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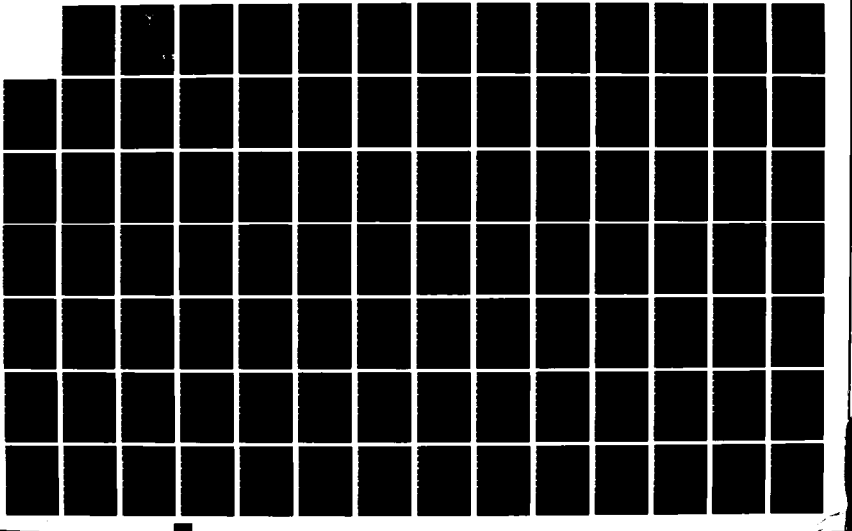

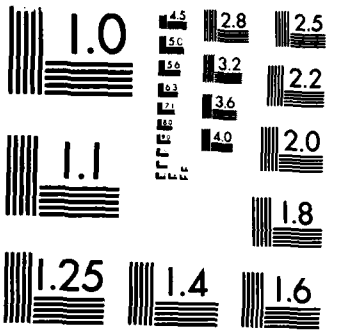

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PERSONALITY TYPE ANALYSIS OF AIR FORCE INSTITUTE OF TECHNOLOGY SCHOOL OF SYSTEMS AND LOGISTICS GRADUATE DEGREE 85S CLASS USING MYERS-BRIGGS TYPE INDICATOR

THESIS

Richard A. Carter
Captain, USAF

AFIT/GLM/LSM/85S-11

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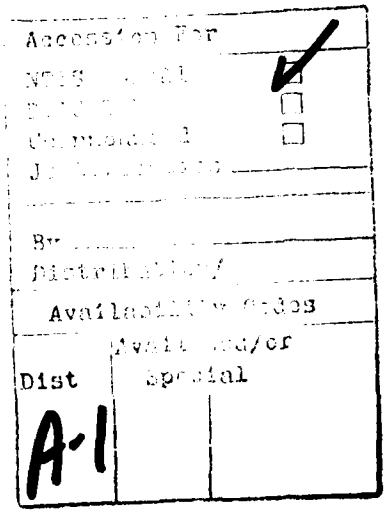

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PERSONALITY TYPE ANALYSIS OF AIR FORCE INSTITUTE OF TECHNOLOGY SCHOOL OF SYSTEMS AND LOGISTICS GRADUATE DEGREE 85S CLASS USING MYERS-BRIGGS TYPE INDICATOR

THESIS

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Logistics Management

Richard A. Carter, B.S.
Captain, USAF

September 1985

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Abstract

The objective of this research was to identify significant learning differences in the AFIT School of Systems and Logistics (AFIT/LS) using the personality type theory developed by psychologist Jung and identified by the Myers-Briggs Type Indicator (MBTI).

The data were collected from graduate students of AFIT/LS through the MBTI and a Preferred Academic Environment Questionnaire. Results of the MBTI categorized each of the subjects into personality types. The Preferred Academic Environment Questionnaire determined student study habits and test taking preferences; AFIT situations which the student felt improved academic performance; and AFIT learning situations which were important to the student. The data were analyzed according to the distribution of MBTI type, the effect of MBTI type upon grade point average, and student preference for instructional technique and learning styles as they related to MBTI type.

The results of the study showed that the majority of students in the 85S class were of a MBTI type which had identifiable characteristics relating to their preferred methods of perceiving and making judgments. The research results also indicated that MBTI type had no significant effect upon grade point average. Finally, the results of the study showed that MBTI type does relate to learning styles and instructional technique preferences.

PERSONALITY TYPE ANALYSIS OF AIR FORCE INSTITUTE OF TECHNOLOGY SCHOOL OF SYSTEMS AND LOGISTICS GRADUATE DEGREE 85S CLASS USING MYERS-BRIGGS TYPE INDICATOR

I. Introduction

By selecting individuals to attend the Air Force Institute of Technology (AFIT) graduate program, the Air Force invests considerable time, resources, and money to provide "carefully selected Air Force officers and civilians the broad educational background" that will provide them with the "ability to analyze and solve complex technical and managerial problems faced by the Air Force and the Department of Defense" (1:2).

The Air Force sees the need to provide an opportunity for educational enrichment, while expecting the success of students given that opportunity, as a means to meet the future needs of the Air Force. As former Commandant of AFIT, Major General Stuart E. Sherman, while addressing the issue of the need for AFIT to rededicate itself to the "mission of providing quality education programs for the Air Force and the Department of Defense", stated:

> A fundamental ingredient to the success of most endeavors is educated leadership. Because the Air Force is in the forefront of the use of science and high technology to fulfill its part of the national security mission, we continue to have a

> demand for well educated -- both professionally and academically -- people.

He went on to add ...

> The remainder of this century will be even more demanding of the Air Force to produce leaders whose experience and educational background are attune to solving the problems encountered in a fast moving aerospace environment. To maintain our narrowing edge in technological superiority requires the continuing pursuit of knowledge; to increase it, requires even more efficient pursuit. Our commitment to the advancement of technology must be a commitment to education, as the fundamental means of furthering and applying knowledge (1:vi).

Sherman's statement underscores the importance to both the Air Force and to the students enrolled in the AFIT resident graduate programs that every effort be made to increase their opportunity for success.

An extensive effort goes into the planning, developing and conducting of the graduate degree program to assure the success of its students in satisfying the educational objectives of the program and the Air Force. One of the methods used to assure the success of AFIT students is the selective admissions policy used. Only those officers who have demonstrated the academic ability and whose performance records have indicated a high probability for success are admitted to advanced degree programs. To be academically eligible for the programs offered, perspective students must fulfill the following academic requirements:

1. Posses at least a 2.5 undergraduate cumulative grade point average on a 4.0 scale for a master's degree program.

2. Achieve an acceptable score on the Graduate Record Examination Aptitude Test or the Graduate Management Aptitude Test.

3. Additional requirements are also specified in Air Force Manual 50-5 to assure students have the required academic background for specific programs. A typical requirement concerns demonstration of past ability to handle a level of mathematics, such as college algebra (1:10).

After academic evaluation and the candidate is determined academically qualified, a second selection process is initiated by Air Force Military Personnel Center (AFMPC). In a highly competitive process AFMPC career management teams make initial nominations of students, who are then processed through another review and final approval selection process. The purpose of this process is to "select only those promotable officers best qualified to serve in positions requiring the education offered by AFIT" (1:14). A recent evaluation of the AFIT selection process based on percentage rates of successful completion of degree requirements indicated, while there were improvements that could be made, the AFIT selection process resulted in higher graduation rates than "normally found in a private university" (20:57).

AFIT resident students are required to maintain high scholastic standards. To be awarded a master degree each student must attain a cumulative grade point average of at least 3.0 (on a 4.0 scale) and attain a grade of at least C-

or S on all required courses. Grades of less than C- or S are considered academic deficiencies and must be remedied before graduation from the program. The burden to achieve these standards is eased for resident students assigned full-time. They have "no major duties beyond applying themselves diligently to their studies" (1:15).

The current AFIT School of Systems and Logistics (AFIT/LS) graduate programs are highly structured; students in degree programs and majors follow a sequence of preselected courses with a maximum of nine hours of electives permitted. With the exception of approved deviations from the program for students with unique needs, most students follow an almost identical sequence of courses. Even the limited number of electives must be selected from a restricted group of approved electives.

It is logical to assume that differences in academic performance of students in the resident graduate programs can be accounted for by inherit differences between the students. The difficult question is what are the significant differences that effect their performance? Intellectual ability is not the only determinant of academic success. It is not an unusual occurance in an educational environment for an intellectually superior student to not perform to the expected level of success that their intellectual ability would indicate possible.

Ivor K. Davies, in his textbook on instructional

techniques, offered the following observation on individual differences:

> People are different; that is their strength. There are similarities between people, and there are important differences. Were it not for the similarities, all instruction would have to be given on an individual basis. Some, of course, is individualized and tailor made to meet individual needs, but not very much.
>
> Individual differences, however, must be recognized. It is foolish to ignore them. Similarily, it is foolish to overemphasize their importance. Some differences are notable, others are not. In the same way, some similarities are significant, others are of little concern (7:286).

Problem Statement

Since the Air Force makes a considerable time and monetary investment in the students attending AFIT and is concerned with the satisfying the demand for well educated people to meet the present and future needs of the Air Force (1:vi), it can be argued that an improvement in the quality and quanity of knowledge and skills recieved would increase the ability of graduates to meet those needs. To enhance the accomplishment of this goal, a better understanding of the significant learning differences of the students involved would be beneficial.

If a reliable, valid and practical method exists to identify significant differences that affect a students academic performance, a better understanding of those differences could be used to improve the instructional-learning process. In more closely matching instruction to

the learning needs of the students, enhanced instructional methods could be encouraged to more successfully meet the needs of the students, the program objectives, and the Air Force. It is even possible AFIT's graduation rate could be improved if the learning needs of the students are more successfully met.

Psychological personality theory offers the potential of being a possible tool to improve students opportunity for academic success if it identifies significant individual differences that relate to the instructional-learning process. A problem results due to the proliferation of definitions of personality, theories on personality, and personality measuring instruments. There is also a lack of agreement on the adequacy of the definitions and theories to explain the complexities of the human personality. This research study therefore addresses the following specific question: Is it possible to identify significant learning differences in the AFIT School of Systems and Logistics using the theory of personality type developed by Swiss psychologist Jung and identified by the Myers-Briggs Type Indicator?

General Background

An initial review of the literature resulted in the selection of the definition of personality according to the dimensions of personality discussed in the psychological type theory of Swiss psychologist C. G. Jung and measured by the

Myers-Briggs Type Indicator (MBTI). The Jungian theory, operationalized by the MBTI, was chosen for this research study due to the work done relating it directly to the instructional-learning process. The theory also stresses the positive strengths of each type, being non-judgmental on the superiority of any one type -- only indicating that a preference of one type may be more appropriate in a given situation.

According to Jung's theory of psychological types, differences in personality can be explained and individuals categorized by their innate preference to methods of perception and judgement. The two possible perception processes are sensing and intuition. Sensing refers to the preferences of taking in information by way of the physical senses. Intuition refers to the preference of looking past the facts offered by the senses to the meaning, possibilites, and relationships of the situation. The two possible judgement processes are thinking and feeling. Thinking refers to the preference for "logical decision making process aimed at impersonal findings" (8:8). The feeling process is more concerned with the "process of appreciation, making judgements in terms of a system of subjective, personal values" (8:8).

According to Jung's theory, the two methods of perception and two methods of judgment are dichotomous processes. While individuals apply all four mental process

in different situations and at different times, they use the different process with different levels of success. Preferred processes become more developed and are identified as the dominant process (14:12).

Jung's theory also identified an additional dimension of personality -- extroversion and introversion. These two terms, which were conceived by Jung from their latin derivations, refer to an individuals orientation (outward or inward) toward his environment. Individuals who rely on their dominant process to relate to their environment are defined as extroverted. An individual who reserves his dominant process for his "inner world" of concepts and ideas is said to be introverted (15:57).

Research Objectives and Hypotheses

The following were the objectives of this research study:

1. To determine if the distribution of type for the AFIT School of Systems and Logistics class of September 1985 (85S) provides indications of a unique distribution of MBTI type.

2. To determine if a difference in MBTI personality type has an affect on academic success as measured by grade point average.

3. To determine if preferences for instructional techniques and learning styles, according to students' perception of effectiveness and importance, can be related to

MBTI personality type.

Research objectives were evaluated with the following hypotheses. The null (Ho) and alternative (Ha) hypotheses for the first research objective were:

Ho: Each observed specific type frequency distribution of the AFIT/LS 85S class was the same as the expected frequency distribution based on the CAPT data base.

Ha: Each observed frequency distribution and expected frequency distribution were not equal.

Evaluation of the second research objective required two sets of hypotheses. The first set was for comparison with only two type groups:

Ho: The mean GPA of one type group was equal to the mean GPA of the corresponding type group.

Ha: The GPA means of the two type groups were not equal.

The second set of hypotheses was for comparison between more than two type groups.

Ho: The GPA means for all type groupings were equal.

Ha: The GPA means for at least two of the type groupings were not equal.

For the third research objective the null (Ho) and alternative (Ha) hypotheses were:

Ho: The rating means of the two MBTI type groups for a specific Preferred Academic Environment Questionnaire statement were equal.

Ha: The mean rating of the one MBTI type group was greater (or less) than the mean rating of the corresponding MBTI type group for a specific Preferred Academic Environment Questionnaire statement.

Due to the computer coding of the MBTI groups, the alternative hypotheses switched back and forth from greater than to less than depending on whether the type group that was expected to have a stronger agreement was coded as group one or group two.

Limitations and Assumptions

In attempting to evaluate the difficulties in using a psychological testing instrument, several limitations need to be understood. As previously mentioned, there is a lack of agreement on the adequacy of psychological instruments in explaining all the complexities of personality. It must be understood that the MBTI does not explain many factors that are important for the complete understanding of personality and academic performance. The value of the MBTI results from its identification of an individuals preferences for fundamental mental processes such as perception and judgment. But it must be understood that there is variability within each type. Individuals of a type are alike in their preferences, but it can not be expected that they always react true-to-type. Differences within the same type also result due to differences in how an individuals preferred

mental processess are exercised and how willing and/or capable an individual is in using a non-preferred mental process (11:18).

It also must be understood that psychological personality testing is not an "exact science". No personality testing instrument is infalliable, and problems with measurement error and lack of precision cannot be avoided. Another source of potential error is the respondent. Problems in understanding questions or a lack of self-understanding can effect the ability of the MBTI to identify the respondents type (11:17-18).

The assumption was therefore made that the respondents answered all questions honestly and accurately. Furthermore, the researcher assumes the statistical results reported are correct in that the data entered into the SPSS programs was done accurately. It was also assumed the type distribution data base used for comparison to the sample was unbiased toward specific areas of academic study.

The assumption was also made that the large number of statistical calculations made did not increase the possibility of generating chance significance to the point the results were questionable.

The assumption was also made that the inability to perform analyses with the discrimination of the full 16 type classification did not adversely affect the ability of this study to achieve the stated research objectives.

II. Literature Review

This chapter presents a discussion of the Myers-Briggs Type Indicator and a review of the literature on the reliability, validity, and applications of the Myers-Briggs Type Indicator in academic environments.

Myers-Briggs Type Indicator

The Myers-Briggs Type Indicator (MBTI) is a self-administered, self-reporting, forced-choice inventory that measures the four dichotomous preferences of an individual based on the theory of Jung. As previously discussed, Jung's theory of types explains personality based on an individuals preference for dichotomous mental perception and judgement processes in respect to the inward or outward orientation of an individuals dominant mental process. The implication of these personality differences can be used to explain predictable consequences of different instructional learning situations. Myers made the observation that "type makes a natural and predictable difference in learning styles and in student response to teaching methods (14:147). The four indices measured by the MBTI are:

EI Extraversion or Introversion

SN Sensing or Intuition

TF Thinking or Feeling

JP Judgement or Perception

The first three indices relate directly to preferences for extaversion or introversion, preferred perception and judgment process as discussed in Jung's theory of type. The fourth index (JP, Judgement or Perception), while not directly related to one of Jung's personality characteristics, was developed by Myers and Briggs based on inferences made in Jung's works. According to the MBTI manual it is "designed to reflect whether a person relies primarily upon a judging process (Thinking or Feeling) or upon a perceptive process (Sensing or Intuition) in his dealings with the outer world, that is in the extroverted part of his life" (15:2).

Since the indices are designed to measure dichotomous preferences, an individual whose scores indicate a stronger reporting of a preference are classified according to the stronger indicator. For example, if an individual's score shows a stronger reporting of a preference for Extroversion (E) verses Introversion (I), then the individual will be classified as an E (or Extrovert). It therefore must be understood that the letter combinations identifying the four indices, such as EI, mean E or I; not a relationship of E to I (15:2).

The letters indicating preferences identified by the four indices are then combined to identify an individuals unique type. The typical table presentation of the resulting sixteen types is:

ISTJ ISFJ INFJ INTJ

ISTP ISFP INFP INTP

ESTP ESFP ENFP ENTP

ESTJ ESFJ ENFJ ENTJ

In-depth descriptions of the characteristics of each type can be found in the work of Isabel Briggs Myers.

The research work of Mary H. McCaulley offers two other techniques of grouping types. By using only the SN (Sensing or Intuition) and the TF (Thinking or Feeling) indicies of the MBTI, four types result. The four types, which correspond to the four columns of the 16 type matrix, differentiate groups according to their preference to perception and judgment. The resulting four types are:

ST SF NF NT

McCaulley's second method of grouping types corresponds to the four quadrants of the 16 type matrix table, using the EI (Extroversion or Introversion) and the SN (Sensing or Intuition) scores of the MBTI. The resulting four types are:

IS IN

ES EN

This method of type identification is reported to be related to an individual's motivation for learning. According to McCaulley's work, the following relationship exists:

IS - Knowledge is important to establish truth.

IN - Knowledge is important for its own sake.

ES - Knowledge is important for practical use.

EN - Knowledge is important for innovation (12:734).

Reliability

To be valid, a personality assesment instrument must be reliable. Both test-retest and split-half reliability studies have been performed on the MBTI to confirm its relibility. A review of several studies follow.

A study by Carskadon on the test-retest reliability of the MBTI indices was performed on 64 male and 70 female psychology students at Mississippi State University using a seven week interval. Test-retest correlation coefficients, significant to the .001 level, were calculated for males and females seperately. The resulting correlation coefficients were:

	Male	Female
EI	.79	.83
SN	.79	.82
TF	.56	.73
JP	.76	.87

The difference between reliability of sex grouped subjects for the TF index was determined to be marginally significant at the .10 level (5:1012).

In a later study by Carskadon on sex differences in test-retest reliabilites of continuous scores of the MBTI (Form G) performed at Mississippi State University, five week test-retest reliability coefficients were calculated for 24

male and 36 female students. Except for the female student TF (Thinking or Feeling) group correlation (.56), all correlation coefficients ranged from .77 to .93. In comparing test-retest correlations between sex differientated groups, the only statistically significant difference was in the TF scale. The correlation coefficient for the male students on the TF was .91 while the correlation coefficient for the same scale for the female subjects was .56 ; completely opposite in direction of the earlier study (4:78).

Using a logical split-half procedure, two seperate halves of each of the four MBTI indices were developed for the purpose of determining split-half reliability. As part of Myers' original research, statistical correlations were determined between the two halves for several groups. Seperate studies were performed (differentiated by sex) for Jr. High students (gifted and under-achieving), Sr. High students (non-college prep, college prep, and National Merit Finalists), and college students. The range and mean of the correlations for each index were as follows:

INDEX	GROUP MEAN RANGE	MEAN OF GROUP MEANS
EI	.77 - .87	.819
SN	.70 - .87	.814
TF	.44 - .86	.757
JP	.71 - .94	.829

According to Myers':

> These reliabilities appear creditable for an instrument of this sort, representing in general

> the upper range of coefficients found in self-report instruments of similar length. It may be noted that while a wide range of age, intellectual ability and socio-economic status is included, the only coefficients below .75 are for the under-achieving 8th grade and the non-prep 12th grade and that much of the lowest values for these groups are on TF. The possibility would seem to exist that the relative uncertainty on TF may reflect a lesser development of the judging process, which may prove to be a significant characteristic of such samples (15:20).

Myers went on to add the following observation ....

> More probably the low coefficients reflect the fact that the development of judgment (whether T or F) is one of the slowest and most reluctant achievements in the process of growing up (15:20a).

A review of the test-retest and split-half reliability studies, even with the conflicting results with the TF index, demonstrates the acceptable creditablity of the instrument in providing reliable results.

Validity

To ensure the MBTI measures the personality traits it professes to, extensive studies have been performed to test the general validity and specific construct validity of the MBTI in a number of applications. A partial review of some of those studies follow.

In a study of the validity of MBTI type descriptions performed at Mississippi State University by Carskadon and Cook, 118 psychology students who were unfamiliar with the

MBTI, were asked to rank and rate the accuracy of MBTI type descriptions. A packet of four randomly ordered one page type descriptions, adapted from Myers' MBTI Manual, were provided to each student eight weeks after being typed using form G of the MBTI. The packet consisted of:

1. The students actual type description.

2. Type description with the EI and JP indices reversed.

3. Type description with the SN and TF indices reversed.

4. Type description with all four indices reversed.

In example, if a student was typed as an ISTJ, the four type description presented would correspond to an ISTJ, ESTP, INFJ, and an ENFP.

The students were required to rank order the four descriptions according to their perceived accuracy of each description and then rate the accuracy of each description on a four point scale. The four point scale corresponded to a rating of the description as being very true, mostly true, partly true, or not very true at all (6:89).

Analysis of the results indicated that 50% of the subjects ranked their actual type description as the most accurate, while only 13% ranked the type description with all indices reversed as the most accurate. In rating the type descriptions, 64% ranked their actual type descriptions as either very true or mostly true and only 8% rated their

actual description as not very true at all. The results also indicated that reversing the SN and TF indices had a greater negative effect on an individuals perception of the accuracy of the type descriptions. Statistical analysis of the ranking and rating confirmed the significant difference in perceived accuracy of the type descriptions and, according to the authors, "thoroughly refuted the idea that type descriptions other than one's own might be equally appealing if given to persons taking the MBTI" (6:89,91).

There is an excellent opportunity to evaluate both the reliability and possible validity of the MBTI because another instrument, the Gray-Wheelwright Questionaire, attempts to measure personality type based on Jung's theory. The Gray-Wheelwright Psychological Type Questionnaire was developed around the same time as the MBTI, independently and with no intercommunication. The major difference between the two instruments is the lack of the JP index on the Gray-Wheelwright Questionnaire. Myers conducted a study to determine the intercorrelations of the two instruments using 47 male Golden Gate College students. After correction for attenuation, the correlation coefficients between the two instruments were calculated as:

EI	1.08	
SN	.97	
TF	1.22	(15:21)

According to Myers':

> It would therefore appear that the MBTI and Gray-Wheelwright (as far as it goes, lacking JP) are reflecting exactly the same things, though with different reliabilities. This degree of agreement seems explicable in only two ways, one reasonable and the other not. The reasonable explanation is that both tests are reflecting the same basic realities, that is, the Jungian opposites which both were designed to reflect. If not, it must be assumed that not only did the authors of the MBTI miss their objective but so also did the Jungian analysts Gray and Wheelwright in exactly the same ways, a coincidence which seems unlikely (15:22).

After demonstrating the general validity of the MBTI, the specific application of the instrument to instruction and learning must be demonstrated. A review of studies concerning this relationship are presented in the next section.

Applications of the MBTI

While it has been argued that typology theories have been ineffective in explaining all aspects of individual differences in personalities, a review of the literature indicates a number of studies using the MBTI have provided valuable insight into educational related differences of students.

In a study by McCaulley and others, a total of 3,718 students from eight engineering schools participated in a two year study to determine MBTI type difference of engineering students as related to their "gender, ethnic origins, choice

of engineering discipline and retention in engineering school" (10:394). Results of the research showed that the engineering students in the study showed a different distribution of type compared to type distribution of college freshmen as indicated by the Center for Applications of Psychological Type (CAPT) data base. CAPT, an organization supporting the use of the Myers-Briggs Type Indicator, maintains an extensive data base of MBTI scores (10:396).

Comparing the two type distributions, a larger percentage of engineering students showed a preference towards Introversion, Thinking, and Judging as measured by the MBTI. Engineering students, as a group, showed a very strong preference toward the Thinking (T) and Judging (J) dimensions, with the four TJ types (ISTJ, INTJ, ESTJ, and ENTJ) representing 49% of the engineering students typed. Comparing the type distributions of the eight schools which participated in the study showed the following range of percentages of type:

Extroversion	33-65%	
Sensing	41-59%	
Thinking	68-83%	
Judgment	45-69%	(10:395)

In an attempt to determine the relationship of type to retention rate, a follow-up study was also performed on 2045 of the 3,718 students. Statistical analysis demonstrated a significant relationship between a student preference toward

Judging and an increased probability of retention to the second year as an engineering student (10:396).

Nisbet and others, in a study of 658 "high-risk" freshmen at Ball State University, attempted to determine if additional instruments were available to generate data that would be predictive of college success. Four instruments including the MBTI were evaluated for their contribution. High risk students were identified by SAT verbal scores of lower than 360 and high school graduation ranking in the lower 25th to 50th percentile. Success was determined by grade point average and retention for one full academic year (17:228-229).

Regression analysis was performed to develop a predictive model of second quarter grade point average and completion of the third quarter. It was determined that significant regression coefficients for the prediction of second quarter grade point average were SAT math scores, high school graduation percentile ranking, the reality orientation and examination behavior scores of the Effective Study Test, and the Judgement/Perception (JP) index of the MBTI (17:233).

Although use of MBTI scores resulted in only a small (non statistically significnant) increase in the prediction of third quarter completion, the study favorably reported that the evaluation of the non-academic measurement tools included in the research "seems to warrant their usefulness in identifying potential problem students" and offered the

potential for developing special programs to "improve the likelihood of such students achieving academic success" (17:234).

A six year study by Godleski and others at the Cleveland State University College of Engineering on the retention rate of different types also indicated that individuals with Intuition and Feeling preferences have shown the lowest retention rates in their program (10:397).

To determine if certain personality types were associated with greater success in completing program objectives, a study by Buhmeyer and Johnson was performed on the Physician-extender training program at the Medical School of South Carolina. A Physician's Assistant (PA) is one of the more familiar examples of a Physician-extender. The study considered six different personality measuring instruments, including the MBTI. A weighted grade point average formula was developed as a measurement of success of the objectives of the program. Stepwise regression analysis was performed to evaluate the independent variables identified by the six personality measuring instruments (2:507-509).

According to the results of the study, Buhmeyer and Johnson concluded that 11% of the variation of cumulative grade point average was accounted for by an individual's preference towards Feeling and Judgement as measured by the Myers-Briggs Type Indicator (2:510).

A study by Yokomoto and others at the Indiana

University/Purdue University in Indianapolis (IUPUI) was performed to determine if a correlation existed between homework scores and exam scores, when the exams were "just like the homework" or conceptual problems "not just like the homework," for Sensing and Intuitive types. A stronger correlation resulted for Sensing types for the "just like the homework" type exams, while the Intuitive types showed a higher correlation for the "not just like the homework" exam type (10:398).

A limited study at the Colorado School of Mines (CSM) by Sloan and others also indicated the "test designed by Intuitive professors may inadvertently give an advantage to Intuitive students" (10:399).

A study by Butler and Roberts at Texas Tech University attempted to determine if a significant relationship existed between an individuals reading ability and scores on each of the four MBTI indicies. The study was limited to proficient adult readers. The 100 participants in the study were randomly selected from upper division undergraduate and graduate students from the College of Education at Texas Tech University. To determine the reading ability of the participants the Nelson-Denny Reading Test was administered. The test measured vocabulary level, reading comprehension, reading rate, and total reading ability (3:80).

The resulting scores indicated "a significant positive correlation between Sensing/Intuitive (SN) scores and

vocabulary, comprehension and total reading scores" (3:81). A statistical t-test analysis of each of the seperate MBTI indices demonstrated a significantly higher score on vocabulary, comprehension, and total reading for Intuitive (N) subjects when compared to Sensing (S) subjects (3:81).

In an extension of the MBTI personality types to preferences in communication styles, based on the contention that "each of the 16 psychological types has a unique pattern of primary, secondary, tertiary, and least preferred communication style" (21:30), a study was performed at the University of Tulsa by Flavil R. Yeakley Jr to determine the effect of differences in communication style preferences of instructors and students. A study of lecture and discussion classes indicated a statistically significant positive correlation between strong similarity of communication style preference and adjusted course grades. Adjusted course grades were determined by subtracting the students grade point average from his course grade. In both studies, the greater the similarity of the communication style preference of the student and the instructor, the higher the students course grade in comparison to his cumulative grade point average. (21:42)

A study performed by Smith, Irey, and McCaulley attempted to answer the question of "How is a college student's personality type related to his preferences for various instructional strategies, his learning traits and his

evaluations of various instructional experiences?" (19:435) in an analysis of a self-paced programmed learning course on thermodynamics. The 53 students who participated in the study, in addition to being type classified by the MBTI, responded to a 13 question opinionnaire on college teaching methods. While no statistically significant correlation was found for any of the 13 questions to students Extraversion/ Introversion (EI) index scores, a statistically correlation (significant to at least the .05 level) was found between at least one of the other three MBTI indices and responses to seven of the questions. The preference toward Intuition (N) on the SN index was postively correlated to a preference for self-paced instruction compared to "more traditional methods of instruction" and students agreement with the statement that "I do my best work in courses when I can work by myself". The preference toward Intuition (N) was negatively correlated to the belief that "self-paced or individualized instruction is very dehumanizing and impersonal" (19:438).

The preference toward Feeling (F) on the TF index was negatively correlated to responses to three of the statements on the questionnaire:

1. I learn best in courses that are highly structured where the instructor sets the goals, methods for learning, and types of tests.

2. I prefer classroom instruction to more individualized approaches to education.

3. I prefer such traditional methods of instructions as lectures, discussions, seminars, and demonstrations to self-paced instruction.

A negative correlation was also found for preference toward Perception (P) on the JP index for the last statement listed above and the agreement with statement that student preferred "lecture courses to all other types of instruction" (19:438).

Additional data provided about the students in the study indicated several additional correlations. For the students in the study, MBTI preference toward Introversion (I) was significantly correlated to a higher cumulative grade point average, and preference toward Thinking (T) was significantly correlated to a larger credit hour course load (19:439).

Another study at Texas Tech University involving 335 college freshman students determined the significantly preferred and least preferred instructional media for learning, according to MBTI personality type. The study by Roberts determined the forced-rank-order preference of the following thirteen instructional media methods:

1. lecture
2. discussion
3. small group work
4. audio recordings
5. readings (texts, articles)
6. programmed instruction
7. tutorial
8. symbols (maps,charts,diagrams)
9. pictures/slides
10. motion pictures/TV
11. environmental
12. field trips/demonstrations/roleplaying
13. laboratory

Analysis of the rankings grouped according to MBTI type indicated that seven of the eight Intuitive (N) type groups significantly preferred reading as an instructional medium. None of th_ eight Sensing (S) type groups significantly prefered reading and one of the Sensing (S) type groups (the ESFPs) significantly indicated reading as a least preferred instructional medium (18:84-86).

Summary

Summaries of findings from a wide variety of studies, including some with limited sample sizes, have been presented. Many of the research studies did not utilize the full breakout of 16 MBTI types but instead performed analyses with groupings of types. While different applications of the MBTI meet with different levels of success, the concensus appears to be that the MBTI is a reliable, valid instrument and has the potential for measuring significant individual differences of students in an academic environment. From the studies cited it may be concluded that the MBTI is a viable tool in understanding personality differences that effect how an individual perceives and processes information. The literature supports the possibility that the AFIT/LS 85S class may represent an unique distribution of personality type. The findings cited also support the relationship of MBTI type to different preferences for learning activities

and instructional methodologies. The studies also support the contention that the differences identified are significant differences affecting a students academic performance.

III. Methodology

This chapter will discuss the methodology used to achieve the objectives of this research study.

Population

The population examined in this study included all resident graduate students in the class graduating September 1985 for the AFIT School of Systems and Logistics. The following graduate degree programs were included in the AFIT School of Systems and Logistics (LS) for the 85S class:

1. Graduate Engineering Management Program
2. Graduate Systems Management Program
3. Graduate Logistics Management Program

The following program majors were options under the Graduate Logistics Management Program:

A. Acquistion Logistics Management
B. Contracting and Acquisition Management
C. International Logistics Management
D. Logistics Management
E. Maintenance Management
F. Transportation Management

The total number of students available for the study was 160. A total of 132 individuals, approximately 82.5% of the possible population, participated in the study by completing

the MBTI. Approximately 72.7% of the possible population (96 of the 132) responded to the Preferred Academic Environment Questionnaire developed for this research study.

Data Collection

Information collected for this study includes scores from the Myers-Briggs Type Indicator, course grades for the first three academic quarters, and responses to the Preferred Academic Environment Questionnaire developed for this study. Since the MBTI Thinking/Feeling (TF) index distribution is effected by gender, the gender of all subjects was also identified. All personal data collected for this study was controlled according to the guidelines of the Privacy Act of 1974.

Form G of the MBTI was provided to all subjects during the fourth academic quarter. Since complete instuctions are provided on the cover of the MBTI booklet and there is no time limit for completing the questions, the MBTI was self-administered as the MBTI manual suggests (15:7). The answer sheets for the MBTI were hand scored using answer keys and scoring procedures as prescribed in the MBTI Manual.

After determination of the four type indices according to the Myers-Briggs Type Indicator, typologies were formed using four seperate techniques. The first step was to differentiate the 16 types formed by combining the 4 seperate indicated preferences that the MBTI measures.

The second step was to differentiate the combinations of perception and judgement as measured by the SN and TF indices (ST,SF,NF,and NT).

The third step was to differentiate according to types grouped by motivation as suggested by the work of Mary H. McCaulley (12:734). The resulting four types, formed by the combination of indicated preferences on the EI and SN indices (IS,IN,ES,and EN).

The fourth method of differentiation was the four determinations of type offered by the seperate MBTI indices:

EI Extraversion or Introversion

SN Sensing or Intuition

TF Thinking or Feeling

JP Judgement or Perception

For each typology, a frequency of type was then determined. Additionally, course grades for the first three quarters were used to determine each subject's mean grade point average (GPA). Grade point averages were determined based on the following AFIT grade point scale:

A	4.0	C	2.0
A-	3.7	C-	1.7
B+	3.3	D	1.0
B	3.0	F	0.0
B-	2.7	S	N/A
C+	2.3	U	N/A

Results from the preferred academic environment

questionnaire were collected during the fourth academic quarter. The 35 question survey instrument (found in Appendix A) was developed based on findings and predictions of research work on student preferences in relation to the four MBTI indices, with emphasis on the results reported in Psychological (Myers-Briggs) Type Differences In Education by McCaulley and Natter (13) and People Types And Tiger Stripes by Lawrence (8). A total of 35 statements were provided. Respondents were asked to reply to each statement utilizing a seven-point Likert scale. The following seven-point Likert scale was provided:

1 = Strongly Agree

2 = Moderately Agree

3 = Slightly Agree

4 = Neither Agree Nor Disagree

5 = Slightly Disagree

6 = Moderately Disagree

7 = Strongly Disagree

Statements 1 through 10 requested the respondent indicate agreement or disagreement with statements concerning study habits and test taking. Statements 11 through 25 requested the respondent indicate agreement or disagreement with statements concerning learning activities or situations that result in better academic performance for the respondent. Statements 26 through 35 requested the respondent indicate agreement or disagreement with statements concerning learning

activities or situations that were important to the respondent.

Analysis Techniques

Subprograms of the Statistical Package for the Social Sciences (SPSS) were utilized to faciliate the statistical analysis of this research study. To limit the probability of a Type I error (rejecting null hypothesis if in fact it is true) to a maximum of five percent, an alpha level limit of 0.05 was used to determine statistical significance.

First Research Objective: To determine if the distribution of type for the AFIT School of Systems and Logistics class of September 1985 provides indications of a unique distribution of MBTI type.

The following null (Ho) and alternative (Ha) hypothesis were used for statistical analysis:

Ho: Each observed specific type frequency distribution of the AFIT/LS 85S class was the same as the expected frequency based on the CAPT data base.

Ha: Each observed frequency distribution and expected frequency distribution were not equal.

Calculations were made to determine the frequency distribution using the four methods previously mentioned. For comparison purposes, corresponding frequency distributions were also determined from the Center for Applications of Psychological Type (CAPT) data base for

college graduate students.

It was decided to analyze the resulting distribution of type in this research study in the same manner as the Selection Ratio Type Tables (SRTT) prepared by CAPT. The SRTT is a CAPT computer program which compares the 16 types and type grouping by calculating a Self Selection Ratio (SSR). The SSR is determined by dividing the observed frequency of a specific type by the frequency of that type in an appropriate base population. The SRTT also determines the statistical significance of the differences observed (9:40;14:40).

In comparing the distribution of type for the subjects to the CAPT data base to determine if significantly more or fewer individuals in any type cell than would be expected, three calculations were performed. Besides reporting the number of individuals represented in each type group; the percentage of the total sample represented in each type group, the selection ratio (SR), and the statistical probability that the ratio was statistically different from the expected were calculated. In example, there were 36 students typed as ISTJs and they represented 27.27% of the total sample. The selection ratio (SR) was obtained by calculating the ratio of the proportion of ISTJs in the sample to the proportion of ISTJs in the data base population. Dividing the percentage of ISTJs in the sample (27.27%) by the percentage of ISTJs in the CAPT data base

(8.31%) results in a SR value of 3.28. An SR value of 3.28 indicates that there were over three and one quarter times as many ISTJs in the sample based on the percentage of ISTJs in the CAPT data base. To calculate the statistical significance of the selection ratios, the SPSS nonparametric NPAR Chi-Square Test was used to test whether a significant difference existed between the observed number of individuals in a specific MBTI type classification and the expected number determined from the CAPT data base. For example, the CAPT data base was used to determine the expected number of observations in the ISTJ classification and in the other combined fifteen classifications. Seperate calculations were then performed for each of the remaining 15 classifications. The same procedure was then followed for making calculations on the other type groupings discussed earlier in this chapter.

Each calculation was made as if it was the only test of statistical significance calculation being made. The major limitation with this methodology is that the large number of calculations increases the possibility of introducing a Type I error. But in defense of this methodology, McCaulley and others in the study entitled Application Of The Myers-Briggs Type Indicator To Medicine and Other Health Professions offered the following observations:

> We stress that we realize that this is a primitive way of describing a complex set of interactions, but that it still can be most informative if used with due caution. Readers

> should keep in mind that when 44 analysis are done as if they are independent, when in fact they are not, one must realize that by chance 2 or 3 "significant" findings are expected to occur. Some users prefer to take seriously only relationships significant at probability levels of one in one-thousand (9:41).

The assumption was made that the type distribution based on 8649 graduate students in the CAPT data base represented a good cross section of graduate students and was not baised towards specific areas of study.

Second Research Objective: To determine if a difference in MBTI type has an effect on academic success as measured by grade point average.

To determine if there was a type difference in academic achievement as measured by cumulative GPA, the SPSS subprogram T-Test was used to compare the group means for E vs I, S vs N, T vs F, and J vs P. For the two sets of four type groupings (IS/ES/IN/EN and ST/SF/NF/NT), the SPSS subprogram BREAKDOWN was utilized to statistically test whether the means of the type groupings were significantly different from each other. This was accomplished by computing the F statistic in a one-way analysis of variance.

The null (Ho) and alternative (Ha) hypothesis for comparison with two groups only were:

Ho: The mean GPA of one type group was equal to the mean GPA of the corresponding type group.

Ha: The GPA means of the two groups were not equal.

The null (Ho) and alternative (Ha) hypothesis for

comparison between more than two type groups were:

Ho: The GPA means for all groupings were equal.

Ha: The GPA means for at least two of the groupings were not equal.

Comparisons of GPA means for the full sixteen types (identified by using all four indices of the MBTI) were not performed due to the expected uneven distribution of type that would result in extremely small groups in many of the sixteen types. It was decided to perform the analysis on grouped types using one or two of the MBTI indicies. Due to this grouping, statistical calculations were possible, but there is the possibility that a finding for grouped types may not hold true for all types within that group (9:41).

Third Research Objective: To determine if preferences for instructional techniques and learning styles, according to students' perception of effectiveness and importance, can be related MBTI personality type.

To determine if there was a significant difference in mean responses between the two appropriate type groups, the SPSS subprogram T-Test was used to test the following null and alternative hypotheses:

Ho: The rating means of the two MBTI type groups for a specific Preferred Academic Environment Questionnaire statement were equal.

Ha: The mean rating of the one MBTI type group was greater (or less) than the mean rating of the corresponding

MBTI type group for a specific Preferred Academic Environment Questionnaire statement.

Due to the expected uneven distribution of type and the resulting small groups using the complete seperation of 16 groups, it was decided to perform the analysis of responses by the specific MBTI index that related to the statement.

The group means of the responses for each of the 35 statements from the Preferred Academic Environment Questionnaire were obtained using the Frequencies subprogram of SPSS.

Using the mean rating as the measure of central tendency, the following criteria was used in interpreting the mean rating for each group: a mean rating of less than 3.5 represented agreement with the statement; a mean rating between 3.5 and 4.5 (inclusive) represents neither agreement nor disagreement with the statement; a mean rating greater than 4.5 indicated disagreement with the statement.

Since the SPSS T-Test subprogram output only provides results according to a two-tailed t-test, the following procedures were followed to convert the results to a one-tailed probability test. Based on the expected direction of the difference in mean response for the type group coded one, the expected positive or negative sign of the t-test statistic was determined. The two-tailed probability indicated on the SPSS T-Test output was then divided by two, giving the appropriate one-tailed probability. The null

hypothesis that the response means were equal was rejected if the resulting one-tailed probability was less than 0.05 and the sign of the t-test statistic was as expected. If both conditions were not satisfied, the null hypothesis was not rejected (15:271).

Summary

This chapter has presented the methodology used in this research study. It has explained the methods used to collect data and the analysis techniques used. The next chapter will discuss the analysis results of the information obtained.

IV. Results and Analysis

This chapter presents the results of the analysis of the data collected through the two survey instruments used, and the mean GPA comparison of MBTI types performed. The results are presented in the following order: MBTI type distribution, mean GPA comparison, and Preferred Academic Environment Questionnaire results.

MBTI Type Distribution Results

The first portion of this section will provide a discussion of the type distribution of the sample. The last portion of this section will discuss the comparison of the sample type distribution to the CAPT gradute student type distribution and the implications of significant differences found.

Of the 132 respondents to the MBTI, 16 were female and 116 were male. Because the percentage of Feeling (F) types is greater for females than it is for males in the general population (8:39), the distribution of type represented by the respondents is presented differentiated by gender. Table I presents the type distribution showing the full 16 type categories for males. Table III presents the type distribution for males grouped into condensed groupings

utilizing one or two of the MBTI indices. Table II and Table IV present the same information for the 16 female respondents.

In reviewing the male distribution presented in Table I, it can be seen that the 16 types are not equally distributed. Of the 16 types, 2 types (ISTJ and ESTJ) account for almost half of the sample (44.82%), while the

TABLE I

Male AFIT/LS 85S Graduate Students MBTI Type Distribution

N= 116

I S T J	I S F J	I N F J	I N T J
N= 30	N= 8	N= 0	N= 5
%=25.86	%= 6.90	%= 0	%= 4.31
I S T P	I S F P	I N F P	I N T P
N= 8	N= 4	N= 2	N= 11
%= 6.90	%= 3.45	%= 1.72	%= 9.48
E S T P	E S F P	E N F P	E N T P
N= 6	N= 3	N= 3	N= 4
%= 5.17	%= 2.59	%= 2.59	%= 3.45
E S T J	E S F J	E N F J	E N T J
N= 22	N= 4	N= 2	N= 4
%=18.96	%= 3.45	%= 1.72	%= 3.45

five least represented types account for 8.62% of the sample. The INFJ type is not represented.

In reviewing the female distribution presented in Table II, the complete lack of an equal distribution is even more noticeable. Of the 16 type categories, 8 types account for 100% of the female sample. The ISTJs and ESTJs again account for a major portion (56.25%) of the sample.

TABLE II

Female AFIT/LS 85S Graduate Students MBTI Type Distribution

N= 16

I S T J	I S F J	I N F J	I N T J
N= 6	N= 3	N= 0	N= 1
%=37.5	%=18.75	%= 0	%= 6.25
I S T P	I S F P	I N F P	I N T P
N= 0	N= 0	N= 0	N= 0
%= 0	%= 0	%= 0	%= 0
E S T P	E S F P	E N F P	E N T P
N= 2	N= 0	N= 0	N= 0
%=12.5	%= 0	%= 0	%= 0
E S T J	E S F J	E N F J	E N T J
N= 2	N= 0	N= 0	N= 2
%=12.5	%= 0	%= 0	%=12.5

While it would be presumptuous to draw any conclusions from the female sample size (16), it is very interesting to note the lack of feeling types. While the purpose of differentiating samples by gender is because females are usually over represented in Feeling types in comparison to males, this does not appear to be the case in this sample. Of the eight feeling types only one is represented in the female distribution, accounting for 18.75% of the female sample. With the male distribution, seven of the eight feeling types are represented, accounting for 22.41% of the male distribution.

In reviewing the type distribution by groupings (Table III and Table IV), the male and female distributions follow almost the same pattern. For both distributions the Is, Ss, Ts and Js outnumber the Es, Ns, Fs and Ps. The ST and IS groupings also represent the largest portion of both distributions. The only noticeable difference between the two distributions is in the IS, IN, ES, and EN groupings, where the EN type grouping is the least represented in the male sample and the IN type grouping is the least represented in the female sample.

Since the type distributions by groupings for the male and female distributions followed almost the same pattern, there were no real surprises in the combined distribution. In the IS, IN, ES, and EN grouping breakdown, the difference in ranking of the female distribution failed to have enough of an impact to change the ranking for the total sample.

TABLE III

Male AFIT/LS 85S Graduate Students MBTI Type Distribution

by Type Groupings

N= 116

Type	N	%
E	48	41.37
I	68	58.62
S	85	73.28
N	31	26.72
T	90	77.59
F	26	22.41
J	75	64.66
P	41	35.34
ST	66	56.90
SF	19	16.38
NF	7	6.03
NT	24	20.69
IN	18	15.52
EN	13	11.21
IS	50	43.10
ES	35	30.17

TABLE IV

Female AFIT/LS 85S Graduate Student MBTI Type Distribution by Type Groupings

N= 16

Type	N	%
E	6	37.5
I	10	62.5
S	13	81.25
N	3	18.75
T	13	81.25
F	3	18.75
J	14	87.5
P	2	12.5
ST	10	62.5
SF	3	18.75
NF	0	0.0
NT	3	18.75
IN	1	6.25
EN	2	12.5
IS	9	56.25
ES	4	25.0

TABLE V

Combined Type Distribution of AFIT/LS 85S Graduate Students

by Type Groupings

N= 132

Type	N	%
E	54	40.91
I	78	59.09
S	98	74.24
N	34	25.76
T	103	78.03
F	29	21.97
J	89	67.42
P	43	32.58
ST	76	57.58
SF	22	16.67
NF	7	5.30
NT	27	20.55
IN	19	14.39
EN	15	11.36
IS	59	44.70
ES	39	29.55

In reviewing the total combined sample (presented in Table V and Table VI), discussion will be based on a comparison to the male sample. The top ranking percentages in the male and female distribution (ISTJ and ESTJ) still maintain the major proportion of the combined distribution, accounting for 45.45% of the combined samples. The INFJ type is the only type not represented and the 5 least represented types account for only 7.58% of the total distribution.

TABLE VI

Combined Type Distribution of AFIT/LS 85S Graduate Students

N= 132

I S T J	I S F J	I N F J	I N T J
N= 36	N= 11	N= 0	N= 6
%=27.27	%= 8.33	%= 0	%= 4.55
I S T P	I S F P	I N F P	I N T P
N= 8	N= 4	N= 2	N= 11
%= 6.06	%= 3.03	%= 1.52	%= 8.33
E S T P	E S F P	E N F P	E N T P
N= 8	N= 3	N= 3	N= 4
%= 6.06	%= 2.27	%= 2.27	%= 3.03
E S T J	E S F J	E N F J	E N T J
N= 24	N= 4	N= 2	N= 6
%=18.18	%= 3.03	%= 1.52	%= 4.55

The following narrative discusses the statistical analysis of the selection ratio comparison of the total AFIT/LS 85S type distribution to the CAPT graduate student type distribution data base. The selection ratio results are presented in Table VII and Table VIII. The female, male, and combined CAPT graduate student type distributions can be found in Appendix B.

It should be noted that in making the statement that a selection ratio (SR) was statistically significant implies rejection of the null hypothesis in favor of the alternative hypothesis. A lack of significance indicates a inability to reject the null hypothesis.

In reviewing the results from the full 16 types comparison, the largest selection ratio (SR) was 3.50 for the ESTP type. The smallest SR value (0.14), discounting the 0 value for the non-represented INFJ category, was for the INFP type. For six of the selection ratios (ISFJ, INTJ, ISFP, ESFP, ENTP, and ENTJ), no significant difference was found at the .05 level. The selection ratios of the INTP and ESFJ types were significant at the .05 level and the selection ratios of the INFJ, ISTP, and ENFJ types were significant at the .01 level. At the most restrictive level of significance (.001) there were five selection ratios indicating a significant difference between the sample and the data base distributions. The 5 types with selection ratios significant at the .001 level were ISTJ, INFP, ESTP, ENFP and ESTJ.

TABLE VII

Selection Ratio Comparison of AFIT/LS 85S Graduate Students

N= 132

I S T J	I S F J	I N F J	I N T J
N= 36	N= 11	N= 0	N= 6
%=27.27	%= 8.33	%= 0	%= 4.55
SR=3.28***	SR=1.02	SR=0.00**	SR=0.85
I S T P	I S F P	I N F P	I N T P
N= 8	N= 4	N= 2	N= 11
%= 6.06	%= 3.03	%= 1.52	%= 8.33
SR=2.82**	SR=0.93	SR=0.14*	SR=1.79*
E S T P	E S F P	E N F P	E N T P
N= 8	N= 3	N= 3	N= 4
%= 6.06	%= 2.27	%= 2.27	%= 3.03
SR=3.50***	SR=0.71	SR=0.18***	SR=0.69
E S T J	E S F J	E N F J	E N T J
N= 24	N= 4	N= 2	N= 6
%=18.18	%= 3.03	%= 1.52	%= 4.55
SR=2.23***	SR=0.38*	SR=0.20**	SR=0.75

* indicates significance at the .05 level
** indicates significance at the .01 level
*** indicates significance at the .001 level

Reviewing the over represented types, it was found there were significantly more ISTJ, ISTP, INTP, ESTP, and ESTJ types in the sample than the CAPT data base distribution indicates would be expected at the .05 level of significance. At the .01 level of significance the INTP type was excluded. At the .001 level, three types remain with SR values of greater than 1.00. They are the ISTJs, ESTPs and the ESTJs. There were five types with SR values of less than 1.00. They were the ESFJs (significant at the .05 level); the ENFJs and INFJs (significant at the .01 level); and the INFPs and ENFPs (significant at the .001 level).

In surveying the selection ratio results of the EI, SN, TF, and JP groupings it was found that each of the type groupings which represented the largest percentage of sample (Is, Ss, Ts, and Js) also has significant SR ratios of greater than one. The largest SR ratio (1.91) was found for the Thinking (T) grouping. The smallest SR ratio was found for the Feeling (F) group (0.37). The significance of this finding may be tempered by the fact that the females in the CAPT distribution accounted for 45.3% of the total CAPT type distribution and the females in the AFIT/LS sample accounted for only 12.12% of the total sample. The previously mentioned lack of F types in the female sample would tend to limit the importance of the lack of females in the total sample.

To avoid ignoring the possibility a type group may have a significant selection ratio of greater or less than one but

TABLE VIII

Selection Ratio Comparison of AFIT/LS 85S Graduate Students

by Type Groupings

N= 132

Type	N	%	SR
E	54	40.91	0.79*
I	78	59.09	1.22*
S	98	74.24	1.73***
N	34	25.76	0.45***
T	103	78.03	1.91***
F	29	21.97	0.37***
J	89	67.42	1.17*
P	43	32.58	0.77*
ST	76	57.58	2.83***
SF	22	16.67	0.74
NF	7	5.30	0.15***
NT	27	20.55	1.00
IN	19	14.39	0.54**
EN	15	11.36	0.37***
IS	59	44.70	2.04***
ES	39	29.55	1.40***

* indicates significance at the .05 level
** indicates significance at the .01 level
*** indicates significance at the .001 level

the same relationship may not hold for the complete breakout of types, exceptions within type groups should be noted. In example, while there were significantly more I types in the sample than in the CAPT distribution, there were two types (INFJ and INFP) which were under represented in the sample.

In examining the ST, SF, NF and NT groupings it was again found that the ST grouping, which represented the largest percentage of the sample also had the largest SR ratio (2.83). The NF grouping, which represents the smallest percentage, also had the smallest SR ratio (0.15). Both the ST and NF SR ratios were significant at the .001 level. No statistical significance was found for the other two groupings and the NT group had a selection ratio of 1.00

In the last grouping analyzed (IS, ES, IN, and EN), two groupings had SR ratios significantly greater than 1.00; IS significant at the .001 level and ES significant at the .05 level. The EN grouping had an SR ratio significantly less than 1.00 at the .001 level and the IN grouping was also under represented (significant at the .01 level). Again the grouping with the highest percentage had the highest SR ratio and the grouping with the smallest percentage had the lowest SR ratio.

While it may seem redundant to discuss the groupings of four types after discussing the EI, SN, TF, and JP type groupings, additional information is gained about the interaction of combined under and over represented type

groups. For example, both the IN and the ES groupings represent the combination of an over represented group and an under represented group. By looking at the resulting selection ratio for each grouping it is fairly obvious which of the over or under represented group had more of an impact. Since the ES grouping has a significant SR ratio of greater than one the over representation of Js had a larger impact than the under representation of Es. Conversely for the IN grouping, the under represented N grouping must have a greater impact since the selection ratio for the IN grouping is significantly less than one.

In reviewing the total results of the selection ratio analyses, the strongest pattern of difference between the sample and the CAPT data base was found in the ST and NF type groupings. With one exception (the INTPs), all type categories with a significant positive selections ratio (greater than 1.00) were found in the ST type column of the MBTI type table. This finding was reinforced with the selection ratio comparison by type groupings for the ST, SF, NF and NT grouping. A pattern also developed for types with a significant selection ratio of less than 1.00. With one exception (the ESFJs), all types which are significantly under represented in the sample were found in the NF column of the MBTI type table. When looking at the selection ratio comparison by type grouping this pattern is again shown in the ST, SF, NF and NT grouping.

The information gained from this analysis provides some valuable insights into the characteristics of the over represented and majority types of the sample. Introverts (I) can be expected to prefer to work alone and uninterrupted, often with intense concentration. They can also be expected to prefer and perform better on written assignments (8:71). Sensing (S) types can be expected to be more comfortable dealing with factual details that can be used in a systematic manner to solve a "realistic and practical" problem (8:72). Thinking (T) types can be expected to be analytical and objective in their dealings with problems, often appearing to be insensitive to other people's feelings (8:74). Judging (J) types can be expected to prefer to control their environment in a planned, orderly and decisive manner (8:76). The under represented dichotomus types for each of these indices can be expected to display opposite characteristics.

The combination of Introversion with Sensing (IS) results in individuals who have been described as "careful compilers" who see the value of knowledge "to establish truth" (13:166). The strongest pattern of type distribution found, the combination of Sensing with Thinking (ST), results in an individual that can be described as "practical and matter-of-fact" due to their tendency to "focus their attention on facts and handle these with impersonal analysis" (8:A-3).

Mean GPA Comparison Results

It was expected that different preferences identified by MBTI indices would be associated with academic performance due to motivational differences and differences affecting a student's skill in demonstrating academic competence. In attempting to determine if a difference existed beween academic performance of different MBTI type groupings, with group GPA means as the basis for comparison, subjects were differentiated according to MBTI type. Table IX summarizes the results from the SPSS T-Test analysis of the group GPA means for E versus I, S versus N, T versus F, and J versus P types.

Discriminating subjects according to their EI preference was expected to demonstrate the affect of the Introverts' (I) stronger skills in writing and better performance on written tests concerned with understanding concepts, improving their chances for increased academic success in a graduate level program (13:152). Seperating subjects according to their SN preference was expected to demonstrate the academic advantage of the Intuitive (N) types due to their tendency to quicker insight. This gives them an advantage in testing (especially with time restrictions) and in understanding complex relationships (13:156). Discriminating subjects according to their TF preference was expected to demonstrate the favorable difference of better application in technical

Table IX

Group Mean GPA Comparison -- One MBTI Index Only

Type Group	N	Mean GPA	Variance
E	54	3.5757	0.0767
I	78	3.6306	0.0686

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-1.16	130	0.250

** Equal Variance Test **

F Value	2-Tail Prob
1.11	0.662

Type Group	N	Mean GPA	Variance
S	34	3.6219	0.0724
N	98	3.5684	0.0708

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-1.03	130	0.319

** Equal Variance Test **

F Value	2-Tail Prob
1.03	0.965

Table IX (continued)

Type Group	N	Mean GPA	Variance
T	103	3.5907	0.0870
F	29	3.6356	0.0605

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
0.75	130	0.455

** Equal Variance Test **

F Value	2-Tail Prob
1.43	0.276

Type Group	N	Mean GPA	Variance
J	89	3.6216	0.0650
P	43	3.5802	0.0870

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-0.83	130	0.408

** Equal Variance Test **

F Value	2-Tail Prob
1.34	0.254

subjects concerning logical cause and effect relationships such as mathematics (13:158). The JP differentiation of subjects was expected to demonstrate the stronger study habits and application of Judging (J) types that results in higher academic grades than expected from their aptitiutde and therefore higher grade point average than Perceptive (P) types (13:162-163).

The pooled variance T-Test SPSS output values were used in all calculations since the results of the F-test of the sample variance, performed as part of the SPSS T-Test analysis, indicated a probability of greater than .05 (alpha level). Therefore, there was insignificant evidence to reject the assumption of equal variances (16:270).

The pooled variance T-Test results did not indicate a significant difference between GPA means by any of the methods of grouping. The data did not present sufficient evidence to reject the hypothesis that the GPA means were equal.

The results of the comparison of mean GPA for the two sets of four type grouping (ST/SF/NF/NT and IS/IN/ES/EN) analyzed by the SPSS subprogram Breakdown are presented in Table X. It was expected that differentiating subjects according to type grouping utilyzing two MBTI indices would demonstate the consolidated effect of the two different preferences.

Table X

Group Mean GPA Comparison -- Two MBTI Indices

Type Group	N	Mean GPA	Variance
ST	76	3.6021	0.0772
SF	22	3.6905	0.0535
NF	7	3.4631	0.0503
NT	27	3.5957	0.0744

** Analysis Of Variance **

F Value	Significance
1.415	0.2414

Type Group	N	Mean GPA	Variance
IN	19	3.5607	0.1006
EN	15	3.5782	0.0373
IS	59	3.6531	0.0580
ES	39	3.5748	0.0930

** Analysis Of Variance **

F Value	Significance
1.011	0.3900

Again, the difference between group means was too small in relation to the variance within the groups to indicate a significant difference between even two of the groupings. This resulted in a failure to reject the hypothesis that the mean GPA for all four groupings were equal.

The mean GPA for all 132 subjects was calculated as 3.6081, with a standard deviation of 0.2673. Due to the small variance within the sample and the resulting lack of statistically significant difference in GPA means, the SPSS NPAR Kruskall-Wallis One Way Analysis Of Variance test was also performed on all comparison methods. However, the Kruskall-Wallis H test of mean rank for each group also failed to identify any statistically significant difference between the type groups.

If MBTI personality type differences affected this sample's motivation and demonstration of academic competence in their first three academic quarters of the AFIT/LS academic environment, the statistical analysis of their resulting GPA means was not able to demonstrate that effect.

Preferred Academic Environment Questionnaire Results

To determine if MBTI type differences were related to preferences for different instructional techniques and learning styles, the mean ratings of the two appropriate dichotomous type groups were analyzed. It was expected that personality differences of the opposite types would result

in a statistically significant difference in agreement rating for statements concerning the AFIT/LS academic environment. The following seven-point Likert Scale was used for indicating agreement or disagreement:

1= Strongly Agree

2= Moderately Agree

3= Slightly Agree

4= Neither Agree Nor Disagree

5= Slightly Disagree

6= Moderately Disagree

7= Strongly Disagree

In relation to the numerical Likert Scale values used, a mean rating of less than 3.5 was interpreted as representing agreement with a statement. A mean rating greater than 4.5 indicated disagreement with a statement. A mean rating between 3.5 and 4.5 (inclusive) represented neither agreement nor disagreement with a statement. In comparing the mean ratings of two type groups, a stronger agreement would be indicated by a lower numerical mean rating value.

The discussion of the results from the Preferred Academic Environment Questionnaire are divided into three sections: Statements 1 through 10, Statements 11 through 25, and Statements 26 through 35. Each section provides a discussion of the SPSS T-Test results for statements where

the expected significant difference in mean responses was found and the reason for selecting the MBTI preference index used to differentiate respondents. Summaries are provided for each section which also include a discussion of statements which failed to produce statistical significant differences. The section concludes with an overall discussion of all three sections of the Preferred Academic Environment Questionnaire (hereafter also referred to as the PAEQ).

The one tailed t-test results for statements with statistical significance are presented in Tables XI, XII, and XIII. Results from statements which failed to produce statistical differences are available in Appendix C. The pooled variance T-Test SPSS output values were used in all calculations since the results of the F-test of the sample variance, performed as part of the SPSS T-Test analysis, indicated a probability of greater the .05 (alpha level). Therefore, there was insignificant evidence to reject the assumption of equal variances (16:270).

Statements Concerning Test Taking and Study Habits -- Statements 1 through 10. The first ten statements requested the respondent indicate agreement or disagreement with statements concerning study habits and test taking. Statistical significant mean rating differences in the predicted direction were found for statements 1, 4, 5, and 8.

Table XI

Preferred Academic Environment Questionnaire Section One

Statements with Significant Differences

Statement 1 (J < P expected)

Type Group	N	Mean Rating	Std Dev
J	73	3.1507	1.630
P	23	4.6522	1.849

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	1-Tail Prob
3.73	94	0.000

Statement 4 (J < P expected)

Type Group	N	Mean Rating	Std Dev
J	73	3.9863	2.072
P	23	5.1739	2.188

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	1-Tail Prob
2.37	94	0.010

Statement 5 (S < N expected)

Type Group	N	Mean Rating	Std Dev
S	77	3.3896	1.640
N	19	4.4211	1.644

T Value	Degrees Of Freedom	1-Tail Prob
2.45	94	0.008

Table XI (continued)

Statement 8 (J < P expected)

Type Group	N	Mean Rating	Std Dev
J	73	3.3973	1.991
P	23	4.8261	2.146

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	1-Tail Prob
2.95	94	0.002

Statement 1: I generally follow a study schedule and divide my time according to what I need to do each day.

Discussion: According to the predicted relationships of the JP index, Judging (J) types can be expected to have and follow a study schedule. Perceptive (P) types are more prone to procrastinate and study as the "spirit moves them" (13:162,164). It was therefore expected J types would indicate a stronger agreement (lower mean rating) with Statement 1 in comparison to P types.

Results: The results from Statements 1 indicate that as a group the Judging types did respond with an overall agreement with this statement, with a mean rating of 3.1507. In comparison, the Perceptive types had a mean rating of 4.6522 which indicated an overall disagreement with this statement. The SPSS T-Test output found the stronger agreement of the Judging group was statistically

significant. The one-tailed probability of 0.000 indicated the possibility of drawing two samples that differ in rating by more than the two group ratings found in this sample was unlikely.

Statement 4: I make systematic notes and/or outlines of class readings.

Discussion: In relationship to a Judging (J) type preference, a student interested in controlling their outer world in a planned and structured manner would see more value in organizing and structuring their study of classroom reading. Being a dichotomous opposite, a Perceiving (P) type preference to keep structure at a minimum, plus a tendency towards procrastination, would result in the opposite perspective (8:54,55). It was expected J types would indicate a stronger agreement with this statement compared to P types.

Results: The results from Statement 4 indicated the Perceiving (P) type group responded with an overall disagreement with this statement. The mean rating of the P type group was 5.1739. The mean rating (3.9863) of the Judging type group indicated neither agreement nor disagreement with the statement. While the J types did not agree with this statement, the SPSS T-Test output indicated the stronger disagreement of the perceiving types was statistically significant with a one-tailed probability of 0.010.

Statement 5: I do better on test questions concerning factual details than on questions concerning synthesis and evaluation.

Discussion: Concerning the preferences of a Sensing (S) type in comparison to an Intuitive (N) type, a Sensing student would be more comfortable dealing with factual details than conceptual reasoning. Sensing types place an importance on details while Intuitive types are more interested in perceiving the relationships and meaning of the facts than to the facts themselves (8:72-73). It was therefore expected the S types would indicate a stronger agreement with Statement 5.

Results: The results from Statement 5 indicated that the Intuitive (N) type group showed neither agreement nor disagreement with this statement. The mean rating of the N type group was 4.4211. The mean rating of the Sensing (S) type group (3.3896) did indicate an overall agreement with the statement. The SPSS T-Test output indicated the difference between the mean ratings of the two groups was statistically significant with a one-tailed probability of 0.008.

Statement 8: I do not let course work pile up, then cram at the last minute.

Discussion: Since Judging (J) types are expected to have and follow a study schedule they are less likely to have the need to cram at the last minute. Due to Perceptive

(P) types' tendency to procrastinate, they would be expected to leave the course work to the last minute more than the Judging type (13:162,164). It was therefore expected Perceptive types would designate a stronger agreement than Judging types for this statement.

Results: The results from Statement 8 indicated that the Judging (J) group showed an overall disagreement with this statement. The mean rating of the J type group was 4.8261. The Perceptive (P) type group had a mean rating of 3.3973, indicating agreement with the statement. The output of the SPSS T-Test showed the difference between the mean ratings of the two groups was statistically significant with a one-tailed probability of 0.002.

Section One Summary. The results from the first section of the PAEQ indicated the Judging/Perceiving (JP) index was the only MBTI preference that produced the results expected. The results showed Judging (J) types indicated they do follow a study plan and do not let course work pile up to the point that they are forced to cram for examinations. The opposite findings were found for the Perceiving (P) types. Perceiving (P) types indicated they do better on test questions concerning factual details and do not make systematic notes and/or outlines of class readings. While the mean rating of the Judging (J) types was not opposite in response (falling into the neither agree nor disagree region), the difference in mean response

between the two groups was in the expected direction and statistically significant.

No statistical difference between mean ratings was found for the remaining six statements in the first section of the Preferred Academic Environment Questionnaire. For Statements 2, 3, 6, 7, 9 and 10; differentiating respondents according to MBTI type preference groupings did not produce the expected significant difference in mean rating. The relationship of MBTI identified preferences to the areas addressed by these statements did not appear to be strong enough to result in a differentiation of mean responses.

Statements 2, 3, and 10 were analyzed by grouping respondents according to their Sensing/Intuitive preferences. The three statements were:

2. Time restrictions on tests do not negatively effect my performance.

3. Hard items at the beginning of a test do not affect my ability to answer easier items later.

10. A good grade on one test increases my confidence for the next one.

Statement 2 was analyzed by comparing the mean rating of the Intuitive (N) types verses the Sensing (S) types because the Intuitive types tend to have quicker insight which gives them an advantage in tests with time restrictions (13:156). While there was a slightly stronger agreement indicated by Intuitive (N) types, both groups

indicated they neither agreed nor disagreed with Statement 2. Statements 3 and 10 were also expected to produce a greater agreement from Intuitive types in comparison to the Sensing respondents. Statements 3 and 10 were taken from Learning Activity Questionnaire items found to be associated with better grades from the Psychological (Myers-Briggs) Type Differences in Education study by McCaulley and Natter (13:178). Since Intuitive types seem to have an advantage in timed tests and have a greater potential for better performance on written tests in general (13:156), it was this author's contention that Intuitive types should indicate a greater agreement with these two statements. The difference between mean response ratings for Statements 3 and 10 was not in the expected direction. Sensing (S) types agreed and Intuitive (N) types neither agreed nor disagreed with Statement 3. Both types agreed with Statement 10.

Statements 6 and 7 were analyzed by differentiating the respondents according to the JP index. The two statements were:

6. I do not neglect or have problems organizing what needs to be done with larger class projects.

7. I do not seem to take more lecture notes than necessary.

The reasons for selecting the JP index for Statement 6 was the same as the reasons cited for Statement 1. The major difference between the two statements was Statement 6

concerned major class projects while Statement 1 concerned daily study planning. While Perceptive (P) respondents indicated an overall disagreement with the statement concerning daily study scheduling, they indicated they did not have problems organizing larger class projects. While a significant difference was found for the mean ratings of J and P respondents for Statement 1, both types indicated they did not have problems organizing larger projects (Statement 6) and the response difference was nonsignificant.

Statement 7 was an item developed from the Learning Activity Questionnaire study previously mentioned. In the results reported by McCaulley and Natter, the Judging types were the only type that significantly indicated they "seem to take more notes than necessary" (13:162). The results for Statement 7 indicated both types responded that they do not take more lecture notes than necessary. The nonsignificant difference was in the expected direction.

Statement 9 (I study with a group for tests) was the remaining statement for which a significant difference was not found. Results from Statement 9 were differentiated according to the Extraversion-Introversion index since the Extravert type would be expected to prefer working with others while the Introvert type prefers to work alone -- where they will not be interrupted (13:150-152). Even though there was a slight difference in response, both types disagreed with this statement.

Statements Concerning Better Academic Performance -- Statements 11 through 25. The next 15 statements requested respondents indicate agreement or disagreement with statements concerning learning activities or situations that result in better academic performance for the respondent. Statistically significant differences were found for statements 15, 16, 19, 21, and 22.

Table XII

Preferred Academic Environment Questionnaire Section Two

Statements with Significant Differences

Statement 15 (J < P expected)

Type Group	N	Mean Rating	Std Dev
J	73	1.7534	0.997
P	23	2.2609	1.421

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	1-Tail Prob
1.91	94	0.029

Statement 16 (S < N expected)

Type Group	N	Mean Rating	Std Dev
S	77	2.8961	1.283
N	19	3.7368	1.790

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	1-Tail Prob
2.35	94	0.011

Table XII (continued)

Statement 19 (S > N expected)

Type Group	N	Mean Rating	Std Dev
S	77	3.5584	1.500
N	19	2.8947	1.487

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	1-Tail Prob
-1.73	94	0.043

Statement 21 (S < N expected)

Type Group	N	Mean Rating	Std Dev
S	77	2.0519	1.037
N	19	2.9474	1.471

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	1-Tail Prob
3.08	94	0.001

Statement 22 (S > N expected)

Type Group	N	Mean Rating	Std Dev
S	77	3.1429	1.295
N	19	2.3158	1.003

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	1-Tail Prob
-2.59	94	0.005

Statement 15: I am most likely to perform better academically in AFIT educational situations that let me know what I am accountable for; when, how, and by what standards.

Discussion: Judging (J) types were expected to show a stronger agreement with this statement due to their desire for a structured system of accountability. The structured environment that a Judging type needs may be seen as too confining to a Perceiving (P) type (8:54).

Results: The results indicate that as a group the Judging (J) types expressed a strong agreement (mean rating of 1.7534) with this statement. The Perceiving (P) type individuals also showed an overall agreement with this statement. The mean rating of the P type group was 2.2609. Even though it appears important to both type groups to know how and what they are accountable for, the output of the SPSS T-Test indicated the stronger agreement of the J types was statistically significant with a one-tailed probability of 0.005.

Statement 16: I am most likely to perform better academically in AFIT educational situations that require accuracy and careful attention to details.

Discussion: Since a Sensing (S) type tends to rely on their senses to perceive the facts of a problem or situation, they tend to develop stronger skills in working with facts. Due to their preference for factual information, they tend to place stronger importance on

precise and accurate details (8:A-2). Intuitive (N) types are expected to be more concerned with the relationship and meaning of situations, placing less of an emphasis on what they see as unessential details (8:73) and therefore were expected to show less of an agreement with this statement in comparison to Sensing types.

Results: The results indicated the Sensing (S) type group showed an overall agreement with the statement. The mean rating of the S type group was 2.8961. The Intuitive (N) type group did not show neither agreement nor disagreement with the statement. The mean rating of the N type group was 3.7368. The SPSS T-Test showed the expected difference between the mean ratings of the two groups was statistically significant with a one-tailed probability of 0.011.

Statement 19: I am most likely to perform better academically in AFIT educational situations that require me to figure out how to put theory into practice.

Discussion: Sensing (S) types are expected to have more problems grasping the abstraction of theory in comparison to Intuitive (N) types. Intuitive types with their stronger ability to deal with theoretical relationships were expected to indicate a stronger agreement with this statement (13:154-156).

Results: The results indicated that the Intuitive (N) type group showed an overall agreement with this statement.

The mean rating of the N type group was 2.8947. The mean rating (3.5584) of the Sensing (S) type group showed neither overall agreement nor disagreement with the statement. The T-Test indicated the stronger agreement of the Intuitive types was statistically significant with a one-tailed probability of 0.043.

Statement 21: I am most likely to perform better academically in AFIT educational situations that give me ample opportunity to think out my ideas before I have to answer.

Discussion: Since communication depends on the translation from symbols into meaning by intuition, Sensing (S) types tend to be at a disadvantage in quickly assimilating exactly what is being asked. They feel more comfortable and sure of their responses when they have the opportunity to take the additional time needed to mentally confirm the soundness of their understanding (14:147,152, 153). Therefore, Sensing types were expected to respond with a stronger agreement to this statement.

Results: The results indicated the Intuitive (N) type group showed an overall agreement of the statement with a mean rating of 2.9474. The mean rating (2.0519) of the Sensing (S) type group showed an stronger overall agreement with this statement. The one-tailed probability of 0.001 showed there was a statistically significant difference between the two groups.

Statement 22: I am most likely to perform better academically in AFIT educational situations that give me the opportunity to be creative and work with my own ideas.

Discussion: Intuitive (N) types prefer and therefore develop their intuition abilities. They are not as interested in the systematic step by step solution to a problem using a standard procedure, but are more comfortable using their inventive and creative abilities (8:7). Therefore, Intuitive types were expected to respond with a stronger agreement to this statement.

Results: The results indicated the Intuitive (N) types responded with an overall agreement with this statement. The mean rating of the N type group was 2.3158. The Sensing (S) type group also showed an overall agreement with this statement. The mean rating of the S type group was 3.1429. The output of the SPSS T-Test indicated the expected stronger agreement of the N types was statistically significant with a one-tailed probability of a 0.005.

Section Two Summary. The results from the second section of the PAEQ demonstrated the relationship of Sensing/Intuitive (SN) preferences to four statements concerning situations that respondents indicated resulted in better academic performance. The Judging/Perceiving (JP) index relationship to Statement 15 was also demonstrated. While a dichotomous response difference was not found for Statement 15 since both Judging and Perceiving types

indicated they are more likely to perform better academically when they know exactly what they are accountable for, the mean response difference was in the expected direction and statistically significant. Sensing (S) types indicated they are more likely to perform better academically in situations requiring accuracy and careful attention to detail. Even though Intuitive (N) types did not indicate agreement (mean response indicated neither agreement nor disagreement), the stronger agreement of the Sensing (S) types was significant. Intuitive (N) types reported being at an academic advantage when they are required to figure out how to put theory into practice. Sensing (S) types did not indicate either agreement or disagreement but the difference in mean response was as expected and significant. Sensing (S) types also show a significantly greater agreement to the statement that they perform better academically when given ample opportunity to think out their ideas before being required to respond. Intuitive (N) types indicated they perform better in situations where they are given the opportunity to be creative and work with their own ideas. Even though there was a significant difference between the mean response of the two groups, a dichotomous response difference was not found for either s atement since both type groups indicated an overall agreement to both statements.

While a statistical difference between mean ratings was

found for statements 15, 16, 19, 21, and 22; the difference between mean responses for the other 10 statements in this section of the questionnaire was not significant. The relationship of MBTI preferences to the areas addressed by these statements did not appear to be strong enough to result in the expected differentiation of mean response. Analysis of Statements 11 and 13 were performed by grouping respondents according to their Extroversion/Introversion (EI) preference. The two statements were:

11. I am most likely to perform better academically in AFIT educational situations that involve other students or take group effort.

13. I am most likely to perform better academically in AFIT educational situations that let me talk over questions and ideas with others in classroom discussions.

Statement 11 was expected to generate a stronger agreement response from Extravert (E) types due to their preference to interact with others while an Introvert (I) is more comfortable in their inner world of personal thoughts (14:56). Even though the nonsignificant difference in agreement was in the proper direction, both type groups neither agreed nor disagreed with this statement. Statement 13 was expected to be more agreeable to Extravert (E) types due to their need for approval and encouragement from the outer world of people, which they are oriented towards (14:55). Even though Extravert (E) types indicated

agreement with Statement 13, the Introvert (I) type group also agreed they perform better academically when they can discuss questions and ideas with others. There was no significant difference in mean response between the two groups.

Statements 12, 14, 17, 18, 24, and 25 were analyzed by dividing the respondents according to their Sensing and Intuitive (SN) preferences. The five statements were:

12. I am most likely to perform better academically in AFIT educational situations that let me work toward goals step by step in an orderly way.

14. I am most likely to perform better academically in AFIT education situations that present information in an orderly, organized, and systematic manner.

17. I am most likely to perform better academically in AFIT educational situations that require initiative to plan and carry out new projects.

18. I am most likely to perform better academically in AFIT educational situations that are more concerned with understanding ideas and concepts than attending to factual details.

24. I am most likely to perform better academically in AFIT educational situations that place time constraints on tests.

25. I am most likely to perform better academically in AFIT educational situations that place the major

emphasis on applications of theory and present examples before explaining the theory.

Statements 12 and 14 were expected to be more appealing to the Sensing (S) type due to their need for approaching problems in a systematic, step by step process where they can be assured of the accuracy and soundness of their perceptions (8:7). The Sensing groups mean response for Statements 12 and 14 indicated greater agreement, but both type groups showed an overall agreement with both statements.

Intuitive (N) types were expected to agree with Statement 17 stronger than Sensing (S) types due to their increased interest in doing things differently and working with their intuitive ability to solve problems in unique ways. In comparison, an S type's tendency to rely on established procedures and decreased ability to cope with complex situations would result in less agreement with this statement (8:72,73). Intuitive (N) types were expected to agree stronger with Statement 18 due to their increased ability to see the meaning of concepts and relationship of ideas. Sensing (S) types tend to place an increased importance on concrete observable facts and therefore develop their skills in dealing with factual details to a greater degree than Intuitive (N) types (8:A-2). Even though the Intuitive (N) group's mean response indicated a slightly greater agreement, both type groups showed an

overall greement with Statements 17 and 18.

For Statement 24, it was expected to see stronger agreement from the Intuitive (N) types due to their intuitive ability which tends to allow them to grasp understanding more quickly. Since a Sensing (S) type tends to be more deliberate in analyzing questions to make sure they understand what is being asked, Sensing types were expected to indicate less of an agreement (14:59,60). Responses from Sensing (S) types did indicate an overall disagreement with this statement. Intuitive (N) type's mean response indicated neither agreement nor disagreement and the difference was not significant. Statement 25 was expected to show a stronger agreement from Sensing (S) types due to their stronger interest in the practical application of theory and a greater need to experience before attempting to deal with abstraction (8:41). Even though a slightly stronger agreement was shown by Sensing (S) types for Statement 25, both types indicated an overall agreement and the difference in mean response was not statistically significant.

Responses to Statement 20 were grouped according to the Judging and Perceiving references of respondents. Statement 20 read: I am most likely to perform better academically in AFIT educational situations that let me concentrate on subjects that are important to me. The structured environment that a Judging (J) type desires may

seem to be too confining to a Perceiving type. Perceptive (P) types would tend to be more comfortable in a flexible atmosphere that allows them to concentrate on their chosen interests, and therefore were expected to agree with the statement stronger than Judging (J) types (8:54; 13:164). Judging and Perceiving types both indicated a strong agreement with this statement. The difference in mean response was in the expected direction, but not statistically significant.

Statement 23 was expected to show a stronger agreement from Feeling (F) respondents when compared to Thinking (T) respondents due to Feeling (F) types' greater concern for human relationships. Statement 23 read: I am most likely to perform better academically in AFIT educational situations that are more concerned with human relationships and ideals instead of theories and facts. While Thinking (T) types tend to make decisions impersonally (depending on facts and logic to make decisions), Feeling (F) types tend to be less analytical and more concerned with people and ideals (8:74,75). The mean response of both type groups indicated neither agreement nor disagreement with this statement, but the difference of a mean response was in the expected direction.

Statements Concerning Important Differences in Learning Styles and Instructional Techniques -- Statements 26 through 35. The last ten statements requested respondents indicate agreement or disagreement with statements concerning learning activities or situations that were important to the respondent. Statistically significant differences were found for Statements 30, 34, and 35. Analysis for all three statements was performed by differentiating respondents according to the SN index.

Statement 30: It is important for me to have an indepth explanation provided on how to apply theory.

Discussion: According to the relationship between learning activities and the perception processes index (SN) of the MBTI, Sensing (S) types are expected to have more problems grasping the abstraction of theory. Sensing types prefer to have an established method of solving a problem step by step. Therefore, indepth explanations on the application of theory would be more important. In addition, Sensing types are more prone to have comprehension problems following partial explanations that would be intuitively obvious to an Intuitive (N) type (13:154). Therefore, Sensing types were expected to show a stronger agreement with this statement.

Results: The results from Statement 30 indicated the Sensing (S) type group showed an overall agreement with this statement. The mean rating of the S type group was 2.5714.

Table XIII

Preferred Academic Environment Questionnaire Section Three

Statements with Significant Differences

Statement 30 (S < N expected)

Type Group	N	Mean Rating	Std Dev
S	77	2.5714	1.219
N	19	3.3158	1.734

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	1-Tail Prob
2.18	94	0.016

Statement 34 (S < N expected)

Type Group	N	Mean Rating	Std Dev
S	77	1.6623	0.926
N	19	2.2105	1.316

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	1-Tail Prob
2.11	94	0.019

Statement 35 (S < N expected)

Type Group	N	Mean Rating	Std Dev
S	77	1.8052	0.828
N	19	2.5263	1.541

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	1-Tail Prob
2.80	94	0.003

The Intuitive (N) type group also showed an overall agreement with this statement with a mean rating of 3.3158. While it seems important to both type groups to have indepth explanations provided, the SPSS T-Test output indicated the stronger agreement of the Sensing types was statistically significant with a one-tailed probability of 0.016.

Statement 34: It is important for me to have information presented in an orderly, organized and systematic manner.

Discussion: According to Gordon Lawrence in People Types and Tiger Stripes, Margaret K. Morgan identified Sensing (S) types as linear learners who prefer a "step by step sequential approach to learning" (8:49). In comparison, Intuitive (N) types tendency to quickly grasp meaning and relationships can result in less of a need for a systematic explanation of what is more obvious to them (13:156). It was therefore expected Sensing types would indicate a stronger agreement with Statement 34.

Results: The results indicated that as a group, the Sensing (S) types expressed a strong agreement with this statement, with a mean rating of 1.6623. The Intuitive (N) type individuals also showed an overall agreement with this statement. The mean rating of the N type group was 2.2105. While it appears important to both type groups to have information presented in an orderly, organized, and systematic manner; the one-tailed probability of 0.018 showed

there was a statistical significance to the stronger agreement of the Sensing group in comparison to the N types.

Statement 35: It is important for me to see the practical value of theory.

Discussion: According to Mary H. McCaulley, the practical utility of knowledge is of more interest to Sensing (S) students. In contrast, Intuitive (N) types can be expected to be more motivated in understanding theory than applying it (9:135). It was therefore expected that Sensing types would indicate a stronger agreement with this statement.

Results: The results indicated that the Sensing (S) type group strongly agreed with Statement 35. The mean rating of the S type individuals was 1.8052. The mean rating (2.5263) of the Intuitive (N) type group also showed overall agreement with the statement. Even though it appears Intuitive respondents also place an importance on the practical value of theory, the T-Test results indicated the stronger agreement of the Sensing group was statistically significant with a one-tailed probability of 0.003.

Section Three Summary. The results from the third section of the PAEQ indicated the Sensing/Intuitive (SN) index was the only MBTI index that produced the expected results for statements concerning learning activities or situations important to the respondents. Even though Sensing (S) types indicated a significantly stronger agreement for

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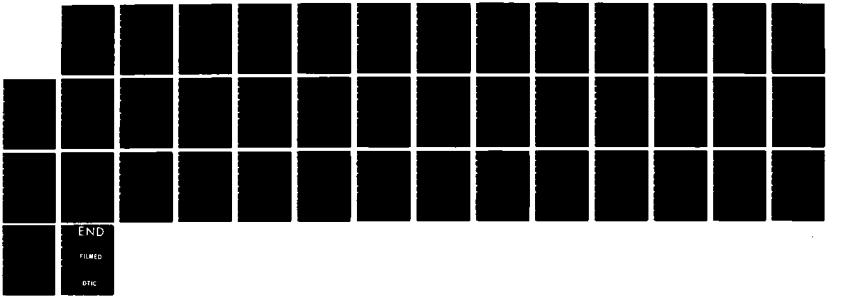

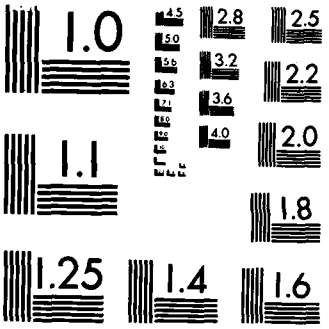

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

three statements, a dichotomous response difference was not found. Both Sensing (S) and Intuitive (N) types indicated they placed an importance on having indepth explanations provided on how to apply theory, on having information presented in an orderly, organized and systematic manner, and on realizing the practical value of theory. The difference between mean responses for the remaining seven statements were not statistically significant.

Statement 26 was expected to result in a difference in rating by Feeling (F) and Thinking (T) respondents. Statement 26 read: It is important for me to receive positive feedback on my performance, not just negative. It was expected that the Feeling (F) types desire for approval and concern for others in making their own decisions or judgements would result in more importance being placed on receiving positive feedback on their course work. In comparison, the Thinking (T) types tendency to make impersonal decisions based on logic would be expected to decrease the importance of positive feedback (8:51). Even though the Feeling (F) types's mean rating did indicate more agreement, both type groups indicated agreement with Statement 26 and the difference was not significant.

Statements 27, 28 and 29 were analyzed by grouping the respondents according to their Extraversion (E) or Introversion (I) preference. The three statements were:

27. It is important for me to have the choice of a

written assignment or an oral presentation.

28. It is important for me to have the opportunity to talk over questions and ideas in classroom discussions.

29. It is important for me to have the choice to work with others in group projects or to work alone.

Statements 27 and 29 were different from the other statements in that they did not identify a situation that was expected to be important to only one of the type groups. Instead the statements were worded to determine if the opportunity of selecting between a choice of situations, one corresponding to an Extraversion (E) type preference and one corresonding to an Introversion (I) type preference, was important to the respondent. Since there was not a predicted direction of difference response *means*, these questions were analyzed using a two-tailed t-test. Due to an Extravert's interest in the outward world of people and action, they tend to prefer the opportunity to work with groups and feel more comfortable making oral presentations. The Introvert's preference to turn inward to reflect on ideas results in a tendency to prefer working alone and on written assignments (14:9,56). For each statement, both type groups indicated an importance on having an opportunity to choose, but there was no significant difference in mean responses. Statement 28 was expected to generate a greater agreement from the Extravert (E) respondent due to their greater need to verbalize their ideas in attempting to determine how others

react to their opinions (8:40). Both type groups indicated overall agreement with Statement 28, but a greater nonsignificant agreement was shown by E types.

The remaining three statements (31, 32, and 33) were analyzed by differentiating respondents according to the Judging/Perceiving (JP) index of the MBTI. The three statements were:

31. It is important for me to know what I am accountable for; when, how and by what standards.

32. It is important for me to write a paper on a topic of my own choice.

33. It is important for me to have the opportunity to be more flexible in following my interests.

Statement 31 is related to a Judging (J) type need for "predictability and structure" and their interest in "what they are accountable for" (8:54). Judging (J) types did indicate a stronger agreement (nonsignificant), but both type indicated it was important to understand what they are accountable for. Statement 33 was expected to result in a stronger agreement by the Perceiving (P) respondents due to their desire to follow their own interest and need for a flexible environment (8:55). Statement 32 was based on the same reasoning with the difference that it related only to the choice of topic for a paper. Both type groups indicated an overall agreement with each statement, but a nonsignificant greater agreement was show by Perceiving (P) types.

Overall Analysis. From the overall results of the Preferred Academic Environment Questionnaire presented in Table XIV, it can be seen that of the 12 statements for which the expected response differences were statistically significant, 8 statements concerned differences relating to the Sensing/Intuitive (SN) index and 4 statements concerned differences relating to the Judging/Perception (JP) index. The only statements producing a clear cut agree versus disagree dichotomy were the two statements concerning study habits (Statements 1 and 8). Results from 5 statements (4, 5, 15, 16 and 19), indicated a significant difference in mean response ratings with one type group agreeing or disagreeing and the other type group's mean response indicating neither agreement nor disagreement. The remaining 5 statements (21, 22, 30, 34 and 35), for which statistical significance was found, had both type groups indicating an overall agreement. Even though statistical differences were not found, it is clear from the results that most statements did produce differences in the expected direction. The PAEQ statements analyzed by differentiating respondents according to the Thinking/Feeling (TF) and Extraversion/Introversion (EI) preferences did not produce significant differences. It therefore appears that for the areas addressed in the questionnaire used, the SN and JP indices of the MBTI identify the strongest differences in preferences for instructional techniques and learning styles.

Table XIV

Preferred Academic Environment Questionnaire Results

Statement	E Group Mean	I Group Mean	Expected Difference	Expected Difference Found	Signif-icant
9	4.8571	4.9180	E < I	Yes	No
11	3.8857	4.0000	E < I	Yes	No
13	2.8000	2.9672	E < I	Yes	No
27	3.4857	3.2131	n/a	n/a	No
28	2.3143	2.6230	E < I	Yes	No
29	2.6000	2.6721	n/a	n/a	No

Statement	S Group Mean	N Group Mean	Expected Difference	Expected Difference Found	Signif-icant
2	3.9740	3.7368	S > N	Yes	No
3	3.2857	3.7895	S > N	No	No
5	3.3896	4.4211	S < N	Yes	Yes
10	2.6623	3.0000	S > N	No	No
12	2.4545	2.7368	S < N	Yes	No
14	1.9221	2.3158	S < N	Yes	No
16	2.8961	3.7368	S < N	Yes	Yes
17	3.1688	2.6842	S > N	Yes	No
18	3.4805	2.8421	S > N	Yes	No
19	3.5584	2.8947	S > N	Yes	Yes
21	2.0519	2.9474	S < N	Yes	Yes
22	3.1429	2.3158	S > N	Yes	Yes
24	4.7792	4.4737	S > N	Yes	No

Table XIV (continued)

Statement	S Group Mean	N Group Mean	Expected Difference	Expected Difference Found	Signif-icant
25	2.8312	3.2632	S < N	Yes	No
30	2.5714	3.3158	S < N	Yes	Yes
34	1.6623	2.2105	S < N	Yes	Yes
35	1.8052	2.5263	S < N	Yes	Yes

Statement	T Group Mean	F Group Mean	Expected Difference	Expected Difference Found	Signif-icant
23	4.1053	3.5500	T > F	Yes	No
26	2.1447	1.7500	T > F	Yes	No

Statement	J Group Mean	P Group Mean	Expected Difference	Expected Difference Found	Signif-icant
1	3.1507	4.6522	J < P	Yes	Yes
4	3.9863	5.1739	J < P	Yes	Yes
6	2.7260	3.0435	J < P	Yes	No
7	2.9178	2.5217	J > P	Yes	No
8	3.3973	4.8261	J < P	Yes	Yes
15	1.7534	2.2609	J < P	Yes	Yes
20	1.8219	1.5652	J > P	Yes	No
31	1.8356	2.1739	J < P	Yes	No
32	2.9041	3.0870	J > P	No	No
33	2.4521	2.0870	J > P	Yes	No

Summary

This chapter has presented the analysis of the findings obtained in this research study. The next chapter will discuss the resulting conclusions as they correspond to the specific research objectives of this study.

V. Conclusions and Recommendations

This chapter presents the conclusions reached by this research effort. The conclusions are based on the results and analysis previously discussed as they correspond to the specific research objectives of this study. The chapter concludes with recommendations for use of this research study and possible further research topics.

First Research Objective Conclusions

First Research Objective: To determine if the distribution of type for the AFIT School of Systems and Logistics class of September 1985 (85S) provides indications of a unique distribution of MBTI type.

Looking at the selection ratio of AFIT/LS 85S graduate students in comparison to the CAPT graduate student data base, a unique distribution of MBTI was found. With one exception (INTP), all type categories with a significant positive selection ratio (greater than 1.00) were found in the ST type column of the MBTI type table. This finding was reinforced by the type grouping selection ratio comparison for the ST, SF, NF and NT grouping. A pattern also developed for types with a significant selection ratio of less than 1.00. With one exception (ESFJ), all types which were significantly under represented in the AFIT/LS 85S sample

were found in the NF column of the MBTI type table. When looking at the selection ratio comparison by type grouping this pattern is again shown in the ST, SF, NF and NT groupings.

Reviewing the percentage of respondents according to type categories, it can be seen that a major portion of the sample (45.45%) was found in two type cells -- ISTJ and ESTJ. The four ST types account for 57.58% of the sample, while the NF types account for only 5.3%. While Intuitive with Feeling (NF) types were under represented, no identifiable pattern was identified for the distribution of SF and NT types. Therefore, it can be said that there is a unique distribution of type for this sample. It is unique in that not only is there a positive selection of ST types, but the ST types represent the majority of the AFIT/LS 85S students sample.

Looking at the implication of this distribution of type, according to the theory on which the MBTI is based, it is possible to make some generalized statements about the over and under represented types of the sample. The students whose MBTI results indicate they have a preference toward Sensing with Thinking (ST) can be expected to focus their attention on concrete, verifiable facts which can be utilized in "hard headed, matter-of-fact impersonal analysis" (14:43). The under represented Intuition with Feeling (NF) types can be expected to focus their interest upon the of a situation, especially when the NF individual can see the humanistic

benefits of those possibilities (14:47).

At the more restrictive differentiation of types, the information gained from this research provides some valuable insights into the characteristics of the over represented and majority types using only one MBTI index. Introverts (I) can be expected to prefer to work alone and uninterrupted, often with intense concentration. They can also be expected to prefer and perform better on written assignments (8:71). Sensing (S) types can be expected to be more comfortable dealing with factual details that can be used in a systematic manner to solve a "realistic and practical" problem (8:72). Thinking (T) types can be expected to be analytical and objective in their dealings with problems, often appearing to be insensitive to other people's feelings (8:74). Judging (J) types can be expected to prefer to control their environment in a planned, orderly and decisive manner (8:76). The under represented dichotomous types for each of these indices can be expected to display opposite characteristics.

Second Research Objective Conclusions

Second Research Objective: To determine if a difference in MBTI personality type has an affect on academic success as measured by grade point average.

Significant differences in academic grade point averages according to MBTI type preferences were not found. There are a number of plausible explanations for this result. The lack

of a significant difference could very well be due to the lack of variance within the GPA's of the sample. In a graduate program where students are expected to maintain at least a 3.0 average and the highest GPA obtainable is a 4.0, it is understandable not to find a large variance in mean GPA's. Due to the small variance found in the sample it would be naive to say that MBTI type preferences does not have an affect on academic performance as measured by GPA. Without speculating on other possibilities such as problems with the methodology used, the safest conclusion that can be reached is that this research study did not identify any affect of MBTI type preference on grade point average.

If the sample would have allowed analysis of the full MBTI type differentiation using all four MBTI indices combined, it is conceivable that a difference might have been found. The reason for this belief is that in combining all four indices to differentiate the full 16 types, it is possible the resulting types would have more strongly reflected significant differences in ability, interest and application. The failure of one index or two indices to reflect a difference in mean GPA may well be due to lack of identification of the total effect of preferences. The use of all four indices may have provided that identification and therefore a lack of significant difference in this research

study may be due to the limitations of this study and not of the MBTI.

There is also the possibility that the AFIT selection process only selects individuals who have successfully learned how to compensate for any MBTI preferences that could have negatively impacted on their grade point average.

Third Research Objective Conclusions

Third Research Objective: To determine if preferences for instructional techniques and learning styles, according to students' perception of effectiveness and importance, can be related to MBTI personality type.

Even though only 2 statements produced a clear cut agree versus disagree dichotomy, 12 statements of the Preferred Academic Environment Questionnaire identified significant differences in respondent's perception of effectiveness and importance of different instructional techniques and learning styles. Of the 12 statements for which statistical differences were found, 8 concerned predictable differences due to the Sensing/Intuitive (SN) type preferences and 4 concerned predictable differences due to Judging/Perception (JP) type preferences. It can therefore be concluded that of the four indices of the MBTI, the SN and JP indices were successful in identifying statistically significant differences in statements concerning instructional techniques and learning styles.

While statistical differences in the direction expected were found for only 12 statements, it was encouraging to note that with few exceptions, even the non-significant differences were in the expected direction. Discounting the two statements which were not analyzed according to an expected difference in agreement according to type (Statements 27 and 29), the only statements that did not generate a difference in mean response in the expected direction were Statements 3, 10, and 32. Statements 27 and 29 were intended to determine if the opportunity of selecting between two stated options; one corresponding to an Extraversion (E) preference and one corresponding to an Introversion (I) preference, was more important to one type in comparison to the other. Statement 3 concerned the effect of difficult test questions at the beginning of a test. Statement 10 concerned the effect of a good test grade on the confidence of the respondent towards the next test. Statement 32 concerned the importance of the option of selecting a topic for a paper of their own choosing. It should be noted that Statements 3 and 10 also had the weakest relationship to MBTI theory -- being based on an inferred relationship between statements determined to be related to better grades in a study by McCaulley and Natter (13:178) and predictions of better performance on tests by Intuitive (N) types (13:156). Even including these two statements, 36.4% of the 33 statements produced statistical significant

differences in the direction predicted by MBTI type classification and approximately 81% of the statements with nonstatistical significant differences were in the proper direction according to predictions of educational differences in relation to MBTI type. It can therefore be concluded the MBTI does indeed relate to this samples' perception of the effectiveness and importance of different learning styles and instructional techniques.

Overall Conclusions

Relating the results of this research study back to the problem statement in Chapter 1, even with the previously discussed lack of results in the affect of MBTI type preferences on academic grade point average, the MBTI did indeed identify significant learning differences. With an understanding of the distribution of types in the AFIT/LS 85S class and the effect those type preferences have on the AFIT/LS instructional-learning process, the problem of enhancing instructional methods to more successfully meet the needs of the students, the program objectives, and the Air Force seems more obtainable.

Limiting factors had an impact on the ability of this research study to investigate the full implications of MBTI type preferences. The size limitations of a single AFIT/LS graduate class did not allow the analysis of the complete differentiation of the full 16 MBTI types. In addition, the

limited number of females in the sample population did not allow investigation of the difference between female and male respondents. This was unfortunate in light of the unexpected lack of Feeling (F) types found in the limited female sample.

The timing of the MBTI survey may have also had an impact on the accuracy of reported MBTI preferences. If subjects had been surveyed prior to beginning their graduate program, it may have been possible to avoid the possibility that respondents were not reacting true-to-type due to the AFIT academic environments influence. If respondents were attempting to adapt to the AFIT/LS academic environment, there is the possibility there MBTI results may have been influenced.

A clear cut agree versus disagree differentiation of respondent's mean response to Preferred Academic Environment Questionnaire statements was not found. More information may have been found if a correlation analysis was performed using the MBTI index scores that indicate the strength of a respondent's type preference.

Recommendations

The results of this research study have revealed a number of patterns in the distribution of MBTI type, and the instruction-learning environment for the AFIT/LS 85S class. Follow up studies should be continued to verify the validity of these findings for future graduate classes. Follow up

studies should strongly consider using a larger sample population and utilizing MBTI index scores. In addition, surveying respondents prior to their start of the graduate program and including an analysis of the type distrubition of instructors may identify stronger implications for the utilization of the MBTI. In attempting to determine the reason for a lack of affect of MBTI type preferences on academic grade point average, an investigation of the adaptability of different types to a graduate academic environment is an area that deserves consideration.

The results of this and any future studies should be made available to all AFIT faculity with the hope that the increased awareness resulting from these findings could be put to use in developing classroom presentations and overall planning of course work.

Workshops where students would be administered the MBTI, and the results of an individual's MBTI explained, would benefit the graduate students in understanding their own strengths and possible shortcomings in particular academic situations. In understanding their reluctance to utilize less preferred mental processes even in situations where they would be more appropriate, a conscious effort could be made to develop and apply less preferred processes more successfully. This increased awareness may very well be the strongest attribute of the MBTI. By being aware of the possibility that students may have more problems

understanding certain concepts, instructors could increase efforts to assure understanding is obtained. In addition, the student could identify situations where increased efforts on their own would be of benefit in assuring full understanding.

The value of applying the MBTI in the many training environments of the Air force is an area of research which also deserves strong consideration.

Appendix A: Preferred Academic Environment Questionnaire

INSTRUCTIONS

This questionnaire contains 35 individual questions. All questions should be answered by indicating the numerical value that corresponds to your degree of agreement with the statement about the AFIT ACADEMIC ENVIRONMENT on the line next to the question. The following numerical scale is provided to indicate your degree of agreement:

1 = STRONGLY AGREE
2 = MODERATELY AGREE
3 = SLIGHTLY AGREE
4 = NEITHER AGREE NOR DISAGREE
5 = SLIGHTLY DISAGREE
6 = MODERATELY DISAGREE
7 = STRONGLY DISAGREE

Section 1:

1. I generally follow a study schedule and divide my time according to what I need to do each day.

2. Time restrictions on tests do not negatively effect my performance.

3. Hard items at the beginning of a test do not effect my ability to answer easier items later.

4. I make systematic notes and/or outlines of class readings.

5. I do better on test questions concerning factual details than on questions concerning synthesis and evaluation.

6. I do not neglect or have problems organizing what needs to be done with larger class projects.

7. I do not seem to take more lecture notes than necessary.

8. I do not let coursework pile up, then cram at the last minute.

9. I study with a group for tests.

10. A good grade on one test increases my confidence for the next one.

Section 2:

I am most likely to perform better academically in AFIT EDUCATIONAL SITUATIONS that:

11. involve other students or take group effort.

12. let me work toward goals step by step in an orderly way.

13. let me talk over questions and ideas with others in classroom discussions.

14. present information in an orderly, organized and systematic manner.

15. let me know what I am accountable for; when, how, and by what standards.

16. require accuracy and careful attention to detail.

17. require initiative to plan and carry out new projects.

18. are more concerned with understanding ideas and concepts than attending to factual details.

19. require me to figure out how to put theory into practice.

20. let me concentrate on subjects that are important to me.

21. give me ample opportunity to think out my ideas before I have to answer.

22. give me the opportunity to be creative and work with my own ideas.

23. are more concerned with human relationships and ideals instead of theories and facts.

24. place time constraints on tests.

25. place the major emphasis on applications of theory and presents example applications before explaining the theory.

Section 3:

IT IS IMPORTANT FOR ME TO:

26. receive positive feedback on my performance, not just negative.

27. have the choice of a written assignment or an oral presentation.

28. have the opportunity to talk over questions and ideas in classroom discussions.

29. have the choice to work with others in group projects or to work alone.

30. have an indepth explanation provided on how to apply theory.

31. know what I am accountable for; when, how, and by what standards.

32. write a paper on a topic of my own choice.

33. have the opportunity to be more flexible and follow my interests.

34. have information presented in an orderly organized and systematic manner.

35. see the practical value of theory.

Appendix B: CAPT MBTI Type Distributions

CAPT Male Graduate Students MBTI Type Distribution

N= 4731

I S T J	I S F J	I N F J	I N T J
N= 465	N= 322	N= 247	N= 298
%= 9.83	%= 6.81	%= 5.22	%= 6.30
I S T P	I S F P	I N F P	I N T P
N= 127	N= 142	N= 502	N= 256
%= 2.68	%= 3.00	%=10.61	%= 5.41
E S T P	E S F P	E N F P	E N T P
N= 91	N= 143	N= 450	N= 215
%= 1.92	%= 3.02	%= 9.51	%= 4.54
E S T J	E S F J	E N F J	E N T J
N= 486	N= 340	N= 319	N= 328
%=10.27	%= 7.19	%= 6.74	%= 6.93

(9:B-18)

CAPT Male Graduate Student MBTI Type Distribution

by Type Groupings

N= 4731

Type	N	%
E	2372	50.14
I	2359	49.86
S	2116	44.73
N	2615	55.27
T	2266	47.90
F	2465	52.10
J	2805	59.29
P	1926	40.71
ST	1169	24.71
SF	947	20.02
NF	1518	23.19
NT	1097	23.19
IN	1303	27.54
EN	1312	27.73
IS	1056	22.32
ES	1060	22.41

(9:B-18)

CAPT Female Graduate Students MBTI Type Distribution

N= 3918

I S T J	I S F J	I N F J	I N T J
N= 254	N= 385	N= 253	N= 166
%= 6.48	%= 9.83	%= 6.46	%= 4.24
I S T P	I S F P	I N F P	I N T P
N= 59	N= 141	N= 427	N= 146
%= 1.51	%= 3.60	%=10.90	%= 3.73
E S T P	E S F P	E N F P	E N T P
N= 59	N= 132	N= 624	N= 162
%= 1.51	%= 3.37	%=15.93	%= 4.13
E S T J	E S F J	E N F J	E N T J
N= 220	N= 355	N= 337	N= 198
%= 5.62	%= 9.06	%= 8.60	%= 5.05

(9:B-19)

CAPT Female Graduate Student MBTI Type Distribution

by Type Groupings

N= 3918

Type	N	%
E	2087	53.27
I	1831	46.73
S	1605	40.96
N	2313	59.04
T	1264	32.26
F	2654	67.74
J	2168	55.33
P	1750	44.67
ST	592	15.11
SF	1013	25.85
NF	1641	41.88
NT	672	17.15
IN	992	25.32
EN	1321	33.72
IS	839	21.41
ES	766	19.55

(9:B-19)

Combined Type Distribution of CAPT Graduate Students

N= 8649

I S T J	I S F J	I N F J	I N T J
N= 719	N= 707	N= 500	N= 464
%= 8.31	%= 8.17	%= 5.78	%= 5.36
I S T P	I S F P	I N F P	I N T P
N= 186	N= 283	N= 929	N= 402
%= 2.15	%= 3.27	%=10.74	%= 4.65
E S T P	E S F P	E N F P	E N T P
N= 150	N= 275	N= 1074	N= 377
%= 1.73	%= 3.18	%=12.42	%= 4.36
E S T J	E S F J	E N F J	E N T J
N= 706	N= 695	N= 656	N= 526
%= 8.16	%= 8.04	%= 7.58	%= 6.08

(9:B-20)

Combined Type Distribution of CAPT Graduate Students

by Type Groupings

N= 132

Type	N	%
E	4459	51.56
I	4190	48.44
S	3721	43.02
N	4928	56.98
T	3530	40.81
F	5119	59.19
J	4973	57.50
P	3676	42.50
ST	1761	20.36
SF	1960	22.66
NF	3159	36.52
NT	1769	20.45
IN	2295	26.53
EN	2633	30.44
IS	1895	21.91
ES	1826	21.11

(9:B-20)

Appendix C: Preferred Academic Environment Questionnaire Statements with No Significant Differences

Statement 2 (S > N expected)

Type Group	N	Mean Rating	Std Dev
S	77	3.9740	2.109
N	19	3.7368	2.579

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-0.42	94	0.676

Statement 3 (S > N expected)

Type Group	N	Mean Rating	Std Dev
S	77	3.2857	2.114
N	19	3.7895	1.843

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
0.95	94	0.343

Statement 6 (J < P expected)

Type Group	N	Mean Rating	Std Dev
J	73	2.7260	1.734
P	23	3.0435	1.796

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
0.76	94	0.450

Statement 7 (J > P expected)

Type Group	N	Mean Rating	Std Dev
J	73	2.9178	1.730
P	23	2.5217	1.675

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-0.96	94	0.337

Statement 9 (E < I expected)

Type Group	N	Mean Rating	Std Dev
E	35	4.8571	1.896
I	61	4.9180	2.019

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-0.15	94	0.885

Statement 10 (S > N expected)

Type Group	N	Mean Rating	Std Dev
S	77	2.6623	1.570
N	19	3.0000	1.491

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
0.85	94	0.399

Statement 11 (E < I expected)

Type Group	N	Mean Rating	Std Dev
E	35	3.8857	1.728
I	61	4.0000	1.623

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-0.32	94	0.746

Statement 12 (S < N expected)

Type Group	N	Mean Rating	Std Dev
S	77	2.4545	1.198
N	19	2.7368	1.727

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
0.84	94	0.404

Statement 13 (E < I expected)

Type Group	N	Mean Rating	Std Dev
E	35	2.8000	1.431
I	61	2.9672	1.366

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-0.57	94	0.572

Statement 14 (S < N expected)

Type Group	N	Mean Rating	Std Dev
S	77	1.9221	0.970
N	19	2.3158	1.204

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
1.51	94	0.135

Statement 17 (S > N expected)

Type Group	N	Mean Rating	Std Dev
S	77	3.1688	1.281
N	19	2.6842	1.057

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-1.52	94	0.131

Statement 18 (S > N expected)

Type Group	N	Mean Rating	Std Dev
S	77	3.4805	1.627
N	19	2.8421	1.893

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-1.48	94	0.142

Statement 20 (J > P expected)

Type Group	N	Mean Rating	Std Dev
J	73	1.8219	1.135
P	23	1.5652	0.992

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-0.97	94	0.333

Statement 23 (T > F expected)

Type Group	N	Mean Rating	Std Dev
T	76	4.1053	1.457
F	20	3.5500	1.356

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-1.54	94	0.128

Statement 24 (S > N expected)

Type Group	N	Mean Rating	Std Dev
S	77	4.7792	1.457
N	19	4.4737	2.091

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-0.75	94	0.457

Statement 25 (S < N expected)

Type Group	N	Mean Rating	Std Dev
S	77	2.8312	1.332
N	19	3.2632	1.485

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
1.24	94	0.219

Statement 26 (T > F expected)

Type Group	N	Mean Rating	Std Dev
T	76	2.1447	1.140
F	20	1.7500	0.851

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-1.44	94	0.152

Statement 27

Type Group	N	Mean Rating	Std Dev
E	35	3.4857	1.669
I	61	3.2131	1.392

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
0.86	94	0.393

Statement 28 (E < I expected)

Type Group	N	Mean Rating	Std Dev
E	35	2.3143	1.183
I	61	2.6230	1.143

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-1.26	94	0.212

Statement 29

Type Group	N	Mean Rating	Std Dev
E	35	2.6000	1.265
I	61	2.6721	1.207

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-0.28	94	0.782

Statement 31 (J < P expected)

Type Group	N	Mean Rating	Std Dev
J	73	1.8356	1.131
P	23	2.1739	1.403

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
1.18	94	0.241

Statement 32 (J > P expected)

Type Group	N	Mean Rating	Std Dev
J	73	2.9041	1.600
P	23	3.0870	1.505

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
0.48	94	0.629

Statement 33 (J > P expected)

Type Group	N	Mean Rating	Std Dev
J	73	2.4521	1.354
P	23	2.0870	0.949

** Pooled Variance Estimate **

T Value	Degrees Of Freedom	2-Tail Prob
-1.20	94	0.233

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Captain Richard A. Carter was born on 23 July 1955 in Akron, Ohio. He graduated from high school in Akron, Ohio in 1973 and attended Miami University in Oxford, Ohio from which he received a degree of Bachelor of Science in Secondary Education in May 1977. Upon graduation, he received a commission in the US Air Force through the ROTC program. He was assigned to Malmstrom AFB, Montana, as a Minuteman Missile Maintenance Officer, serving as Combat Targeting Officer, Site Maintenance Officer, Officer-in-Charge Recurring Training and Officer-in-Charge Missile Quality Control. In 1981, Captain Carter attended and completed missile combat crew training at Vandenberg AFB, California and then returned to Malmstrom AFB, Montana serving as a missile combat crew member and flight commander while assigned to the 564th Strategic Missile Squadron. He then served as a missile combat crew instructor and Chief of Operation Branch in the 341st Strategic Missile Wing at Malmstrom AFB, Montana until May 1984 when he entered the Air Force Institute of Technology School of Systems and Logistics.

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Thesis Chairman: Dennis E. Campbell, GM-13

Assistant Professor of Maintenance Management

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The objective of this research was to identify significant learning differences in the AFIT School of Systems and Logistics (AFIT/LS) using the personality type theory developed by psychologist Jung and identified by the Myers-Briggs Type Indicator (MBTI).

The data were collected from graduate students of AFIT/LS through the MBTI and a Preferred Academic Environment Questionnaire. Results of the MBTI categorized each of the subjects into personality types. The Preferred Academic Environment Questionnaire determined student study habits and test taking preferences; AFIT situations which the student felt improved academic performance; and AFIT learning situations which were important to the student. The data were analyzed according to the distribution of MBTI type, the effect of MBTI type upon grade point average, and student preference for instructional technique and learning styles as they related to MBTI type.

The results of the study showed that the majority of students in the 85S class were of a MBTI type which had identifiable characteristics relating to their preferred methods of perceiving and making judgments. The research results also indicated that MBTI type had no significant effect upon grade point average. Finally, the results of the study showed that MBTI type does relate to learning styles and instructional technique preferences.

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