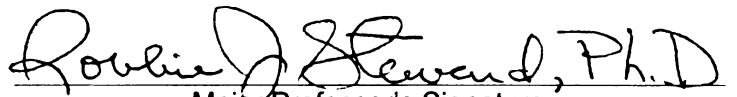This is to certify that the
thesis entitled

Myers-Briggs Type Indicator Jungian Personality Dimensions
and Strong Interest Inventory Holland Themes: The
Multivariate Analysis of the Relationship Between MBTI
Personality Dimensions and the Six Strong General
Occupational Themes

presented by

Matthew A. Miller

has been accepted towards fulfillment
of the requirements for the

__Ph.D.__ degree in __Counseling Psychology__

<u>~~Robin J. Steward, Ph.D~~</u> .
Major Professor's Signature

<u>December 13, 2002</u>

PLACE IN RETURN BOX to remove this checkout from your record.
TO AVOID FINES return on or before date due.
MAY BE RECALLED with earlier due date if requested.

DATE DUE	DATE DUE	DATE DUE
MAR 1 5 2004 0 9 2 2 0 3		
DEC 0 3 6 2004		
JAN 1 6 2006		
0 2 0 9 0 6		
1908 5679		
01 2 9 03		

6/01 c:/CIRC/DateDue.p65-p.15

MYERS-BRIGGS TYPE INDICATOR JUNGIAN PERSONALITY DIMENSIONS
AND STRONG INTEREST INVENTORY HOLLAND THEMES:
THE MULTIVARIATE ANALYSIS OF THE RELATIONSHIP BETWEEN MBTI
PERSONALITY DIMENSIONS AND THE SIX STRONG GENERAL
OCCUPATIONAL THEMES

By

Matthew A. Miller

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Counseling and Educational Psychology

2002

ABSTRACT

MYERS-BRIGGS TYPE INDICATOR JUNGIAN PERSONALITY DIMENSIONS
AND STRONG INTEREST INVENTORY HOLLAND THEMES:
THE MULTIVARIATE ANALYSIS OF THE RELATIONSHIP BETWEEN MBTI
PERSONALITY DIMENSIONS AND THE SIX STRONG GENERAL
OCCUPATIONAL THEMES

By

Matthew A. Miller

The Strong Interest Inventory and the Myers-Briggs Type Indicator are the most

frequently used vocational assessment instruments across a variety of settings (Hammer

& Kummerow, 1997). But the literature accumulated on the two instruments thus far has

failed to fully explore the possible relationships between Myers-Briggs Type Indicator

personality dimensions and Strong Interest Inventory themes. The relevance of a

theoretically and methodologically correct approach to the exploration of the relationship

between the two instruments is couched within MBTI theory development and Holland's

(1985) vocational theory development. The current proposed study seeks to address the

shortcomings reflected in the literature via canonical correlation. Canonical correlation

can be applied to adequately address the following research question: to what extent and

in what ways do MBTI personality dimensions overlap with Strong Interest typology? A

sample of 423 individuals who have taken both the Strong Interest Inventory and the

Myers-Briggs Type Indicator, Form G, was collected. Results indicated that (a)

multivariate analysis of the relationship between MBTI personality dimensions and

Strong interest themes yielded significant amounts of variance explained between the two

variable sets, (b) multivariate analysis of the relationship between MBTI personality

dimensions and Strong interest themes resulted in a more comprehensive explanation of

the relationships between the two variable sets than did bivariate correlation, and (c) gender affects the relationship between the two sets. Practical and research related implications of the findings are discussed.

ACKNOWLEDGMENTS

The author would like to thank Dr. Robbie J. Steward, Dissertation Chair and Academic Advisor, for her ongoing support and mentorship throughout the dissertation process specifically and the graduate education process generally.

The author thanks the following dissertation committee members for the contribution of their time and ideas to this manuscript: Dr. Alfiee Breland, Dr. Susan Frank, and Dr. Lee June. Each of these individuals has also uniquely contributed to the author's professional development, for which the author is grateful.

The author thanks Dr. Walter Buboltz, Louisiana Tech University Department of Counseling Psychology, for serving as a consultant on this manuscript and for his many investments in the author's professional development.

The author thanks Ms. Beverly Grunden, Wright State University Department of Mathematics, and Dr. Ken Frank, Michigan State University Department of Counseling and Educational Psychology, for serving as statistical consultants on this manuscript.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

The Strong Interest Inventory (Harmon, Hansen, Borgen, & Hammer, 1994) and the Myers-Briggs Type Indicator (Myers & McCaulley, 1985) are the most frequently used vocational instruments among career counselors in colleges and universities, among practitioners in community-based mental health and agencies and in private practice, and among practitioners in organizational settings (Hammer & Kummerow, 1997). Yet as more professionals are using both the Strong Interest Inventory and the Myers-Briggs Type Indicator, questions such as "how might this client be helped by examining her or his results on both the Strong and the MBTI?" have consistently emerged from the field (Hammer & Kummerow, 1997). In response to questions such as this, Hammer and Kummerow (1997) stated, "much more research is needed on the use of the Strong Interest Inventory and the Myers-Briggs Type Indicator...so that our understanding about the strengths and limitations of using both instruments together can be enhanced" (p. 125).

Although a body of research has accumulated in the last two decades exploring the relationship between the two instruments, the generalizability of much of the current research is limited by methodological shortcomings, use of outdated versions of the Strong Interest Inventory, and lack of consistency across results. Before delving into a discussion of the literature and shortcomings therein, a review of the basic composition of the Strong Interest Inventory and the Myers-Briggs Type Indicator will be addressed.

Strong Interest Inventory Overview

The development of the Strong Interest Inventory (Strong) was based upon the research of E.K. Strong (1943) and John Holland (1973, 1985). E.K. Strong hypothesized that an individual with interests similar to those of persons working in a given occupation will be more likely to find satisfaction in that particular occupation than would a person who does not share common interests with those workers (Buboltz, Thomas & Johnson, in press). From the Strong's inception in 1927 until 1974, the instrument was considered atheoretical (Hammer & Kummerow, 1997). However, with the instrument's revision in 1974, the work of John Holland was integrated into the Strong and "represented an important milestone in interest measurement" (Harmon et al., 1994, p. 43).

The Strong provides feedback within four scales: General Occupational Themes, Basic Interest Scales, Occupational Scales, and the Personal Style Scales (Harmon et al., 1994). Results on the Strong are structured around Holland's (1985) theory of interest typology (Harmon et al., 1994). Among the four feedback scales on the Strong, the General Occupation Themes (GOT) are most closely and directly related to Holland's (1985) theoretical system (Harmon et al., 1994).

Holland's (1985) theory of vocational interest typology is based on four main assumptions. First, most people can be categorized according to six interest themes— Realistic, Investigative, Artistic, Social, Enterprising, and Conventional—and one theme or combination of these themes may characterize each person (Holland, 1985). The Realistic individual purportedly gravitates toward vocational and avocational activities centered on building or repairing, hands on activities, and the outdoors. The Realistic individual is likely interested in vocations ranging from agriculture, athletics, and/or the

2

military (Harmon et al., 1994). The Investigative type theoretically is drawn toward researching and analyzing activities within the sciences (Harmon et al., 1994). The Artistic type, as the name implies, gravitates toward creating and enjoying the arts ranging from music and drama to culinary (Harmon et al., 1994). The Social type is purported to have interests in helping and instructing others and/or religious activities and are often found in fields such as social work, counseling, and teaching (Harmon et al., 1994). The Enterprising individual enjoys selling, persuading, and managing via occupational fields such as law, sales, and merchandising (Harmon et al., 1994). The Conventional type is hypothesized to prefer processing and organizing activities via computer activities typically found within data management and office services (Harmon et al., 1994). Second, occupational environments can be divided into the same six themes and a particular person dominates each environment (Holland, 1985). Therefore, the personality composition of co-workers establishes the tone within a given occupation. Third, people search for environments that let them exercise their skills and abilities, express their attitudes and values, take on problems and roles they find stimulating and satisfying, and avoid tasks that they find distasteful or difficult (Holland, 1985). Fourth, job performance, satisfaction, and stability are influenced by an interaction between a person's personality and the characteristics of his or her working environment (Holland, 1985).

Holland's theory organized the six themes by placing them along the points of a hexagon. The hexagonal arrangement of interest themes reads R-I-A-S-E-C from left to right (Harmon et al., 1994). Similar types are located adjacently (e.g., Realistic and

Investigative) whereas those types that are most dissimilar are diametrically opposed

from one another (e.g., Artistic and Conventional) (Harmon et al., 1994).

<u>Myers-Briggs Type Indicator Overview</u>

The Myers-Briggs Type Indicator (MBTI) is a measure of personality as defined

by C.G. Jung (Myers & McCaulley, 1998). Jung theorized that an individual's

perceptions of and judgements about events and experiences in life comprise and explain

the development of personality (Hall & Lindzey, 1970). Behavior, therefore, may better

be understood and predicted through the exploration of individual perceptions and

judgements. Jung discovered what he believed to be patterns of perceiving and patterns

of judging across human behavior. Jung's theory of personality describes various

consistent behavioral patterns that result from how individuals assimilate information and

make decisions (Hammer & Kummerow, 1997).

The MBTI represents an attempt to quantify Jungian personality theory (Hammer

& Kummerow, 1997). The MBTI explores an individual's preferred patterns of

perceiving and judging life events through the analysis of two important dimensions:

attitude and functions (Myers & McCaulley, 1985). Attitude is explored through the

ways in which an individual likes to be energized (Extravert versus Introvert) and the

ways in which an individual deals with the outer world (Judging versus Perceiving).

Extraverts (E) are energized through activities and other people. Introverts (I) prefer time

and space alone and are energized by reflection. Judging (J) types deal with the outer

world in an organized way whereas Perceiving (P) types prefer to be more spontaneous

(Myers & McCaulley, 1985).

Functions are examined through how one takes in information (Sensing versus Intuition) and how one goes about making decisions (Thinking versus Feeling). Sensing (S) types take-in information by noticing facts and details first. The Sensing type looks to the present and what is (Myers & McCaulley, 1985). Conversely, Intuitive (N) types often notice the big picture and the many possibilities therein first. The Intuitive type looks to the future and what can be (Myers & McCaulley, 1985). The Thinking (T) type makes decisions relying on objective and rational methodology. This individual prefers to step back and analyze a situation carefully, evaluating pros and cons from a perceived rational perspective (Myers & McCaulley, 1985). The Feeling (F) type makes decisions through a more personal, subjective, and values-oriented approach. This individual prefers to place himself or herself within a decision and to note where harmony and disharmony may occur (Myers & McCaulley, 1985).

Through the analysis of attitude and functions, eight personality dimensions (E, I, S, N, T, F, J, P) are created and divided into four dichotomies (E-I, S-N, T-F, J-P). Jungian theory hypothesized that everyone uses each personality dimension at different moments; however, Jung stated that individuals express preferred attitudes and functions and seek to implement their preferences within their workworld (Myers & McCaulley, 1985). Individual preference patterns along the four dichotomy combine to create a four-letter personality type. A total of sixteen personality types exist within the MBTI classification system (Myers & McCaulley, 1985). Each of the sixteen types is presumed to possess and express unique characteristics (Myers & McCaulley, 1985).

Related to vocational psychology, differences between the MBTI personality dimensions are hypothesized to serve as helpful indicators of career choice and

satisfaction (Zunker, 1998). Myers and McCaulley (1985) stated that one of the most important motivations for career choice is a desire for work that will permit the use of preferred functions and attitudes. Furthermore, tasks that require preferred functions and attitudes demand less effort for better performance and provide greater levels of satisfaction (Myers & McCaulley, 1985). MBTI results are purported to be helpful, therefore, toward the consideration of career opportunities that utilize preferred attitudes and functions (Myers & McCaulley, 1998).

Conjoint Use of the Strong and MBTI—a call for research

Both the Strong and MBTI manuals recommend using the two instruments together (Healy, 2000). Proponents of using the two instruments together have suggested that MBTI results can assist an individual toward a better understanding of their Strong results (Healy, 2000). Furthermore, Hammer and Kummerow (1997) argued that the MBTI and the Strong presented unique but complimentary information. Yet questions remain regarding the integration of the two instruments (Hammer & Kummerow, 1997). Hammer and Kummerow (1997), for example, stated that more research is needed on the use of the Strong Interest Inventory and Myers-Briggs Type Indicator together. Toward this end, Hammer and Kummerow (1997) stated that a number of topics offer a logical beginning for future research efforts. One such area highlighted by the authors was the analysis of the relationship between Holland's interest themes employed on the Strong Interest Inventory and Jungian personality dimensions employed on the Myers-Briggs Type Indicator (Hammer & Kummerow, 1997).

<u>Strong Interest Themes and MBTI Personality Dimensions—an overview of the research</u>

Although the existent literature will be reviewed in detail within chapter two of

the manuscript, the present discussion will focus on highlighting the theoretical and

methodological shortcomings inherent within the current literature.

Published explorations of the relationship between Strong interest themes and the

MBTI personality dimensions have typically employed one of two research designs.

First, researchers have compared the relationship between MBTI personality dimensions

(e.g., E-I, S-N, T-F, and J-P) with the six Strong interest themes (e.g., R-I-A-S-E-C).

Second, researchers have compared the relationship between MBTI four-letter types (e.g.,

INTJ) and the six Strong interest themes. Within the first methodological paradigm,

researchers have typically employed Pearson correlations or MANOVA to statistically

evaluate the relationship between MBTI personality dimensions and Strong interest

themes. Examples of Pearson correlational analyses include those performed by

McCaulley (1978), Dillon and Weissman (1987), Decola (1992) and Hammer and

Kummerow (1997). On the other hand, Buboltz, Thomas, and Johnson (in press)

performed MANOVA analysis.

All of the aforementioned studies discovered moderate correlations between

MBTI personality dimensions and the Strong interest themes. Only one relationship, a

moderate correlation between MBTI Feeling and Strong Social, was significant across all

studies. The validity of the findings is limited however because the full multivariate

relationships occurring among and between the MBTI personality dimensions and the

Strong interest typologies have been left unexplored or accounted for (K. Frank, personal

communication, May, 2001). This likely explains the questionable level of consistency

obtained between research findings. Specifically regarding the multivariate nature of the relationship among and between the two instruments, exploration into the theoretical foundations of the Strong Interest Inventory and the Myers-Briggs Type Indicator reveals the dynamic and interactive nature inherent within the classification systems employed.

To illustrate the multivariate nature of the six Strong interest themes, Holland (1985) noted that a classification system comprised of only six independent themes was insufficient to fully represent human and occupational workplace diversity (Harmon et al., 1994). Holland therefore (1985) expanded his vocational interest classification system to include combinations of the six themes such as Realistic-Artistic and Social-Enterprising. Holland (1985) also expanded his theory to include placement of the six types along a hexagon wherein similar types were located adjacent to one another and highly dissimilar types were located opposite of one another. Scoring on the Strong was constructed such that an individual's score on any single interest theme was only relevant vis-à-vis other interest scale scores. It is these dynamics of Holland theory and interest theme combinations that are not and cannot be fully explored using Pearson correlation or MANOVA (K. Frank, personal communication, May, 2001).

To illustrate the multivariate nature of the MBTI personality dimensions, Myers and McCaulley (1998) discussed the fact that in developing personality theory, "Jung, Myers, and Briggs were constantly attentive to the dynamic character of the personality types they were describing. The richness, depth, and breadth of their descriptive systems result from the dynamic interplay of the functions and attitudes inherent in each type. It is important to bear this in mind in applying MBTI theory and interpreting the MBTI personality inventory" (p. 23). As is evident from the preceding citation, the importance

the MBTI authors (Myers & McCaulley, 1985; 1998) placed on the interactive nature of the MBTI personality dimensions is derived from the evolution of Jung's own thinking (Myers & McCaulley, 1998). Initially, Jung's attempt to explain individual differences in personality stemmed from his observation that there were two types of people: extraverts and introverts (Myers & McCaulley, 1998). However, ten years after his initial observations, Jung noted that these two types did not provide a complete picture (Myers & McCaulley, 1998). Jung then subdivided his initial extravert and introvert types into six types by identifying Sensing versus Intuitive type and Thinking versus Feeling type (Myers & McCaulley, 1998). Myers and Briggs extended Jung's model by adding the Judging versus Perceiving dichotomy (Myers & McCaulley, 1998).

In summary, MBTI theory asserts that the interactions of MBTI personality dimensions result in behaviors that cannot be predicted from exploration of each preference separately (Myers & McCaulley, 1998). Because each preference in a given type interacts with all of the other preferences in that type, MBTI personality theory asserts that any combination of two or more preferences will yield behaviors that are more than the sum of their parts (Myers & McCaulley, 1998). According to MBTI personality theory therefore, unique relations exist among the personality dimensions that suggest characteristics or behaviors not apparent at a univariate or bivariate level of analysis (Myers & McCaulley, 1998). Myers and McCaulley (1985), for example, interpreted a high score on MBTI Thinking dimension differently when it was paired with MBTI Sensing dimension than when it was paired with MBTI Intuition dimension. Hammer (1996) therefore stated, "researchers are implored to make more use of (MBTI) preference combinations or (MBTI) whole types in their research" (p. 50). It is these

MBTI personality dimension combinations that are not fully explored when performing

Pearson correlation or MANOVA analyses (K. Frank, personal communication, May,

2001).

The second research design typically employed within the literature is the

comparison of the MBTI four-letter types (e.g., ESTJ) with the six Strong interest

themes. Within this design, researchers have used profile mean analysis (Hammer &

Kummerow, 1997) and chi-square analysis (Buboltz et al., in press) to statistically

evaluate the data. Based upon a sample of 468 college students, Hammer and Kummerow

(1997) calculated the three MBTI four-letter personality types with the highest mean

score within each of the six GOTs and ranked them in descending order. Hammer and

Kummerow's (1997) findings presented some theoretical conundrums. Furthermore,

several points of disagreement--as well as some points of agreement--were established

between the authors' data and that of previous bivariate studies by Dillon and Weissman

(1987), Hammer and Kummerow (1997), and Buboltz et al. (in press). Based upon data

derived from 426 college students, Buboltz, Thomas, and Johnson (in press) employed

Chi-square analysis to determine significant relationships among MBTI four-letter

personality types and Strong interest themes. Chi-square analysis revealed that the

sixteen MBTI types and the Strong GOT types were not independent (Buboltz et al., in

press). Several of the MBTI types appeared to cluster within one or two of the Strong

interest themes (Buboltz et al., in press). Interestingly however, no four-letter MBTI type

and Strong interest theme relationships agreed between Buboltz et al. (in press) and

Hammer and Kummerow (1997).

In addition to the questionable levels of consistency between the findings of

Hammer and Kummerow (1997) and Buboltz et al. (in press), the validity of the reported

findings of these two typology studies is limited by at least one important consideration: a

typology approach to the investigation of MBTI personality dimensions and Strong

interest types treats the dimensions as discrete variables as opposed to continuous; it

therefore overlooks the subtle complexity of the potential relationships among MBTI

personality dimensions and Strong interest themes. For example, individuals scoring at

the 5th and 35th percentiles of the Thinking-Feeling MBTI scale are treated the same

within a typology analysis (Healy, 2000).

Strong Interest Themes and MBTI Personality Dimensions—a call for new research

Researchers have attempted to gain a better understanding of the relationships

between MBTI personality dimensions and Strong interest themes as well as MBTI

personality types and Strong interest themes via bivariate correlation analysis,

MANOVA, chi square analysis, and profile mean score analysis. By virtue of not fully

exploring or accounting for potential relationships within and between each classification

system (e.g., Pearson Correlation) and minimizing variability within each classification

system (e.g., MANOVA), a fuller understanding of the potential relationships between

the MBTI personality dimensions and the Strong interest types has not been reached. In

short, bivariate correlational analyses and the use of categorical data are not fully

appropriate toward the development of a deeper understanding of the relationship

between MBTI personality dimensions and Strong interest themes. A gap therefore

exists in the field's understanding of the relationship between the MBTI personality

dimensions and the Strong interest types. The relevance of exploring this gap hinges

upon the fact that the Strong and the MBTI are the two most frequently used vocational

assessment instruments across a variety of settings (Hammer & Kummerow, 1997).

Furthermore, both instruments promote conjoint usage (Myers & McCaulley, 1985;

Harmon et al., 1994).

The current proposed study seeks to distinguish itself from previous research

through exploring the relationship between and among MBTI personality dimensions and

Strong interest themes from a multivariate perspective. Specifically, the research design

will uniquely position the analysis to reveal which MBTI and Strong variables most

strongly covary and in-turn, the ways in which MBTI personality dimensions and Strong

interest themes might be combined to maximize covariance. Practically therefore,

results will highlight those variables that "go together" most frequently. To do so,

canonical correlation will be employed to address the following research question: "to

what extent and in what ways do MBTI personality dimensions overlap with Strong

Interest themes?"

Canonical correlation is a multivariate statistical procedure not often seen within

behavioral sciences literature (Jaccard & Becker, 1990). This lack of use is not related to

its value but more likely due to the lack of understanding surrounding its function and

purpose (Jaccard & Becker, 1990). Canonical correlation addresses the degree of overlap

between sets of variables. The present research question will therefore be addressed in

three steps. First, canonical correlation will treat the four MBTI dimensions (i.e., E-I, S-

N, T-F, J-P) as one set "X" and will treat the six Holland codes as one set "Y". As has

been discussed, the treatment of each as a set versus independent constructs is

theoretically sound. Second, one new variable will be created for set X (MBTI

dimensions) based upon those MBTI variables that best correlate with Strong Interest variables. This variable or variables will be called the function of X {f(X)}. One new variable will also created for set Y (Holland themes) consisting of those variables that best correlate with the MBTI personality dimensions. This set will be called the function of Y {f(Y)}. Third, the correlation between f(X) and f(Y) will be analyzed.

Detailed hypothesis statements will be discussed further in chapter two. Generally speaking however, the present study hypothesizes that the MBTI personality dimensions and Strong interest themes interact (i.e., covary) and are potentially correlated to previously unknown extents. More will therefore be revealed, it is hypothesized, regarding the relationships between and among MBTI personality dimensions and Strong interest themes if they are analyzed from a multivariate perspective as opposed to categorical and/or bivariate perspectives. Formally stated, the hypothesis asserts that the correlation between the two sets (i.e., MBTI personality dimensions and Strong interest themes) and the percent of variance accounted for within the canonical correlation functions will be considerably higher than any percentage of variance accounted for by a bivariate regression or correlation analysis procedures (K. Frank, personal communication, May, 2001).

The relevance of the present study is as follows: it is the first known study to explore the multidimensional complexity of the relationships between MBTI personality dimensions and Strong interest themes from the perspective of (a) the ways in which each of the two interest and personality sets represented on the Strong and MBTI overlap (i.e., covary) and (b) the extent of the overlap between the two sets.

Practically, counselors can gain a valid understanding as to what common patterns exist between MBTI personality dimensions and Strong interest themes. The primary purpose of the present analysis therefore is to highlight patterns of covariance between interest and personality. This knowledge could assist the counselor and client alike to assemble interpretive pieces of each instrument in a theoretically and empirically validated manner and to apply this knowledge toward therapeutic goals such as increased self-understanding, increased decision-making skills, and increased occupational satisfaction.

CHAPTER TWO

REVIEW OF LITERATURE

The present chapter will begin by discussing the relationship between counseling

psychology and vocational psychology. The discussion will then turn toward a model—

the Person-Environment (P-E) theory—often used within the field for addressing

vocational and avocational issues. As will be highlighted, use of the Myers-Briggs Type

Indicator (Myers & McCaulley, 1985) and the Strong Interest Inventory (Harmon,

Hansen, Borgen, & Hammer, 1994) is based within the P-E model. An overview of

general research on the Strong will be presented as will an overview of general research

on the MBTI. Thorough discussion will occur around empirical reviews of Holland's

(1985) theory, upon which interpretation of the Strong rests, and upon existent literature

addressing the conjoint use of the Strong and MBTI. Critical review of the literature will

focus upon literature specifically exploring Strong interest themes and MBTI personality

dimensions. The present chapter will conclude by expanding upon the research questions

proposed and the specific hypotheses therein.

Historical Context

Alone among the helping professions, counseling psychology devotes significant

attention to the role of work in the lives of people (Dowd, 1998). The profession

originated out of a commitment to assisting individuals with work-related concerns or

questions (Dowd, 1998). In fact, the study of vocational psychology has been called the

single most identifiable characteristic of the field (Chartrand, 1991).

Following the conclusion of World War II and the national rise of affluence

therein, counseling psychology broadened its scope of practice to include personal

development in areas other than work (Dowd, 1998). Yet the field's historical interest in vocational counseling research and practice endured, due largely to the field's belief in the strong overlap between work, interpersonal, and intrapersonal domains (Fitzgerald & Osipow, 1986).

One of the hallmarks of mental health is the capacity to work and to love (Blustein & Spengler, 1995). Most researchers would agree that compelling evidence exists in support of an interrelationship between work and mental health (Blustein & Spengler, 1995). Studies highlight the reciprocal relationships between unemployment (Osipow & Fitgerald, 1993), job stress (Osipow, 1979), and work related problems (Herr, 1989 in Blustein & Spengler, 1995) to increased emotional distress. Similar links have been found between career satisfaction and factors such as anxiety, depression, somatic difficulties, and self-esteem (Blustein & Spengler, 1995).

In response to these observations, intervention models have been proposed for infusing the career counseling processes with greater attention toward increased intrapersonal and interpersonal awareness (Blustein & Spengler, 1995). The consensus underlying these models is that effective counseling does not maintain overt distinctions between career and noncareer domains (Blustein & Spengler, 1995). Counseling psychologists have been at the forefront of this integration between career and noncareer domains (Dowd, 1998). The discipline is currently recognized as a profession that assists relatively well-intact individuals to maximize their intrapersonal and interpersonal developmental potential across work, academic, and home domains (Dowd, 1998). In so doing, counseling psychology makes use of interventions designed both to help individuals adjust to their environment and modify their environment (Dowd, 1998). One

intervention model in particular, the Person-Environment theory (P-E), represents a widely used and widely accepted theoretical approach within the field intended to promote individual adjustment to vocational and avocational contextual factors as well as the ability to modify one's vocational and avocational environments (Chartrand, 1991).

Person-Environment Model Overview

The P-E model is a descendant of the Trait and Factor theory. Widely considered the original model of vocational psychology, the Trait and Factor theory (Parsons, 1909) focused upon matching an individual's traits with the requirements of a specific occupation (Zunker, 1998). The foundation of the Trait-Factor model can be traced to Parson's (1909) assertion that vocational choice involves self-knowledge, occupational knowledge, and an understanding of the relationship between the two. A model evolved from Parson's writings wherein the vocational counseling process was viewed as a facilitation of self-understanding, realistic planning, and action (Zunker, 1998).

Beginning in the early 1900's and continuing until the 1950's, the Trait and Factor approach was widely considered the hallmark of career counseling (Chartrand, 1991). The popularity of the theory faded, however, as humanistic and developmental approaches began to permeate counseling psychology and allied fields (Chartrand, 1991). The Trait and Factor model came to be criticized for its promotion of the following assumptions: (a) occupational choice is a single event; (b) a single type of person works in each job; (c) there is a single right goal for every career decision-maker; and (d) occupational choice is available to everyone (Chartrand, 1991). Criticisms such as these created the caricature of the model as a "test and tell" counseling approach that unfolded in "three interviews and a cloud of dust" (Chartrand, 1991, p. 519).

17

The Person-Environment (P-E) model of counseling evolved following the Trait-Factor model's decline (Chartrand, 1991). P-E theorists believed in the usefulness of the Trait and Factor perspective yet recognized a need for a more dynamic interpretation of the interactive nature of the person and environment relationship (Chartrand, 1991). The P-E model therefore introduced the following four assumptions pertaining to individuals selecting and shaping their environment: first, people are viewed as capable of making rational decisions (Jones, Stefflre, & Stewart, 1970; Chartrand, 1991). In the tradition of cognitive-behavioral approaches, a cognitive orientation guides the search for determinants and interventions (Jones et al., 1970; Chartrand, 1991). Second, people and work environments differ in reliable and meaningful ways (Jones et al., 1970; Chartrand, 1991). This is not meant to imply that a single type of person works in each job but that important patterns exist and can be used to better organize people and environments (Chartrand, 1991). Third, increased congruence between personal characteristics and job characteristics yields greater likelihood of occupational satisfaction (Holland, 1985; Chartrand, 1991). Therefore, knowledge of person and environment patterns can be used to inform individuals about the probability of satisfaction in different work settings. Fourth, the P-E fit is a reciprocal process in which individuals shape the environment and the environment influences the individual (Round & Tracey, 1990; Chartrand, 1991). Individuals seek and create environments that allow them to express preferred characteristics. It is this dynamic reciprocity aspect of the P-E model that most clearly distinguishes it from the Trait-Factor model (Chartrand, 1991).

In addition to shifting the person and environment relationship from static to dynamic and from one-way to reciprocal, P-E theorists were also concerned with

18

addressing the overlap between work and personal domains, giving greater attention toward a broad range of presenting client issues beyond career choice or satisfaction (Rounds & Tracey, 1990; Chartrand, 1991). Rounds and Tracey (1990) asserted that career counseling was actually a subset of psychotherapy and should not be viewed as an entity to itself. The authors proposed that viewing career counseling as a form of psychotherapy would facilitate a better understanding of career change processes (Blustein & Spangler, 1995). Applying their assertions to the counseling process, Rounds and Tracey (1990) proposed a P-E framework that integrated components of decision-making, information processing, and problem solving (Blustein & Spengler, 1995). Based in part upon the work of Rounds & Tracey (1990), Chartrand (1991) elucidated P-E assumptions, objectives, and methods addressing work and non-work overlap. According to Chartrand (1991), the P-E model assumes that people and environments change continually in an on-going adjustment process. The primary goal of the model therefore is not to simply make a one-time match between an individual and an environment but to facilitate the acquisition of problem-solving skills (Chartrand, 1991). Problem-solving skills are developed through the teaching of a four step information-processing system consisting of (a) perceiving and appraising the current situation, (b) establishing concrete and realistic goals, (c) developing plans and pattern matching, and (d) taking action (Chartrand, 1991). Since Chartrand's (1991) seminal work, recent advances in P-E theory have addressed the career counseling process with a greater attention toward the broad range of issues that clients present (Blustein & Spengler, 1995). Lofquist and Dawis (1991) applied a P-E model to client issues ranging

from career questions, marital counseling, and addiction counseling (Blustein & Spangler, 1995).

The acquisition of self-understanding, information processing skills, and goal-setting skills are paramount within a P-E approach (Chartrand, 1991). In order to facilitate these objectives, the P-E process has traditionally included the administration of assessment instruments to assist individuals in understanding their personal traits, behaviors, and characteristics (Buboltz, Thomas, & Johnson, in press). Lowman (1991) emphasized the assessment of one's interests, abilities, and personality characteristics to create a comprehensive approach to career assessment and to provide the individual with as much information as possible for adequate self-understanding. A wide variety of career and vocational instruments have been developed in an effort to measure personality and interest attributes (Dillon & Weissman, 1987). Undoubtedly, two of the most frequently used (Hammer & Kummerow, 1997) instruments are the Strong Interest Inventory (Harmon, Hansen, Borgen, & Hammer, 1994) and the Myers Briggs Type Indicator (Myers & McCaulley, 1985).

<u>Strong, MBTI, and the P-E Model</u>

Assumptions underlying the use of the Strong Interest Inventory (Strong) and the Myers-Briggs Type Indicator (MBTI) are consistent with the P-E model (Hammer & Kummerow, 1997). Authors of both the Strong and the MBTI recognized a need to go beyond a simplistic matching of people with jobs. Authors of both instruments also believed that people act as change agents in shaping their own careers (Hammer & Kummerow, 1997). Authors of both instruments believed it is important that clients learn a career exploration process based upon a self-exploration process rather than simply

attain a particular career goal (e.g., choosing a vocation) (Hammer & Kummerow, 1997).

Authors of both instruments believed that the knowledge of individual characteristics can

be used to not only evaluate the match with a possible job but also to inform the

counseling approach used with clients. For example, a study by Kivlighan, Hageseth,

Tipton, and McGovern (1981) found that matching counseling approaches to the client's

Strong interest themes had a positive effect on counseling outcomes (Hammer &

Kummerow, 1997). Similar evidence has been reported for the application of MBTI

personality dimensions to counselor interventions (Hammer & Kummerow, 1997).

Authors of both instruments also attempted to broaden the scope of their applications

beyond purely career related domains to interpersonal and intrapersonal domains

(Hammer & Kummerow, 1997).

Strong Interest Inventory Overview of Applications and Research

Commensurate with the P-E model, the Strong is purported to be useful as a

vehicle for discussion, a stimulus for self-exploration, a tool to help people understand

themselves and their environments, and a basis for action plan formation (Harmon et al.,

1994). A recent survey of counseling psychologists found that 87 percent of respondents

use the Strong Interest Inventor (Katz, Joyner, & Seaman, 1999). Furthermore, they use

it more frequently than any other test (Katz et al., 1999). In fact, the Strong is widely

regarded as the "most scientifically sound, thoroughly researched, and widely used

interest inventory" (Harmon et al., 1994).

The Strong is a questionnaire that inquires about a respondent's level of interest in

a wide range of familiar occupations, occupational activities, hobbies, schools subjects,

and types of people (Harmon et al., 1994). For each of the 317 items, the respondent is

asked to indicate his or her preferences from among three categories on an answer sheet. The Strong uses a person's responses to the items to compare her or his response patterns to those of people of different types and in different occupations (Harmon et al., 1994). Most people can answer with little difficulty the Strong's questions about what they like and dislike but few may understand how their individual patterns of likes and dislikes are related to the patterns of people working in various occupations (Harmon et al., 1994). The purported power of the Strong therefore rests on two assumptions: (1) that the day-to-day activities typical of a specific occupation are reflected in the interests of the people who are employed in it and (2) that those who have a similar pattern of interest will be satisfied in that occupation if they have compatible values and the necessary knowledge and abilities (Harmon et al., 1994).

Results of the Strong are organized into four areas: 6 General Occupational Themes (GOT) that reflect the individuals overall orientation to work according to Holland's six interest types including Realistic, Investigative, Artistic, Social, Enterprising, and Conventional; 25 Basic Interest Scales (BIS) that report consistency of interests or aversions in areas such as art, science, and public speaking; 211 Occupational Scales (OS) representing the degree of similarity between the individual's interests and the characteristic interests of individual's within those occupations; and 4 Personal Style Scales that measure aspects of the style in which individual's prefer in relation to learning, leading, working, and taking risks (Harmon et al., 1994).

The Strong has been the subject of hundreds of research initiatives spanning over fifty years (Harmon et al., 1994). Research has focused on individual, occupational,

group, institutional, cultural, and societal interest pattern trends and shifts (Harmon et al., 1994).

The Strong—studying individual change

Harmon et al. (1994) noted that the Strong has been used to explore case studies of interest pattern change over time wherein a single person is seen as representing a generalized phenomenon of interest. For example, Harmon et al. (1994) cited the case of an individual whose Strong General Occupational Theme (GOT) scores shifted from Social to Investigative over a ten-year test-retest trial. Confounding variables influencing the shift in GOT types included the fact that the individual had, over the course of the ten-year period, engaged in a different style of collective decision-making within his engineering research group and had attended training sessions to help him function more effectively within his environment (Harmon et al., 1994). That interest types can change therefore in response to workplace socialization is an important finding from case study data. Such findings are supportive of P-E assumptions regarding the reciprocal nature of person and environment dynamics (Harmon et al., 1994).

The Strong—studying group change

In a study by the American Association of Medical Colleges (Hutchins, 1964), 2,800 medical students were administered the Strong upon entering and upon graduating (Harmon et al., 1994). The results indicated that the students demonstrated decreased interest in both scientific and social interests after having scored very high in these areas initially and a mild increase in adventuresome interests (Campbell, 1971; Harmon et al., 1994). These findings have served as a basis for further exploration into issues of professional socialization. Research however has indicated that most people's interests

as measured by the Strong are stable over short periods of time (Harmon et al., 1994). Over two or three years, some changes may occur particularly in younger individuals yet the inventory results generally reflect such changes (Harmon et al., 1994). When samples tested in the 1930's and 1940's are compared with analogous samples tested in the 1970's and 1980's, results indicated that the vocational interest patterns are more stable over longer time spans than many originally believed (Harmon et al., 1994). That interest themes can change in response to workplace socialization, particularly when individuals are younger, yet tend to stabilize as individuals grow older is supportive of P-E assumptions regarding the reciprocal nature of person and environment dynamics. Furthermore, that level of reciprocity appears to be moderated by person characteristics such as chronological age is an important contextual variable to consider within the self-exploration and information P-E processes (Harmon et al., 1994).

The Strong—studying characteristic interests of people in particular occupations

Data from the Strong compiles detailed information about a myriad of occupations in an effort to help people decide if they would be satisfied with employment in a given occupation. For example, sampling data on the recent Strong (1994) demonstrated that female geologists interests were concentrated within Investigative academic areas such as science and mathematics as well as Realistic interests within outdoor settings involving mechanical activities (Harmon et al., 1994). Conversely, their aversions were concentrated within interest areas traditional to the Social theme such as social service, religious activities, and traditional home or family activities (Harmon et al., 1994). They also demonstrated disinterest in Enterprising activities such as sales and marketing (Harmon et al., 1994). The fact that interest types can clearly be defined and

strongly imbedded support P-E assumptions regarding the importance of self-awareness as well as the potential impact one might have on their environment and vice-versa (Harmon et al., 1994).

The Strong—studying cross-cultural influences

The strong is widely used internationally. Holland and Gottfredson reported in 1992 that the Strong had been translated into seventeen languages (Harmon et al., 1994). Various studies have used the Strong to compare occupational data from other countries (Harmon et al., 1994). Examples included research performed with German-speaking psychologists and accountants (e.g., Lonner, 1968, 1969), Pakastani physicians and engineers (e.g., Shah, 1971), Irish students (e.g., Hanlon, 1971) as well as Spanish translations of the Strong (Foud, 1984). The results of these studies demonstrated similarity of interests across several countries among people in the same occupations (Harmon et al., 1994). The fact that people tend to select occupations commensurate with cross-culturally valid interest patterns supports the P-E premise that individuals seek out and create environments that allow them to express preferred characteristics.

Shifting from a broad overview of general research and uses of the Strong commensurate with the P-E model, discussion will presently focus on a review of the theoretical foundations upon which the Strong rests--Holland's (1959; 1985) theory of vocational psychology (Hammer & Kummerow, 1997). A review of the evolution of Holland's theory, a critical evaluation of Holland's theoretical constructs, and a brief overview of the historical integration between Holland's theoretical premises and the Strong are paramount are foundational to the present study.

Holland's Theory—an overview and critique

In an attempt to develop an occupational classification system closely tied to

psychometric research, Holland originally proposed in 1959 six categories of

occupational interests comprised of Realistic, Investigative, Artistic, Social, Enterprising,

and Conventional types (Harmon et al., 1994). The Realistic individual was believed to

possess interests primarily centered on building or repairing and hands on activities

typically within outdoor or natural settings (Holland, 1985). The Investigative type

theoretically was drawn toward researching and analyzing activities (Holland, 1985).

The Artistic type was believed to be primarily interested in creating and enjoying the arts

(Holland, 1985). The Social type was purportedly interested in helping and instructing

others (Holland, 1985). The Enterprising individual primarily enjoyed selling,

persuading, and managing (Holland, 1985). The Conventional type was hypothesized to

prefer processing and organizing activities (Holland, 1985). Most people, according to

Holland, could be characterized according to these six types. Furthermore, most work

environments could be categorized according to the same six types. Holland described

the evolution of his interest typology system as follows:

> The formulation for the types grew out of my experience as a vocational
> counselor and clinician, and out of my construction of a personality
> inventory from interest material. After reviewing the vocational
> literature—especially factor analytic studies of personality and vocational
> interests—I concluded that it might be useful to categorize people into six
> types. The present types are analogous in some ways to those proposed
> earlier by Adler, Fromm, Jung, Sheldon, and others. They differ from
> these earlier typologies in their origin—which is largely our vocational
> literature—and in their definitions. The six major factors identified in
> Guilford's comprehensive factor analysis of human interest—mechanical,
> scientific, social welfare, clerical, business, and aesthetic—approximate
> the present types. To the best of my knowledge, Guilford's factor analysis

is the most explicit forerunner of the present typology (Harmon et al., 1994, p. 52).

Career satisfaction was hypothesized to be the result of being clear about one's interests via the demonstration of identifiable type preferences, named differentiation by Holland, possessing consistent interest themes via the possession of similar type preferences, named consistency by Holland, and finding an occupational environment congruent with one's interest themes, named congruency by Holland. Holland's theory therefore is built upon the constructs of congruence, consistency, and differentiation.

Congruence appears to be the most widely studied and debated aspect of his theory in recent years (Hackett & Lent, 1992). Congruency represents a matching of one's dominant interest type(s) with an occupation characterized by parallel interest type(s). For example, a Realistic-Investigative individual establishes congruency through placing oneself in an occupational setting characterized by Realistic and Investigative activities and demands. Conversely, congruency is not achieved if the same individual were to be located within an environment characterized by, for example, Conventional and Enterprising activities. In a review of the congruence literature, Spokane (1985) concluded that most studies found mixed or positive results for the congruency theory (Hackett & Lent, 1992). Spokane (1985) concluded that, "on balance, congruence is associated with performance, satisfaction, and stability as predicted by Holland" (Hackett & Lent, 1992, p. 424). Based upon a meta-analytic review of 41 congruence studies, Assouline and Meir (1987) discovered small effect sizes for the relations of congruence to achievement and stability; mean correlations were .06 and .15 respectively (Hackett & Lent, 1992). The mean correlation of congruence to satisfaction was .21 for general

occupational categories but rose steeply to .42 when congruence involved the fit between person and occupation specialty (Hackett & Lent, 1992). Meir (1988) and Meir and Yaari (1988) found stronger congruence-satisfaction relationships when congruence involved the fit between personality type and occupational specialty as well (Hackett & Lent, 1992). Several studies in recent years have reported positive relationships between congruence level and job satisfaction in adults (e.g., Elton & Smart, 1988; Gottfredson & Holland, 1990; Rounds, 1990) and educational satisfaction in students (e.g., Gade, Fuqua, & Hurlburt, 1988 in Hackett and Lent, 1992). In their summary of the congruence literature, Hackett and Lent (1992) stated, "the preponderance of evidence does suggest a relationship between Holland's personality types and choice of environment, which generally holds for men, women, majority, and minority subjects in the studies we reviewed" (p. 425). Hackett and Lent (1992) however also noted that the congruence hypothesis has yielded mixed findings.

Consistency is said to occur when similar Holland interest types characterize an individual's personality Strong results. Inconsistency occurs when dissimilar types characterize an individual's personality type. Holland's six personality types are arranged along the points of a hexagon according to the acronym RIASEC. Holland personality types nearest each other on the hexagon (e.g., Realistic and Investigative) are theoretically more similar than are non-adjacent types. Furthermore, those types that are diametrically opposite (e.g., Realistic and Enterprising) on the hexagon are theoretically highly dissimilar. Most correlational research seems to corroborate Holland's idea of typology consistency. In a recent reference sample of 9, 467 women and 9,484 men, Realistic and Investigative were highly correlated (.53) as were Enterprising and Social

(.42), Enterprising and Conventional (.41) and Social and Artistic (.33). Conversely, the

lowest rates of correlation existed among those types located opposite one another on the

hexagon. For example, Realistic and Social (.06), Enterprising and Investigative (-.01),

and Conventional and Artistic (-.04) (Harmon et al., 1994).

Holland's idea of typology consistency has not been accepted without debate.

Consistency has generated the greatest amount of cross-cultural validity questions

(Rounds & Tracey, 1996). Most reviews on Holland's hexagonal structure conducted in

the 1980's and early 1990's found support for the ordering of RIASEC (Rounds &

Tracey, 1996). For example, Hansen (1987) said that, "generally, the structure of

interests of international and cross-ethnic populations seem to correspond to Holland's

model almost as well as does the structure of interests of Whites" (Rounds & Tracey,

1996, p. 311). Summarizing the literature, Holland stated that the "ordering of RIASEC

types is similar even when the data, sexes, and cultures vary" (Rounds & Tracey, 1996. P.

311). In the early to middle 1990's however, the belief emerged that perhaps confidence

in the structure of Holland's model and its applicability to the culturally diverse was

premature. As contradictory research emerged from Fouad & Dancer (1992) and

Swanson (1992), theorists and researchers adopted a less accepting outlook on the

structure of Holland's theory and began proposing alternative structures (Rounds &

Tracey, 1996). Gati (1991) claimed that Holland's order did not adequately account for

the relationships among the six types (Rounds & Tracey, 1996). Rather, according to

Gati (1991), a three-group partition [(RI) (AS) (EC)] demonstrated a better fit with cross-

cultural populations (Rounds & Tracey, 1996). According to Gati's (1991) model,

correlations between types belonging to the same category (e.g., R, I) were greater than

correlation's between pairs of types outside the category (e.g., R, A) (Rounds & Tracey, 1996).

Both Holland's and Gati's models have since received criticism for the relationship ascribed between the A and S types (Rounds & Tracey, 1996). Several researchers have noted the cross-cultural discontinuity between Artisitc (A) and other Holland types. Rounds and Tracey (1996) attempted to address this discrepancy through adjusting Gati's (1991) model so that the A type existed within its own category and the S type was added to the EC category [i.e., (RI) (A) (SEC)]. To test their hypothesis, Rounds and Tracey (1996) conducted a structural meta-analysis to evaluate the fit of Holland's (1985) model, Gati's (1991) model, and their own to cross-cultural populations. From the meta-analysis, samples were derived representing individuals from various cultures within the U.S. (N=16; African-American, American Indian, Asian-American, and Hispanic), eighteen foreign countries (N=75), and individuals of European descent within the U.S (N=20). Gati's (1991) model and Rounds and Tracey's (1996) model achieved the best fit to the data. Both models represented the international samples and the U.S. "benchmark" samples equally well and showed a better fit to the international samples than did Holland's RIASEC model (Rounds & Tracey, 1996). Across the 18 countries in the international sample, both Gati's (1991) and the Rounds' and Tracey (1996) models fit equally well for 12 countries. According to Rounds and Tracey (1996), none of the differences between these two models presented "a compelling reason to recommend in general one model over the other" (p. 325). Rounds and Tracey (1996) suggested that the results might be used to (a) counterpoint previous conclusions supporting Holland structure across cultures and to (b) warn publishers,

authors, and assessors that the knowledge pertaining to consistency within Holland's

model may not be applicable to cross-cultural groups. In 1998, however, Day and

Rounds seemed to offer contradictory evidence. Day and Rounds (1998) asserted that

people of different ethnicity and sexes hold the same cognitive map of the workworld

when the structures of preferences are explored. Furthermore, Day and Rounds (1998)

stated that the "RIASEC arrangement of general occupational themes prevails

legitimately. Previous research suggesting otherwise probably suffered multiple perils of

. . . small sample size, unrepresentative sampling, selective attrition…and attenuated

categorization" (p. 735).

A third important Holland construct--one closely linked with consistency--is

differentiation. Differentiation occurs when an individual clearly expresses a preference

for a Holland personality type(s) in relation to other types. For example, differentiation

occurs when an individual scores high on a Realistic interest pattern and scores low on a

Social interest pattern. Theoretically, consistency and differentiation will be evidenced

only when an individual's self-identity is well developed. As Holland (1985, p. 73)

acknowledged, differentiation and consistency have had a "checkered research career—

about as many negative as positive findings" (Hackett & Lent, p. 425). A review by

Hackett and Lent (1992) corroborated this trend; neither of those constructs has been

found to uniformly predict career choice stability. Holland (1985, 1987b) argued

however that well-designed studies that closely followed his theory and employed

defensible outcome measures have produced the most findings in support of his theory

whereas studies lacking these qualities have often produced disconfirming results

(Hackett & Lent, 1992).

In summary, the Holland hypothesis that seems to have received the most consistent support involves the prediction that persons tend to select or prefer environments that match their interest (Hackett & Lent, 1992). Conversely, "research has not been entirely kind to the theory" (Hackett & Lent, 1992, p. 425). As Holland (1985) acknowledged, the constructs of differentiation and consistency have had a "checkered research career—about as many negative as positive findings" (p. 73). Yet Holland's theory has had "an undeniable impact" on psychology (Hackett & Lent, 1992, p. 425). According to a review by Hackett and Lent (1992), the theory's relative simplicity and parsimony have made it accessible to professionals and layperson alike. Furthermore, commensurate with a P-E approach, its classification scheme provides a useful framework for organizing information about persons, environments, and their interactions (Hackett & Lent, 1992).

Strong Interest Inventory and Holland's Occupational Theory

At its inception in 1927, the Strong was an empirical yet atheoretical instrument (Harmon et al., 1994). A criticism of the Strong in its early development was the fact that it lacked a parsimonious organizational structure (Harmon et al., 1994). In 1974, the General Occupational Themes (GOT) were first introduced into the Strong and represented the merger of Holland's work with that of E.K. Strong (Harmon et al., 1994). The GOTs assess an individual's interest patterns and yield a Holland personality theme. The GOTs therefore represent a direct link to Holland's theory on the Strong. The merger between Holland's theory and the Strong was widely considered a powerful enhancement to the instrument (Harmon et al., 1994).

The GOT results are purported to be particularly useful when counseling or advising beginning college students (Harmon et al., 1994). The GOTs can be used to help those students who are not prepared to select a major to understand their general interests (Harmon et al., 1994). The themes and their relationship on the hexagon provide a cognitive map for students who are trying to select and academic major from what is often a confusing web of options (Harmon et al., 1994).

Research has demonstrated the benefits of helping students acquire a general cognitive framework for exploring interests (Harmon et al., 1994). Shahnasarian and Peterson (1988) showed a video that interpreted the six themes to a group of students to help them identify alternatives for consideration. The study concluded that the cognitive schema offered by the six themes sensitized the students to information in their environment and helped them encode as well as retrieve information (Harmon et al., 1994). Jacoby, Rue, and Allen (1984) applied the idea of cognitive mapping literally. Specifically, the authors created a map for each of the six types highlighting academic programs, career possibilities, internship and volunteer possibilities, campus organizations, and recreational activities (Harmon et al., 1994). Jacoby et al. (1984) stated that such maps could be used successfully in recruitment, orientation programs, academic advising, and career counseling (Harmon et al., 1994).

Research has also demonstrated the benefits of using a client's GOT information to inform the counseling process. A study by Kivlighan, Hageseth, Tipton, and McGovern (1981) found that matching counseling approaches to an individual's GOT had a positive effect on career counseling outcomes (Hammer & Kummerow, 1997). Realistic clients, for example, preferred counseling to be concrete and anchored to

examples in real life (Hammer & Kummerow, 1997). Investigative types on the other hand preferred to understand the patterns and relationships among the scales and how the tests they have taken relate to one another (Hammer & Kummerow, 1997).

Using Additional Sources of Information

Beyond eliciting information regarding an individual's interest patterns, the authors of the Strong endorsed integrating information about an individual's personality, values, and beliefs via MBTI results to provide a deeper understanding regarding what careers and work environments an individual is likely to find satisfying and rewarding (Harmon et al., 1994). Authors of the Strong noted, "using the Strong and the Myers-Briggs Type Indicator has been shown to be particularly useful" (Harmon et al., 1994, p. 238). From a P-E perspective, use of these two instruments together can, according to Strong authors, provide deeper levels of self-understanding leading to improved information-processing and critical thinking procedures and help confirm particular areas that warrant further exploration (Harmon et al., 1994).

Myers-Briggs Type Indicator and Vocational Psychology

The MBTI has long been used as a tool in career counseling (Hammer, 1996). A primary goal of Isabel Briggs Myers in creating the instrument was to help individuals choose work that they would find meaningful and at which they could be productive (Hammer, 1996). Over the course of the last fifty years, the MBTI has become, along with the Strong, the most widely used instruments in college counseling centers, community colleges, private career or educational counseling practices, and high schools (Hammer, 1996).

The MBTI's popularity as a career-counseling tool has been well established. In 1991, the National Research Council (NTC) conducted a survey of individuals who had received an interpretation of the MBTI as part of a career development program (Hammer, 1996). The survey was conducted five months after the participants completed the career development program (Hammer, 1996). Among the findings reported by the NTC, 97 percent of respondents remembered taking the MBTI and remembered their type; 84 percent felt the results confirmed what they already knew about themselves; 61 percent said that it was the most helpful aspect of the program; a number of respondents reported that the best way to improve the overall program was to provide more information on the MBTI; the ratings for the MBTI were significantly higher than those given to any other instrument used within the program (Hammer, 1996).

The MBTI has been used to explore a number of topics pertinent to vocational psychology such as occupational selection, career decision-making, and job satisfaction. As will be discussed, the following P-E model assumptions have been directly addressed and tested: (a) people and work environments differ in reliable and meaningful ways; (b) the greater the level of congruence between person and environment characteristics, the greater the likelihood of occupational satisfaction and success; (c) person and environment fit is a reciprocal process in which individuals shape the environment and the environment shapes individuals (Chartrand, 1991).

Myers-Briggs Type Indicator—studying occupational selection

P-E theory states that people and work environments differ in reliable and meaningful ways (Chartrand, 1991). This is not meant to imply that a single type of person resides within a given occupational context but that important patterns exist and

can be better used to help people organize themselves within generally congruent

environments (Chartrand, 1991). If MBTI personality theory is correct and

commensurate with P-E theory, MBTI personality types should be distributed across

occupations in ways that are consistent with the characteristics of that work environment

(Hammer, 1996). The data to date indicates that MBTI types are distributed across

occupations in ways that are generally consistent with theoretical predictions (Hammer,

1996). In general, the more an occupation focuses on certain tasks, the less equally

distributed the types will be across occupations (Hammer, 1996). Descouzis (1989)

examined a sample of tax preparers--an occupation that requires careful attention to detail

in combination with an ability to recall a myriad of pertinent facts (Hammer, 1996).

Type theory would predict that individuals whose dominant function was Introverted

with Sensing (i.e., ISTJ and ISFJ) would predominate in this field (Hammer, 1996).

Descouzis (1989) found that 100 percent of the sample demonstrated a preference for

Sensing versus Intuitive (Hammer, 1996). ISTJ and ISFJ types comprised a statistically

significant 44 percent of the sample (Hammer, 1996). This pattern can also be observed

across occupations within a given organization. Steckroth, Slocum, and Sims (1980)

studied ninety-six business executives (Hammer, 1996). Personnel and sales positions

were related to a preference for Feeling whereas economics, operations research, and

operations management were related to preferences for Thinking (Hammer, 1996). A

preference for Perceiving was related to sales and operations management and preference

for Judging to planning positions (Hammer, 1996). Differentiation by MBTI type is most

noticeable within clearly defined occupations. Conversely, broad occupations such as

teaching may provide a satisfactory environment for a large number of different types depending upon the subject being taught (Hammer, 1996).

The pattern of distributions of types by occupations holds across different cultures (Hammer, 1996). Using a Norwegian translation of the MBTI, Nordvik (1994) found that pilots and industrial workers, two occupations that required workers to engage in highly similar tasks, had a statistically significant similarity in personality types (Hammer, 1996). Eighty-eight percent of the pilots were STJs as were 96 percent of the industrial workers (Hammer, 1996). Hammer (1996) concluded that the evidence to support the proposition that occupational choice is related to the preferences as measured by the MBTI is "abundant and compelling" (p. 37).

The MBTI—studying career decision making

Gibb (1991) used the MBTI to explore career indecision among a sample (N=139) of White, married, middle-class women (Hammer, 1996). Results indicated that Perceiving types tended to report higher levels of career indecision and lower levels of confidence in decision-making skills (Hammer, 1996). Lynch and Hepp (1985) explored career decision-making in college students and found that higher scores in Perceiving were associated with self-reports of uncertainty and indecisiveness (Hammer, 1996). Similarly, DiRusso, Carney, and Bryan (1995) reported that among undergraduates within a sample classified as being least decided, Perceiving types in general and those with SP and TP preferences specifically were significantly overrepresented (Hammer, 1996). Ikenberry (1987) reported a connection between career indecision and the J-P as well as E-I scales (Hammer, 1996). Conversely, Apostal (1988) reported a link between career decidedness and high Thinking scores as well as linkages between S-N and T-F

dichotomies and expressed interests and perceived competencies (Hammer, 1996).

McKenna, Martin, and Schmidt (1990) studied the MBTI type of those considering

retirement (Hammer, 1996). These authors found that Judging Types, Extraverted and

Judging types in particular, were significantly overrepresented among those rated high on

retirement planning (Hammer, 1996). ESTJ types achieved the highest score on the

retirement planning measure (Hammer, 1996).

In summary of the data using the MBTI to explore career decision making

readiness, Judging types consistently demonstrated more career decisiveness than did

Perceiving types (Hammer, 1996). Less definitive linkages have been made between

career indecisiveness and the E-I, T-F, and S-N dichotomies (Hammer, 1996). The fact

that the MBTI distinguishes degrees of career decision and indecision by the Judging and

Perceiving personality dimension preferences potentially informs the counselor as to

unique personality needs within each of the following P-E information processing steps:

(a) perceiving and appraising the current situation, (b) establishing concrete and realistic

goals, (c) developing a plan, and (d) taking action (Chartrand, 1991).

The MBTI—studying job satisfaction

One assumption inherent within the use of the MBTI and commensurate with a P-

E framework is that knowledge of person and environment characteristics can be learned

and used to inform individuals about the probability of satisfaction within a given

occupation (Chartrand, 1991). A number of studies have explored the effect of MBTI

personality characteristics and job satisfaction, coworker satisfaction, and occupational

stress. Hammer and Macdaid (1992) reviewed fifteen studies on the relationship between

the MBTI and career satisfaction within the MBTI Career Report Manual. Among the

studies reviewed, five showed no relationship between type and occupation satisfaction (Hammer, 1996). Within these five studies, the occupational populations explored only dieticians and teachers (Hammer, 1996). In the other ten studies, the relationship generally supported the hypothesis that the MBTI is related to job satisfaction in ways consistent with theory (Hammer, 1996). Furthermore, the T-F scale in particular appeared to be highly related to satisfaction with coworkers (Hammer, 1996). Fitzgerald (1994) studied managerial skills, stress and coping, and job satisfaction in 386 managers in a leadership development program (Hammer, 1996). Using the Managerial Job Satisfaction Questionnaire, Fitzgerald (1994) found that extraverted managers reported significantly more job satisfaction than did introverted managers (Hammer, 1996). Using the Occupational Stress Inventory, Fitzgerald (1994) found that managers preferring INP personality dimensions reported more stress around role insufficiency and role ambiguity, those preferring NTP personality dimensions reported more stress with role boundaries, and Introversion was associated with more stress in the area of responsibility (Hammer, 1996). Perceiving types reported more vocational and physical strain (Hammer, 1996). Introverts and Perceiving types reported using fewer coping responses (Hammer, 1996). Managers with clear scores in either direction on the J-P and T-F scales reported less stress than those with unclear scores on the two dichotomies (Hammer, 1996). Managers with clear scores on the J-P dichotomy also reported higher levels of job satisfaction (Hammer, 1996). Johnson (1991) selected 100 pastors and administered the Pastoral Satisfaction Survey (PSS). Among the 63 pastors who responded, a preference for Thinking predicted satisfaction with administrative tasks whereas Feeling was a predictor of satisfaction with professional interaction (Hammer, 1996).

Across findings within the literature, Introverts and Perceiving types reported

higher levels of job dissatisfaction than did Extravert and Judging types. The T-F scale

appeared to be important in predicting satisfaction with coworkers (Hammer, 1996).

Knowledge of the relationship between MBTI personality dimensions and work

satisfaction, coworker satisfaction, and work stress is purported to be useful within a P-E

framework (Hammer & Kummerow, 1997). Specifically, such data could be used to

inform the information-processing stages and reinforce solid and generalizable decision-

making and interpersonal skills based upon knowledge of self (Chartrand, 1991).

Another assumption inherent within the use of the MBTI in career counseling and

derived directly from the P-E model states that those who choose occupations wherein

the tasks and the individuals are congruent with their personality preferences are more

likely to derive satisfaction from the work environment (Hammer, 1996). Furthermore,

the person and environment fit is believed to be a reciprocal process in which individuals

attempt to shape the environment and the environment influences the individual

(Hammer, 1996). A number of studies have tested this hypothesis using the MBTI.

Watson (1990) used the MBTI to study the relationship between personality and job

satisfaction among 63 agriculture teachers. Data revealed that the teacher participants

were primarily SJ types. Furthermore, those individuals with SP temperaments reported

the lowest levels of job satisfaction (Hammer, 1996). Buie (1988) reported that among a

sample of computer professionals, a profession primarily populated by Intuitive

preferences and not by Sensing preferences, those who preferred Intuition were more

satisfied than were the Sensing types (Hammer, 1996). Richard (1994) surveyed 1,220

lawyers and found a link between Extraversion, Thinking, and Judging types and work

satisfaction (Hammer, 1996). Preferences for Sensing or Intuition were related to choice of specialty but not to satisfaction (Hammer, 1996). Scarbrough (1987) found that SF accounting managers, who were the least frequently occurring types in a sample of accounting managers, were significantly more likely to report an intention to leave the job than were the majority NT types (Hammer, 1996). Shewchuk and O'Connor (1995) found that a sample of 522 health care executives were largely TJ types and had a more positive sense of well-being than did non-TJ types within the sample (Hammer, 1996). Marcic, Aiuppa, and Watson (1989) also studied health care executives and found that those executives who had preferences similar to the majority in the organization possessed higher levels of self-esteem (Hammer, 1996). Roush (1989) compared the MBTI types of those who voluntarily resigned from the United States Naval Academy to those who persisted at the Academy (Hammer, 1996). Voluntary resignation was correlated with preferences for Introversion, Intuition, Feeling and Perceiving types (Hammer, 1996). Findings lend support for the P-E supposition that stress and dissatisfaction are a result of an individual being in a work environment that does not reward his or her natural preferences (Hammer, 1996). As P-E theory predicts, in dissatisfying situations, individuals attempt to modify the environment to meet their preference needs and if unable to adequately do so, often leave (Chartrand, 1991).

Research on the MBTI appears to have consistently supported the following P-E assumptions: (a) people and work environments differ in reliable and meaningful ways; (b) the greater the level of congruence between person and environment characteristics, the greater the likelihood of occupational satisfaction and success; (c) person and environment fit is a reciprocal process in which individuals shape the environment and

the environment shapes individuals (Chartrand, 1991). The MBTI manual states that the instrument is useful toward increased self-awareness and knowledge applicable toward improved information-processing and decision-making skills (Myers & McCaulley, 1985). The manual also recommends conjoint use of the Strong toward these ends (Myers & McCaulley, 1985).

The Strong and the MBTI: Together in Research

Hammer and Kummerow (1997) hypothesized that the Strong and MBTI have achieved an extensive level of use because counselors and clients have found that, true to P-E model objectives, both instruments enable people to better understand themselves and their environments. Individuals are able then to apply this increased understanding of self and environment toward general information-processing and decision-making procedures. As a result, they are better able to confront daily problems and decisions (Hammer & Kummerow, 1997). Yet as more career professionals are using both the Strong and the MBTI, Hammer and Kummerow (1997) concluded that more research is needed on the conjoint use of the Strong and MBTI so that a better understanding of the relationship between the two instruments could be achieved.

Five known and published studies have compared the effectiveness of using the instruments together (Katz, Joyner, & Seamen, 1999). Four of the studies did not establish a statistically significant benefit for using the two instruments together (e.g., Hayslip, 1995; O'Neil, Price, & Tracey, 1979; Takai & Holland, 1979; Talbot & Birk, 1979). However, only one (Talbot & Birk, 1979) of these four studies used a control group (Katz et. al., 1999). Furthermore, three were published in the 1970's before revisions were made to both the Strong and the MBTI (Katz et al., 1999). Additionally,

one study (Hayslip, 1995) used only 37 participants divided across three treatment

settings (Katz et al., 1999). The most recent study (Katz et al., 1999) to explore the topic,

however, established evidence suggesting the efficacy of joint usage of the Strong and

MBTI. Katz et al. (1999) found that the instruments, when used in tandem, resulted in

higher rates of career related change (i.e., change in career goal, change in specificity of

career goal, and increase in certainty of career goal) as compared to individuals who

received information from a single instrument. Specifically, 85 percent of participants in

the dual-usage group changed their career goal, changed the specificity of their career

goal, and/or changed the level of certainty with reference to their career goal as compared

to approximately 67 percent of participants in conditions involving the administration of

only one instrument or neither instrument (Katz et al., 1999). The results of this study,

according to Katz et al., (1999), supported the P-E model's belief in the importance of

self-understanding toward effective career development. In short, greater self-

understanding was purported to encourage the widest possible consideration of careers

and to maximize the chances of reaching a satisfying choice (Katz et al., 1999).

Generalizability of the results is limited by the fact that the participants were all

undergraduate students at the same institution (Katz et al., 1999). Possible nesting effects

were therefore ignored. Furthermore, whole classes were assigned to treatment

conditions (Katz et al., 1999). It's possible therefore that confounding variables were

introduced based on characteristics of students in various types of classes (Katz et al.,

1999). Finally, individual score interpretations were not provided within the study (Katz

et al., 1999). Although professional interpretation of Strong and MBTI results is not

overtly mandated within either instrument's manuals, a test-and-tell model of instrument

administration and interpretation is widely discouraged (Chartrand, 1991). Counselors are encouraged to help clients make use of their functions through practice and not through understanding alone (Myers & McCaulley, 1985).

In light of the each instrument's emphasis on interpretive issues, several articles have addressed the interpretive uses of the Strong and MBTI from a conceptual perspective. For example, Pinkney (1983) highlighted ways in which the MBTI may be used as an alternative to the Strong. Specifically, Pinkney (1983) stated that the use of the MBTI in the career counseling process might lead to psychological awareness on the part of the client, which can augment vocational information received from a more traditional career instrument (Buboltz et al., in press). Lowman (1991) discussed the Strong and the MBTI as examples of interest and personality measures that may be used in conjunction with information on abilities toward the creation of a comprehensive career assessment approach. Lowman did not, however, directly address the interpretation of the MBTI and Strong together (Hammer & Kummerow, 1997). Miller (1992) used a case study to discuss how to synthesize results from the Strong and the MBTI. Miller (1992) stated that the use of the MBTI in conjunction with the Strong may lead to better psychological understanding on the part of an individual and can lead to individual's understanding the interaction of their preferences with different work situations (Buboltz, Thomas, & Johnson, in press). Similarly, Peterson (1995) discussed the integration of the two instruments through the provision of case examples. Neither Miller (1992) nor Peterson (1995) however attempted to discuss the MBTI and Strong relationship in a comprehensive manner (Hammer & Kummerow, 1997).

44

Beyond conceptual and qualitative work on the interpretation of the Strong and the MBTI, Hammer and Kummerow (1997) stated that more empirical data was needed regarding the strengths and limitations of using both instruments simultaneously. Hammer and Kummerow (1997) suggested, "there are number of topics that seem to offer a logical beginning for future research efforts" (p. 125). A suggestion offered was the exploration of the correlational relationship between the Strong and MBTI using large samples of adults and students (Hammer & Kummerow, 1997). Because the Strong results are built upon the foundations of Holland's (1985) theory of vocational interests and the six interest themes therein reflected on the Strong General Occupational Themes (GOT), a logical starting place for exploring the correlational relationship between the Strong and the MBTI seemingly exists within the exploration of correlations between the Strong GOTs and the MBTI personality dimensions.

In the last two decades, multiple studies have attempted to explore the relationship between Holland interest themes contained within the Strong GOTs and MBTI personality dimensions. Some studies have explored the relationship via correlating the four MBTI personality dimensions (i.e., Extraversion-Introversion [E-I], Sensing-Intuitive [S-N], Thinking-Feeling [T-F], and Judging-Perceiving [J-P]) with the six interest themes (i.e., Realistic [R], Investigative [I], Artistic [A], Social [S], Enterprising [E], Conventional [C]). Others have explored the relationship via grouping MBTI personality dimensions by type (e.g., INFP, ESTJ, etc) and assessing the relationship of these four-letter types with the six Strong interest themes. The findings of each however are limited by important theoretical and methodological considerations.

Several studies have used correlational or similar techniques to analyze the relationship between the four MBTI personality dimensions (i.e., E-I, S-N, T-F, J-P) and the six Strong interest themes (R-I-A-S-E-C). McCauley (1978) found statistically significant but low correlations between the majority of Jungian and Holland types on the two instruments. Using the updated version of the MBTI, Dillon and Wiessman (1987) employed Pearson correlations and found significant relationships between several of the MBTI poles and Strong interest themes. Specifically, the MBTI Extraversion pole was found to "significantly agree" (p. 72)—defined by the authors as an agreement over 50 percent ($p<.05$)—with Strong Social and Enterprising themes for men and women and Strong Conventional themes for men (Dillon & Weissman, 1987). The MBTI Introversion pole was not found to significantly agree with any Strong interest themes (Dillon & Weissman, 1987). The MBTI Sensing pole was found to significantly agree with Conventional Strong interest theme for men and women and Strong Realistic interest theme for men only (Dillon & Weissman, 1987). The MBTI Intuition pole was found to significantly agree with the Strong Artistic interest theme for men and women and the Strong Investigative and Social themes for women only (Dillon & Weissman, 1987). The MBTI Thinking pole was found to significantly agree with the Strong Realistic interest theme for men and the Strong Investigative and Enterprising interest themes for women (Dillon & Weissman, 1987). The MBTI Feeling scale significantly agreed with no Strong interest themes for women and with Artistic and Social interest themes for men (Dillon & Weissman, 1987). The MBTI Judging pole was found to significantly agree with only the Conventional Strong interest theme for both men and women (Dillon & Weissman, 1987). The MBTI Perceiving pole significantly agreed

with the Artistic Strong interest theme for men and women and the Social interest theme

for women only (Dillon & Weissman, 1987). Dillon and Weissman suggested that the

meaning of GOTs could be enhanced with the integration of Jungian typology scales to

potentially increase an individual's self-awareness, underlying decision-making style, and

understanding of preference style.

A few years following the analysis performed by Dillon and Weissman (1987),

Decola (1992) performed a similar analysis and concluded that the MBTI types are not

good predictors of the Strong interest themes but that consistent relationships between the

two instruments do exist (Buboltz et al., in press). Specifically, Decola (1992) found

relationships between MBTI Extraverted and Feeling types with Strong Social interest

theme, MBTI Introverted and Sensing types with Strong Conventional interest theme,

and MBTI Intuitive types with Strong Enterprising and Conventional interest themes

(Buboltz et al., in press). Corresponding findings between Decola (1992) and Dillon and

Weissman (1987) were achieved with both purporting significant correlations between

MBTI Extraversion and Strong Social interest theme, MBTI Sensing and Strong

Conventional interest theme, and MBTI Feeling and Strong Social interest theme interest

theme. All other purported significant correlations between the two studies, however,

failed to correspond.

In 1997, Hammer and Kummerow compiled correlations of the MBTI personality

dimensions with the Strong interest themes for 757 adults and college students. Within

their large sample, Hammer and Kummerow (1997) reported "moderate" (p. 41)

correlations between MBTI Extraversion and Strong Social and Enterprising interest

themes, MBTI Intuition and Strong Artistic interest theme, MBTI Sensing and Strong

47

Conventional interest theme, MBTI Thinking and Strong Realistic interest theme, MBTI Feeling and Strong Artistic and Social interest themes, MBTI Perceiving and Strong Artistic interest theme, and MBTI Judging and Strong Conventional interest theme. Hammer and Kummerow (1997) concluded that because the correlations of the Strong GOTs with the MBTI personality dimensions were symmetrical across the Holland hexagon, the pattern of correlations attained from the data offered evidence of convergent and divergent validity. In short, opposite preferences on MBTI scales tended to correlate with interest themes diametrically opposed on the Holland hexagon (Hammer & Kummerow, 1997). In comparison to previous studies, Hammer and Kummerow (1997) were the only researchers to emerge with such broad and theoretically supported correlation patterns. In comparison to the findings of Dillon and Weissman (1987) and Decola (1992), additional evidence was asserted for the existence of the following correlations: MBTI Extraversion and Strong Social interest theme, MBTI Sensing with Strong Conventional interest theme, and MBTI Feeling with Strong Social interest theme.

Within the last year, Buboltz, Thomas, and Johnson (in press) revisited the relationship between MBTI personality dimensions and Strong interest themes but used MANOVA analysis as opposed to Pearson correlation to do so. The dominant Holland theme served as the independent variable and the Extroversion-Introversion, Judgment-Perception, Thinking-Feeling, and Sensing-Intuition continuous scores of the MBTI served as the dependent variables. Significant main effects based on the Holland code were found for three of the four dependent MBTI variables. Specifically, Buboltz et al. (in press) ascertained significant relationships between MBTI Extroversion and Strong Enterprising interest theme, MBTI Feeling and Strong Social as well as Artistic interest

themes, and MBTI Intuitive and Strong Artistic interest theme. Data from Buboltz et al.(in press) corresponded with Dillon and Weissman (1987) and Hammer and Kummerow (1997) for the following relationships: MBTI Intuition and Strong Artistic interest theme, MBTI Extraversion and Strong Enterprising theme, and MBTI Feeling and Strong Artistic interest theme. Data from Buboltz et al. (in print) corresponded only with Decola (1992) on the purported relationship between MBTI Feeling and the Strong Social interest theme. Universal agreement among Buboltz et al. (in press), Hammer and Kummerow (1997), Decola (1992), and Dillon & Weissman (1987) was obtained only for a reported correlation between MBTI Feeling and the Strong Social interest theme. Within the Dillon and Weissman (1987) analysis however, the correlation between MBTI Feeling and Strong Social interest theme was significant only for males. Buboltz et al. (in press) concluded from their analysis that the majority of the differences within their data occurred for individuals with either Artistic or Social Strong interest themes. These differences in personality, according to Buboltz et al. (in press), were in expected directions. For example, commensurate with Dillon and Weissman (1987) and Hammer and Kummerow (1997) findings, Artistic individuals demonstrated higher levels of MBTI Intuition than all other codes. Commensurate with Dillon and Weissman (1987), Decola (1992), and Hammer and Kummerow (1997) findings, individuals with a Strong Social interest theme demonstrated higher levels of MBTI Feeling than all other Strong interest themes (Buboltz et al., in press). Taken together, these results indicated with regard to the MBTI scales, both Artistic and Social interest themes might possess unique personality profiles (Buboltz et al., in press).

Above and beyond the fact that questionable levels of consistency existed across research findings, the validity of the reported findings by McCauley (1978), Dillon and Weissman (1987), Decola (1992), Hammer and Kummerow (1997), and Buboltz et al., (in press) is limited by at least one important consideration: bivariate correlational analysis and/or MANOVA have limited validity when applied to MBTI personality dimensions and Strong interest themes (Frank, personal communication, May 2001). A bivariate correlational design or MANOVA design fails to capture the full depth and breadth of relationships occurring among and between the MBTI personality dimensions and the Strong interest typologies (Frank, personal communication, May 2001). The bivariate correlational analysis such as that employed by, for example, Dillon & Weissman (1987) and Hammer and Kummerow (1996) simply correlated isolated MBTI personality dimensions by independent Strong interest themes and in turn, failed to consider the interactive nature of each. The use of MANOVA, as employed by Buboltz et al., (in press), created a similar problem in that it permitted only one Strong interest theme to serve as a predictor variable at any one time and in turn, failed to fully consider interest themes vis-à-vis other interest themes. It also treated the MBTI variables as categorical, in comparison to continuous, and therefore reduced variability.

Evidence abounds from the development of both the MBTI personality dimensions and the Strong interest themes speaking to the interactive and dynamic nature inherent within both descriptive systems. To illustrate the interactive nature of the Strong interest theme system, Holland (1985) noted in a revision of his theory that a classification system comprised of only six independent themes was insufficient to fully represent human and occupational workplace diversity (Harmon et al., 1994). Holland

50

therefore (1985) expanded his vocational interest classification system to include combinations of the six themes such as Realistic-Artistic and Social-Enterprising. Based upon the evolution of Holland's theory, the General Occupational Themes on the current version of the Strong are ipsative. Practically stated, the six GOTs are essentially ordinal in nature and the continuous score on any theme is relevant only when compared to the scores of the other 5 themes (Buboltz et al., in press).

To illustrate the multivariate nature of the MBTI personality dimensions, Myers and McCaulley (1998) discussed the fact that in developing personality theory,

> Jung, Myers, and Briggs were constantly attentive to the dynamic character of the personality types they were describing. The richness, depth, and breadth of their descriptive systems result from the dynamic interplay of the functions and attitudes inherent in each type. It is important to bear this in mind in applying MBTI theory and interpreting the MBTI personality inventory (p. 23).

MBTI theory asserts that the interactions of MBTI personality dimensions result in behaviors that cannot be predicted from exploration of each preference separately (Myers & McCaulley, 1998). Because each preference in a given type interacts with all of the other preferences in that type, MBTI personality theory asserts that any combination of two or more preferences will yield behaviors that are more than the sum of their parts (Myers & McCaulley, 1998).

The study of the refinement of Jung's personality theory demonstrates the importance he appeared to place on the interactive nature of his evolving personality dimensions. Initially, Jung's attempt to explain individual differences in personality stemmed from his observation that there were two types of people: extraverts and introverts (Myers & McCaulley, 1998). However, ten years after his initial observations,

Jung noted that these two types did not provide a complete picture (Myers & McCaulley, 1998). Jung stated,

> What struck me now was the undeniable fact that while people may be classified as introverts or extraverts, this does not account for the tremendous differences between individuals in either class. So great, indeed, are these differences that I was forced to doubt whether I had observed correctly in the first place. It took nearly ten years of observation and comparison to clear up this doubt (Jung, 1921/1971, p. 535; Myers & McCaulley, 1998, p. 29).

Jung ensuingly subdivided his initial extravert and introvert types into six types by identifying Sensing versus Intuitive type and Thinking versus Feeling type (Myers & McCaulley, 1998). Myers and Briggs extended Jung's model by adding the Judging versus Perceiving dichotomy (Myers & McCaulley, 1998). According to MBTI personality theory therefore, there are unique relations among the personality dimensions that suggest characteristics or behaviors that may not be apparent at a univariate or bivariate level of analysis (Myers & McCaulley, 1998). Myers and McCaulley (1985), for example, interpreted a high score on Thinking differently when it was paired with Sensing than when it was paired with Intuition. Hammer (1996) therefore stated, "researchers are implored to make more use of (MBTI) preference combinations or (MBTI) whole types in their research" (p. 50).

When introducing the review of existent MBTI personality and Strong interest theme research, it was stated within the present manuscript that multiple studies have attempted to explore the relationship between the two. To this point, studies exploring the relationship between the four MBTI personality dimensions (i.e., Extraversion-Introversion [E-I], Sensing-Intuitive [S-N], Thinking-Feeling [T-F], and Judging-Perceiving [J-P]) with the six interest themes (i.e., Realistic [R], Investigative [I], Artistic

[A], Social [S], Enterprising [E], Conventional [C]) via Pearson correlation or MANOVA have been reviewed. Cognizant of dynamic and interactive relationships within MBTI personality dimensions and within Strong interest themes, other researchers have explored the relationship between MBTI personality dimensions and Strong interest themes via grouping MBTI personality dimensions by type (e.g., INFP, ESTJ, etc) and assessing the relationship of these four-letter types with the six Strong interest themes. It is upon these studies that attention will now be focused.

Based upon a sample of 468 college students, Hammer and Kummerow (1997) calculated the three MBTI four-letter personality types with the highest mean score within each of the six GOTs and ranked them in descending order. According to this methodology, the following results emerged: (a) GOT Realistic was correlated with MBTI types ISTP, ENTP, and INTP; (b) GOT Investigative was correlated with MBTI types INTJ, INTP, and ISFP; (c) GOT Artistic type was correlated with MBTI types INFP, ENFP, and ENFJ; (d) GOT Social type was correlated with MBTI types ENFJ, ENFP, INFJ; (e) GOT Enterprising type was correlated with MBTI types ESTJ, ISFJ, and ENFP; (f) GOT Conventional Type was correlated with MBTI types ESTJ, ISFJ, and INTJ. Social and Enterprising Strong interest types were correlated with eleven of the sixteen types within the data cited, corroborating earlier findings that college students generally have higher mean scores on the Social and Enterprising Strong scales than do adult samples (Hammer & Kummerow, 1997). Yet the finding also presented some theoretical conundrums. First, Strong interest theme Conventional was the highest theme code for the MBTI type INTJ yet the dominant MBTI function within the INTJ type, Intuition, was theoretically associated with Strong interest theme Artistic. Bivariate

correlational analyses by Dillon (1987) and Hammer and Kummerow (1997) as well as MANOVA analysis by Buboltz et al. (in print) also documented moderately significant correlations between MBTI Intuition and the Strong Artistic interest theme. Second, the Strong Social interest theme was the highest theme for MBTI type INTP (Hammer & Kummerow, 1997). Yet the dominant function of Thinking and the dominant Attitude of Introversion theoretically, according to the authors, aligned the INTP type more with Strong interest type Conventional. In contrast to the authors' theoretical prediction associating INTP and Conventional, previously discussed bivariate analyses uniformly stated that MBTI Introversion did not significantly correlate with any Strong interest themes (Dillon & Weissman, 1987; Decola, 1992; Hammer & Kummerow, 1997; Buboltz et al., in press) and MBTI Thinking correlated with the Realistic Strong interest theme (Hammer & Kummerow, 1997). According to these results therefore, INTP could theoretically also be aligned with the Strong Realistic interest theme if any theme at all.

Although bivariate correlation analysis and the present typology analysis contained several inconsistencies across findings, some consistencies also existed. Bivariate analyses displayed moderate but significant correlations between MBTI Intuition (Dillon, 1987; Hammer & Kummerow, 1997; Buboltz et al., in press), MBTI Feeling (Dillon, 1987; Hammer & Kummerow, 1997; Buboltz et al., in press), MBTI Perceiving (Hammer & Kummerow, 1997) and the Artistic Strong interest theme. Within the present Hammer and Kummerow (1997) analysis, two of the three four-letter MBTI types associated with the Artistic Strong interest theme were INFP and ENFP. The third type identified was ENFJ (Hammer & Kummerow, 1997).

Based upon data derived from 426 college students, Buboltz, Thomas, and Johnson (in press) employed Chi-square analysis to determine significant relationships among MBTI four-letter personality types and Strong interest themes. Buboltz et al. (in press) Chi-square analysis revealed that the sixteen MBTI types and the Strong GOT types were not independent (Buboltz et al., in press). Several of the MBTI types appeared to cluster within one or two of the Strong interest themes. Specifically, individuals with the ENTJ personality type appeared to cluster in the Strong Artistic and Enterprising interest themes (Buboltz et al., in press). The INFP type tended to cluster in the Strong Artistic and Social interest themes (Buboltz et al., in press). The ESFJ type appeared to cluster with the Strong Social interest theme (Buboltz et al., in press). Significant differences between the six Strong interest types by the sixteen MBTI personality types were difficult to discern among the following personality types: (a) INTJ, (b) ISTP, (c) ESTP, (d) ESFP, (e) and ENTJ (Buboltz et al., in press). Interestingly, no four-letter MBTI type placements by Strong interest themes corresponded between Buboltz et al. (in press) and Hammer and Kummerow (1997). Regarding other findings of note between the two analyses, both placed only MBTI Introverts within Strong Investigative. However none of the previously discussed bivariate or MANOVA analysis found any correlation neither between MBTI Introversion and the Strong Interest themes nor between Strong Investigative and the MBTI personality dimensions. Corresponding with bivariate and MANOVA analyses findings, both placed MBTI Introversion exclusively within the Strong Artistic interest theme and MBTI Feeling exclusively within the Strong Social interest theme.

In addition to the questionable levels of consistency between the findings of

Hammer and Kummerow (1997) and Buboltz et al. (in press), the validity of the reported

findings of these two typology studies is limited by at least one important consideration:

by taking a pure typology approach within the statistical design, investigators have made

MBTI personality dimensions and Strong interest types discrete as opposed to continuous

and have therefore overlooked the subtle complexity of the potential relationships among

MBTI personality dimensions and Strong interest themes. For example, individuals

scoring at the 5th and 35th percentiles of the Thinking-Feeling MBTI scale is treated the

same (Healy, 2000). In contrast, interpreting the score as continuous assumes that people

with higher scores are more likely to show a given personality quality than people with

lower scores regardless of whether they are in the same or different category (Healy,

2000). Pertaining to the MBTI, Healy (2000) explored the validity of categorical (i.e.,

type) analysis versus continuous (i.e., personality dimensions) analysis. The analysis

revealed that type, or categorical, MBTI score interpretation was consistent with two of

the four expected relationships between the MBTI personality dimensions and Strong

interest type scores for women but not for any of the relationships for men within the

sample (Healy, 2000). Healy (2000) concluded that because his statistical design may

have capitalized on sampling error and the findings for male participants did not support

categorical interpretation, replication would be appropriate.

Strong interest themes and MBTI personality dimensions—a call for new research

Researchers have attempted to gain a better understanding of the relationships

between MBTI personality dimensions and Strong interest themes via bivariate

correlational analysis, typology analysis, chi square analysis, and profile analysis. By

.

virtue of not adequately exploring or accounting for potential relationships within each classification system and minimizing variability therein through the use of categorical variables or bivariate analyses, fuller understandings of the potential relationships between the MBTI personality dimensions and the Strong interest types have not been reached. In short, bivariate correlational analyses and the use of categorical data are, in the opinion of this author, not fully appropriate toward the development of deeper understandings of the relationship between MBTI personality dimensions and Strong interest themes. The existence of a gap in the field's understanding of the relationship between the MBTI personality dimensions and the Strong interest types is therefore being asserted. The relevance of exploring this gap hinges upon the fact that the Strong and the MBTI are the two most frequently used vocational assessment instruments across a variety of settings (Hammer & Kummerow, 1997). Furthermore, both instruments promote conjoint usage.

The current proposed study seeks to distinguish itself from previous research through exploring the relationship between and among MBTI personality dimensions and Strong interest themes from a multivariate perspective. The present analysis will reveal which MBTI and Strong variables most strongly covary. Practically therefore, results will highlight those variables that "go together" most frequently. To do so, canonical correlation will be employed to address the following research question: "to what extent and in what ways do MBTI personality dimensions overlap with Strong Interest themes?"

The question will be addressed in three steps. First, canonical correlation will treat the four MBTI dimensions (i.e., E-I, S-N, T-F, J-P) as one set X and will treat the six Holland codes as one set Y. The treatment of each as a set, as opposed to independent

constructs, is theoretically sound. Second, one new variable will be created for set X (MBTI dimensions) and will be called the function of X {f(X)}. It will be comprised of those MBTI personality dimensions that most strongly correlate with one another in relation to Strong interest themes. One new variable will also created for set Y (Holland themes) and will be called the function of Y {f(Y)}. It will be comprised of those Strong GOTs that most strongly correlate with one another in relation to MBTI personality dimensions. Third, the degree of correlation between the two functions will be computed.

Applied to the present study therefore, at least three questions are being asked and directly addressed within the larger research question. First, which MBTI personality dimensions overlap (i.e., covary) with one another in relation to Strong interest types? Second, which Strong interest themes overlap (i.e., covary) with one another in relation to MBTI personality dimensions? Third, how strongly do the MBTI dimensions and Strong dimensions overlap? These questions have not been, to the best of the author's knowledge, previously addressed within the literature.

Hypothesizing regarding potential answers to research questions one and two is theoretically laden and fraught with errant empirical foundations. First, predicting which MBTI personality dimensions overlap with one another, aside from which overlap within the context of Strong interest themes, presents a conundrum. Jung's concept of the personality dimensions grew from his "empirical observations over many years" (Myers & McCaulley, 1998. p. 23) from which Jung reportedly concluded, "I distinguish these functions from one another because they cannot be related to or reduced to one another" (Myers & McCaulley, 1998, p. 23). Second, the prediction of which Strong interest types

overlap with one another in the context of MBTI personality dimensions has not been previously explored in the literature. From a bivariate perspective, the prediction of which GOTs are related to one another has a clearer empirical basis for hypothesis formulation. For example, according to Holland's hexagonal model and principal of consistency, Realistic and Investigative as well as Enterprising and Social should share the highest correlation coefficients. Conversely, Conventional and Artistic should be weakly correlated (Holland, 1985). All other dimensional relationships remaining should share a moderate, at best, degree of correlation (Holland, 1985). However, as was previously stated, the effect of the MBTI dimensions on these relationships is unknown at present. Third, one may look to previous research for guidance but findings are based on bivariate or categorical analyses of the two constructs. As has been discussed, bivariate research has commonly reported the following moderate relationships between the MBTI personality dimensions and the Strong interest themes: MBTI Extravert and Strong Social, MBTI Intuitive and Strong Artistic, MBTI Feeling and Strong Artistic, MBTI Feeling and Strong Social, and MBTI Sensing and Strong Conventional. These relationships should be expected to be valid and reliable in their entirety only if the MBTI personality dimensions and Strong interest themes do not significantly correlate from a multivariate perspective (i.e., if MBTI personality dimensions should be considered as isolated poles and Strong interest themes as isolated types).

The third question addressed via canonical correlation pertains to the extent of overlap between correlated MBTI personality dimensions and Strong interest themes. Hammer and Kummerow (1997) reported bivariate correlations between MBTI preferences and Strong interest themes ranging 0.00 to .48. Specifically, Strong Realistic

was moderately correlated with MBTI Thinking whereas its opposite, Strong Social, was moderately correlated with MBTI Feeling and Extraversion (Myers & McCaulley, 1998). Strong Artistic was moderately correlated with MBTI Intuition, Perceiving, and Feeling whereas its opposite—Strong Conventional—was moderately correlated with MBTI opposites Sensing and Judging (Myers & McCaulley, 1998). Strong Enterprising was moderately correlated with MBTI Extraversion (Myers & McCaulley, 1998). Formally stated, the research hypothesis asserts that the correlation between the two sets (i.e., MBTI personality dimensions and Strong interest themes) and the percent of variance accounted for within the first canonical correlation will be considerably higher than any percentage of variance accounted for by a bivariate regression and correlation analysis procedures.

The relevance of the present study is as follows: it is the first known study to explore the multidimensional complexity of the relationships between MBTI personality dimensions and Strong interest themes from the perspective of (a) the ways in which each of the two interest and personality sets represented on the Strong and MBTI overlap (i.e., covary) and (b) the extent of the overlap between the two sets.

Practically, counselors can gain a theoretically valid understanding as to what MBTI personality dimensions and Strong interest themes tend to go together. Correlations between MBTI personality dimensions and Strong interest types have been used, among other things, in the past to suggest counseling strategy and treatment planning. Using bivariate correlation analysis data, Hammer and Kummerow (1997 identified typical versus unusual MBTI and Strong combinations. Based upon this data, the authors suggested that when a client's Strong and MBTI results indicated an unusual

combination (i.e., in the opposite direction of the correlations), more personal exploration around identity issues was suggested (Hammer and Kummerow, 1997). Hammer and Kummerow (1997) also argued that the joint use of the Strong and the MBTI provided information regarding counseling strategies. For example, with clients whose MBTI type and Holland codes were congruent, counseling strategies were purported to be clearer than with those whose results were incongruent (Hammer & Kummerow, 1997). An ESTJ client with GOT dominant themes Conventional and Enterprising was purported to appreciate a structured and detailed career search strategy whereas an INTJ client with an Investigative and Realistic GOT dominant theme was hypothesized to prefer more individual work encouraging research and reflection (Hammer & Kummerow, 1997). However, the examples drawn by Hammer and Kummerow (1997) are based upon correlation research drawn from analysis of MBTI poles as opposed to dimension combinations. More information is therefore needed highlighting patterns of covariance between interest and personality.

CHAPTER THREE

METHODS

<u>Participants</u>

The sample consisted of 423 undergraduate state university students within the western region of the United States. Forty-five percent (192) of the individuals in the sample were males, 54% (231) were female and the remainder of the sample (n=3), who were excluded from the analysis and were not counted toward the total, did not indicate gender on their assessment materials. The racial and ethnic demographics of the sample were unknown. However, general setting characteristics suggest the sample was primarily White. The university within which the sample was derived announced a year 2000 enrollment of approximately 26,000 students. Students were enrolled at the university representing all 50 states and 102 foreign countries. The international student population in the year 2000 was reported to be approximately 1,600. The majority (i.e., approximately 18,000) of students however were reported to be in-state students representing all counties within the state. The state, according to year 2000 estimates, reported population of approximately 2,000,000 people. Individuals identifying as White comprised approximately 1.9 million of the population totals. Individuals identifying as Asian (apx. 37,000) or as American Indian (apx. 30,000) were the next most frequently occurring population groups.

College students were selected for two reasons. First, the design and hypotheses of the study are an outflow of previous research largely employing college students as the sample. Second, the demand for vocational counseling services appears to be especially high on college campuses and therefore particularly relevant to this population (e.g., Slaney & MacKinnon-Slaney, 1993 in Hammer & Kummerow, 1997).

Procedures

Data for this study were obtained from undergraduate students taking a career development and planning class at a large state university in the western region of the United States. All students who participated in the class were required to complete the Strong Interest Inventory (Harmon, Hansen, Borgen, & Hammer, 1994) and the Myers-Briggs Type Indicator (Myers & McCaulley, 1985). Human Subjects approval was obtained to use the data, which was stored on a computer in the testing center of the university. Once the data was downloaded from the computer, the instruments were matched for each individual. After the matching was completed, the scores on the MBTI indexes were converted to continuous scores as per the procedure outlined in the Manual (Myers & McCaulley, 1985). Within the manualized transformation, a midpoint was set at 100 (Myers & McCaulley, 1985). Preference scores for E, S, T, and J were subtracted from 100. Preference scores for I, N, F, and P were added to 100. The same procedure was employed for the three other polar dimensions of the MBTI. Once the transformations were completed for the MBTI, results from both instruments were then entered in a data file for purposes of statistical analyses. Although continuous variables will be used for the present proposed study, MBTI type categories can be determined based on these continuous scores. For example, on the E-I dimension a score below 100

would be typed as Extravert (E), while scores above 100 would be typed Introvert (I) (Myers & McCaulley, 1985).

The sample was diversified in terms of both personality types and vocational interests with fairly adequate representation of most types and interests. With regards to the MBTI dimensionality, the sample was found to be 47.2% Extravert, 54.2% judging, 46.2% sensing, and 44.1% thinking. Similarly, the continuous scores for these four MBTI scales were 102.5 ($\underline{SD}$ = 27.4), 100.2 ($\underline{SD}$ = 27.4), 102.0 ($\underline{SD}$ = 27.1, and 100.6 ($\underline{SD}$ = 23.8) respectively. Noting once again that a continuous score of 100 indicates the dividing point between Extravert/introvert, judging/perceiving, sensing/intuition, and thinking/feeling, the sample was almost evenly split on all four dimensions of the MBTI.

Measures

Strong Interest Inventory (Harmon, Hansen, Borgen, & Hammer, 1994).

The Strong contains 317 items that assess interests in occupations, interests in different types of people and environments, and interests in leisure activities. Results of the Strong are organized into four areas: Six General Occupational Themes (GOT), 23 Basic Interest Scales, 162 Occupational Scales, and 4 Personal Style Scales (Harmon, Hansen, Borgen, & Hammer, 1994). For the purpose of the present study only the six GOTs were explored (Harmon et al., 1994).

The six General Occupational Themes (GOTs) are based on Holland's (1985) theory of vocational types and reflect a person's overall occupational orientation. The six types are as follows: (a) realistic – people who like action, are concrete, adventurous and who have areas of interest which include mechanical, construction and repair activities; (b) investigative – people who prefer to work alone, have a strong scientific orientation

and enjoy discovering new ideas and facts; (c) artistic – people who value aesthetic qualities, like self-expression, and enjoy being spectators or observers; (d) social – people who enjoy working with others, are caring and nurturing, and solve problems through discussion; (e) enterprising – people who are verbally oriented and enjoy selling, seeking positions of power and leadership; and finally (f) conventional – people who like activities that require organization and attention to detail and accuracy (Buboltz, Thomas, & Johnson, 01).

The GOT scales were normed on a general reference sample consisting of 18,951 employed adults selected on the basis of job satisfaction, job experience, typicality of job description, and age (Harmon et al., 1994). The general reference sample was purported to be randomly constructed and balanced for gender as well as being equally representative of the fifty new occupations added to the Strong (Harmon et al., 1994). Sixty-two percent of women in the sample reported being "very satisfied" in their occupation; the percentage of men reporting the same was 58.7 (Harmon et al., 1994). The remainder of the sample, both male and female, reported being "somewhat satisfied" (Harmon et al., 1994). Women in the sample averaged 13.8 years of experience in their occupation and men averaged 18.2 years of experience (Harmon et al., 1994). The average age of women in the sample was 40.5 years and average age of male participants was 44.6 years (Harmon et al., 1994). Within the total general reference sample, 18,789 reported their ethnicity. Eight percent (n=1,424) were non-Caucasian, two percent (n=378) were African-American, two percent (n=363) were Hispanic/Latino American, less than one percent (n=80) was Native American/American Indian, and approximately 1.4 percent (n=254) was of other ethnicity (Harmon et al., 1994). Across the fifty

occupations represented by the reference sample, 26 had five to ten percent ethnic

minority representation, 9 occupations had more than ten percent ethnic minority

representation, and 15 occupation had less than five percent ethnic minority

representation (Harmon et al., 1994). The highest ethnic minority representations were

for translators (26.7%), childcare providers (20.3%), and flight attendants (19.5%). The

lowest minority representations were for farmers (2.1%), veterinarians (2.3%) and

accountants (2.3%) (Harmon et al., 1994).

The GOT scales were not appreciably changed for several years until the 1994

revision (Harmon et al., 1994). For the 1994 Strong revision, the new GOT scales were

constructed by deleting items weakly correlated with the existing scales and adding items

that were more highly correlated (Harmon et al., 1994). On the new GOTs, Cronbach's

alpha was increased to .90 or better for all six scales, a level previously reached by only

two scales (Harmon et al., 1994). Test-retest reliabilities were also improved. When all

individuals in the 1994 general reference sample were scored on the 1985 and the 1994

GOT scales, the test-retest correlations were .95 for females and .96 for males (Harmon

et al., 1994). The alpha reliabilities for the general occupational themes range from .90

for the Social scale to .94 for the Artistic scale (Harmon et al., 1994). Test-retest

reliabilities were examined over 3 and 6-month time intervals and ranged from .84 for

Enterprising to .92 for Realistic (Harmon et al.). Several research studies have examined

the validity of the GOTs and consistently have concluded that the General Occupational

Themes of the Strong provide the best measure of the Holland RIASEC hexagon (Tracey

& Rounds, 1993). Futhermore, Harmon et al. (1994) stated that the GOTs appear to

separate occupations in accordance with theoretical expectations. Donnay and Borgen

(1996) stated that "it is possible to accurately predict exact occupational group membership from the Strong…people in diverse occupations show large differences in likes and dislikes, whether in terms of vocational interests or in terms of personal styles. The Strong provides valid and comprehensive measures of these differences" (p. 290).

The General Occupational Themes produced on the Strong are ipsative in nature, which is to say that the continuous score on any of the six GOTs are relevant only when compared to scores from the other 5 themes (Buboltz et al., in press). Within the present analysis therefore, individual scores on the six GOTs will be treated as continuous variables to maximize variability.

Myers-Briggs Type Indicator (Myers & McCaulley, 1985).

The MBTI is a 126 item forced-choice instrument. Results from the MBTI classify individuals along four interlocking dimensions, each dimension having two polar preferences. The Extroversion-Introversion index (E-I) indicates whether a person directs his/her perception and judgment upon the environment (E) or upon the inner world of ideas (I). The Sensation-Intuition index (S-N) indicates whether a person relies on sensing (S) or intuition (N) processes in perceiving and dealing with the world. The Thinking-Feeling (T-F) dichotomous dimension indicates whether a person relies on thinking (T) or feeling (F) processes in making judgments. The Judging-Perceiving (J-P) index, indicates whether a person uses judging (J) or a perceptive (P) attitude in dealing with the environment. With the use of four indices, 16 types can be generated and the individuals in these types are presumed to differ in preferences, personality characteristics, value judgments, interests, and numerous surface traits (Buboltz, Thomas, & Johnson, in press).

For each index, a series of dichotomous items exists. The first dimension is a general attitude toward the world either extraverted (E), which reflects the individual's preference for an interactive outer world, or introverted (I), where attention and energy are directed inward, focusing on internal representations of the world.

The second dichotomy that Jung defined is Sensation-Intuition (S-N), which reflects two different modes of perceiving. The Sensation type prefers perception of the observable environment directly through the senses and orients cognitively to facts and details. Intuition, on the other hand, refers to going beyond the information that is provided by the senses and looks for meaning and possibilities within the data received and processed. The Sensation dimension is reflected in practical and realistic characteristics of the environment whereas the Intuition dimension is associated with the preference for creative and imaginative processes (Buboltz et al., in press).

The Thinking-Feeling (T-F) dichotomy reflects two different ways of judging the world. Once information is received, it is assumed to be processed in either a Thinking (T) or Feeling (F) style. The Thinking style prefers a reliance on reasoning, logic, and impersonal methods to make judgments about the world. Conversely, the Feeling (F) style arranges the contents of consciousness based on relevance to needs for affiliation, harmony, and warmth (Buboltz et al., in press).

The final dimension, Judgment-Perception (J-P), reflects a preference for judging or perceiving functions. This dimension was proposed by Myers (1962) and serves a dual purpose in the interpretation of the MBTI. The Judging (J) theme prefers situations to be planned and orderly, to be completed, and for issues to be resolved. Individuals who prefer the Perception (P) theme prefer to live a more flexible style, in a reactive manner,

tending to keep their options open while gathering more information. Individuals are viewed as needing both of these attitudes, but with one of the styles being dominant over the other style. Another purpose of the J-P dimension is to determine dominant versus auxiliary functions (Buboltz et al., in press).

Although the MBTI items were written within a forced-choice format, the instrument is not purported to be as aversive to most as other forced-choice instruments (Myers & McCaulley, 1985). This claim is based upon the fact that all items reflect two opposing rather than two competing choices. Construction of the current version of the MBTI entailed the following process: (1) determining items to reflect preferences described by Jung for all four dichotomies; (2) identifying the dominant and auxiliary functions via the development of the J-P dichotomy; (3) writing, testing, weighting, and selecting items that would achieve the greatest separation and least amount of overlap between the dichotomies; (4) establishing precision in the center of the scale so that persons with indeterminate preferences would be more likely classified according to their true preferences; (5) establishing an objective check on the division points for each dichotomy (Myers & McCaulley, 1985).

The original research for the MBTI measured the responses of a variety of populations ranging from fourth grade students to older adults (Myers & McCaulley, 1985). From 1942 to 1944, a large number of MBTI questions were written and evaluated based upon a criterion group consisting of approximately twenty of the authors' relatives and friends (Myers & McCaulley, 1985). Items created from this initial validation trial became Form A. Form B was a rearrangement of the same items (Myers & McCaulley, 1985). Form C reflected an advance in validity testing wherein items that

were highly intercorrelated were omitted (Myers & McCaulley, 1985). Form C3 represented yet another statistical advance, incorporating item weights to better differentiate individuals scoring toward the middle of the poles (Myers & McCaulley, 1985). Form D was published in 1962. Revisions to Form D focused upon item delivery. Specifically, key words or phrases within items were thought to trigger preference differentiation. Therefore, Form D introduced word-pairing that consisted of key words only and eliminated potentially obfuscating or unnecessary item content (Myers & McCaulley, 1985). Ensuing Forms E and F evolved from sex and type evaluation of Form D items (Myers & McCaulley, 1985). Form G, originating in 1977 and revised in 1985, was normed on 1,114 males and 1,111 females in grades 4-12 within three Maryland public schools and four private schools in Pennsylvania (Myers & McCaulley, 1985). Form G reflects several improvements to Form F. Forty items were omitted for validity reasons. Nine of the items were rewritten to avoid ambiguity. The items were rearranged so that the scored items were presented prior to the unscored items. The respondent therefore must provide feedback on the first 95 items for the instrument to be scored (Myers & McCaulley, 1985). The additional thirty-one items were unscored and experimental.

The internal consistency of the four MBTI scales was quite high in all samples available to date, whether computed using logical split-half, consecutive item split-half, or coefficient alpha (Myers & McCaulley, 1998). A summary of Form G data suggests that sample characteristics related to type development may create reliability variation across groups. Specifically, groups composed of people who are believed to have less command over perception and judgment (e.g., chronologically younger participants)

should exhibit lower reliabilities (Myers & McCaulley, 1998). The quality of perception and judgment has also been found to be influenced by an individual's level of achievement (Myers & McCaulley, 1998). It is therefore expected that within samples consisting of comparable age levels, those individuals with higher achievement levels will report their preferences more consistently (Myers & McCaulley, 1998). College and university samples possessed higher reliabilities than did high school samples (Myers & McCaulley, 1998). Reliabilities were also found to be higher in groups with higher average intelligence as measured by standard intelligence tests (Myers & McCaulley, 1998). Nonetheless, internal consistency coefficients based on coefficient alpha have been deemed to be acceptable for adults and adequate for younger samples alike (Myers & McCaulley, 1985). Based upon a data bank consisting of 32,671 individuals, split half correlations for Form G were .82 (E-I), .84 (S-N), .83 (T-F), and .86 (J-P) (Myers & McCaulley, 1998).

Test-retest reliabilities of the MBTI demonstrate consistency over time with levels of agreement much greater than chance (Myers & McCaulley, 1998). From a meta-analytic sample consisting of 1,139 individuals, Form G demonstrated test-retest reliabilities across a time period of less than nine months of .84 (E-I), .81 (S-N), .77 (T-F), and .82 (J-P) (Myers & McCaulley, 1998). Across a time period greater than nine months, test-retest reliabilities were .70 (E-I), .68 (S-N), .59 (T-F), and .63 (J-P) (Myers & McCaulley, 1998). The reliability coefficient for the T-F scale is the lowest of the four scales in Form G (Myers & McCaulley, 1998). When subjects reported a change in type, it was most likely to occur in only one preference, and in scales where the original preference clarity was low (Myers & McCaulley, 1998). Changes in mood were not

found to significantly affect test-retest correlations (Myers & McCaulley, 1998). Isabel Myers administered one of the original forms of the indicator to the 87 members of a high school class graduating in 1943. At the 50th reunion of the class, Katherine Myers administered Form G to 39 of these same people. Over this fifty-year period, eight people (21%) had the same type, 13 (33%) had changed one letter, 16 (41%) had changed two letters and two (5%) had changed three letters (Myers & McCaulley, 1998). No one in the group changed all four letters. Over a fifty-year interval therefore, 54 percent changed either none or one letter whereas the level of agreement expected by chance would be approximately 6 percent (Myers & McCaulley, 1998).

Hammer (1996) concluded that the reliability of the MBTI continuous preference scores appeared to be quite good. For individuals whose preference scores lie outside of the uncertainty zone surrounding type cutoffs, type assignment appeared to be reasonably stable over time (Hammer, 1996). Yet test-retest reliability has been referred to as the Achilles heel of the MBTI among its critics (Hammer, 1996). Hammer (1996) highlighted that because cutoff scores are used within each of the four dichotomies, the size of acceptable standard error around the cutoff score is decreased. Furthermore, under the current scoring system research indicates that many individuals receive low preference scores (Hammer, 1996). Therefore, forcing such individuals to fit into a two-category structure can produce a high rate of erroneous classifications (Hammer, 1996). Most of the type-switches within test-retest analyses occur not surprisingly in individuals with low preference clarity (Hammer, 1996). Hammer (1996) suggested efforts to improve the measurement precision of the MBTI at the cutoff point via the addition of

test items or the use of Item Response Theory-based scoring to decrease the number of individuals scoring close to the cutoffs.

Exploratory and Factor analytic results have offered strong support for the construct validity of the MBTI (Myers & McCaulley, 1998). Several exploratory studies employing large samples have produced factor analytic structures that almost exactly matched hypothesized patterns of loadings (Myers & McCaulley, 1998). Myers and McCaulley (1998) recently concluded, "there is no question that the results of the factor analytic studies reported over the last ten year period have been very supportive of the validity of the four-scale structure of the MBTI" (p. 173). Hammer (1996) concluded large amounts of empirical data indicated that MBTI scores demonstrated good convergent, discriminant, and predictive validity.

The MBTI scales have been correlated with a number of personality and interest scales across multiple studies (Myers & McCaulley, 1998). Results of the analyses are presented within the Myers-Briggs Type Indicator Manual (Myers & McCaulley, 1998). MBTI Extraversion has been found related to extraversion as measured by the 16 Personality Factors, Millon Index of Personality Styles, NEO-PI, and the Jungian Type Survey (Myers & McCaulley, 1998). Constructs related to MBTI Extraversion included: (a) sense of comfort in the environment which is demonstrated in measures named self-acceptance, well-being, autonomy, self-confidence, and stability; (b) action on the environment as shown in correlations with dominance, assertiveness, social boldness, capacity for status, leadership, change, aggression, and exhibitionism; (c) sociability and relatedness to others as shown in scales such as outgoing, sociability, social interaction, social relations, valuing of community, empathy, high interpersonal needs, and peer

cohesion; (d) responsiveness to the environment shown in measures such as liveliness; (e) ways of coping by the use of social and emotional resources; and (f) career interests that relate to general social and enterprising interests (Myers & McCaulley, 1998).

MBTI Introversion type has been correlated with introversion as measured by the 16 Personality Factors, Millon Index of Personality Styles, NEO-PI, and the Jungian Type Survey (Myers & McCaulley, 1998). Constructs related to MBTI Introversion included: (a) lack of comfort with the environment in measures such as anxiety, hesitating, retiring, abasement, deference, yielding, and accommodating; (b) need to control external stimulation in scales such as privateness and preserving; (c) independence from the environment in measures such as self-reliance and self-control; (d) tendency to be stressed by environmental demands as evidenced by correlations with burnout scales such as exhaustion and depersonalization; (e) career interests in the investigative and scientific areas (Myers & McCaulley, 1998).

MBTI Sensing type has been correlated with sensing as measured by the Millon Index of Personality Styles and the Jungian Type Survey (Myers & McCaulley, 1998). Constructs related to MBTI Sensing included: (a) taking a practical approach such as in correlations with tough-mindedness; (b) managing reality as demonstrated by correlations with scales such as control and order; (c) accepting reality as seen in relationships with measures of rule consciousness, accommodating, retiring, self-control, conforming, yielding, socialization, endurance, achievement via conformity, norm favoring, deference and a valuing of home activities, economic security, and physical comfort; and (d) career interests including conventional, athletics, mathematics, law, organizational management, data management, and office services (Myers & McCaulley, 1998).

MBTI Intuitive was correlated with intuitiveness as measured by the Millon Index of Personality Styles, and the Jungian Type Survey (Myers & McCaulley, 1998). Constructs related to MBTI Intuitive included: (a) openness to the environment as demonstrated by correlations with variables such as modifying, sensitivity, openness to change, risk-taking, flexibility, and variety; (b) thinking abstractly in relationships with measures of reasoning, abstractedness, intellectual efficiency, and valuing of an academic learning environment; (c) independence as seen in correlations with scales measuring achievement via independence, free child, and autonomy; and (d) career interests such as music, drama, art, applied arts, and writing (Myers & McCaulley, 1998).

MBTI Thinking type has been correlated to thinking as measured by the Millon Index of Personality Styles and the Jungian Type Survey (Myers & McCaulley, 1998). Constructs related to MBTI Thinking included: (a) logical analysis as demonstrated by correlations with scales such as asserting, dissenting, complaining, tough-mindedness, expressed control, and order; (b) behaviors related to thinking and acting independently as with measures of independence, autonomy, achievement, endurance, and risk-taking; and (c) career interests in the realistic and investigative areas and in mechanical activities, science, mathematics, law, and data management (Myers & McCaulley, 1998).

MBTI Feeling type has been found to be related to feeling as measured by the Millon Index of Personality Styles and the Jungian Type Survey (Myers & McCaulley, 1998). Constructs related to MBTI Feeling included: (a) concern for others as demonstrated by correlations with measures of nurturing, warmth, and affection; (b) adaptability to others as shown in variables such as accommodating, agreeing, sensitivity, deference, and desire for peer cohesion; and (c) career interests in the social and artistic

areas and activities such as music, drama, art, culinary art, social service, and people-oriented workstyle (Myers & McCaulley, 1998).

MBTI Judging type has been correlated with (a) attempt to create order in the environment as shown in correlations with scales such as systematizing, perfectionism, and control; (b) respect for social mores as shown in relationships with scales such as order, conforming, rule consciousness, responsibility, socialization, self-control, endurance, and valuing economic security; and (c) career interests in the conventional area and in data management and office services activities (Myers & McCaulley, 1998).

Constructs relating to MBTI Perceiving type include (a) openness to environment as shown by relationships with measures of innovation, openness to change, abstractedness, flexibility, variety, creativity, change, and risk-taking; (b) career interests in the artistic area and interests in activities related to nature, music, drama, art, and writing (Myers & McCaulley, 1998).

Myers and McCaulley (1998) asserted at least two warnings regarding interpreting correlation results. First, several of the correlation analyses performed employed MBTI preference scores as opposed to MBTI continuous scores. The conventional notation therefore that positive correlation associated with, for example, I, N, F, and P connote negative correlation with E, S, T, and J are not applicable. On the other hand, correlations of MBTI continuous scores have their limitations as evidence for construct validity. They report only the four preference scores one at a time and do not show the sixteen types as dynamic entities. Correlations also have the problem of clarity of preference.

The principal criticism to the validity of the MBTI is the use of bipolar types. Jungian theory posits the existence of dichotomies yet some have argued that evidence of bimodal distributions of preference scores is nonexistent. If Jung was correct about dichotomous populations and if the MBTI correctly separates the two populations on each preference scale then discontinuity around the midpoint of each scale is expected (Myers & McCaulley, 1998). In order to constitute a discontinuity, there must be a significantly greater rate of change at the point of discontinuity than at either side of the point (Myers & McCaulley, 1998). According to Myers and McCaulley (1998) recent research has indicated that evidence for the dichotomous nature of the scales was established in plots of preference scores against external variables such as intelligence, vocabulary skill, and academic major. Analyses of these plots demonstrated that the only significant differences between successive groups of scores were exactly at the midpoint of the scales. (Myers & McCaulley, 1998).

Design

Canonical correlation will be employed to explore the following question: to what extent and in what ways do MBTI personality dimensions overlap with Strong interest themes? This method of data analysis will address the research question in three stages. First, canonical correlation will treat the eight MBTI dimensions as one set X and will treat the six Holland themes as one set Y. The treatment of each as a set is theoretically valid and allows for the exploration of relationships within each set (i.e., X and Y). Second, one new variable will be created for set X (i.e., MBTI poles) and will be called the function of X {f(X)}. One new variable will also created for set Y (i.e., Holland types) and will be called the function of Y {f(Y)}. Third, the correlation between

77

f(X) and f(Y) will be analyzed. Analysis of the correlation between functions (f) facilitates a multivariate exploration of the relationship between sets MBTI and Strong.

The composition and analysis of Eigen values and Eigen vectors serves as the foundation for canonical correlation. First, correlation within and between variable sets X and Y yields Eigen values. Second, Eigen values mathematically yield Eigen vectors. Third, Eigen vectors provide the recipe for combining set X and set Y into functions. Specifically, Eigen vectors always collapse set X and set Y in such a way as to yield the best possible correlation. Fourth, after sets X and Y have been combined into a function, a canonical correlation value is given indicating the level to which the canonical functions are correlated. Finally, the canonical correlation value squared indicates the proportion of variation accounted for in set Y by set X within a particular function. The first function is typically the only function that is analyzed because it represents the best fit between the sets. However, dimension reduction analysis can be employed to statistically determine the amount of functions to explore.

Canonical correlation is not limited by unequal cell size considerations (K. Frank, personal communication, February 2001). Given the fact that the proposed study is attempting to estimate at least 16+6+1 parameters, 200 observations were needed to achieve fairly stable results (K. Frank, personal communication, February, 2001). A sample size of 423 was therefore comfortably sufficient to perform the analysis.

CHAPTER FOUR

RESULTS

Archival data were collected from 426 undergraduate students from a state

university located in the western region of the United States. The data of three

individuals were excluded due to missing information, reducing the sample to 423. Each

of the 423 individuals had taken both the Myers-Briggs Type Indicator (1986, Form G)

and the Strong Interest Inventory (1994). Scores on each of the four polar dimensions of

the MBTI indexes were converted to continuous scores creating the following pairs: (1)

Extravert/Introvert (EI), (2) Sensing/Intuitive (SN), (3) Thinking/Feeling (TF), and (4)

Judging/Perceiving (JP). The data also included individuals scores on the following six

General Occupational Themes (GOT) within the Strong: (1) Realistic, (2) Investigative,

(3) Artistic, (4) Social, (5) Enterprising, (6) Conventional.

Sample Demographics and Distribution

Frequency data was generated to determine if basic distributional assumptions

underlying multivariate analysis were satisfied. Frequency analysis demonstrated that the

sample consisted of 192 (45 percent) males and 231 (55 percent) females. Frequency

data regarding MBTI personality dimensions revealed the following sample distribution:

47 percent were classified as Extravert (n=200) and 53 percent as Introvert (n=223); 46

percent were Sensing (n=196) and 54 percent (n=227) were Intuitive; 44 percent (n=187)

were Thinking and 56 percent (n=236) were Feeling; 54% (n=228) were Judging and 46

percent (n=195) were Perceiving. The mean EI continuous score was 102.5 (SD = 27.4),

the mean SN score was 100.2 (SD = 27.4), the mean TF score was 102.0 (SD = 27.1),

and the mean JP continuous score was 100.6 (SD = 23.8). Probability plots for all four

continuous dimensions demonstrated normal distributions of scores around the mean of 100.

Frequency and descriptive data on the six General Occupational Themes (GOT) revealed that each were normally distributed around the mean of fifty. The mean Realistic score was 47.09 (SD = 9.59), the mean Investigative score was 46.86 (SD = 9.93), the mean Artistic score was 51.57 (SD = 9.89), the mean Social score was 51.58 (SD = 10.07), the mean Enterprising score was 52.29 (SD = 9.36), and the mean Conventional score was 49.90 (SD = 9.30). Probability plots for each of the six GOTs corroborated the fact that the data was normally distributed.

Bivariate Relationships between MBTI dimensions and GOTs: Full Data Set

Similar to research previously performed and cited exploring the relationship between MBTI poles and Strong interest themes, Pearson correlations were calculated to determine what bivariate relationships existed within the sample (a) *among* the MBTI dimensions, (b) *among* the six GOT interest themes, and (c) *between* the four personality dimensions of the MBTI and the six GOTs. These analyses were performed for to satisfy two purposes. First, the analyses permitted the testing of the hypothesis that the percent of variance accounted for within the first canonical correlation for the full data set would be higher than any percentage of variance accounted for by bivariate analysis procedures. Second, because canonical correlation describes the relationships between canonical variates but does not describe relationships between the variables on the same side of the equation (e.g., the direction of the relationship between variables within the Strong variate), bivariate analyses can be used to hypothesize direction of relationships within canonical variates.

As highlighted on Table 1 (see below), bivariate analysis among the MBTI dimensions revealed the following statistically and practically significant (p<.05, r<.3) relationship: SN and JP were positively correlated (r = .407). This finding is consistent with previously cited bivariate analyses. Results are also confirmed Jung's theory that the personality dimensions are, from a bivariate perspective, largely independent of one another.

Table 1 - Bivariate Correlations Among MBTI Personality Dimensions: Full Data Set

	Extravert-Introvert value	Sensing-iNtuition value	Thinking-Feeling value	Judging-Perceiving value
Extravert-Introvert value	1.000	-0.1163	-.0613	-.1043
Sensing-iNtuition value	-.1163	1.000	.0813	.4071*
Thinking-Feeling value	-.0613	.0813	1.000	.0289
Judging-Perceiving value	-.1043	.4071*	.0289	1.000

Note: asterisk (*) indicates statistically significant relationship at the .05 level

Bivariate analysis among the six GOTs revealed numerous statistically and practically significant (p<.05, r>.3) relationships. As Table 2 indicates (see next page), the strongest relationship existed between Realistic and Investigative. This finding was commensurate with Holland's theory of consistency. The strength of relationships between Enterprising and Conventional, Enterprising and Social, and Artistic and Social supported Holland's hexagonal arrangement of RIASEC according to the theory of consistency as well. Perhaps of mild surprise vis-à-vis theory was the strength of the relationship found between Investigative and Conventional (see Table 2 next page). Although the fact that a significant relationship between the two dimensions does not

contradict Holland's (1985) theory of consistency, the strength of the relationship was more significant than other relationships, such as Enterprising and Social, predicted by Holland's (1985) consistency theory to be stronger. Unique sample characteristics may have been at play, suggesting the need for retesting before reliable generalizations of the present findings are made.

Table 2 - Bivariate Correlations Among General Occupational Themes: Full Data Set

	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
Realistic	1.000	.5083*	.2044	.1428	.1012	.2077
Investigative	.5083*	1.000	.2456	.1525	.0457	.3487*
Artistic	.2044	.2456	1.000	.3173*	.2228	.0061
Social	.1428	.1525	.3173*	1.000	.3264*	.2631
Enterprising	.1012	.0457	.2228	.3264*	1.000	.4515*
Conventional	.2077	.3487*	.0061	.2631	.4515*	1.000

Note: asterisk (*) indicates statistically significant relationship at the .05 level (r>.3)

Bivariate correlations were also calculated between the four MBTI personality dimensions and the six interest themes (see Table 3 below). A positive correlation indicated a relationship between higher MBTI dimension scores and the respective GOT. Conversely, a negative correlation indicated a relationship between the lower MBTI dimension scores and the respective GOT.

Table 3 - Bivariate Correlations Between the MBTI Dimensions and GOT: Full Data Set

Strong/MBTI	Extravert-Introvert	Sensing-iNtuition	Thinking-Feeling	Judging-Perceiving
Realistic	-.02077	-.03664	-.11468*	.18965*

Table 3 (cont'd).

Investigative	.05906	.08469	-.10108*	.01416
Artistic	-.07976	.050426*	.11882*	.13828*
Social	-.14242*	-.00313	.38351*	-.09575*
Enterprising	-.29950*	-.04185	-.07846	-.06842
Conventional	-.01267	-.25047*	-.05895	-.21647*

Note: asterisk (*) indicates statistically significant relationship at the .05 level

Statistically and practically significant (p<.05, r>.3) relationships were found between MBTI personality dimension SN and Strong GOT Artistic (p<.0001; r=.504), MBTI personality dimension TF and Strong GOT Social (p<.0001; r=.384), and between MBTI personality dimension EI and Strong GOT Enterprising (p<.0001; r= -.299). Weak yet statistically significant relationships (p<.05, r<.3) were found between the following nine MBTI personality dimensions and Strong GOT interest themes: MBTI personality dimension SN and GOT Conventional (p<.0001; r= -.250), MBTI personality dimension JP and GOT Conventional (p<.0001; r= -.216), MBTI personality dimension JP and GOT Realistic (p<.0001; r= .190), MBTI personality dimension EI and GOT Social (p=.0033; r= -.142), MBTI personality dimension JP and GOT Artistic (p=.0044; r=.138), MBTI personality dimension TF and GOT Artistic (p=.0145; r=.119), MBTI personality dimension TF and GOT Realistic (p=.0183; r= -.115), MBTI personality dimension TF and GOT Investigative (p=.0377; r= -.101), and MBTI personality dimension JP with GOT Social (p=.0491; r= -.096). Table 4 (see next page) summarizes these relationships in descending order by absolute value of the correlation.

Table 4 - Significant Bivariate Correlations Between the MBTI Dimensions and GOT
Listed by Absolute Correlation Value: Full Data Set

MBTI	GOT	Correlation (r)
SN	Artistic	.504
TF	Social	.384
EI	Enterprising	-.300
SI	Conventional	-.250
JP	Conventional	-.216
JP	Realistic	.190
EI	Social	-.142
JP	Artistic	.138
TF	Artistic	.119
TF	Realistic	-.115
TF	Investigative	-.101
JP	Social	-.096

The most variation accounted for via bivariate analysis occurred between MBTI

personality dimension SN and Strong GOT Artistic (r=.503). It may therefore be stated

that Strong Artistic accounted for 25 percent of the variance in SN scores within the

present sample.

Canonical Correlation Analysis: Full Data Set

Unique to the present analysis was the use of canonical correlation to identify

latent relationships between the four MBTI personality dimensions and the six

occupational interest themes. The specific question being addressed is as follows: to what extent and in what ways do the MBTI personality dimensions and the Strong GOTs overlap? Theoretically and statistically, canonical correlation represents the soundest data analytic design to explore the relationship among and between these variables. Through the simultaneous analysis of correlations within sets X (i.e., MBTI personality dimensions) and Y (i.e., Strong GOT) and between sets X and Y, canonical correlation creates a statistical procedure for combining sets X and Y into a function. A function represents the best possible correlation between variable sets X and Y and yields a value that indicates the level to which the variable sets are correlated. The canonical correlation value squared indicates the proportion of variation accounted for in set Y by set X within a particular function. The first function is typically the only function that is explored because it represents the best fit between the variable sets (K. Frank, personal communication, 11/99).

To What Extent Do the MBTI Personality Dimensions and the Strong GOTs Overlap: Full Data Set

Canonical correlation analysis on the full data set yielded four statistically significant canonical functions (see Table 5 below).

Table 5 - Canonical Correlation Analysis: Full Data Set

Canonical Function	P-value	Canonical Correlation	Squared Canonical Correlation
1	<.001	.600	.360
2	<.001	.497	.247
3	<.001	.339	.115

Table 5 (cont'd).

4	<.001	.289	.084

Although all four functions differed significantly (p<.05) from zero, the practical

significance of functions three and four was questionable. Specifically, a danger with a

sample size as large as the one employed in the present analysis was that several

functions might appear significant (Grunden, personal communication, February 2002).

What is practically significant, as determined by the magnitude of the relationship,

therefore becomes an important consideration (Grunden, personal communication,

February 2002). The first two functions accounted for 36 percent and 24 percent

respectively of the proportion of shared variance between the four MBTI personality

dimensions and the six Strong occupational interest themes. Functions one and two

accounted for 60 percent of total shared variance. In comparison, function three

accounted for only 12 percent of shared variance and function four accounted for only 8

percent of shared variance. Statistically, redundancy analysis results may be explored to

determine the practical significance of a given function (Grunden, personal

communication, February 2002). The redundancy index (see Table 6 next page) on the

present canonical analysis revealed significant decreases from functions one (proportion

index = .0942) and two (proportion index = .0623) to functions three (proportion index =

.0287) and four (proportion index = .0199). The analysis therefore proceeded with the

interpretation of the first two significant canonical functions.

Table 6 - Canonical Redundancy Index: Full Data Set

Canonical Function	Canonical R-Square	Proportion Index
1	.3604	.0942
2	.2470	.0623
3	.1152	.0287
4	.0837	.0199

In What Ways Do the MBTI Personality Dimensions and the Strong GOTs Overlap: Full Data Set.

A general principle of canonical interpretation is to include within a function any variable with a standardized coefficient greater than or equal to +/-.25 (Grunden, personal communication, February 2002; K. Frank, personal communication, March 2002). Typically, if the standardized coefficient value closely approximates .25 but its validity for inclusion within a function remains in question, confirmation of the most important variables can be attained via exploration of values yielded as a result of correlations with the canonical variate and correlations with the opposite canonical variate (Grunden, personal communication, February 2002; K. Frank, personal communication, March 2002). By this method, a variable may reliably be included within a canonical function if at least two of the three methods discussed above indicated (Grunden, personal communication, February 2002; K. Frank, personal communication, March 2002).

Using the inclusion criteria described above, SN was the most important (standardized coefficient = 1.0340) within the MBTI variate on the first canonical function and Artistic (.9195), Realistic (-.3651), and Conventional (-.3056) were the most

important variables within the GOT set on the first canonical function (see Table 7

below).

Table 7 - Inclusion Criteria for First Canonical Function: Full Data Set

1st Canonical Function	Standardized Coefficient	Correlation w/ Canonical Variate	Correlation w/ Opposite Canonical Variate
	MBTI 1	MBTI 1	GOT 1
Extravert-Introvert	.117	.005	.003
Sensing-iNtuition*	1.034	.962	.578
Thinking-Feeling	.184	.255	.153
Judging-Perceiving	-.180	.234	.140
	GOT 1	GOT 1	MBTI 1
Realistic*	-.365	-.159	-.096
Investigative	.200	.122	.073
Artistic*	.920	.848	.509
Social	-.023	.113	.068
Enterprising	-.166	-.134	-.081
Conventional	-.306	-.387	-.232

Note: asterisk (*) indicates inclusion in the first canonical function, full data set

The complete relationship determined by the first canonical function was as

follows: MBTI = .1173 EI + 1.0340 SN + .1835 TF - .1801 JP; GOT = -.3651 R + .1997

I + .9195 A - .0228 S -.1656 E -.3056 C. This relationship may be summarized as

follows: SN ←→ Artistic – 1/3 (Realistic + Conventional) =.60. The equation

symbolizes the fact that the maximum correlation between the four MBTI personality

dimensions and the six Strong GOTs was obtained when an individual's SN score was

correlated with the linear combination of their Artistic score minus one-third the sum of

the Realistic and Conventional scores.

The correlation being interpreted from canonical correlation is that which exists

between the two canonical variates or sets of variable. Based upon canonical correlation

findings, it may therefore validly be stated that higher levels of a variable on one side of

the canonical equation are correlated with higher or lower, depending upon the factor loading direction, values of a variable on the other side of the equation. Within canonical correlation however, inferences regarding the relationship between two variables on the same side of the function based upon the function alone cannot be validly drawn. One must look at the simple bivariate correlations for that information (Grunden, personal communication, May 2002).

Applied to the present data, 36 percent of the variation within an individual's SN score was accounted for by their Artistic, Realistic, and Conventional scores. Simple bivariate correlations suggested that within the Strong variate, Artistic and Realistic were positively and significantly (weak) correlated (r=.20), Artistic and Conventional were uncorrelated (r=.00), and Realistic and Conventional were positively and significantly (weak) correlated (r=.21).

Analysis revealed that the second canonical function was composed of MBTI variables TF and JP and GOT variables Social, Realistic, and Enterprising (see Table 8 below).

Table 8 - Inclusion Criteria for Second Canonical Function: Full Data Set

2nd Canonical Function	Standardized Coefficients	Correlations w/ Canonical Variate	Correlations w/ Opposite Canonical Variate
	MBTI 2	MBTI 2	GOT 2
Extravert-Introvert	-.044	-.044	-.022
Sensing-iNtuition	-.155	-.223	-.111
Thinking-Feeling*	.916	.896	.445
Judging-Perceiving*	-.362	-.394	-.196
	GOT 2	GOT 2	MBTI 2
Realistic*	-.337	-.336	-.167
Investigative	.224	-.228	-.113
Artistic	-.137	-.032	-.016
Social*	.993	.790	.393

Table 8 (cont'd).

| Enterprising | -.392 | - .056 | -.028 |
| Conventional | .193 | .128 | .064 |

Note: asterisk (*) indicates inclusion in the second canonical function, full data set

The complete relationship determined by the second canonical function was as follows: MBTI = -.0436 EI - .1548 SN + .9162 TF - .3623 JP; GOT = - .3367 R -.2242 I - .1369 A + .9931 S - .3918 E + .1928 C. The relationship determined by the second canonical function is summarized as follows: TF - 1/3 JP ←→ Social - 1/3 Realistic = .497. The equation signifies that the second largest correlation occurs when the linear combination of an individual's TF score minus one-third of their JP score is correlated with their Social score minus one-third their Realistic score. Although the method of standardized coefficients suggests that Enterprising might have had some importance, the other two methods disagreed with this result (see Table 8 above). Practically, the second canonical function indicated that 24 percent of the variation within an individual's TF and JP scores was accounted for by their Social and Realistic scores. Bivariate correlations suggested that TF and JP were positively but not significantly correlated (r=.01). Social and Realistic were positively and significantly (weak) correlated (r=.14).

A sensitivity analysis validated the results obtained within the first and second canonical functions. Three of the variables in the GOT set were selected and removed one at a time and canonical correlations were repeated. Coefficients and correlations did not vary significantly upon the removal of one of the variables from the GOT set (Grunden, personal communication, 11/01).

In addition to the use of canonical correlation, a second unique aspect of the

present study was the consideration of the effect of gender on the latent relationships

between the four MBTI personality dimensions and the six occupational interest themes.

Because differences are purported to exist between males and females on the GOT

dimensions, the data set was divided according to gender. Bivariate correlations between

the four MBTI personality dimensions and the six GOTs were computed as were

canonical correlations on each gender set.

Frequency data indicated that the male sample consisting of 192 individuals was

normally distributed around the mean of fifty on the six GOT scales. The mean Realistic

score was 51.06 (SD = 9.93), the mean Investigative continuous score was 48.44 (SD =

10.19), the mean Artistic continuous score was 48.83 (SD = 9.98), the mean Social

continuous score was 50.07 (SD = 10.19), the mean continuous Enterprising score was

52.47 (SD = 9.83), and the mean Conventional continuous score was 49.19 (SD = 8.96).

Males were also normally distributed around the mean of 100 along each of the four

MBTI dimensions. The mean EI value was 103 (SD=25.59), the mean SN value was 99

(SD=27.19), the mean TF value was 95 (SD=22.61), and the mean JP value was 104

(SD=27.17).

Bivariate Correlations Between MBTI Dimensions and GOTs: Male Data Set

Simple bivariate correlations were calculated to explore two-dimensional

relationships within the male sample between the four personality dimensions of the

MBTI and the six GOTs. As highlighted on Table 9 (see next page), bivariate analysis

revealed statistically significant (p<.05) relationships between MBTI personality

dimension SN and Strong GOT Artistic (r=.481) and between MBTI personality

dimension TF and Strong GOT Social (r=.361). Statistically significant but weak

relationships were found between MBTI personality dimension EI and Strong GOT

Enterprising (r= -.284), between MBTI personality dimension SN and GOT Conventional

(r= -.241), between MBTI personality dimension JP and GOT Conventional (r= -.257),

between MBTI personality dimension JP and GOT Artistic (r=.148), and between MBTI

personality dimension JP with GOT Social (r= -.187).

Table 9 - Bivariate Correlations Between the MBTI Dimensions and GOT: Male Data Set

	Extravert-Introvert	Sensing-iNtuition	Thinking-Feeling	Judging-Perceiving
Realistic	-.07674	-.13825	-.00515	.06353
Investigative	-.00184	.01845	.09765	-.09396
Artistic	-.01038	.48139*	.12742	.14847*
Social	-.11821	.02940	.36088*	-.18706*
Enterprising	-.28375*	-.01746	.03211	-.12528
Conventional	-.04432	-.24108*	.04719	-.25728*

Note: asterisk(*) indicates statistical significance at the .05 level.

Differences regarding strength of relationship between bivariate correlations

performed on the full data set in comparison to bivariate correlations performed on the

male data set are outlined on Table 10 (see next page).

Table 10 - Comparison of Significant Bivariate Correlations Between the MBTI Dimensions and GOTs Listed By Absolute Correlation Value: Full Data Set and Male Data Set

MBTI	GOT	Full Data Set (r)	Male (r)
Sensing-iNtuitive	Artistic	.504	.481
Thinking-Feeling	Social	.384	.361
Extravert-Introvert	Enterprising	-.300	-.284
Sensing-iNtuitive	Conventional	-.250	-.241
Judging-Perceiving	Conventional	-.216	-.257
Judging-Perceiving	Realistic	.190	
Extravert-Introvert	Social	-.142	
Judging-Perceiving	Artistic	.138	.148
Thinking-Feeling	Artistic	.119	
Thinking-Feeling	Realistic	-.115	
Thinking-Feeling	Investigative	-.101	
Judging-Perceiving	Social	-.096	-.187

The five largest correlations for the full data set remained significant for the male gender set. However, non-statistically significant differences in the strength of the relationships emerged. For example, correlations within the male sample were slightly stronger for JP and Conventional, JP and Artistic, and JP and Social relationships. Correlations were slightly weaker for SN and Artistic, TF and Social, EI and Enterprising, and SN and Conventional. The most variation accounted for in the full data set was 25 percent, which was between MBTI SN and GOT Artistic. In comparison, the

most variation accounted for within the male data set was 23 percent, also occurring between MBTI SN and GOT Artistic.

Gender Considerations: Female Demographics and Distributions

Frequency data indicated that the female sample consisting of 231 individuals was normally distributed around the mean of fifty on the six GOT scales although, true to Strong Interest Inventory theory, the Realistic scale produced the lowest average female scores. The mean Realistic score was 43.79 (SD = 9.93), the mean Investigative continuous score was 45.54 (SD = 9.52), the mean Artistic continuous score was 53.84 (SD = 9.24), the mean Social continuous score was 52.82 (SD = 9.81), the mean Enterprising continuous score was 52.14 (SD = 8.96), and the mean Conventional continuous score was 49.00 (SD = 9.59). The fact that females reflected lower levels of interest in Realistic and Investigative domains vis-à-vis Artistic and Social domains highlights perhaps the effects of gender socialization within the culture from which the sample was drawn. Females were normally distributed around the mean of 100 along each of the four MBTI dimensions. The mean EI value was 102 (SD=28.54), the mean SN value was 104 (SD=26.91), the mean TF value was 105 (SD=23.84), and the mean JP value was 97.11 (SD=27.12).

Bivariate Correlations Between MBTI Dimensions and GOTs: Female Data Set

Simple bivariate correlations were calculated to determine what two-dimensional relationships existed within the female sample between the four personality dimensions of the MBTI and the six GOTs. Bivariate analysis revealed statistically significant ($p<.05$) relationships between MBTI personality dimension SN and Strong GOT Artistic ($r=.517$), between MBTI personality dimension TF and Strong GOT Social ($r=.373$),

between MBTI personality dimension EI and Strong GOT Enterprising (r= -.317),

between MBTI personality dimension SN and GOT Conventional (r= -.258), between

MBTI personality dimension JP and GOT Conventional (r= -.191), between MBTI

personality dimension JP and GOT Realistic (r=.247), between MBTI personality

dimension JP with GOT Artistic (r= .207), and between MBTI personality dimension EI

with GOT Social (r=-.156).

The five largest correlations for the full and male data sets remained significant

for the female data set (see Table 11 below). No statistically significant differences

emerged between full, male, and female data sets across the five strongest correlations.

Beyond the five largest correlations, significant yet weak (r<.3) bivariate correlations

were found within the female data set that did not exist within the full or male data sets.

These relationships included the following: SN and Investigative, TF and Enterprising,

SN and Realistic, and TF and Conventional (see Table 11 below). Only one pair of

correlated variables showed a significant (p<.05) difference between males and females.

Specifically, the relationship between TF and Investigative differed significantly between

males (r= .098) and females (r=-.220). At a less restrictive level of significance (p<.10),

SN and Realistic significantly differed between males (r= -.138) and females (r=.138).

Table 11 – Comparison of Significant Bivariate Correlations Between the MBTI
dimensions and GOTs Listed by Absolute Correlation Value: Full Data Set, Male Data
Set, Female Data Set

MBTI	GOT	Full Data Set ®	Male ®	Female ®
Sensing-iNtuitive	Artistic	.504	.481	.517
Thinking-Feeling	Social	.384	.361	.373

Table 11 (cont'd).

Extravert-Introvert	Enterprising	-.300	-.284	-.317
Sensing-iNtutive	Conventional	-.250	-.241	-.258
Judging-Perceiving	Conventional	-.216	-.257	-.191
Judging-Perceiving	Realistic	.190		.247
Exravert-Introvert	Social	-.142		-.156
Judging-Perceiving	Artistic	.138	.148	.207
Thinking-Feeling	Artistic	.119		
Thinking-Feeling	Realistic	-.115		
Thinking-Feeling	Investigative	-.101		-.220
Judging-Perceiving	Social	-.096	-.187	
Sensing-iNtuitive	Investigative			.171
Thinking-Feeling	Enterprising			-.171
Sensing-iNtutive	Realistic			.138
Thinking-Feeling	Conventional			-.135

To What Extent Do the MBTI Personality Dimensions and the Strong GOTs Overlap: Male Data Set

Canonical correlation analysis on the male set produced three statistically significant functions (see Table 12 next page). Function one accounted for 39 percent of the variance, function two accounted for 24 percent of the variance, function three accounted for 10 percent of the variance, and function four accounted for 4 percent of the variance. Function four was not statistically significant (p<.05).

Table 12 - Canonical Correlation Analysis: Male data set

Canonical Function	P-value	Canonical Correlation	Squared Canonical Correlation
1	<.001	.624	.389
2	<.001	.494	.244
3	<.001	.324	.105
4	<.001	.194	.038

Based on reasoning employed within the analysis of full-data set canonical functions, only canonical functions one and two were deemed practically significant. Redundancy analysis confirmed the practical significance of functions one and two versus three and four (see Table 13 below).

Table 13 - Canonical Redundancy Index: Male Data Set

Canonical Function	Canonical R-Square	Proportion Index
1	.3893	.1058
2	.2443	.0598
3	.1052	.0258
4	.0377	.0090

In What Ways Do the MBTI Personality Dimensions and the Strong GOTs Overlap: Male Data Set

MBTI variable SN was the most important (standardized coefficient = 1.0039) within the first canonical function and the Strong GOT variables Artistic (.9495),

Realistic (-.4692), and Conventional (-.3100) were the most important within the first

canonical function (see Table 14 below).

Table 14 - Inclusion Criteria for First Canonical Function: Male Data Set

1st Canonical Function	Standardized Coefficient	Correlation w/ Canonical Variate	Correlation w/ Opposite Canonical Variate
	MBTI 1	MBTI 1	GOT 1
Extraversion-Introversion	.233	.153	.096
Sensing-iNtuitive*	1.004	.963	.601
Thinking-Feeling	.135	.159	.099
Judging-Perceiving	-.073	.333	.208
	GOT 1	GOT 1	MBTI 1
Realistic*	-.469	-.260	-.162
Investigative	.159	.061	.038
Artistic*	.950	.781	.487
Social	-.054	.103	.064
Enterprising	-.174	-.113	-.070
Conventional*	-.310	-.364	-.227

Note: asterisk (*) indicates inclusion in the first canonical function, male data set

The complete relationship determined by the first canonical function was as

follows: MBTI = .2333 EI + 1.0039 SN + .1354 TF - .0728 JP; GOT = -.4692 R + .1591

I + .9495 A - .0544 S -.1742 E -.3100 C. Based upon the standardized coefficient cutoff

value of +/- .25, the relationship determined by the first canonical function may be

summarized as follows: SN ←→ Artistic – 1/2 Realistic – 1/3 Conventional = .624. This

symbolizes the fact that for males, the maximum correlation occurs when SN was

correlated with the linear combination of the Artistic score minus one-half the sum of the

Realistic and one-third the sum of the Conventional scores. Across the three methods of

inclusion, disagreement existed regarding the importance of MBTI EI. EI therefore was

not included within the first function. Practically, it may be concluded that 39 percent of

the variation within a male's SN score was accounted for by their Artistic, Realistic, and

Conventional scores (see Table 12). Male bivariate correlation data suggested that a positive, significant, and moderate correlation exists between Artistic and Realistic (r=.25); a positive and nonsignificant relationship existed between Artistic and Conventional (r=.09); and a positive, significant, and moderate relationship existed between Realistic and Conventional (r=.25).

As indicated on Table 15 (see below), the second canonical function was as follows: MBTI = -.0161 EI - .1194 SN + .7652 TF - .7022 JP; GOT = - .4822 R -.2077 I - .2396 A + 1.0394 S - .2340 E + .2318 C. TF and JP were the most important variables in the MBTI variate. Social was the most important variable in the GOT variate followed by Conventional and Investigative. GOT Realistic appeared important when considering standardized coefficients, however, the other two inclusion methods minimized its importance. Realistic was therefore excluded from the second function.

Table 15 - Inclusion Criteria for Second Canonical Function: Male Data Set

2nd Canonical Function	Standardized Coefficients	Correlations w/ Canonical Variate	Correlations w/ Opposite Canonical Variate
	MBTI 2	MBTI 2	GOT 2
Extraversion-Introversion	-.016	-.056	-.028
Sensing-iNtuitive	.119	-.134	-.066
Thinking-Feeling*	.765	.750	.371
Judging-Perceiving*	-.702	-.628	-.311
	GOT 2	GOT 2	MBTI 2
Realistic	-.482	-.129	-.064
Investigative*	.208	.289	.143
Artistic	-.240	.103	.051
Social*	1.039	.835	.413
Enterprising	-.234	.233	.115
Conventional*	.232	.382	.189

Note: asterisk (*) indicates inclusion in the second canonical function, male data set

99

The second function may be summarized as follows: TF – JP ←→ Social + 1/5 (Investigative + Conventional) = .494. This symbolizes the fact that the second largest correlation occurred when the difference between an individual's TF and JP scores was correlated with their Social score plus one-fifth the sum of Investigative and Conventional scores. It may also be concluded that 24 percent of the variation within an individual's TF and JP scores was accounted for by Social, Investigative, and Conventional scores (see Table 12). Bivariate correlation data suggests that a positive and nonsignificant relationship existed between TF and JP within the MBTI variate (r=.03). Within the Strong variate, bivariate data indicated that a positive, significant, and moderate relationship existed between Social and Investigative (r=.30), Social and Conventional (r=.30), and Investigative and Conventional (r=.45).

To What Extent Do the MBTI Personality Dimensions and the Strong GOTs Overlap: Female Data Set

Canonical correlation analysis on the female set produced four statistically significant functions (see Table 16 below).

Table 16 - Canonical Correlation Analysis: Female Data Set

Canonical Function	P-value	Canonical Correlation	Squared Canonical Correlation
1	<.001	.601	.362
2	<.001	.519	.270
3	<.001	.378	.143
4	<.001	.303	.092

Function one accounted for 36 percent of the variance, function two accounted for 27 percent of the variance, function three accounted for 14 percent of the variance, and function four accounted for 9 percent of the variance. Based on redundancy analysis, only canonical functions one and two were deemed practically significant (see Table 17 below).

Table 17 - Canonical Redundancy Index: Female Data Set

Canonical Function	Canonical R-Square	Proportion Index
1	.3617	.0935
2	.2691	.0746
3	.1429	.0368
4	.0916	.0189

In What Ways Do the MBTI Personality Dimensions and the Strong GOTs Overlap: Female Data Set

SN was the most important MBTI variable (standardized coefficient = .9934) followed by TF (standardized coefficient = -.3642) within the first female canonical function (see Table 18 next page). For the GOT variate, the most important variables were Artistic (standardized coefficient = .8255), Social (standardized coefficient = - .4310), Investigative (standardized coefficient = .3833), and Conventional (standardized coefficient = -.2330).

Table 18 - Inclusion Criteria for First Canonical Function: Female Data Set

1st Canonical Function	Standardized Coefficient	Correlation w/ Canonical Variate	Correlation w/ Opposite Canonical Variate
	MBTI 1	MBTI 1	GOT 1
EI	.126	.002	.001
SN*	.993	.919	.553
TF*	-.364	-.293	-.176
JP	-.061	.323	.194
	GOT 1	GOT 1	MBTI 1
Realistic	-.075	.254	.153
Investigative*	.383	.430	.259
Artistic*	.826	.791	.476
Social*	-.431	-.350	-.210
Enterprising	-.004	-.062	-.038
Conventional*	-.233	-.323	-.195

Note: asterisk (*) indicates inclusion in the first canonical function, female data set

The relationship may be summarized as follows: SN – 1/3 TF ←→ Artistic + 1/2 (Investigative – Social) – 1/4 Conventional = .601. This symbolizes the fact that for females, the maximum correlation occurred when the SN score minus one-third of TF score was correlated with the Artistic score plus half the difference of Investigative minus Social less one-fourth of Conventional scores. It may also be stated that 36 percent of the variation within a female's SN and TF scores was explained by their Artistic, Investigative, Social, and Conventional scores (see Table 16). Female bivariate data suggested that SN and TF were positively yet weakly correlated ($r=.08$). Within the Strong variate, bivariate data suggested that Artistic and Investigative were moderately and positively correlated ($r=.27$), Artistic and Social were weakly and positively correlated ($r=.17$), Artistic and Conventional were weakly and negatively correlated ($r=-.06$), Investigative and Social were positively and weakly correlated ($r=.06$), Investigative

and Conventional were positively and moderately correlated (r=.27), and Social and

Conventional were positively and weakly correlated (r=.24).

For the second canonical function generated by the female data, TF was the most

important variable in the MBTI variate followed by SN (see Table 19 below). The most

important variable in the GOT variate was Social, with all other GOT variables excluding

Realistic having some importance (see Table 19 below).

Table 19 - Inclusion Criteria for Second Canonical Function: Female Data Set

1st Canonical Function	Standardized Coefficient	Correlation w/ Canonical Variate	Correlation w/ Opposite Canonical Variate
	MBTI 1	MBTI 1	GOT 1
Extraversion-Introversion	-.0844	-.1565	-.0812
Sensing-iNtuitive*	.3001	.3798	.1970
Thinking-Feeling*	.9232	.9491	.4924
Judging-Perceiving	-.0172	.1965	.1019
	GOT 1	GOT 1	MBTI 1
Realistic	-.1288	-.0787	-.0408
Investigative*	-.3350	-.3116	-.1617
Artistic*	.4301	.3611	.1874
Social*	.7790	.6576	.3411
Enterprising*	-.4128	-.2872	-.1490
Conventional*	-.2577	-.3854	-.1999

Note: asterisk (*) indicates inclusion in the second canonical function, female data set.

The second function may be summarized as follows: TF + 1/3 SN←→Social +

1/2 (Artistic - Enterprising) – 2/5 Investigative – 1/3 Conventional = .519. This

symbolizes the fact that the second largest correlation occurred when the linear

combination of TF plus one-third of SN was correlated with Social plus one-half the

difference of Artistic minus Enterprising minus two-fifths of Investigative minus one-

third of Conventional. Practically, it may be concluded that 27 percent of variation within

a female's TF and SN scores was accounted for by Social, Artistic, Enterprising,

Investigative, and Conventional scores (see Table 16). Bivariate data suggested that TF

and SN were positively but weakly correlated (r=.08). Within the Strong variate, female

bivariate data suggested that Social and Artistic were weakly and positively correlated

(r=.17), Social and Enterprising were positively and weakly correlated (r=.23), Social and

Investigative were positively and weakly correlated (r=.06), Social and Conventional

were positively and weakly correlated (r=.24), Artistic and Enterprising were positively

and weakly correlated (r=.18), Artistic and Investigative were positively and moderately

correlated (r=.26), Artistic and Conventional were negatively and weakly correlated

(r=.06), Enterprising and Investigative were positively and weakly correlated (r=.02),

Enterprising and Conventional were positively and strongly correlated (r=.43), and

Investigative and Conventional were positively and moderately correlated (r=.27).

To What Extent Do the MBTI Personality Dimensions and Strong Interest Themes

Overlap: Summary

Canonical correlation analysis accounted for more variance explained than did

bivariate correlation analysis. The first and second canonical functions together

accounted for 61 percent (full data set), 63 percent (male data set), and 63 percent (male

data set) of the variance between MBTI personality dimensions and GOTs. In

comparison, the strongest bivariate correlation across all three data sets, SN and Artistic,

accounted for 25 percent, 23 percent, and 27 percent of the variance between MBTI

personality dimensions and GOTs within full, male, and female data sets respectively.

In What Ways Do the MBTI Personality Dimensions and Strong Interest Themes

Overlap: First Canonical Function Summary

Table 20 (see below) highlights canonical correlation analysis findings across all

three data sets.

Table 20 - Canonical Correlation Summary

	First Canonical Function	Second Canonical Function
Full Data Set	SN ⟺Artistic - 1/3(Realistic + Conventional) →36% variance accounted for	TF -1/3 JP⟺ Social – 1/3 Realistic →25% variance accounted for
Male Data Set	SN ⟺ Artistic – 1/2 Realistic – 1/3 Conventional →39 % variance accounted	TF – JP⟺ Social + 1/5 (Investigative + Conventional) →24% variance accounted for
Female Data Set	SN – 1/3 TF⟺ Artistic + ½ (Investigative – Social) – ¼ Conventional →36% variance accounted for	TF + 1/3 SN ⟺Social + ½ (Artistic-Enterprising) – 2/5 Investigative – 1/3 Conventional →27% variance accounted for

The first canonical function represents the best (i.e., most highly correlated)

combination of the two variable sets in question. Analysis of the first canonical function

on the full data set revealed that 36 percent of the variation within an individual's SN

score was explained by their Artistic, Realistic, and Conventional Scores. The relative

significance of each of the GOTs was summarized as follows: SN ←→ Artistic – 1/3

(Realistic + Conventional). The first canonical function on the male data set revealed

that 39 percent of the variation within a male's SN score was explained by their Artistic,

Realistic, and Conventional GOT scores. The relative significance of the GOTs in

relation to each other was summarized as follows: SN ←→ Artistic – 1/2 Realistic – 1/3

Conventional. The first canonical function on the female data set revealed that 36

percent of the variation within a female's SN and TF scores was explained by their

Artistic, Investigative, Social, and Conventional scores. The relative significance of these variables in relation to each other was summarized as follows: SN – 1/3 TF ←→ Artistic + ½ (Investigative – Social) – ¼ Conventional. There appears to be very little difference between these functions across the male and full data sets; however, the relationship for female data set appears to be more complicated. Specifically, the first canonical function for the female data set included, in addition those variables shared with the other two data sets, MBTI TF and GOT Artistic. Across all three data sets, varying combinations of Strong interest themes explained a significant amount of variance in MBTI SN scores.

In What Ways Do the MBTI Personality Dimensions and Strong Interest Themes Overlap: Second Canonical Function Summary

Typically, only the first function within canonical correlation is explored. However, because the second canonical functions generated by the full, male, and female data sets were both statistically and practically significant, the analysis included consideration of the second function. The second canonical function represented the best (i.e., highest correlated) combination of the two variable sets after accounting for relationships outlined in the first canonical function. Analysis of the second canonical function on the full data set revealed that 25 percent of the variation within an individual's TF and JP scores was explained by their Social and Realistic scores. The relative significance of the GOTs in relation to each other was indicated by the value of their respective standardized coefficients and may be summarized as follows: TF – 1/3 JP ←→ Social – 1/3 Realistic. The second canonical function on the male data set revealed that 24 percent of the variation within a male's TF and JP scores was explained by their

106

Social, Investigative, and Conventional scores. The relative significance of the GOTs in relation to each other was indicated by the value of their respective standardized coefficients and may be summarized as follows: TF – JP ←→ Social + 1/5 (Investigative + Conventional). The second canonical function on the female data set revealed that 27 percent of the variation within a female's TF and SN scores was explained by their Social, Artistic, Enterprising, Investigative, and Conventional Scores. The relative significance of each of the GOTs in relation to each other was indicated by the value of their respective standardized coefficients and may be summarized as follows: TF + 1/3 SN ←→ Social + ½ (Artistic – Enterprising) – 2/5 Investigative – 1/3 Conventional. Across the second canonical functions (i.e., full, male, and female data sets), the consistently important variables were MBTI TF and GOT Social. Beyond these, the important variables differed across the three data sets. Realistic appears to be important for the full data set but not for the male and female sets. Investigative and Conventional appear to be important with positive coefficients for the male data set but with negative coefficients for the females. The variables Artistic and Enterprising appear to be important for only the female data set.

CHAPTER FIVE

DISCUSSION

Most researchers would agree that compelling evidence exists in support of a strong positive correlation between work satisfaction and mental health (Blustein & Spengler, 1995). Studies highlight the reciprocal relationships between unemployment (Osipow & Fitzgerald, 1993), job stress (Osipow, 1979) and work related problems (Herr, 1989 in Blustein & Spengler, 1995). Similar links have been found between career satisfaction and factors such as anxiety, depression, somatic difficulties, and self-esteem (Blustein & Spengler, 1995). In response to these observations, intervention models have been proposed for infusing the career counseling processes with greater attention toward increased intrapersonal and interpersonal awareness (Blustein & Spengler, 1995). ·

The Person-Environment theory (P-E) represents a widely accepted theoretical approach intended to promote individual adjustment to vocational and avocational contextual factors as well as the ability to modify one's vocational and avocational environments via self-understanding, information processing skills, and goal-setting skills (Chartrand, 1991). In order to facilitate these objectives, the P-E process has traditionally included assessment instruments (Buboltz, Thomas, & Johnson, in press). Two of the most frequently used (Hammer & Kummerow, 1997) instruments are the Strong Interest Inventory (Harmon, Hansen, Borgen, & Hammer, 1994) and the Myers Briggs Type Indicator (Myers & McCaulley, 1985).

Both the Strong and MBTI manuals recommend using the two instruments together (Healy, 2000). Proponents of using the two instruments together have suggested that MBTI results can assist an individual toward a better understanding of their Strong

results (Healy, 2000). Furthermore, Hammer and Kummerow (1997) argued that the MBTI and the Strong presented unique but complimentary information. Yet questions remain regarding the integration of the two instruments (Hammer & Kummerow, 1997). Five studies, for example, have compared with varying findings the effectiveness of using the instruments together (Katz, Joyner, & Seamen, 1999). Four of the aforementioned studies did not establish a statistically significant benefit for using the two instruments together (e.g., Hayslip, 1995; O'Neil, Price, & Tracey, 1979; Takai & Holland, 1979; Talbot & Birk, 1979) whereas the most recent study to explore the question established evidence supporting the use of both instruments in the career counseling process (Katz et al., 1999). Specifically, Katz et al. (1999) found that the instruments, when used in tandem, resulted in higher rates of career related change (i.e., change in career goal, change in specificity of career goal, and increase in certainty of career goal) as compared to individuals who received information from a single instrument.

A parallel body of research has attempted to gain a better understanding of the integration of the two instruments via explorations of the relationships between Holland and Jungian personality theories. Researchers have historically attempted to do so via bivariate correlation analysis, MANOVA, chi square analysis, and profile mean score analysis. By virtue of not fully exploring or accounting for potential relationships within each classification system or by minimizing variability therein through the use of categorical variables or bivariate analyses, fuller understandings of the potential relationships between the MBTI personality dimensions and the Strong interest themes have not been reached. Bivariate correlational analyses and the use of categorical data

are not, therefore, fully appropriate toward the development of deeper understandings of the relationship between MBTI personality dimensions and Strong interest themes.

The current study distinguished itself from previous research through exploring the relationship between and among MBTI personality dimensions and Strong interest themes from a multivariate perspective. Specifically, the research design uniquely positioned the analysis to simultaneously explore relationships among all four MBTI personality dimensions and all Strong interest types as well as significant relationships between MBTI personality dimensions and Strong interest themes. Canonical correlation addressed the following research question: to what extent and in what ways do MBTI personality dimensions overlap with Strong Interest typology? Because the Strong Interest Inventory (Harmon et al., 1994) is normed differently for males and females, the analysis included canonical correlation computations for the full data set as well as by gender. These questions have not been, to the author's awareness, simultaneously addressed using canonical correlation in the literature thus far. Results from canonical correlation demonstrated that (a) multivariate analysis of the relationship between MBTI personality dimensions and Strong interest themes resulted in more significant amounts of variance explained between the two variable sets than did bivariate correlation, (b) multivariate analysis of the relationship between MBTI personality dimensions and Strong interest themes resulted in a more comprehensive explanation of the relationships between the two variable sets than did bivariate correlation, and (c) gender affects the relationship between the two sets.

<u>To What Extent Do the MBTI Personality Dimensions and Strong Interest Themes</u>

<u>Overlap?</u>

Canonical correlation analysis on the full data set generated four statistically

significant canonical functions. However, only the first two functions were considered

practically significant, together accounting for about 61 percent of the variability between

the two sets of variables. The first two canonical functions on the male data set

accounted for 63 percent of the variance between the two data sets. The first two

canonical functions on the female data set also accounted for 63 percent of the variance

between the data sets. In comparison, Hammer and Kummerow (1997), in their review

of the literature, reported bivariate correlations between MBTI preferences and Strong

interest themes ranging 0.00 to .48. This translates to, at best, bivariate analysis

accounting for 23 percent of the variance between the two data sets. Within the present

analysis, bivariate correlation accounted for, at best, 25 percent (r = .50) of the variance

between the two sets. The percentage of variance accounted for by canonical correlation

was therefore, as predicted, considerably higher than any percentage of variance

accounted for by a bivariate regression and/or correlation analysis procedures.

Support of this finding is likely attributable to the fact that MBTI personality

dimensions and Strong interest themes are indeed, as theory suggests, interactive and

dynamic in nature and should not be isolated to bivariate or categorical analysis. As has

been discussed, Holland (1985) noted in a revision of his theory that a classification

system comprised of only six independent themes was insufficient to fully represent

human and occupational workplace diversity (Harmon et al., 1994). Holland therefore

(1985) expanded his vocational interest classification system to include combinations of

the six themes. MBTI theory asserts that the interactions of MBTI personality dimensions result in behaviors that cannot be predicted from exploration of each preference separately (Myers & McCaulley, 1998). Because each preference interacts with all other preferences, MBTI personality theory asserts that any combination of two or more preferences will yield behaviors that are more than the sum of their parts (Myers & McCaulley, 1998). Unique relationships among the MBTI personality dimensions therefore exist that may suggest characteristics or behaviors that not apparent at a bivariate level of analysis (Myers & McCaulley, 1998).

Practically and generally, these results suggest the importance of practitioners and researchers alike attending to the multivariate nature of the relationship between the MBTI personality dimensions and the Strong interest themes because the multivariate results are (a) more descriptive and (b) account for a greater degree of overlap between the two sets. Furthermore, gender appears to be an important moderator within the relationship between MBTI personality dimensions and Strong interest themes.

In What Ways Do the MBTI Personality Dimensions and Strong Interest Themes Overlap?

As has been discussed above, bivariate analysis demonstrated that the strongest relationship between the two sets occurred between MBTI Intuitive and GOT Artistic ($r=.50$). In comparison, canonical correlation revealed that although MBTI SN and GOT Artistic were indeed correlated, the maximum correlation between the two sets was obtained when MBTI SN was correlated with Strong Artistic, Realistic, and Conventional theme scores. Specifically, the canonical formula generated on the first function (i.e., SN←→Artistic -1/3(Realistic + Conventional)) implied that higher levels of SN (i.e.,

more Intuitive) were correlated with higher levels of Artistic preferences and lower levels of Realistic and Conventional preferences. The data therefore indicated that the strongest correlation between the two constructs existed between the level of which an individual processes information through facts and details, the present and what is (Sensing), versus through the big picture, the future and what can be (Intuitive); with the level of their interests in creating and enjoying the arts (Artistic), with engaging in hands on activities and the outdoors activities (Realistic), and with processing and organizing activities (Conventional).

It is important to note that these findings do not imply that Artistic preferences were negatively correlated with Realistic and Conventional interest themes. To the contrary, this conclusion is false based upon bivariate analyses findings. What these findings do imply is that higher levels of SN preferences covary with higher levels of Artistic interests and then lower levels of Realistic and Conventional interests. Canonical correlation does not address what underlying factor(s) unify these variables. A factor analytic design would likely be more appropriate to address this question directly. Given this caveat, it may be intuitively and theoretically rationalized that a correlation exists between preferences toward taking in and processing information from a "gut-level" and future-oriented perspective (i.e., Intuitive) and interests in activities commensurate with the Artistic theme such as the performing, visual, and musical arts. The same may be said for reasoning a correlation between taking-in and processing information via the five senses, prioritizing facts and details, and focusing on that which is "known" in the here and now (i.e., Sensing) with interests in activities commensurate with the Realistic theme such as athletics and the military and Conventional theme such as data processing and

accounting. The use of continuous scores in canonical correlation highlights the fact however that a purely dichotomous (i.e., typology) conceptualization of the relationship may not be wholly appropriate. For example, an individual may have a median SN score (e.g. 95-105) that may be correlated with mildly to moderately elevated Artistic interests (e.g. 55-60), average to above average Realistic interests (e.g., 50-55), and average to above average Conventional interests (e.g., 50-55).

In conclusion of the first canonical function, a fact that is clearly supported by the data was as follows: among the potential MBTI and GOT combinations, MBTI SN and Strong GOT Artistic, Realistic, and Conventional covaried, or went-together, most frequently. In practical language, it may therefore be stated that a common pattern between the MBTI personality dimensions and the GOTs was as follows: higher SN scores covaried with higher Artistic scores and then lower Realistic and Conventional scores. Stated another way, canonical correlation revealed that when MBTI SN was elevated, it was a good probability Strong Artistic was elevated and then Strong Realistic and Conventional were de-elevated.

Canonical analysis demonstrated that the second strongest correlation relationship between the two sets occurred when MBTI TF and JP were correlated with Strong Social and Realistic theme scores. Specifically, the canonical formula generated on the second function (i.e., TF – 1/3 JP ←→ Social -1/3 Realistic) implied that higher levels of TF (i.e., more Feeling) and lower levels of JP (i.e., more Judging) were correlated with higher levels of Social interests and lower levels of Realistic interests. The data therefore indicates that the second strongest correlation between the two constructs exists between the level of which an individual makes decisions using facts and depersonalized rationale

(i.e., Thinking) versus through placing themselves within a situation and measuring the affective impact of a decision on self and others (i.e., Feeling) and the way in which they deal with or present to their external world; whether it be it be in an organized manner (Judging) or in a spontaneous manner (Perceiving), with the intensity of their preferences for helping, instructing, and working with others (Social) and for hands-on activities (Realistic).

As was applicable to the interpretation of the fist canonical function, these findings do not imply that the MBTI personality dimensions TF and JP were negatively correlated or that the Strong interest themes Social and Realistic were negatively correlated. Based upon bivariate analyses findings within the present sample, TF and JP were positively yet quite weakly correlated (r=.02) and Social and Realistic interest themes were positively and weakly yet statistically significantly correlated (r=.14). What these findings do imply is that increased levels of TF preferences and decreased levels of JP preferences are correlated with higher levels of Social interests and lower levels of Realistic interests. Although canonical correlation does not address what underlying factor(s) unifies these variables, results from the second canonical function can be theoretically rationalized. A correlation between higher levels of TF (i.e., more Feeling) and higher levels of Social interests is somewhat intuitive. It stands to reason that individuals who tend to engage in decision-making processes by considering the emotional impact of a decision on self and others are also interested in helping and serving others through teaching, counseling, or the ministry. However, the correlation between higher levels of TF (i.e., more Feeling) and lower levels of JP (i.e., more Judging) with higher Social interests and lower Realistic interests is somewhat

counterintuitive. Specifically, it may reasonably be hypothesized that individuals who prefer flexibility, ambiguity, and spontaneity (i.e., MBTI Perceiving) may be linked more closely with higher Social interests and lower Realistic interests. Instead, the second canonical function revealed that individuals' who prefer organization and a systematic approach to the external world (i.e., MBTI Judging) are correlated with higher Social interests and lower Realistic interests. On the other hand, this finding may come as no surprise to many counselors and teachers who prefer planfullness and orderliness, task completion, and issue resolution. Conversely, it is theoretically possible that many individuals with Thinking preferences and Realistic interests prefer spontaneity and flexibility (i.e., more MBTI Perceiving). Consider for example the military troop (Strong Realistic) who relishes ambiguous and complicated battle scenarios that require ongoing flexibility (MBTI Perceiving). When engaged in such situations, the soldier enjoys the process of gathering as much information as possible; analyzing potential courses of action vis-à-vis standard operating procedures, operational instruction manual guidelines, and experience (MBTI Thinking); selecting and implementing a course of action; and reinitiating the process based upon changing environmental data.

In conclusion of the second canonical function, a fact that is clearly supported by the data is as follows: after accounting for the relationship within the first canonical function, MBTI TF and JP and Strong GOT Social and Realistic covaried, or went-together, most frequently. In practical language, it may therefore be stated that the second most common pattern between the MBTI personality dimensions and the GOTs was as follows: higher TF and lower JP scores covaried with higher Social and then lower Realistic scores. Stated another way, canonical correlation revealed that when

MBTI TF scores were elevated and JP scores were de-elevated, it was a good probability that Strong Social scores were elevated and then Strong Realistic scores were de-elevated.

Implications to the Practitioner: Canonical Correlation Findings, Full Data Set

Authors of the Strong endorsed integrating information about an individual's personality, values, and beliefs via MBTI results to provide a deeper understanding regarding what careers and work environments an individual is likely to find satisfying and rewarding (Harmon et al., 1994). Furthermore, Hammer and Kummerow (1997) argued that the MBTI and the Strong presented both unique and complimentary information. Results from the first canonical correlation suggested that the search for statistically complimentary information starts with an exploration of the relationship between MBTI SN and Strong Artistic, Conventional, and Realistic scores. Specifically, the data indicates that the most significant correlation between the MBTI personality dimensions and the Strong interest themes existed between the level in which an individual processes information through the facts and what is (Sensing) versus through consideration of the future and what may be (Intuitive) and the level of their interests in Artistic, Realistic, and Conventional activities. The data suggested that increased levels of SN preferences are correlated primarily with increased Artistic interests but also with lower Realistic and Conventional interests. Based upon second canonical function findings, the practitioner is next challenged to consider the level to which an individual prefers to make decisions by obtaining facts (Thinking) versus by employing a subjective values-oriented approach (Feeling) and the level to which an individual prefers to

approach the external world, whether it be in an organized and procedural manner (Judging) or in a spontaneous and flexible manner (Perceiving). These preferences are directly correlated primarily to the level of an individual's interests for Social activities such as teaching and counseling but also with lower levels of interest in Realistic activities such as construction, engineering, or military service. Unique information such as MBTI EI preferences and level of interest in Strong Investigative and Enterprising theme domains may be used to complete the explanatory picture created for an individual seeking to increase self-understanding, promote decision-making facilitation toward career preferences and interests, and to ultimately achieve career satisfaction.

A number of valid factors may create a scenario wherein individuals do not fit the profile highlighted. For such individuals, the career counselor should consider the fact that the generalizability of the present study is limited in several important ways. Given this caveat however, Holland (1985) stated that individuals with similar preference patterns tend to locate themselves within similar occupations. Furthermore, Holland (1985) stated that when a mismatch between individual interests and the occupational environment occurred, the individual tended to either adjust their interests to meet the demands of the environment or to adjust the environment to adapt to their interests and preferences. If unsuccessful with either, the individual tended to pursue other occupational options or environments. The career counselor therefore would benefit by being aware of common patterns between MBTI and Strong data and by appropriately preparing individuals who do not fit within these common patterns for potential inter and intrapersonal hurdles they may face in pursuit of their interests and preferences.

<u>In What Ways Do the MBTI Personality Dimensions and Strong Interest Themes</u>

<u>Overlap: The Effect of Gender</u>

Based upon the data, researchers and practitioners alike are also encouraged to consider gender as an important moderator variable when interpreting similarities between MBTI personality dimensions and Strong Interest themes. Canonical correlation results differed across males and females within the present sample. Gender results also differed at times from results generated from the full data set.

The first canonical function for males included the same variables as the first canonical function for the full data set (see Table 20). Canonical correlation revealed that the maximum correlation among males between the two sets was obtained when MBTI SN was correlated with Strong Artistic, Realistic, and Conventional theme scores. The canonical formula generated on first function (i.e., SN$\leftrightarrow$Artistic -1/2 Realistic – 1/3 Conventional) implied that, among the potential MBTI and GOT combinations, MBTI SN and Strong GOT Artistic, Realistic, and Conventional covaried, or went-together, most frequently within the male sample. In practical language, it may therefore be stated that the most common pattern between the MBTI personality dimensions and the GOTs for males was as follows: higher SN scores covaried with higher Artistic scores and then lower Realistic and Conventional scores. Stated another way, canonical correlation revealed that when MBTI SN was elevated, it was a good probability that Strong Artistic was elevated and then Strong Realistic and Conventional were de-elevated. The data therefore indicated that the strongest correlation among males between the two variable sets existed between the level of which a male processes information through facts and details, the present and what is (Sensing), versus through the big picture, the future and

what can be (Intuitive); with the intensity of his interests in creating and enjoying the arts (Artistic), with engaging in hands on activities and the outdoors activities (Realistic), and with processing and organizing activities (Conventional).

It is notable that although the first canonical function for males appeared similar to the first canonical function derived from the full data set, Strong interest theme Realistic played a more significant role in terms of its contribution to the canonical equation (see Table 20). The fact that the Realistic interest theme exacted a more significant role with males is supported by Strong Interest Inventory normative data. Furthermore, the Realistic theme elicited the second highest mean for males within the present sample (x=51.1), second only to Enterprising (x=52.47). However, the significance of the correlation between SN and Realistic in connection with Artistic and Conventional interest levels is new data.

Canonical correlation revealed that the second most significant correlation between the two male variable sets was obtained when MBTI TF and JP were correlated with Strong Social, Investigative, and Conventional theme scores. Specifically, the canonical formula generated on the second function (i.e., TF-JP$\leftrightarrow$ Social +1/5{Investigative + Conventional}) implied that, after accounting for the relationship within the first canonical function, MBTI TF and JP and Strong GOT Social, Investigative, and Conventional covaried, or went-together, most frequently. In practical language, it may therefore be stated that the second most common pattern within males between the MBTI personality dimensions and the GOTs was as follows: higher TF and lower JP scores covaried with higher Social, Investigative, and Conventional scores. Stated another way, canonical correlation revealed that when MBTI TF scores were

120

elevated and JP scores were de-elevated, it was a good probability that Strong Social, Investigative, and Conventional scores were elevated. The data therefore indicated that the second strongest correlation between MBTI personality dimensions and Strong interest themes among males existed between the level of which a male makes decisions via facts and detached rationale (Thinking) versus through placing himself within a situation and assessing the affective impact of options on others and self (Feeling), and his attitude toward the outside world; whether he prefer spontaneity and flexibility (Perceiving) or order and structure (Judging); with the intensity of his interests in creating and enjoying the arts (Artistic), with engaging in hands on activities and the outdoors activities (Realistic), and with processing and organizing activities (Conventional).

Canonical correlation revealed that the maximum correlation among females between MBTI personality dimensions and Strong interest themes was obtained when MBTI SN and TF were correlated with Strong Artistic, Investigative, Social, and Conventional theme scores. Specifically, the canonical formula generated on first function (i.e., SN – 1/3 TF$\longleftrightarrow$Artistic +1/2 {Investigative – Social} – ¼ Conventional) implied that MBTI SN and then JP and Strong GOT Artistic, Investigative, Social, and Conventional covaried, or went-together, most frequently among females within the sample. In practical language, it may therefore be stated that the most common pattern between the MBTI personality dimensions and the GOTs for females was as follows: higher SN and then lower TF scores covaried with higher Artistic and Investigative scores and then lower Social and Conventional scores. Stated another way, canonical correlation revealed that among females in the sample, when MBTI SN scores were elevated and TF scores were de-elevated, it was a good probability that Strong Artistic

and Investigative scores were elevated and then Strong Social and Conventional scores were de-elevated. The data therefore indicated that the strongest correlation among females between the two variable sets existed between the level of which a female processes information through facts and details, the present and what is (Sensing), versus through the big picture, the future and what can be (Intuitive) and the level to which a female goes about making decisions based upon objective and rational methodology (Thinking) versus through a more personal, subjective, and values-oriented approach (Feeling) with the level of her Artistic, Investigative, Social, and Conventional interests.

The first female canonical function highlighted the fact that Investigative and Social are both moderately and nearly equally important after Artistic (standardized coefficients = .38 and -.43 respectively) but are related differently to MBTI SN and TF. This finding paralleled Holland's (1985) theory that Investigative and Social were highly dissimilar. Bivariate analysis within the present sample noted a correlation between the two only slightly above zero (i.e., .06). Interestingly, the only variables not included within the first female canonical function were Realistic and Enterprising, two interest themes commonly associated with males. It should not be implied however from this data alone that females' necessarily possess low levels of Realistic and Enterprising interests. Data indicates that females within the sample did possess lower mean levels of Realistic interests (x=43) but above average mean Enterprising scores (x=52). What the data does indicate is that Realistic and Enterprising interests did not significantly contribute to significant percent of variance explained within the MBTI variate. Interests in these domains likely should be considered as contributing unique information toward self-understanding in addition to EI and JP preferences.

Canonical correlation revealed that the second strongest correlation between the two variable sets occurred when MBTI TF and SN were correlated with levels of interest in Social, Artistic, Enterprising, Investigative, and Conventional activities. The canonical formula generated for the second female function, TF + 1/3 SN ←→ Social +1/2 (Artistic - Enterprising) – 2/5 Investigative – 1/3 Conventional, suggested that after accounting for the relationship within the first canonical function, MBTI TF and SN and Strong GOT Social, Artistic, Enterprising, Investigative, and Conventional covaried, or went-together, most frequently. In practical language, it may therefore be stated that the second most common pattern between the MBTI personality dimensions and the GOTs for females was as follows: higher TF and SN scores covaried with higher Social and Artistic Scores and then lower Enterprising, Investigative, and Conventional scores. Stated another way, canonical correlation revealed that when MBTI TF and SN scores were elevated, it was a good probability that Strong Social and Artistic scores were elevated and then Strong Enterprising, Investigative, and Conventional scores were de-elevated.. The data therefore indicated that a significant correlation existed between (a) the level to which a female processes information through facts and details, the present and what is (Sensing), versus through the big picture, the future and what can be (Intuitive); (b) the level to which a female goes about making decisions based upon objective and rational methodology (Thinking) versus through a more personal, subjective, and values-oriented approach (Feeling); (c) and the level of her Social, Artistic, Enterprising, Investigative, and Conventional interests.

It is notable in the second canonical function that all Strong interest themes with the exception of Realistic played a significant role toward the percent of variance

123

explained within TF and SN scores. According to Holland's (1985) theory, this could be due to females' within the sample possessing undifferentiated (aside from Realistic) interest preferences. According to Holland (1985), differentiation occurs when an individual clearly expresses a preference for a Holland personality type(s) in relation to other types. Theoretically, differentiation will be evidenced only when an individual's self-identity is well developed. Instead of labeling a client with an identity issue however, canonical correlation may provide a stimulus for processing undifferentiated vocational interests. The practical implications of the present data are as follows: if a counselor is concerned about level of differentiation with individual clients, she is encouraged to explore the client's clarity of preference and dominant functions within TF and SN domains. According to the first and second canonical functions, if preferences are somewhat clear within these domains and Sensing or Intuition form the dominant functions, the counselor might consider the exploration of Artistic interests. If the client has higher levels of Intuitive preferences, a counselor might explore, based upon canonical correlation findings, career options that are primarily Artistic but also blend aspects of Investigative activities. If the client has higher levels of Sensing preferences, the counselor may consider exploring Artistic, Social, and Conventional interests, prioritizing a balance between Artistic and Social. If the client's dominant function is TF, higher scores (i.e., more Feeling) may suggest the consideration of primarily Social occupations with a blend of Artistic activities. If scores are more toward MBTI Thinking, a counselor may start with the exploration Artistic and Enterprising interests mixed with levels of interest in Investigative and Conventional interests. As this discussion and examination of the canonical functions has highlighted, a female's level of

interest in Artistic and Social activities has an effect on the relationship between MBTI SN and TF. It is important to note however that other Strong interest themes impact this relationship as well. The specifics of this are missed when performing bivariate analysis only.

In What Ways Do the MBTI Personality Dimensions and Strong Interest Themes
Overlap: A Summary

Hammer and Kummerow (1997) stated that more information was needed regarding unique versus complimentary contributions of the MBTI personality dimensions and the Strong interest themes. The present data suggested that (a) the two constructs do offer both unique and complimentary information and (b) the specifics therein are moderated by gender.

Data from the first canonical function, full data set, revealed that Artistic, Realistic, and Conventional scores covaried with MBTI SN scores. Among males and females combined therefore, the most common pattern between the two instruments was as follows: when SN scores were elevated, it was a strong probability that GOT Artistic scores would be elevated and then Realistic and Conventional scores would be de-elevated. The same most common relationship was true for males; however, the intensity of interests for Realistic tasks was more important toward the explanation of variance in SN scores. Data from the first canonical function, female data set, revealed that Artistic, Investigative, Social, and Conventional scores covaried with MBTI SN and TF scores. When females were evaluated in isolation therefore, the most common pattern between the two instruments was as follows: when SN scores were elevated and JP scores de-

elevated, a strong probability existed that Artistic and Investigative scores were elevated

and then Social and Conventional scores were de-elevated.

Data from the second canonical function, full data set, revealed that Social and

Realistic scores were correlated with MBTI TF and JP scores. The second most common

pattern therefore between the two instruments was as follows: when TF scores are

elevated and JP scores are de-elevated, it is a good probability that GOT Social will be

elevated and then GOP Realistic scores will be de-elevated. Data from the second

canonical function, male data set, revealed that Social, Investigative, and Conventional

scores were complimentary toward variance explained in TF and JP scores. For males

therefore, the second most common pattern between the two instruments was as follows:

when TF scores are elevated and JP scores are de-elevated, it is a good probability that

GOT Social, Investigative, and Conventional scores will be elevated The second

canonical function for the female data set revealed that several Strong interest themes

(i.e., Social, Artistic, Enterprising, Investigative, and Conventional) were significant

toward proportion of variance explained in MBTI TF and SN scores. For females

therefore, data from the first and second canonical functions revealed that knowing where

women are on MBTI SN and TF scales is most important toward revealing overlap

between the two instruments.

Contrary to Jungian theory and one of the research hypotheses within the present

analysis, MBTI personality dimensions were found to correlate with one another within

four of six canonical functions generated. This is likely not because Jung was incorrect

in asserting the independence of his dimensions but more likely attributable to the fact

that when analyzed in context of the Strong interest themes, MBTI dimensions may

indeed be complimentary while others remain unique in their contribution. The practitioner is encouraged to bear this in mind when interpreting results of the two instruments. For example, the practitioner should consider that data indicates a significant proportion of variance within SN and TF scores are explained by a female's level of interest in Artistic, Investigative, Social, and Conventional interest themes. The practitioner is therefore encouraged, based upon the data, to consider and to discuss the ways in which a female's interests in performing arts or drama (Artistic), science (Investigative), education (Social) and data processing (Conventional) may be influenced by the ways in which they gather information (SN) and make decisions (TF). Based upon these findings, the researcher is encouraged to move beyond bivariate analysis with MBTI dimensions and to use multivariate strategies.

Findings across canonical functions were largely commensurate with Holland's (1985) theory and with research hypotheses. On the first canonical function across full, male, and female data sets, Artistic was the consistently important variable. On the second canonical function across full, male, and female data sets, Social was the most important variable. These findings correspond to previous research. Buboltz et al. (in press), for example, concluded from their analysis that the majority of the differences within their data occurred for individuals with either Artistic or Social Strong interest themes. Commensurate with Dillon and Weissman (1987) and Hammer and Kummerow (1997) findings, Artistic individuals demonstrated higher levels of MBTI Intuition than all other codes. Commensurate with Dillon and Weissman (1987), Decola (1992), and Hammer and Kummerow (1997) findings, individuals with a Strong Social interest theme demonstrated higher levels of MBTI Feeling than all other Strong interest themes

127

(Buboltz et al., in press). Taken together, these results indicated with regard to the MBTI scales, both Artistic and Social interest themes might possess unique personality profiles (Buboltz et al., in press). What previous research missed however was the role of other Strong interest themes within the context of MBTI personality dimensions. Specifically, although Artistic was the most important variable within the first canonical function, Realistic and Conventional played statistically significant roles in the full and male data sets. Investigative, Social, and Conventional played statistically significant roles in the female data set. The roles that these themes played were consistent with Holland's (1985) theory. In the full and male data sets, an individual's scores on the Realistic and Conventional themes was considered vis-à-vis their level of interest in Artistic activities and contributed to the proportion of variance explained in MBTI SN. Realistic and Conventional are located adjacently along Holland's hexagon and therefore proposed to be similar. Realistic and Artistic are located in close proximity along the hexagon and therefore proposed to be moderately to weakly correlated. Conventional and Artistic are located diametrically opposite of one another along the hexagon and therefore are proposed to be highly dissimilar. The canonical function for the full data set captured these dynamics by adding Realistic and Conventional scores together then subtracting the total by one-third from the Artistic score. This combination was able to account for 36 percent of the variance in SN scores whereas the Artistic-SN bivariate connection only accounted for 25 percent of the variance. Canonical function for the male data set captured the same Holland dynamics but also accounted for the fact that Realistic tends to be stronger in males and therefore have a greater impact on Artistic interests. A greater measure of the Realistic score was therefore subtracted from the Artistic score. Within

the female data set, Investigative and Conventional scores were subtracted from one another and the resultant sum added to Artistic. Investigative and Conventional are located opposite one another on the hexagon and therefore considered to be dissimilar. Yet they both are located adjacent to the Artistic theme and therefore considered to be congruent with this theme. Conventional, located opposite of Artistic and only weakly correlated with Investigative and Social, was subtracted as well. Taken together, this combination of scores accounted for 36 percent of the variance in MBTI SN and TF. Given this information, practitioners and researchers are encouraged to consider the dynamic nature of the two constructs in relation to one another and to look beyond bivariate associations.

Conclusion

Assumptions underlying the use of the Strong Interest Inventory (Strong) and the Myers-Briggs Type Indicator (MBTI) are consistent with the P-E model (Hammer & Kummerow, 1997). Authors of both the Strong and the MBTI recognized a need to go beyond a simplistic matching of people with jobs, that people can act as change agents in shaping their own careers, and that instrument users should learn a career exploration process based upon a self-exploration rather than simply attain a particular career goal (e.g., choosing a vocation) (Hammer & Kummerow, 1997). Authors of both instruments also believed that the knowledge of individual characteristics can be used to not only evaluate the match with a possible job but also to inform the counseling approach used with clients. Authors of the Strong noted, "using the Strong and the Myers-Briggs Type Indicator has been shown to be particularly useful" (Harmon et al., 1994, p. 238). From a P-E perspective, use of these two instruments together can, according to Strong authors,

provide deeper levels of self-understanding leading to improved information-processing and critical thinking procedures and help confirm particular areas that warrant further exploration (Harmon et al., 1994). The current study calls into question the validity of treatment planning and implementation based upon bivariate research and suggests the need for further research matching treatment planning with multivariate findings. Specifically, does a client's and a counselor's knowledge and understanding of multivariate MBTI-Strong relationships significantly enhance the facilitation of Person-Environment goals including increased self-understanding, increased decision-making process skills, increased clarity of occupational selection, and increased occupational satisfaction. Present findings suggest but do not confirm that P-E process goals will be better facilitated using multivariate analysis considerations versus bivariate and/or categorical analysis.

Hammer and Kummerow (1997) stated that more information was needed regarding unique versus complimentary contributions of the MBTI personality dimensions and the Strong interest themes. The present data suggests that (a) the two constructs do offer both unique and complimentary information and (b) the specifics therein are moderated by gender. Further research is needed to test the reliability of the present findings, bearing in mind that test-retest reliability has been referred to as the Achilles heel of the MBTI among its critics (Hammer, 1996). Hammer (1996) highlighted that because cutoff scores are used within each of the four dichotomies, the size of acceptable standard error around the cutoff score is decreased. Furthermore, under the current scoring system research indicates that many individuals receive low preference scores (Hammer, 1996). Therefore, forcing such individuals to fit into a two-

category structure can produce a high rate of erroneous classifications (Hammer, 1996). Most of the type-switches within test-retest analyses occur not surprisingly in individuals with low preference clarity (Hammer, 1996). The present study sought to resolve this issue in part via the use of continuous scores as opposed to typology status. Continuous scores are still susceptible, however, to decreased reliability due to ambiguous clarity of preference on the MBTI dimensions.

The generalizability of the data is limited by several important considerations. The fact that only college students were used within the sample limits generalization to other groups. College students were used for at least two important reasons. First, Strong interest theme data is purported to be particularly useful when counseling or advising beginning college students (Harmon et al., 1994). The GOTs can be used to help those students who are not prepared to select a major to understand their general interests (Harmon et al., 1994). The themes and their relationship on the hexagon are purported to provide a cognitive map for students who are trying to select and academic major from what is often a confusing web of options (Harmon et al., 1994). Second, previous research primarily employed a college student population. This is largely attributable to the fact that the most readily available and applicable population from which to sample is college students who are typically confronting important occupational choices. Aside from the homogenous nature of the sample, other factors relevant to the college sample have been found to impact reliability. A summary of MBTI Form G data suggested that sample characteristics may create reliability variation across groups. Specifically, groups composed of people who are believed to have less command over perception and judgment (e.g., chronologically younger participants) should exhibit lower

reliabilities (Myers & McCaulley, 1998). An individual's level of achievement has also

been found to affect the quality of perception and judgment (Myers & McCaulley, 1998).

It is therefore expected that within samples consisting of comparable age levels, those

individuals with higher achievement levels will report their preferences more consistently

(Myers & McCaulley, 1998). College and university samples possessed higher

reliabilities than did high school samples (Myers & McCaulley, 1998). Reliabilities were

also found to be higher in groups with higher average intelligence as measured by

standard intelligence tests (Myers & McCaulley, 1998). A sample comprised of differing

age, achievement, and intelligence levels is therefore suggested toward increased

generalizability of findings.

A second limitation to generalizability is the racial/ethnic homogeneity of the

sample. Although the exact racial and ethnic demographics of the sample are unknown,

general setting characteristics suggest the sample was primarily White. Individuals

identifying as Asian or as American Indian were the next most frequently occurring

population groups within the university from which the sample was derived. As has been

discussed, Holland's theory in particular has been scrutinized for cross-cultural

applicability. In the early to middle 1990's, the belief emerged that perhaps confidence in

the structure of Holland's model and its applicability to the culturally diverse was

inaccurate. Gati (1991) claimed that Holland's order did not adequately account for the

relationships among the six types (Rounds & Tracey, 1996). Rather, according to Gati

(1991) a three-group partition [(RI) (AS) (EC)] demonstrated a better fit with cross-

cultural populations (Rounds & Tracey, 1996). According to Gati's (1991) model,

correlations between types belonging to the same category (e.g., R, I) were greater than

correlation's between pairs of types outside the category (e.g., R, A) (Rounds & Tracey, 1996). Both Holland's and Gati's models have since received criticism for the relationship ascribed between the A and S types (Rounds & Tracey, 1996). Several researchers have noted the cross-cultural discontinuity between Artistic (A) and other Holland types. Rounds and Tracey (1996) attempted to address this discrepancy through adjusting Gati's (1991) model so that the A type existed within its own category and the S type was added to the EC category [i.e., (RI) (A) (SEC)]. To test their hypothesis, Rounds and Tracey (1996) conducted a structural meta-analysis to evaluate the cross-cultural validity of the three models. Results indicated that Gati's (1991) model and Rounds and Tracey's (1996) model achieved the best fit to the data. Rounds and Tracey (1996) suggested that the results might be used to (a) counterpoint previous conclusions supporting Holland structure across cultures and to (b) warn publishers, authors, and assessors that the knowledge pertaining to consistency within Holland's model may not be applicable to cross-cultural groups. In 1998, however, Day and Rounds seemed to offer contradictory evidence. Day and Rounds (1998) asserted that people of different ethnicity and sexes hold the same cognitive map of the workworld when the structures of preferences are explored. Furthermore, Day and Rounds (1998) stated that the "RIASEC arrangement of general occupational themes prevails legitimately. Previous research suggesting otherwise probably suffered multiple perils of . . . small sample size, unrepresentative sampling, selective attrition…and attenuated categorization" (p. 735). Due to the mixed results regarding the cross-cultural validity of Holland's model, ensuing studies are encouraged to pursue racial diversity within their sample or sample racial and ethnic groups in addition to White/Caucasian.

The use of canonical correlation limits the findings in three important ways. First, canonical correlation is designed to examine the relationships between two groups of variables. It therefore does not answer questions regarding specific relationships within each variate outside of the context of the opposite variate. For example, canonical correlation permits the conclusion that higher levels of SN are correlated with higher levels of Artistic and lower levels of Realistic and Conventional interests. This does not imply that outside of the context of the relationship with SN, Artistic and Realistic and Artistic and Conventional are necessarily negatively correlated. Bivariate analysis is therefore useful toward the explanation of relationships within canonical variates. Second, canonical correlation is an explanatory tool and not a predictive tool. Future research should consider employing predictive data analytic models to the present findings. Finally, as the well-known statistical principle states, correlation does not equal causation. Although canonical correlation uncovered important correlations between MBTI personality dimensions and Strong interest themes, it does not address potential underlying factors that unify the relationships discovered and which could validly be said to "cause" the relationship. Future research studies should consider a data analytic method that allows for the exploration of, specifically, underlying factors unifying correlated relationships between the MBTI personality dimensions and the Strong Interest themes.

REFERENCES

Blustein, D. & Spengler, M. (1995). Personal adjustment: Career counseling and psychotherapy. In Walsh, B.W., & Osipow, S., (Eds.), Handbook of Vocational Psychology

Buboltz, W., Jr., Thomas, A., & Johnson, P., (in press). The relationship between the MBTI and SII: Implications for Conjunctive Use in Counseling. In Columbus, F., (Ed.), Advances in Psychology Research.

Buboltz, W., Jr., Johnson, P, Cassiday, S., & Miller, M.A. (1999). The relationship between Strong personal style scales and MBTI poles. Journal of Career Assessment, 8, 131-146.

Chartrand, J.M. (1991). The evolution of trait-and-factor career counseling: A person x environment fit approach." Journal of Counseling and Development, 69, 518-524.

Day, S.X., & Rounds, J. (1998). Universality of vocational interest structure among racial and ethnic minorities. American Psychologist, 53, 728-736.

DeCola, L. A. (1992). The relationship between the Myers-Briggs Type Indicator and Strong-Campbell Interest Inventory. (Doctoral Dissertation, University of Akron, Akron, Ohio).

Dillon, M., & Weissman, S. (1987). Relationship between personality types on the Strong-Campbell and Myers-Briggs Instruments." Measurement and Evaluation in Counseling and Development, 20, 68-79.

DiTiberio, J.K., & Hammer, A.L., (1993). Manual: Introduction to type in college. Palo Alto, CA: Consulting Psychologists Press, Inc.

Dowd, E.T. (1998). Counseling psychology. In R.J. Corsini & A.J. Auerbach (Eds.), Concise encyclopedia of psychology (pp 178-179). New York: John Wiley and Sons.

Graff, R.W., Larrimore, M., Whitehead, G.I., & Hopson, N.W. (1991). Career counseling practices: A survey of college/university counseling centers. Poster presented at the annual meeting of the American Psychological Association, San Francisco, CA.

Hackett, G., & Lent, R.W., (1992). Theoretical advances and current inquiry in counseling psychology. In S.D. Brown & R.W. Lent (Eds.), Handbook of counseling psychology (pp. 419-452).

Hall, C.S., & Lindzey, G., (1970). Theories of personality (2 ed). New York, NY: John Wiley and Sons, Inc.

Hammer, A.L., (1996). MBTI applications: A decade of research on the Myers-Briggs Type Indicator. Palo Alto, CA: Consulting Psychologists Press, Inc.

Hammer, A.L., & Kummerow, J.M. (1997). Strong and MBTI career development guide - revised. Palo Alto, CA: Consulting Psychologists Press, Inc.

Harmon, L.W., Hansen, J.C., Borgen, F.H., & Hammer, A.L. (1994). Strong interest inventory applications and technical guide. Stanford, CA: Stanford University Press.

Healy, C.C., (2000). Interpreting the Myers-Briggs Type Indicator to help clients in understanding their Strong Interest Inventory. Journal of Career Development, 26, 295-308.

Holland, J.L. (1985). Making vocational choices (2 ed.). Englewood Cliffs, NJ: Prentice-Hall.

Jaccard, J., & Becker, M.A. (1990). Statistics for the behavioral sciences (2 ed.) Belmont, CA: Wadsworth Publishing Company.

Jones, A.J., Stefflre, B., & Stewart, N.R. (1970). Principles of Guidance (6th ed.). New York: McGraw-Hill.

Katz, L., Joyner, J.W., & Seaman, N., (1999). Effects of joint interpretation of the Strong Interest Inventory and the Myers-Briggs Type Indicator in career choice. Journal of Career Assessment, 7, 281-297.

Lowman, R.L. (1987). Occupational choice as a moderator of psychotherapeutic approach. Psychotherapy, 24, 801-808.

Lowman, R.L. (1991). The clinical practice of career assessment: Interests, abilities, and personality. Washington, DC: American Psychological Association.

Miller, M.A., Buboltz, W.C., (1999, April). The relationship between MBTI attitude types and SII Holland interest types. Poster presented at the annual meeting of the Great Lakes Conference, Ohio State University, Columbus, OH.

Miller, M.J. (1992). Synthesizing results from an interest inventory and a personality inventory to improve career decision-making. Journal of Employment Counseling, 29, 50-59.

Myers, I.B., & McCaulley, M.H. (1998). Manual: A guide to the development and use of the Myers-Briggs Type Indicator. Palo Alto, CA: Consulting Psychologists Press, Inc.

Myers, I.B., & McCaulley, M.H. (1985). Manual: A guide to the development and use of the Myers-Briggs Type Indicator. Palo Alto, CA: Consulting Psychologists Press, Inc.

Pinkney, J.W. (1983). The Myers-Briggs Type Indicator as an alternative in career counseling. Personnel and Guidance Journal, 61, 173-177.

Rounds, J. & Tracey, T.J. (1990). From trait and factor to person-environment fit counseling: Theory and process. In W.B. Walsh & S. H. Osipow, (Eds.), Career Counseling. Hillsdale, NJ:Erlbaum.

Rounds, J. & Tracey, T.J. (1996). Cross-cultural structural equivalence of RIASEC models and measures. Journal of Counseling Psychology, 43. 310-329.

Strong, E.K. (1943). Vocational interests of men and women. Stanford, CA: Stanford University Press.

Zunker, V.G. (1998). Career counseling. Applied concepts of life planning. (5 ed.) Pacific Grove, CA: Brooks/Cole Publishing.

Zunker, V.G. (1994). Career counseling. Applied concepts of life planning. (4 ed.) Pacific Grove, CA: Brooks/Cole Publishing.