he prefers to use those cognitive processes in dealing with the outer world. Myers (1962, p. 63) states that:

Any preference, however slight, suffices to start the individual along one path rather than its opposite. How far he will go,...depends upon the individual,...the intrinsic strength of his preference.

Each MBTI preference letter is given a numerical value indicating the strength of the preference. It is important, however, to note that the reported score for each preference is not

necessarily a direct measure of the strength of that preference or the excellence of the type development. The reported score may not reflect true strength due to "accident,...the hazards of self-report, or because of unusual appreciation of supplementary development of the opposite process or attitude, which would be admirable rather than detrimental" (Myers, 1962, p. 73). The increase in the strength of a preference may be indicative of two things; that the person being tested is right about his preferences and that implications can be reasonably made for that preference (Myers, 1962).

Flexibility of Preference

As noted in Myers (1962, p. 73), the high development of all processes may result in low preference scores because the individual is sufficiently comfortable in dealing with his environment in a variety of ways. As stated by Goldberg (cited in Moursund, 1976, p. 27) "logically, it would seem obvious that if different situations call for different stylistic approaches, it is the person who can switch from one style to another rather than the person who always approaches a task in the same way who will do best in the long run."

In comments about a study done by Eisner (cited in Moursund, 1972, p. 17) it states that "the findings are...consistent with the notion that the individual who can choose which cognitive style he wishes to use has an advantage over the one who is locked into a

particular mode of functioning."

It would appear that low preference strength can be an indication of either high flexibility or lack of development of preferences and/or processes.

Studies Using the MBTI

The results of the MBTI have been used extensively in research and counseling. The areas of application include theoretical research, statistical research, psychological studies, and educational, vocational and personal counseling (Buros, 1978; Myers, 1962). However, only very limited research has been done relating the results of the MBTI to academic achievement, and even less in the areas of reading comprehension achievement.

In a study done for comparison of MBTI scores in a sample of National Merit Scholarship finalists, results showed that there was a greater frequency of intuitives and introverts represented in the sample. "A preference for intuition and introversion appeared to be associated with scholastic aptitude as measured on SAT's (Myers, 1962, p. 35). There also seemed to be a difference in types in favor of use of Judging (J) in dealing with the outer world. Myers states that "the three preferences which appear to contribute most to scholastic success are the I, N, and J preferences" (Myers, 1962, p. 43).

In a study relating MBTI types to various aspects of mathematical achievement, as measured by the Stanford Achievement

Test in Mathematics (SATM) (May, 1971), the researcher suggests that the intuitives, as a group, perform better than sensors in arithmetic achievement in computation, concepts, and application. The study involved two hundred ninety-five eighth grade students who had taken both the MBTI and the SATM.

A study of 2,514 first-term college freshmen at the University of Florida at Gainesville (Millot, 1974) involved the comparison of their MBTI scores and their scores on the McGraw-Hill Basic Skills System Reading Test. Three general hypotheses were presented, one of which was that there is a significant relationship between MBTI preferences and reading skill. Seventeen of the thirty-three correlations obtained were acceptable at the alpha level of .001. There was a significant correlation with paragraph comprehension and introversion, intuition, and perception. IN types demonstrated superior reading skills, while ES types performed the poorest. Of the total types, INTP scored best, whereas ESTP scored the worst.

Summary

This chapter reviewed the theoretical base and findings of research in the areas of cognitive style, typology, and the relationship of type to achievement.

A review of the literature on cognitive style suggests that an individual's cognitive style has a definite relationship to educational outcomes, particularly when looking at the dimensions

of field-dependence/field-independence, impulsivity/reflectiveness, and cognitive complexity/simplicity.

The research on typology supports the idea that there is a connection between cognitive style and personality. It appears that one's cognitive style, personality, and abilities are interrelated. Thus, cognitive style, and the manifestation of that in one's personality, must be considered when assessing abilities and aptitudes.

Studies conducted using the Myers-Briggs Type Indicator suggest that introversion and intuition tend to correspond closely with academic success as measured by standardized tests. Only very limited research has been done in the comparison of type and achievement scores, thus the need for this study to support or refute these early findings.

Chapter III

Design of the Study

Purpose

The purpose of this study was to examine the impact that personal preferences in cognitive functioning have on student scores obtained on a standardized reading comprehension achievement test.

Questions

The following null hypotheses were formulated for this study:

1. There will be no significant relationship between the type-preference scores and the literal questions of the reading comprehension subtest. The variables will be independent.
2. There will be no significant relationship between the type-preference scores and the inferential questions of the reading comprehension subtest. The variables will be independent.
3. There will be no significant relationship between the type-preference scores and the percent correct of those attempted on the reading comprehension subtest. The variables will be independent.
4. There will be no significant relationship between the type-preference scores and the percentile rank in which they fall. The variables will be independent.

5. There will be no significant relationship between the type composites and the percentile rank in which they fall. The variables will be independent.

Methodology

Subjects

The subjects for this study consisted of one hundred students, randomly selected from a group of in-coming college freshmen at a mid-size technical institute in Upstate New York.

Instruments

Myers-Briggs Type Indicator. Form G of the Myers Briggs Type Indicator (MBTI) was used in this study. This form consists of 126 forced-choice items. The responses translate into two function type-preference scores (S/N, T/F) and two attitude type-preference scores (E/I, J/P).

Under the theory constructed by Myers and Briggs the four MBTI preference scores can be categorized as the following bi-polar preferences:

	Preference for:	Affects a person's choice:
E/I	Extraversion or Introversion	To <u>focus</u> the dominant (favorite) process on the outer world or on the world of ideas.

S/N	Sensing or Intuition	To use one kind of <u>perception</u> instead of the other when either could be used.
T/F	Thinking or Feeling	To use one kind of <u>judgment</u> instead of the other when either could be used.
J/P	Judgment or Perception	To use the judging or perceptive <u>attitude</u> for dealing with the outer world.

(Myers & Myers, 1982, p. 9).

The reliability of the MBTI is most often confronted by the question of whether the results are a measure of the reliability of the indicator or of the person taking it. The unmeasurable, yet potent, variable of to what extent the person taking the MBTI has developed the processes and attitudes which he prefers "enters every equation as an unknown quantity...Also unknown is the mean level of type development for any of the various samples that [are] tested, and how many [are]...answering initially at random because their type is insufficiently developed to govern their responses" (Myers, 1962, p. 12).

Nelson-Denny Reading Test. Form E of the Nelson-Denny Reading Comprehension Subtest was used for this study. The test consists of thirty-six questions, eighteen literal, eighteen inferential, as labeled in Table 6 of Brown, Bennet, and Hanna (1981, p. 10). The eight reading passages upon which the questions are based are of varying length. Grade equivalents for the passages range from ninth to sixteenth grade, with an average difficulty of thirteenth to fifteenth grade (Cummins, 1981).

Forms E and F of the Nelson-Denny Reading Test were standardized with 25,000 students, coming from three population samples: high school students (ninth - twelfth grade), two-year college students, and four-year college students. Minority student representation was twenty-nine percent for the total population. There was a high significance of content dependence, and alternate form reliability coefficients were .77 for the comprehension subtest.

Cummins (1981, p. 58) agrees when "the publisher states that reliability coefficients of these magnitudes suggest that...Comprehension scores are sufficiently accurate for prudent professional use with either individual students or group data."

Procedure

Both tests were administered at the orientation for in-coming freshmen at the Rochester Institute of Technology, Rochester, New York, in September 1983.

Scoring of the MBTI disclosed the following information:

1. Each student's preference for Extraversion or Introversion (E/I) in focusing their dominant process.
2. Each student's preference for Sensing or Intuition (S/N) in perception.
3. Each student's preference for Thinking or Feeling (T/F) in judgment.
4. Each student's preference for Judging or Perception (J/P) in dealing with the outer world.
5. Each student's type composite score.

Each student's Nelson-Denny Reading Test was analyzed for the following:

1. The percent correct of those attempted on the literal questions.
2. The percent correct of those attempted on the inferential questions.
3. The percent correct of those attempted on the entire sub-test.
4. The percentile rank for their total score according to the normative tables.

Analysis of Data

A chi-square analysis was performed on all data to determine independence of variables. Appropriate critical values were assigned to each contingency table to determine if there were

significant relationships between the variables at the .05 level.

Summary

In ascertaining whether or not a relationship exists between personality type preference and reading comprehension achievement, this study compared responses on the Myers-Briggs Type Indicator (MBTI) and the Nelson-Denny Reading Comprehension Subtest.

The study was comprised of one-hundred students, randomly selected from a group of in-coming freshmen at a mid-sized technical college. Comparisons were made between their responses on the MBTI and their responses on the literal and inferential questions of the Nelson-Denny, as well as the percent correct out of the number they attempted, and the percentile ranking they obtained from their total score.

A chi-square analysis was used on all variables to determine whether or not they were independent.

Chapter IV

Analysis of the Data

Purpose

This study was conducted for the purpose of determining whether or not a relationship exists between an individual's cognitive preferences and his performance on a standardized reading comprehension test.

Findings and Interpretations

Statistical Analysis

Five hypotheses were investigated through the use of a chi-square test of independence. The data was constructed into various tables which showed the observed and expected cell frequencies for each relationship tested. Each table for primary analysis was divided into categories of above average, average, and below average scores. Above average scores were one standard deviation or more above the mean, average scores were within one standard deviation of the mean, and below average scores were those falling one standard deviation or more below the mean. All calculations were based solely on the sample data, except the percentile ranks, which were translated from normative data to sample data.

Above average, average, and below average ranges for each group of data can be found in the Appendix.

Findings

The first null hypothesis stated that there would be no significant relationship between the type-preference scores and the scores on the literal questions of the reading comprehension test.

Tables 1, 2, 3, and 4 show the expected and observed cell frequencies.

Table 1

Observed and Expected Cell Frequencies
for Literal Questions and E/I Preferences

	E	I	Total
Above	15.9	14.1	30
Average	12	18	
Average	30.21	26.79	57
Below	6.89	6.11	
Average	8	5	13
Total	53	47	100

$$N = 100 \quad df = 2 \quad \chi^2 = 2.96$$

Table 2

Observed and Expected Cell Frequencies
for Literal Questions and S/N Preferences

	S	N	Total
Above	13.5	16.5	
Average	13	17	30
Average	25.65	31.35	
Average	24	33	57
Below	5.85	7.15	
Average	8	5	13
Total	45	55	100

$$N = 100 \quad df = 2 \quad \chi^2 = 1.66$$

Table 3

Observed and Expected Cell Frequencies for
Literal Questions and T/F Preferences

	T	F	Total
Above	18	12	
Average	19	11	30
	34.2	22.8	
Average	32	25	57
Below	7.8	5.2	
Average	9	4	13
Total	60	40	100

$$N = 100 \quad df = 2 \quad \chi^2 = .95422$$

Table 4

Observed and Expected Cell Frequencies for
Literal Questions and J/P Preferences

	J	P	Total
Above	15.9	14.1	30
Average	19	11	
Average	30.21	26.79	57
Below	26	31	
Average	6.89	6.11	13
Total	8	5	
	53	47	100

$$N = 100 \quad df = 2 \quad \chi^2 = 2.9147$$

The degrees of freedom for each table were two and the critical value was 5.99. The following chi-square values were found: Table 1 was 2.96, Table 2 was 1.66, Table 3 was .95422, and Table 4 was 2.9147. Each value was below the critical value, thus the null hypothesis was retained. No significant relationship was found between type preference scores and scores on the literal questions of the standardized test.

The second null hypothesis was that there would be no significant relationship between the MBTI preference scores and the scores on the inferential questions of the reading comprehension subtest.

Table 5 shows the observed and expected cell frequencies for E/I preferences and scores on the inferential questions. The degrees of freedom were two and the critical value was 5.99. The chi-square value obtained was .6126866, thus not significant at the .05 level.

Table 5

Observed and Expected Cell Frequencies for Inferential Questions and E/I Preferences

	E	I	Total
Above	7.95	7.05	15
Average	8	7	
Average	35.51	31.49	67
Below	9.54	8.46	18
Average	11	7	
Total	53	47	100

$$N = 100 \quad df = 2 \quad \chi^2 = .6126866$$

Table 6 shows the observed and expected cell frequencies for S/N preferences and scores on the inferential questions. The degrees of freedom were again two, with the critical value at 5.99. The chi-square value of 8.09119 was significant at the .05 level.

Table 6

Observed and Expected Cell Frequencies for
Inferential Questions and S/N Preferences

	S	N	Total
Above	6.75	8.25	15
Average	8	7	
Average	30.15	36.85	67
Below	8.1	9.9	
Average	24	43	18
Below	13	5	
Total	45	55	100

$N = 100$ $df = 2$ $\chi^2 = 8.09119^*$

* = significant at .05 level

A secondary analysis was done to further investigate the relationship among the variables. Since it appeared from the data in Table 6 that the scores for those with an S preference seemed more likely to fall in either the above average or below average ranges, and that those with an N preference tended to fall in the average range, the contingency table was reconstructed to focus on these relationships more closely.

Table 7 supported the data of Table 6 with a chi-square value of 6.911722, which is significant at the .05 level with the table having one degree of freedom and a critical value of 3.84.

Table 7

Secondary Analysis of Cell Frequencies for
Inferential Questions and S/N Preferences

	S	N	Total
Average	24	43	67
Above & Below	21	12	33
Total	45	55	100

$$N = 100 \quad df = 2 \quad \chi^2 = 6.911722^*$$

* = significant at .05 level

Table 8 shows the observed and expected cell frequencies of the T/F preference scores and scores on the inferential questions of the reading comprehension test. With two degrees of freedom and a critical value of 5.99, the chi-square value of 2.2339 was not significant at the .05 level.

Table 8

Observed and Expected Cell Frequencies for
Inferential Questions and T/F Preferences

	T	F	Total
Above	9	6	15
Average	7	8	
Average	40.2	26.8	67
Below	10.8	7.2	
Average	13	5	18
Total	60	40	100

$$N = 100 \quad df = 2 \quad \chi^2 = 2.2339$$

Table 9 shows the observed and expected cell frequencies of the J/P preference scores and the scores on the inferential questions. The chi-square value of 2.3829 was not significant at the .05 level, with two degrees of freedom and a critical value of 5.99.

Table 9

Observed and Expected Cell Frequencies for
Inferential Questions and J/P Preferences

	J	P	Total
Above	7.95	7.05	
Average	9	6	15
Average	35.51	31.49	
Average	32	35	67
Below	9.54	8.46	
Average	12	6	18
Total	53	47	100

$$N = 100 \quad df = 2 \quad \chi^2 = 2.3829$$

The second null hypothesis can be rejected on the basis that there appears to be a significant relationship between a person's preference for sensing or intuition and his performance on inferential questions on a standardized reading comprehension test.

The third null hypothesis stated that there would be no significant relationship between the type-preference scores and the percent correct of those attempted on the reading test.

Tables 10, 11, 12 and 13 show the observed and expected cell frequencies for the type-preference scores and the percent correct of the number attempted. With two degrees of freedom and a critical value of 5.99 for each table, the following chi-square

values are not significant at the .05 level: Table 10, at 1.701536; Table 11, at 1.01097; Table 12, at 1.064213; Table 13, at .728336.

Table 10

Observed and Expected Cell Frequencies for
Percent Correct of Number Attempted and E/I Preferences

	E	I	Total
Above	10.6	9.4	20
Average	8	12	
Average	34.98	31.02	66
Below	7.42	6.58	
Average	8	6	24
Total	53	47	100

$N = 100$ $df = 2$ $\chi^2 = 1.701536$

Table 11

Observed and Expected Cell Frequencies for
Percent Correct of Number Attempted and S/N Preferences

	S	N	Total
Above	9	11	20
Average	9	11	
Average	28	30	66
Below	6.3	7.7	14
Average	8	6	
Total	45	55	100

$$N = 100 \quad df = 2 \quad \chi^2 = 1.01097$$

Table 12

Observed and Expected Cell Frequencies for
Percent Correct of Number Attempted and T/F Preferences

	T	F	Total
Above	12	8	
Average	10	10	20
Average	39.6	26.4	
Average	41	25	66
Below	8.4	5.6	
Average	9	5	14
Total	60	40	100

$$N = 100 \quad df = 2 \quad \chi^2 = 1.064213$$

Table 13

Observed and Expected Cell Frequencies for
Percent Correct of Number Attempted and J/P Preferences

	J	P	Total
Above	10.6	9.4	20
Average	12	8	
Average	34.98	31.02	66
Below	7.42	6.58	14
Average	8	6	
Total	53	47	100

$$N = 100 \quad df = 2 \quad \chi^2 = .728336$$

No significant relationship was found between type-preference scores and the percent correct of those attempted; thus, the null hypothesis was retained.

The fourth null hypothesis posed was that there would be no significant relationship between type-preference scores and the percentile ranks obtained on the reading comprehension subtest.

Table 14 shows the observed and expected cell frequencies for E/I preferences and percentile rankings. The table has two degrees of freedom and a critical value of 5.99. The resulting chi-square value is 1.106717, not significant at the .05 level.

Table 14

Observed and Expected Cell Frequencies for
Percentile Ranks and E/I Preferences

	E	I	Total
Above	11.13	9.87	
Average	9	12	21
Average	29.68	26.32	
Average	31	25	56
Below	12.19	10.81	
Average	13	10	23
Total	53	47	100

$$N = 100 \quad df = 2 \quad \chi^2 = 1.106717$$

In Table 15 is shown the observed and expected cell frequencies for S/N preferences and percentile ranks. The resulting chi-square value of .524918 is not significant at the .05 level with two degrees of freedom and a critical value of 5.99.

Table 15

Observed and Expected Cell Frequencies for
Percentile Ranks and S/N Preferences

	S		N		Total
Above		9.45		11.55	21
Average	8		13		
Average	26	25.2	30	30.8	56
Below		10.35		12.65	23
Average	11		12		
Total	45		55		100

$$N = 100 \quad df = 2 \quad \chi^2 = .524918$$

Table 16 shows the observed and expected cell frequencies for T/F preferences and percentile rankings. With two degrees of freedom and a critical value of 5.99, the chi-square value of 1.411534 is not significant at the .05 level.

Table 16

Observed and Expected Cell Frequencies for
Percentile Ranks and T/F Preferences

	T	F	Total
Above	12.6	8.4	21
Average	11	10	
Average	33.6	22.4	56
Below	13.8	9.2	
Average	16	7	23
Total	60	40	100

$$N = 100 \quad df = 2 \quad \chi^2 = 1.411534$$

Table 17 shows the observed and expected cell frequencies for J/P preferences and percentile ranks. There are two degrees of freedom and the critical value is 5.99; thus, the chi-square of 7.30709 is significant at the .05 level.

Table 17

Observed and Expected Cell Frequencies for
Percentile Ranks and J/P Preferences

	J	P	Total
Above	11.13	9.87	
Average	14	7	21
Average	29.68	26.32	
Average	23	33	56
Below	12.19	10.81	
Average	16	7	23
Total	53	47	100

$$N = 100 \quad df = 2 \quad \chi^2 = 7.30709^*$$

* = significant at .05 level

To further investigate this relationship, a secondary analysis was done on the data. Table 18 shows the observed and expected cell frequencies for J/P preferences and percentile ranks with above average and below average scores grouped together. The chi-square value of 7.27 is again significant at the .05 level. It appears that those with a J preference score tend to fall within a broader range of scores than those with a P preference, who tend to fall in the average range.

Table 18

Secondary Analysis of Cell Frequencies for
Percentile Ranks and J/P Preferences

	J	P	Total
Average	23	33	56
Above & Below	30	14	44
Total	53	47	100

$N = 100$ $df = 1$ $\chi^2 = 7.27^*$

* = significant at .05 level

The fourth null hypothesis is, therefore, rejected on the basis that there was a significant relationship between J/P type-preference scores and percentile rankings on the standardized reading test.

The fifth null hypothesis stated that there would be no significant relationship between type composite scores and percentile rankings. Table 19 shows the sixteen type composites and the observed and expected cell frequencies within the categories of percentile rankings. With thirty degrees of freedom and a critical value of 43.8, the chi-square of 38.204779 is not significant at the .05 level. Because of the limited number of subjects falling within each composite category, no significant

relationships were apparent through informal analysis.

Table 19

Observed and Expected Cell Frequencies for
Percentile Ranks and Type Composites

	ISTJ	ISFJ	INFJ	INTJ	ISTP	ISFP	INFP	INTP
Above	2.1	.63	1.47	1.47	.63	.84	1.26	1.47
Average	2	1	3	2	0	1	1	1
Average	5.6	1.68	3.92	3.92	1.68	2.24	3.36	3.92
Below	2.3	.69	1.61	1.61	.69	.92	1.38	1.61
Average	5	0	1	1	0	1	2	0
Total	10	3	7	7	3	4	6	7

Table 19
(continued)

Observed and Expected Cell Frequencies for
Percentile Ranks and Type Composites

	ESTP	ESFP	ENFP	ENTP	ESTJ	ESFJ	ENFJ	ENTJ	TOTAL
Above	1.05	.63	1.68	2.31	2.52	1.05	.84	1.05	
Average	0	0	2	2	4	0	2	0	21
Average	2.8	1.68	4.48	6.16	6.72	2.8	2.24	2.8	56
Below	1.15	.69	1.84	2.53	2.76	1.15	.92	1.15	
Average	1	1	0	2	3	0	2	4	23
Total	5	3	8	11	12	5	4	5	100

N - 100 df = 30 $\chi^2 = 38.2047796$

Summary

Five null hypotheses were tested through the use of a chi-square test of independence. Two of these five hypotheses were rejected at the .05 level of significance. There appears to be a significant relationship between S/N type-preferences and scores on inferential questions of a standardized reading comprehension subtest, as well as a relationship between J/P type-preferences and percentile rankings on the subtest.

No significant relationships were shown between type-preference and scores on literal questions or the percent correct of those attempted. Also, type composites were not significantly related to percentile rankings.

Chapter V

Conclusions and Implications

Purpose

The purpose of this study was to determine if a relationship exists between type-preferences and performance on standardized reading comprehension tests.

Conclusions

The conclusions reached relate to the results of the chi-square analysis of relationships between type-preference and scores on the standardized reading tests.

Two null hypotheses were rejected. The first suggested that a relationship existed between type-preference and performance on inferential questions on the standardized reading test. More specifically, the performance for sensors (S) or intuitors (N) appeared to be related to the probability of falling within various ranges of ability. Those with S preferences were more likely to fall in the above average or below average ranges, whereas those with N preferences clustered in the average range. It appears that performance on inferential questions by N types may be quite consistent and predictable, whereas S types may not necessarily possess the skills needed to perform adequately.

The second null hypothesis rejected suggested that a

significant relationship did exist between an individual's preference for judgment (J) or perception (P) and his percentile ranking on the reading test. J types tended to fall in a wider range of categories than P types. This is possibly due to the J types' need for closure, resulting in impulsive responding to achieve that end (Myers and Myers, 1980; Lawrence, 1982). Those with a P preference-type are generally better able to deal with open-ended situations and may have been generally more reflective and cautious about their responses. Consequently, they would predictably fall more often within the average range.

Other relationships investigated did not show significant results upon which to base further conclusions.

Implications for Research

The population from which the sample was randomly selected was in itself limited. Although the results can most certainly be generalized to other college populations, particularly college freshmen at four-year institutions, it would be beneficial to see if the same conclusions are reached with a less well-defined population and with students in other fields of study.

As mentioned in Chapter I of this study, the limitations of this study included sample size, disregard for preference strength and flexibility, and a less specific consideration of the role of the dominant and auxiliary functions in performance. Some or all of

these factors could be accounted for in future research using the Myers-Briggs Type Indicator.

The strength of one's preference might be of particular interest in future studies. Elimination of low preference scores, based on mean preference scores for each gender, could result in more clear-cut implications for those with strong preferences and a possible lack of flexibility in dealing with various perceptual and judging tasks.

Implications for Classroom Practice

As results of this study showed, it is possible that those students with sensing (S) preferences for perceiving information may be more likely to have difficulty in dealing with inferential questions on standardized reading tests. Thus, those whose type shows a preference for sensing may benefit from training and guidance in thinking intuitively and drawing inferences. However, it appears from the mean scores listed in the Appendix, that inferential questions are more difficult than literal questions to all students.

Monitoring of response times and questioning judging (J) type students about their responses may also improve their scores on standardized reading tests. Since it is possible that J types may be more impulsive in their responses, due to their desire to achieve closure; it is important to guide them to reflect upon

their choices before responding to questions. Of course training in both responding to inferential questions and reflecting upon choices could be beneficial to all students.

The largest implication from this study for classroom practice is the need to recognize that all students are unique in their abilities, potential, and personalities. These factors working together make an objective standardized test a less reliable indicator of achievement when these factors are not considered. It is important that teachers be aware of their students' particular cognitive preferences and expect that these preferences will impact on all measures of ability, particularly standardized tests.

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Appendix

Appendix

Mean Scores, Standard Deviations, and Ranges
for Above Average, Average, and Below Average Scores
for Each Contingency Table

Table(s)	\bar{X}	s.d.	Above	Average	Below
1- 4	89.91	9.48	100	81-99	0-80
5- 9	67.07	14.49	82-100	53-81	0-52
10-13	78.72	10.03	89-100	69-88	0-68
14-19	63.76	24.24	88-100	40-87	0-39

N = 100 (for all tables)