COLLEGE MAJOR SELECTION AND PERSONALITY VARIABLES AS DETERMINANTS IN LIFELONG CAREER DECISION-MAKING

by

Sharon E. Imperial

An Abstract of a thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in the Department of Psychological Science University of Central Missouri

November, 2013
ABSTRACT

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The choice of a college major and subsequent vocational selection is important because it has lifelong consequences. This study recruited 61 Midwestern undergraduate university students in order to examine the relationship between their college major selection and twelve personality variables. Specifically, it was expected that the scores of Extraversion, Investigative, Social, Enterprising, and individual General Self-Efficacy would yield significant differences between the two major fields of science and humanities. The participants were administered the NEO Five-Factor Inventory-3, Holland Self-Directed Search, and General Self-Efficacy Scale. Participants were also asked to report their individual choice of college major. All 61 majors reported were then categorized according to whether they belonged in the science or humanities field. Analyses of all data included twelve independent samples t-tests conducted on the participants’ mean scores on the two personality inventories and the GSES. Significant differences between the fields of science and humanities were found for the three Holland RIASEC types of Investigative, Social, and Enterprising. These findings contribute to the body of research support for Holland’s theory of vocational choice that individuals select vocations which are compatible with their personalities.
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A Thesis
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Purpose of the Study

The purpose of this research study is to examine empirically the possibility of a link between personality traits and college major selection and to expand its relative knowledge base regarding vocational choice. Research studies on the relationships between students’ personality traits and their college major selections can provide a valuable resource in helping students make the best choice in college major selection. At a practical level, good fits between individuals’ personality characteristics and their work environments translate into greater job satisfaction and stability, increased personal growth, and maximized activation of individuals’ talents and abilities (Osipow, 1973). Expanding the knowledge base regarding the connection between individual personality traits and career choice can reduce the occurrence of misguided and inappropriate career paths. Choosing an inappropriate career can and does result in personal, occupational, and economic losses as well as diminished quality of life (Parsons, 1909). Furthermore, expanding the knowledge base regarding college major selection makes for a win-win dynamic in that it benefits both students and academic counselors.

Thesis of the Study

This study focuses on three factors as they relate to career decision making: 1) the role of personality traits; 2) the role of vocational interests and abilities; and 3) the role of self-efficacy as a personality variable. In the context of this study, these three factors converge as they center upon the important decision of career choice. Also explored is the interface between vocational psychology, which is an applied branch of psychology, and personality psychology as it centers upon the task of career selection. Selected major contributors and their theories regarding these
three factors, as they relate to vocational decision-making and college major selection by college students, are discussed.

This study focuses upon the trait-factor model in examining the influence of personality traits in relation to college major selection. Therefore, the theoretical foundation for the trait-factor paradigm is discussed in the literature review. Specifically, significant differences are expected between the mean scores obtained by science and humanities majors on the personality variables of Extraversion and General Self-Efficacy, and on the personality types of Investigative, Social, and Enterprising.

In the context of this study, a distinction is made between science and humanities. The classification of humanities includes the academic category of liberal arts. Examples of humanities studies are art appreciation, music theory and performance, English literature, history, languages, public relations, and anthropology. All of these branches of study center around the human experience and are influenced by culture. Science, on the other hand, is concerned with empirical methodological investigation and with the explanation of observable phenomena. This quasi-experimental study seeks to explore and evaluate the findings for the following three research questions: 1) Does the empirical evidence suggest a link between choosing a humanities major and having strong initiative and leadership skills? 2) Do the various branches of science attract students who have a high level of intellectual curiosity? 3) Do students’ levels of general self-efficacy influence their choice for either a science or a humanities major? The findings for these research questions are addressed in the Discussion section.
Definition of Terms

Agreeableness: a personality factor described as “sensitive, warm, tolerant, easy to get along with,…” (Nevid, 2006, p. 358).

Artistic: a personality model type which needs individualistic expression and prefers to deal with his/her environment through self-expression in artistic media (Holland, 1966).

Congruence: the degree of consistency between an individual’s high point code and the occupational environment of his chosen field (Osipow, 1973).

Conscientiousness: a personality trait described as “reliable, responsible, self-disciplined, ethical, hard-working,…” (Nevid, 2006, p. 358); “the individual’s degree of organization, persistence, and motivation in goal-directed behavior” (Derlega, Winstead, & Jones, 2005, p. 199).

Conventional: a personality model type which tends to be conforming and values material possessions and social status (Holland, 1966).

Differentiation: the level of distinctiveness of either a personality or an occupational description (Holland, Powell, & Fritzscbe, 1997).

Enterprising: a personality model type which prefers to dominate and to lead others, to engage in ambiguous social tasks, and to be orally assertive (Holland, 1966).

Extraversion: a personality trait characterized by a high level of interpersonal activity, attention seeking, and “…need for stimulation; and capacity for joy” (Derlega et al., 2005, p. 199).

Investigative: a personality model type which is asocial, task-oriented, and intraceptive (Holland, 1966).

Neuroticism: a personality trait characterized by a lack of stability in emotional disposition and inability to cope in a positive manner (Derlega et al., 2005).
Openness: “proactive seeking and appreciation of experience for its own sake; toleration for and exploration of the unfamiliar” (Derlega et al., 2005, p. 199).

Personality(a): “the dynamic organization within the individual of those psychophysical systems that determine his characteristic behavior and thought” (Allport, 1961, p. 28).

Personality(b): the make-up of an individual which enables the prediction of the responses he/she will make in a given circumstance (Cattell, 1950).

Personality pattern: “a pattern of similarity and dissimilarity” (p. 10) derived from an individual’s resemblance to each of Holland’s six types (Holland, 1966).

Personality profile: the application of the descriptions of Holland’s six types to an individual’s scores from his “personality inventories, his self-descriptions, his choice of vocation or field of training, his life history, or combinations of these data” (Holland, 1966, p. 11).

Personality psychology: the study of traits or individual differences (Costa & McCrae, 1992).

Personality structure traits: a description refering to “the pattern of covariation among these traits” (p. 509). An example of this pattern as presented in the Eysenck study occurs when the two traits of sociability and cheerfulness merge together and combine to define a dimension called extraversion (as cited in McCrae & Costa, 1997b).

Personality traits: dimensions of individual difference (McCrae & Costa, 1997b).

Personality traits: defined as “relatively enduring styles of thinking, feeling, and acting” (McCrae & Costa, 1997b, p. 509).

Personality type: the single model derived from comparing an individual’s attributes with those of each of Holland’s model types and determining which type fits the best (Holland, 1966).

Realistic: a personality model type which is unsociable, lacking in verbal and interpersonal skills, and having conventional political views and socioeconomic values (Holland, 1966).
**Self-concept**: an individual’s image and evaluation of himself (Super, 1957).

**Self-efficacy**: a belief about one’s personal competence in a given area (Bandura, 1997).

**Social**: a personality model type in which individuals prefer to use their strong verbal and interpersonal skills to solve problems through social engagement of others (Holland, 1966).

**Trait**: “a broad system of similar action tendencies” (Allport, 1961, p. 337).

**Type**: a model which is used to measure the real individual (Holland, 1966).

**Vocational choice**: operationally defined as an expressed intention to enter a particular field of work (Crites, 1969).

**Procedural Overview**

The participants in this study consisted of 61 undergraduate students attending a Midwestern university. After reading and signing the informed consent form, participants were administered the NEO-Five Factor Inventory (NEO-FFI-3), Self-Directed Search (SDS), and General Self-Efficacy Scale (GSES). The NEO-FFI-3 is a brief version of the NEO Personality Inventory-Revised (NEO-PI-R). The NEO-FFI-3 measures the following personality traits: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (OCEAN). The Self-Directed Search (SDS) is a vocational interest inventory which measures six personality types: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC). The GSES is a standardized 10-item self-report, self-efficacy measure with four Likert scale response options ranging from 1) *not at all true* to 4) *exactly true*. The GSES is sourced in Appendix A. The participants also responded to a brief self-report questionnaire which consisted of one question concerning their college major. This self-report questionnaire is found in Appendix B. The approved informed consent form used in this study is found in Appendix C.
Role of Personality Traits in Career Decision-Making

Two important elements in trait-and-factor theory are the psychology of individual differences and the analysis of occupations. The rationale underlying the trait-factor approach assumes that because of the inherent differences in the roles which occupations expect individuals to assume, the ideal personal characteristics of members of various vocational groups vary (Osipow, 1973). Trait and factor theory adheres to three basic beliefs: 1) individuals display differences in traits; 2) the characteristics required of occupational members are unique for each occupation; and 3) the goal of vocational guidance should be to appropriately match individuals with jobs (Zaccaria, 1970, p. 26).

A strength of personality trait theory is that it relies upon statistical and objective data (Osipow, 1973). It is neither subjective nor influenced by personal experience. On the other hand, a criticism of trait theory is that it cannot predict future behavior. Nor does it address the issue of personality development (Osipow, 1968). An additional limitation of trait theory is that because it is concerned only with the present, it does not allow for changing negative aspects of a personality trait. The trait-factor approach is fundamentally research oriented and empirically measured because its goal is to increase the accuracy of identification of distinctive personality attributes inherent in members of various careers (Osipow, 1973).

Overview of Personality Trait-Factor Theory

The literature review highlights some of the significant developments which occurred in personality psychology in the twentieth century after it emerged as a discipline in the social sciences in the 1930s. According to McAdams (1997), personality psychology was eclipsed by experimental social psychology in the mid-1960s and almost vanished as a discipline in the 1970s.
and early 1980s. It was replaced by behaviorism, which denies that individuals have stable psychic structures and tendencies in their personalities which account for their behavior (McAdams, 1997).

In the post-World War II era from 1950 to 1970, personality psychologists began examining key personality constructs in empirical hypothesis-testing research (McAdams, 1997). Much of the literature in the 1950s and 1960s focuses upon this measurement of key constructs. Between 1950 and 1970 three conceptual trends emerged in the personality psychology field: 1) the whole person concept was broken down into dispositional constructs; 2) the theory of tension reduction, dominant in the 1930s and 1940s, became weaker as a means of explaining human motivation; and 3) the introduction of cognitive approaches ushered in a new way of understanding the individual (McAdams, 1997). The trend in the 1950s was a factor analytic approach to personality structure. Cattell used factor analysis in developing his 35 clusters of personality traits (McAdams, 1997). Later, in the 1960s, the cognitive model of understanding the dynamics of human behavior was introduced. It replaced the former mechanistic approach of tension-reduction theories which had emphasized the stimulus-response model (McAdams, 1997).

As the 1960s came to a close, two distinct camps competed for dominance: the “trait psychologists” and the environmental “situationists.” Trait psychologists proposed personality constructs; whereas, the “situationists” were essentially social psychologists who stressed that the nature of the situation accounted for behavior (McAdams, 1997, p. 18). These two polarized camps reached a consensus in the 1980s which acknowledged the interaction of both traits and situations in accounting for behavior (McAdams, 1997). Since the late 1980s, interest in individual differences in persons has revived. The interface of cognitive developmental psychology and personality emerged in the 1980s with the formulation of developmental theories about the self (McAdams, 1997).
Major Contributions of Selected Personality Trait Theorists

Traits are simply aspects of behavior which are more generalized and varied in expression than are habits (Allport, 1961). Allport believed that common traits provide strong methodology and theory for studies which compare personalities. Allport’s trait theory is comprised of cardinal, central, and secondary traits. In the chapter “Structure of Personality,” Allport (1955) described cardinal traits as a small number of broad, future-oriented, intentional dispositions which are unique for each individual. Central traits are the general, common characteristics of an individual. For example, the description of being generous would be considered a central trait. Allport categorized secondary traits as those which only emerge in certain situations. According to Allport (1955), these traits are flexible enough to allow for latitude in enabling the individual to meet cultural and situational requirements.

Allport viewed the structure of personality as a system in which all of its parts are related. In a personality study published by Allport in 1937, he maintained the unique wholeness of the person (as cited in McAdams, 1997). According to Allport, human personality follows the path of “self-actualization” (p. 85) in that it propels the individual toward goal fulfillment (Allport, 1961). In Allport’s view, personality is not static but continually growing and learning; the process of becoming is lifelong. According to Allport’s theory, inborn dispositions provide the raw substance for personality development. They account for at least three sets of factors: 1) survival instincts; 2) genetic heritability dispositions; and 3) learning capacity (Allport, 1955). As explained in the chapter entitled “Disposition,” the learning process enables human infants to develop a moral conscience, a self-concept, and a hierarchical organization of individualized personality traits (Allport, 1955). According to Allport, culture has a huge impact on shaping personality. Moreover,
personality and cultural setting cannot be separated. Allport believed that sociocultural systems operate as a matrix outside of personality systems.

Like Allport, Murray also espoused the whole person orientation. However, unlike Allport, Murray borrowed eclectic ideas from Freud and Jung. Murray conceptualized approximately 27 basic, largely unconscious, psychogenic needs which influence situations in the individual’s life (McAdams, 1997). Most research on Murray’s theory, according to McAdams (1997), has focused upon these three prominent needs: 1) Need for Power (nPow); 2) Need for Affiliation (nAff); and 3) Need for Achievement (nAch). External environmental forces act upon these needs to produce tension states, which are reduced when these needs in the individual are satisfied. Central to Murray’s motivational theory, according to his writings in 1938, was his belief that the direction of an individual’s activities is the key element in the analysis of that individual’s motives (as cited in Hall, Lindzey, & Campbell, 1998). The tension reduction viewpoint was weakened in the 1950s and was replaced by cognitive theories in the 1970s (McAdams, 1997).

The conceptualizations of Allport and Murray provided some of the foundation for Cattell (1950b) in his factor analysis. By means of factor analysis, Cattell developed fundamental personality measurement techniques. Allport, Murray, and Cattell all shared the belief that human personality is integrated and holistic (McAdams, 1997). Unlike Allport, however, Cattell posited in the chapter entitled “Personality and the Cultural Pattern” that cultural influences make little or no difference in basic personality differences (Cattell, 1950a). Despite this divergence in their theories, Cattell was, nonetheless, influenced by Allport’s list of about 4,000 personality traits.

The basic adjective list of trait terms served as the rudimentary foundation for the preliminary scientific attempt to measure personality traits. In 1934 Thurstone, who used the multivariate models approach, reported his study of trait adjectives. Specifically, Thurstone
provided raters with a list of 60 trait adjectives. He then asked each rater which adjectives were appropriate to describe someone he/she knew well. When Thurstone studied the intercorrelations among the 60 adjectives, he found that five common factors accounted for them (Wiggins & Trapnell, 1997).

Cattell (1950b), who is known for his contribution of the 16 Personality Factor Model, also used this “adjective list” lexical approach to compile common adjectives describing personality. In 1943 Cattell reported his organization of these selected adjectives into 35 clusters of descriptors (Wiggins & Trapnell, 1997). He later used these 35 clusters to conduct factor analytic studies. After examining patterns in these 35 clusters, Cattell constructed a hierarchy of 16 Personality Factors (PF), which represent the main traits. He arranged these 16 traits on a continuum. Individuals were assessed in accordance with where on the continuum they fell. From this continuum Cattell developed his Sixteen Personality Factor Questionnaire (16 PF) and conducted numerous studies on it. This valuable assessment, first published in 1949, continues in usefulness today.

Cattell viewed a personality trait as a mental structure which enabled regularity and consistency in human behavior (McAdams, 1997). As Cattell explained in the chapter entitled “Problems of Personality Study,” domains of personality can be measured on conditions in definite units just as scientifically in psychological science as in chemistry and physics (Cattell, 1950b). Cattell expressed his definition of personality in the following mathematical equation: $R = f(P,S)$. In this equation, $S$ represents the stimulus or situation. $R$ represents the behavioral reaction. $P$ represents the researcher’s object of investigation (Cattell, 1950b, p. 23). Furthermore, Cattell proposed that occupational success is linked to personality. To investigate this hypothesis, he studied four diverse hobbies pursued by adults as indicators of vocational interests. Results
demonstrated that each hobby showed a distinct personality interest pattern (Cattell, 1950c). Cattell believed that hobbies are useful as indicators of personality and can open a possible pathway to a new vocation.

Later, Goldberg was the first personality researcher to present a confirmation in 1980 that five large factors accounted for trait description insofar as the English language was concerned (Wiggins & Trapnell, 1997). Goldberg conducted a factor analysis of 75 variables, consisting of small synonym clusters, and 133 scales. Goldberg’s factor extraction and rotation research produced psychometric results which indicated that the five-factor structure remained stable on all counts in number of factors extracted, method of variable selection, variety of samples, and targets of self and peer ratings (Wiggins & Trapnell, 1997). By his factor analysis study, Goldberg renewed scientific interest in the lexical approach to personality study and redirected attention once again to the Five-Factor Model (FFM).

*Five-Factor Personality Variables*

The previously mentioned 35 personality trait clusters developed by Cattell are the forerunner of the current five-factor trait model of personality. Several research studies which used both observer and self-report ratings were conducted on the FFM in the 1980s. In the 1990s, a surge of renewed interest in the FFM produced important research findings, such as those reported by Costa and McCrae. The FFM currently ranks as the most widely adopted trait model of personality and the most influential formulation of constructs to describe individual differences in personality (McAdams, 1997). This model classifies individual differences in personality into five broad factors of Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (OCEAN). Nevid points out the multicultural applicability of the FFM: “Cross-cultural studies
show that personality traits resembling the ‘Big Five’ emerge in many different cultures, …” (Nevid, 2006, p. 358).

Many psychologists consider the “Big Five” to be the best representation to date of personality trait structure. The following five dimensions are now viewed as probable universals of human nature which transcend cultural and ethnic differences (McAdams, 1997). Specific facets of personality traits derive from the following five broad domains. These core domains are binary, which means that their negative components are present at the opposite far end of the five domain continua. However, this study is mainly concerned with the positive aspects in each domain.

Openness is the least researched and perhaps the least understood of all five concepts. According to McCrae and Costa (1997a), Openness to Experience is associated with the facets of intellect, imagination, and culture. For example, Open individuals demonstrate creativity and have active imaginations. They are bored by routine activities and seek variety. They are distinguished by their natural curiosity. Although Open individuals have an insatiable intellectual curiosity, it is too narrow and limiting in judgment to label the construct of Openness as intellect. Moreover, past literature indicates that people high in intellect can be closed (McCrae & Costa, 1997a).

Individuals who score high in Openness to Experience tend to be flexible in their principles and beliefs and to hold liberal social and political views (McCrae & Costa, 1997a). They relish intellectual challenges and seek exposure to new external stimuli. Open individuals actively seek new and diverse experiences. For example, an individual who enjoys the adventure aspect of international travel in his/her leisure time might be considered to have a high level of Openness to Experience. Conversely, an individual who avoids unfamiliar places and prefers familiar routines might be considered to have a low level of Openness to Experience.
Openness is a broad constellation of traits in the cognitive, emotional, and behavioral domains. Openness refers to how individuals process experience (McCrae & Costa, 1997a). Open individuals usually have a strong esthetic appreciation of the arts. They often see possibilities in circumstances which others fail to see. Individuals who are high in Openness to Experience demonstrate a willingness to consider novel ideas and to try creative approaches to problem solving. Previous research findings indicate that the majority of people are intermediate in Openness (McCrae & Costa, 1997a).

Open men and women tend to have strong intellectual interests which may lead them to seek advanced levels of education. However, education itself appears to have little effect upon the development of Openness (McCrae & Costa, 1997a). It is interesting to note that most midlife career changers have a high level of Openness (McCrae & Costa, 1997a). McCrae reported in 1987 his finding that Openness is the only one of the five factors which is positively related to psychometric measures of intelligence and other cognitive abilities; however, Openness was not found to be equivalent to intelligence (as cited in McCrae & Costa, 1997a). Heritability of Openness, however, is similar to heritability of intelligence and has found some support in the research literature. For example, Bergeman and colleagues studied adult Swedish twins and reported in 1993 that their findings suggest that Openness may have a strong heritable component (as cited in McCrae & Costa, 1997a).

Open people tend to have a wide and ever-increasing range of interests which is always expanding. For example, open people delight in tasting different food, traveling to new places, seeing new sights, and reading new books (McCrae & Costa, 1997a). Their desire to explore the world does not depend upon their cognitive abilities but rather upon their natural curiosity. As opposed to closed individuals, Open individuals have a capacity for deeply focused attention. Open
individuals are more emotionally ambivalent than are closed individuals. They also have a greater tolerance of ambiguity in their perceptual domain (McCrae & Costa, 1997a). When processing new information which conflicts with their preconceived notions, Open individuals are more likely to change their minds about an issue than are closed individuals. McCrae and Costa describe a Rogerian conceptualization of Openness as “a mental phenomenon related to the scope of awareness or the depth and intensity of consciousness” (McCrae & Costa, 1997a, p. 835).

Conscientiousness is equated with the Will to Achieve (Costa & McCrae, 1992). Conscientious individuals tend toward strict organization, a persevering work ethic, punctuality, and persistence. Conscientious individuals tend to be highly organized, focused, and diligent (Costa & McCrae, 1992). In describing Conscientiousness, Hogan and Ones (1997) refer to the socioanalytic theory that Conscientiousness is an interpersonal behavioral coping strategy for finding approval in one’s group. The concept of Conscientiousness revolves around the central idea of conformity and socially prescribed self-control (Hogan & Ones, 1997). Meta-analytical validity generalization studies reported by Barrick and Mount in 1991 indicate that among the big five dimensions of personality, Conscientiousness alone shows consistent validities across organizations, occupations, and situations (as cited in Hogan & Ones, 1997).

Conscientious individuals are law-abiding and like the structure of rules (Hogan & Ones, 1997). They tend to avoid debates and differences of opinion. They lack impulsivity and spontaneity. Their disposition leans toward cautiousness; they tend to approach situations with a cautious orientation. They like a high level of orderliness and tidiness in their work environment. They tend to be critical, methodical, dependable, reliable, and well-organized in their work habits. They demonstrate a responsible work orientation; they believe in working hard and persevering (Hogan & Ones, 1997).
The model of Extraversion consists of six primary traits or facets which include the following: 1) Assertiveness; 2) Excitement-Seeking; 3) Activity (lively action); 4) Gregariousness; 5) Warmth (ardor); and 6) Positive Emotions (Watson & Clark, 1997). All of these facets share the attribute of positive emotionality. Extraversion is associated with Surgency, which refers to dominance/submissiveness (Costa & McCrae, 1992). Extraverts like to join clubs, groups, and committees. They take a passionate interest in work-related activities. They tend to be fun-loving and animated. Extraverts tend to be sociable, verbal, and demonstrative. Extraverts are interested in others and have a high level of interpersonal interactions and activities (Derlega et al., 2005). Extraversion is described by characterizations such as boldness, enthusiasm, assertiveness, and optimism (Watson & Clark, 1997). In temperament extraverts tend to be cheerful and upbeat. Extraverts seek out the company of other people and are confident and comfortable in social interactions. They tend to be lively, energetic, and outgoing.

Extraversion and Agreeableness are both dimensions of interpersonal behavior. Agreeable individuals tend to look for the best in others, to be generous to others’ needs, and to have a pleasant disposition. Agreeableness is contrasted with Antagonism at the far end of the continuum. Trait words which Goldberg used in 1981 to describe the dimension of agreeableness (as cited in Graziano & Eisenberg, 1997) are associated with attributes such as generosity, kindness, helpfulness, and consideration for others. Prosocial behavior is linked to the trait of agreeableness (Graziano & Eisenberg, 1997). Examples of prosocial behavior are the actions of volunteering of one’s time or resources and donating to a charity. In both of these actions a sympathy and concern for others, characteristic of agreeableness, is demonstrated. High-A individuals tend to be trusting, accommodating, congenial, and cooperative. Neuroticism, on the other hand, is characterized by

**Previous Research Findings Regarding Personality Traits and College Major Choice**

The research literature regarding Neuroticism indicates that it has been associated with the negative, maladaptive form of perfectionism. Slaney and colleagues developed the Almost Perfect Scale-Revised (APS-R) in order to measure the dimensions of the construct of perfectionism (Rice, Ashby, & Slaney, 2007). Of particular interest is the Discrepancy subscale of the APS-R because it measures “… the perceived gap between one’s performance expectations and performance self-evaluations,…” (Rice et al., 2007, pp. 385-386). By measuring respondents’ self-perceptions of failing to measure up to their self-imposed performance standards, the Discrepancy subscale provides a clear indication of maladaptive perfectionism. Higher scores on the 12-item Discrepancy scale indicate a higher level of perfectionism (Rice et al., 2007). Discrepancy is operationalized by the APS-R to measure the negative attribute of perfectionism which is related to Neuroticism (Rice et al., 2007). Two samples consisted of undergraduate university students. Both samples were administered the NEO Five-Factor Inventory-Form S (NEO-FFI-S) and the APS-R. Rice et al. (2007) found a significant and particularly strong association between Discrepancy and the Five-Factor Model (FFM) dimension of Neuroticism in both samples as demonstrated by correlations of .59 and .65 (p. 393). Further studies are needed on Discrepancy and its association with Neuroticism.

Personality trait stability has been a topic of interest to researchers. A review of the literature reveals convergent findings that personality traits tend to be very stable despite the aging process. According to Costa and McCrae (1988), findings from their retest stability analyses indicated that personality changes very little in adulthood. Across the adult life span from age 30 to age 80, the
social and emotional dispositions of most people remain remarkably constant (Costa & McCrae, 1988). Similarly, Cattell (1950c) pointed out in the chapter entitled “The Life Course of Personality” his observation that an individual’s interests are more stable between the ages of 20 and 60 than they are in youth. Cattell’s finding is consistent with that of Strong who, likewise, found remarkably little change in personality patterns after the age of 20 (Cattell, 1950c). Furthermore, according to McCrae and Costa (1990), repeated findings imply that generational differences in anxiety, impulsiveness, and openness to feelings are rare and small.

In contrast to the stability of personality traits, the research literature reported that the mean importance of major life goals tends to decrease over time. According to Roberts, O’Donnell, and Robins (2004), the link between personality traits and major life goals appears to be weaker than researchers have previously speculated. Roberts et al. (2004) reported their findings from a four-year longitudinal study in which college students rated the importance of 26 life goals which measured seven broad dimensions. Their study examined the relationship between change in major life goals and change in the Big Five personality traits during the students’ four-year college program. Roberts et al. (2004) found support for a modest but meaningful relationship between the students’ main life goals and the Big Five personality traits, as measured by the 60-item NEO-Five Factor Inventory (NEO-FFI).

Roberts et al. (2004) found that esthetic goals were related only to Openness. Higher scores on social goals were associated with higher scores on Agreeableness, Neuroticism, and Openness; whereas, higher scores on relationship goals were associated with higher scores on Extraversion and Agreeableness (Roberts et al., 2004). Higher scores on hedonistic goals were associated with higher Extraversion and Openness scores but lower Agreeableness scores; whereas, higher scores on political goals were associated with higher scores on Extraversion but lower scores on
Agreeableness (Roberts et al., 2004). Correlational findings indicated that changes in Extraversion surpassed all other trait domains in demonstrating more significant relationships to change in major life goals. Roberts et al. (2004) concluded that “… changes in life goals are linked to changes in personality traits in several interesting and theoretically relevant ways” (p. 549).

Previous research studies in the vocational literature have demonstrated empirical results which suggest that personality traits are associated with college major choice. The Goldschmid study concluded that particular personality patterns are indeed associated with educational choice (Goldschmid, 1967). Regression analysis was used to test the hypothesis that significant personality tests will covary with choice of major. The study forecasted college majors in the two divisions of science and humanities by means of five personality tests which college students had taken when they were freshmen (Goldschmid, 1967). Out of the 16 regression equations, 11 yielded significant results on cross-validation and supported the hypothesis that personality characteristics are positively related to choice of major (Goldschmid, 1967).

The personality characteristics which best identified each group of students were broken down into five broad categories: 1) life orientation; 2) adjustment modalities; 3) patterns of interest; 4) social behavior; and 5) cognitive functioning approaches (Goldschmid, 1967). The Goldschmid study confirmed that students in a particular major share certain personality traits which are significantly different from those in other majors. It further demonstrated that educational choice is significantly influenced by particular personality patterns. It provided empirical support for the researcher’s hypothesis that specific college majors attract particular personality traits (Goldschmid, 1967).
Summary of Role of Personality Traits in Career Decision-Making

The scope of this study is limited to the trait-factor approach in personality psychology as it applies to college major selection and career choice. Trait-and-factor theory focuses upon individual differences and analysis of occupations. Vocational psychology began with the pioneering work of Parsons (1909); whereas, personality psychology emerged as a specialty in the 1930s (McAdams, 1997). Vocational psychology gained strength in the post-World War II era because of the trend to classify occupations according to education and training needed, skills required, etc. At the same time, personality psychology experienced a surge in research which measured key constructs in empirical hypothesis-testing (McAdams, 1997).

The contributions of selected trait theorists examined in this study were those of Allport, Murray, Goldberg, and Cattell. Allport and Murray both maintained the unique wholeness of the person (McAdams, 1997). Allport viewed personality as continually changing and modifying itself (Allport, 1961). Allport’s view of personality fluctuation is opposite to the current findings that personality remains remarkably stable over time (McCrae & Costa, 1990). Murray reported in 1938 about his tension reduction theory, which emerged from his conceptualization of approximately 27 psychogenic needs. According to Murray, satisfaction of these needs reduced tension states in the individual (as cited in McAdams, 1997). This tension-reduction model was replaced in the 1960s by the cognitive model of personality psychology (McAdams, 1997). The tension-reduction model was further weakened by the introduction of Bandura’s (1995) social learning theory.

The construction of the adjective list was the first rudimentary attempt to measure personality traits. The adjective list approach was used in 1934 when Thurstone compiled a list of 60 personality trait adjectives. Later, in 1943, Cattell reported his use of the adjective list to delineate
35 personality trait clusters which were descriptors (as cited in Wiggins & Trapnell, 1997). This resulted in the development by Cattell of the Sixteen Personality Factor Questionnaire (16 PF). The adjective list foundation contributed to the development of trait-factor theory, which is the primary focus of this study. Despite being nearly eclipsed and replaced by behaviorism in the 1970s and early 1980s, trait-factor theory has survived and adapted itself to the contemporary occupational landscape.

Personality psychology became subordinate to experimental social psychology in the mid-1960s (McAdams, 1997). As the 1960s drew to a close, personality psychology divided into two separate camps: 1) trait psychologists, who posited personality constructs; and 2) social psychologists, who placed the reason for behavior on the “situation.” The polarized “traitists” and the “situationists” did not reach an agreement until the 1980s, at which time the two groups finally credited both traits and situations in accounting for behavior (McAdams, 1997, p. 18). Another significant development for personality psychology in the 1980s was the emergence of cognitive developmental psychology (McAdams, 1997). This approach, which emphasizes developmental theories about the self, has become the dominant trend to date (McAdams, 1997).

The five-factor theory, bolstered by Goldberg in 1980, posits that five main factors account for personality trait description. The early 1990s gave rise to the “Big Five” model, which was researched by Costa and McCrae (1992). This model categorizes individual personality differences into the five broad binary domains of Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (OCEAN). This study tests the Extraversion domain of the FFM. Specifically, H₁ expects to find a significant difference in the mean Extraversion scores of science and humanities majors. The literature review provided ample empirical evidence to support the view that college major selection is associated with individual personality traits. For example, a 16 regression
equations analysis study found that significant personality tests covaried with choice of major (Goldschmid, 1967). It further demonstrated that educational choice and personality characteristics are positively related.

*Role of Vocational Interests and Abilities in Career Decision-Making*

According to Savickas and Baker (2005), the factory production system changed the economy from farming to manufacturing between 1850 and 1908. Another significant development during this era was that the modernization of American cities from 1880 to 1920 created a need for vocational psychology (Savickas & Baker, 2005). In recent decades increased effort has been directed toward the development of efficient classification systems and career assessment tools which can match individuals to specific occupations (Krumboltz & Coon, 1995). According to Tinsley, “The objective of career assessment is to help people chart their own personal path to a productive, fulfilling life,…” (Tinsley, 2000, p. 340). Career decisions have far reaching implications for life satisfaction. Individuals derive a large portion of their belief about their self-worth and personal identity from the work that they do. For example, in Western culture occupational choice continues to be the principal determinant of social status (Super, 1957; Savickas, 1995).

Vocational psychology refers to the psychological study of occupations (Super, 1957). Vocational psychology is concerned with how successfully individuals choose and adjust to their specialty of work (Savickas, 1995). According to Tinsley (2001), vocational psychology is currently at a crossroads and is being weakened “… by the marginalization of the field within its parent discipline of counseling psychology” (p. 246). Career development was a major focus of counseling psychologists in the 1950s and 1960s (Tinsley, 2001). In 1971, the home base of vocational psychology was at the center of counseling psychology (Tinsley, 2001). Research on
vocational behavior from 1973 to 1998 ranked second only to counseling research in productivity (Tinsley, 2001). However, since 1977, according to Tinsley (2001), vocational psychology has been marginalized in the discipline of counseling psychology. Consequently, vocational psychology is losing the interest and commitment of scholars. Tinsley (2001) expressed concern that the number of skilled vocational psychologists will decrease.

Parsons posited in the chapter entitled “The Importance of Scientific Method” that vocational choice is a vitally important life problem which should be solved carefully and scientifically (Parsons, 1909). According to Parsons (1909), the decision centers upon the foundation of vocational interests and abilities. Parsons proposed that an individual’s interests, abilities, aptitudes, goals, and limitations should be matched to industries which would best fit the individual’s resources and offer him/her the best chance for success. In his chapter entitled “The Principles and Methods Involved,” Parsons proposed that the principle of adaptation is a key, fundamental component of the vocational choice process (Parsons, 1909). An occupational choice which is out of harmony with the individual’s personal traits will result in inefficiency, lack of enthusiasm, distaste for the work, and low pay. Parsons taught that an occupation is far more than simply a means of making a living. Parsons envisioned a large demand for vocational counselors to assist adults with the scientific choice of occupation and their adaptation to it.

*Overview of Vocational Trait-Factor Theory*

The trait-factor model expects to find a relationship between individuals’ ability levels and the educational and occupational levels which they attain (Betz, 1994a). Trait and factor theory maintains that the direction of an individual’s main enthusiasms and abilities points to the vocational fields in which he/she will find the most success and fulfillment (Parsons, 1909; Leong & Brown, 1995). The literature indicates that the first major vocational testing movement evolved
from this trait-factor perspective (Osipow, 1973). This approach laid the ground work for the later
development of the robust psychometric movement. Vocational interest inventories, such as the
Strong Vocational Interest Blank (SVIB) and the Kuder Preference Record (KPR), are based upon
the foundation of the trait-factor model (Osipow, 1973, p. 10). Likewise, the Differential Aptitude
Test and the Guilford-Zimmerman Aptitude Survey are based upon the foundation of the trait-
factor model (Osipow, 1973, p. 10). A review of the literature indicates that the objective
measurement of traits is the best means for predicting future job success. The influence and utility
of the trait-factor approach remain strong in contemporary vocational psychology.

Major Contributions of Selected Career Development Theorists

The literature indicates that both differential and developmental models have contributed to
the understanding of vocational behavior (Phillips & Pazienza, 1988). For example, Super
believed that the choice of occupation went far beyond mere livelihood to actually define a “way
of life” and a “social role” for the individual (Super, 1957, p. 35). According to Super (1957),
certain attitudes and values are also linked to specific types and fields of work. In 1953, Super
proposed five vocational life stages which covered one’s entire life span: 1) growth (as one
matures); 2) exploration (looking for one’s niche); 3) establishment; 4) maintenance; and 5)
developed the Adult Career Concerns Inventory (ACCI). The ACCI is designed for career
It is highly reliable with Cronbach alphas in the .80s and .90s (Betz, 1988, p. 111). In the chapter
of his book entitled “Super’s Developmental Self-Concept Theory of Vocational Behavior,”
Osipow points out that the only weakness in Super’s theory is its limited range, which could be
made more comprehensive by incorporating into the theory social and economic determinants which directly impact career decision-making (Osipow, 1973).

Super posits that self-concept development plays a big role in career development (Osipow, 1968, 1973). According to Super, an individual’s vocational life is a continuous cycle. Likewise, the individual’s vocational self-concept continues to change across the life span as different vocational behaviors are required. This adaptation feature is found both in Super’s developmental theory and in the theory of the trait-factor camp. The discussion of Super’s theory in the chapter entitled “Super’s Developmental Self-Concept Theory of Vocational Behavior” indicates that the majority of research findings support the important role of the self-concept in career choice (Osipow, 1968). Empirical research supports two basic components of Super’s theory: 1) Individuals choose a career as the vehicle through which to implement their self-concepts; and 2) Career development and career decisions are ongoing and continual throughout the life span (Osipow, 1968).

Parsons, an early pioneer in vocational psychology, educated his community about the relationship between a good vocational match and success. According to Parsons, wisely choosing a vocation is by far preferable to job hunting (Parsons, 1909). Parsons (1909) introduced the following three-step process by which vocational decisions are made: 1) an individual has a clear understanding of himself and his personal attributes; 2) he has a knowledge of the requirements for success, advantages/disadvantages, and of the compensation in different fields of work; and 3) he has realistic reasoning regarding the relationships between these two groups of facts (Crites, 1969; Parsons, 1909; Zaccaria, 1970). The individual makes an inventory of his personal attributes and capabilities; weighs them against those required by the occupations in which he is interested; and
selects the occupation he “matches” the best. According to Parsons (1909), the decision of vocational choice is arrived at by means of a cognitive problem-solving process (Crites, 1969).

The vocational literature indicates that the current version of the person-environment fit model, known as the Theory of Work Adjustment (TWA), evolved from the trait-factor model first introduced by Parsons. The person-environment perspective is central to this more recent TWA. In this theory, the concept of correspondence (interaction) between the individual and his/her work environment (P-E) is characterized by a balanced, harmonious relationship (Fitzgerald & Rounds, 1994, p. 330). As explained by Dawis and Lofquist in 1991, the TWA transcends mere occupational choice and can predict adult vocational adjustment (as cited in Fitzgerald & Rounds, 1994). The TWA is concerned with how effectively the individual and his (her) environment interact to generate job satisfaction and continued on-the-job success. Unlike Holland’s theory, TWA is not concerned with career choice. Rather, TWA focuses upon the process of the worker’s adjustment to the occupational environment (Fitzgerald & Rounds, 1994). For example, TWA is concerned with how flexible and adaptable the worker is to change in the work environment. According to Tinsley (2001), vocational rehabilitation counseling has utilized the TWA as a blueprint.

Holland acknowledged that he was impressed by Guilford’s factor analysis research “… in which he obtained six major factors to account for the diversity of interests and personality traits: mechanical, scientific, social welfare, clerical, business, and esthetic” (Holland, 1973, p. 5). The comprehensive factor analysis study of human interests published by Guilford and his colleagues in 1954 resembled Holland’s typology. Holland’s Vocational Preference Inventory (VPI), published in 1958, consisted of 160 occupations. The VPI was very foundational in that it “actually guided much of Holland’s theory-building efforts” (Hartung & Niles, 2000, p. 7). The VPI
demonstrated a strong relationship to the empirical trait-factor model represented in the Strong Vocational Interest Blank (SVIB). Holland published VPI research findings in 1968 (Osipow, 1973).

Holland’s RIASEC model was incorporated into the Strong Interest Inventory (SII), which was created by Strong in 1927 and revised in 2004. The SII preceded the Self-Directed Search and retains wide usage as a robust vocational interest inventory (Hartung & Niles, 2000). Holland’s first publication of the Self-Directed Search in 1970 combined the former VPI instrument with questions about the individual’s self-estimate of his/her abilities. According to Holland and Rayman (1986), Holland worked from 1953 to 1958 to make the SDS scales equal in length (Holland & Rayman, 1986, p. 59). The Self-Directed Search (SDS) stimulates self-inquiry. It generates a summary statement that combines the individual’s perception of his abilities and preferences (Osipow, 1973). Holland called this summary statement the **Summary Code** (Holland, 1966). The Summary Code is a useful guide for locating a job pool for the purpose of occupational exploration (Holland, Powell, & Fritzsche, 1997).

Holland saw a need in the field of vocational psychology for a utilitarian vocational theory with workable, practical applications. Holland’s (1966) structural-interactive theory holds a prominent place in the trait and factor paradigm, which derives from the earlier pioneering work of Guilford and Cattell. Holland developed a theory of vocational behavior which he hoped would serve as an intellectual tool for career counselors, researchers, and students to utilize in a practical manner. The vocational literature supports the consensus that the six personality types affect vocational behavior in the following domains: 1) occupational selection; 2) success in academic performance; 3) output in creativity; and 4) individual growth and vocational stability (Holland, 1966).
Holland believed that individuals choose occupations based upon their motivation, knowledge, ability, and personality, as indicated by the following example: “To work as a carpenter means not only to use tools but also to have a certain status, community role, and a special pattern of living” (Holland, 1966, p. 4). According to Holland’s theory, “people search for environments and vocations that will permit them to exercise their skills and abilities, to express their attitudes and values, to take on agreeable problems and roles, and to avoid disagreeable ones” (Holland, 1966, p. 11). A person’s vocational behavior is explained by the interaction of his personality pattern and his environment. Holland’s career selection theory “assumes that vocational and social behavior result from the interaction of people and environments” (Hartung & Niles, 2000, p. 7). Simply put, people feel most satisfied when they live, work, and socialize with people who most resemble themselves.

**Constructs of RIASEC Model**

Holland espoused that self-selection theory “is both a theory of vocational life and a theory of personality” (p. 8), which is applicable to all ages across the life span (Holland, 1966). It contains seven basic assumptions: 1) Vocational choices are actually expressions of personality; 2) As demonstrated by the Vocational Preference Inventory (VPI), interest inventories serve as personality inventories; 3) Social scientists have found some degree of scientific support for the reliability of vocational stereotypes; 4) A vocation’s members share similar personality characteristics and developmental histories; 5) The similarity of personalities accounts for why members of a vocation respond in a similar fashion to challenging situations; 6) Congruence between an individual’s personality and his/her environment determines that individual’s level of vocational success; and 7) Vocational interests should be defined in a conceptual manner so that they mean more than the mere scales of interest inventories (Holland, 1966).
The construct of *congruence* refers to the amount of agreement or degree of compatibility between the individual’s personality traits and his/her environment as defined by the hexagonal model (Holland, 1973). In other words, congruence refers to the relatedness and complementarity between an individual and his/her environment. High congruence indicates that a high level of compatibility is occurring between type and environment and that, consequently, a good fit exists (Hartung & Niles, 2000; Fitzgerald, Fassinger, & Betz, 1995). Congruent interactions occur when people and environments belong to the same type or model. In contrast, incongruent interactions occur when vocational types live in environments which provide opportunities and rewards that are foreign to the person’s preferences and abilities (Holland, 1973). An example of incongruence is a Realistic type uncomfortably living in a Social environment.

Holland discovered the hexagon in 1969 (Holland & Rayman, 1986). In Holland’s hexagonal model the six personality types are arranged in clockwise order beginning with Realistic. Holland posited that the structural relations among the personality types and environments are best represented by this circular order in the hexagonal model. Those types and environments which are “adjacent on the hexagon are more similar than types that are located one removed or on the opposite side of the hexagon” (Hesketh & Rounds, 1995, p. 378). The distance between types on the hexagon determines the similarity of personality types. Similarity is increased by shorter distances between two types (Holland, 1973). Likewise, congruence is increased by shorter distances between a personality type and an environment type (Pike, 2006). In other words, the shorter the distance on the hexagon between any two types or environments, the more similar those types or environments will be (Hartung & Niles, 2000). A Realistic individual in a Realistic environment represents the highest possible congruence; whereas, a Realistic individual in the adjacent Investigative or Conventional environments represents less congruence (Pike, 2006).
In Holland’s RIASEC model, individuals are classified by personality type according to their high-point score on the occupational preference measure (Pike, 2006). In this study the Self-Directed Search (SDS) was used to obtain these scores. According to Holland, consistency refers to the similarity between the primary and secondary types (Holland, 1966). This similarity is represented by a single Holland code. The location of the types on the RIASEC hexagon determines the consistency (Holland et al., 1997). A high consistency would be found if the first two letters of the code are adjacent on the hexagon. For example, a 21 code (Intellectual-Realistic) is consistent. Both of these types are unsociable and masculine (Holland, 1966). On the other hand, inconsistent codes are contradictory. A low consistency would be found if the first two letters of the Holland code are situated in opposite positions on the hexagon (Holland et al., 1997). A classic example of an inconsistent code is a 13 (Realistic-Social) code (Holland, 1966). Realistic and Social types have things/people orientations respectively. A further discrepancy in a 13 code is that a Realistic type has poor interpersonal skills, while a Social type has good interpersonal skills. In this way inconsistency is an indication of dissonant personality types (Holland, 1966).

Stability and change in vocational selection are determined both by the dominant characteristics and by the consistency of the individual’s personality pattern (Holland, 1966). People with consistent personality patterns tend to maintain their direction of choice; whereas, people with inconsistent codes have vocational histories which show many job changes (Holland, 1966). Past literature indicates that a consistent personality pattern enables more successful functioning and greater survivability at a given job. The ideal outcome is for college students to have highly similar or consistent codes because the research literature suggests that these individuals will find it easier to make educational and vocational choices (Hartung & Niles, 2000).
Realistic types prefer to operate machines and tools. They prefer to work with material things and with concrete rather than abstract problems. The Realistic trait is comprised of technical interests such as those found in engineering jobs (Betz, 1994b). They prefer outdoor physical activity (Hartung & Niles, 2000). They tend to be unsociable and lacking in interpersonal communication adeptness (Zaccaria, 1970). They value tradition. Investigative types seek knowledge and value scholarly achievements. They tend to have an abstract orientation and like to figure out problems. Often lacking in interpersonal skills, they are sometimes perceived as asocial (Zaccaria, 1970). Artistic types value innovation and creativity and tend to be nonconforming. They do not like highly structured and routine tasks (Hartung & Niles, 2000). They like to express themselves via artistic media as a way of managing environmental challenges (Zaccaria, 1970).

In contrast, Social types prefer social service activities. The Social type is verbally articulate and has a feminine orientation (Zaccaria, 1970). Socially adept individuals are outgoing and engaging. They enjoy working on educational projects which involve interpersonal interaction (Hartung & Niles, 2000). Empirically, females have tended to score highly in Social and less highly in Realistic. Enterprising types prefer leadership roles wherein they can persuade others and tend to be sociable and outgoing. They tend to gravitate toward opportunities wherein they can dominate and lead others by using their verbal skills advantage (Zaccaria, 1970). They value political and financial achievements (Pike, 2006). Conventional types prefer to maintain structured, orderly, and methodical routines (Pike, 2006). They tend to achieve their goals through conformity. Sometimes referred to as “sustainers,” they like to maintain the status quo and follow tradition (Hartung & Niles, 2000).

Holland (1966) constructed six environmental models which are derived from the same concepts as the six personality types, e.g. RIASEC. These six environments parallel the six
personality types and reward the characteristics of the corresponding personality types. In Holland’s vocational theory, “the dominant features of an environment are dependent upon the typical characteristics of its members” (Holland, 1966, p. 53). In other words, the genre of people who form the group determines the climate which the group creates. For example, according to Holland (1966), the Realistic environment requires minimal social and verbal skills, is characterized by superficial conversations, and requires its members to perform “explicit, physical, concrete tasks” (p. 54). The Intellectual environment requires intelligence, abstract thinking, and often writing ability. Individuals in this environment mostly prefer to work with ideas and things.

On the other hand, the Social environment calls for an interest in nurturing and caring for others, often in the capacity of teaching or training specific populations. Physical stamina is not required, but strong communication skills are necessary. The Conventional environment attracts individuals who are comfortable with routine verbal and quantitative processing, such as in an accounting office. Tasks generally involve “set procedures or sequences” (Holland, 1966, p. 58). The Enterprising environment is characterized by tasks which are geared toward persuading other people. The Artistic environment engages all of the individual’s previous experience to create artistic forms through his (her) creativity and imagination (Holland, 1966). These environments can be either consistent or inconsistent. Consistent environments provide a narrow range of similar benefits and expectations; whereas, inconsistent environments provide different benefits and expectations and are usually less influential (Holland, 1973).

Previous Research Findings Regarding RIASEC Model

Previous studies of the six types have yielded interesting findings. According to Holland, individuals of the Social and Enterprising type respectively have the greatest capacity for change (Holland, 1966). Consistent personalities resist change; whereas, inconsistent personalities are
more receptive to change. The literature indicates that Realistic and Intellectual types and those with consistent codes change jobs the least (Holland, 1966). Furthermore, individuals with consistent codes also demonstrate greater work satisfaction and are more likely to perform creatively than are individuals with inconsistent codes (Holland, 1966). Intellectual and Artistic types have been found to demonstrate the highest level of creativity (Holland, 1966). An example of the most uncreative would be the inconsistent Realistic-Enterprising pattern because these types generate little or no creative potential (Holland, 1966). Previous literature indicates that the choices of Realistic and Intellectual men have tended toward stability; whereas, Social, Conventional, Enterprising, and Artistic men have demonstrated instability as indicated by a pattern of changing their vocational choices (Holland, 1966).

Gender differences in the self-efficacy of a sample of 1,147 employed adults and three samples of a total sample of 706 college students for the six Holland themes were examined by Betz, Harmon, and Borgen (1996). General Occupational Themes (GOT) scores from the 1994 version of the Strong Interest Inventory and confidence scores from the Skills Confidence Inventory (SCI) were used in the Betz et al. (1996) study. Of the 60 items in the shortened SCI measure, ten items pertained to each of the RIASEC themes. A high confidence score indicated a high level of self-efficacy in that particular Holland theme. Betz et al. (1996) found that scores for college men in the large sample were significantly higher than those for women on the Investigative, Enterprising, and Conventional confidence scales. Realistic confidence scores in all of the samples yielded significant male/female differences. Employed women demonstrated significantly more confidence than college women on all of the RIASEC themes except Artistic (Betz et al., 1996). The Betz et al. (1996) study suggests that individuals’ vocational interests can
be expanded by increasing their confidence levels, and consequently, their self-efficacy. Furthermore, it illustrates how self-efficacy and vocational interests are interrelated.

Regarding Holland vocational preferences, Brown, White, and Gerstein (1989) distinguish between low self-monitors and high self-monitors. Low self-monitors are typified by their tendency to seek congruence between their beliefs and their behavior. High self-monitors, on the other hand, tend to change their behavior to meet the dictates of social situations. Brown and colleagues (1989) found in their self-monitoring research that men are more influenced by self-monitoring motivations than are women. Men who preferred the Social environment demonstrated a lower level of self-monitoring; whereas, men who preferred the Enterprising environment demonstrated a higher level of self-monitoring (Brown et al., 1989). In contrast, women with high self-monitoring tendencies preferred Artistic occupations. Brown et al. (1989) found support for the premise that self-monitoring vocational behavior is associated with vocational orientation.

A study reported by Walsh, Vaudrin, and Hummel in 1972 converged with Holland’s belief that environment plays a crucial role in vocational preference and persistence (Osipow, 1973). The Walsh et al. study (as cited in Osipow, 1973) evaluated the direction of change in personality orientation relative to the length of time spent in a college major. In a study of 319 college students who were administered the Perceived Change Inventory, the results suggested that the longer a student remained in a college major environment, “the greater the development of appropriate traits” (as cited in Osipow, 1973, p. 74). The findings indicated that at least some degree of accentuation of their existing personality orientations occurred. The results of this study suggest that as college students specialize in a particular major, they are at the same time acquiring personality traits which are compatible with that major’s vocational field.
Most of the previous research conducted on the RIASEC model has centered upon hypotheses about the personality types. Specifically, Holland conducted a large-scale monograph study to test his theory of personality types in which 1,576 men and 1,571 women, all freshmen from 28 colleges, were categorized as types and subtypes according to their VPI profiles (as cited in Holland, 1985). They were then compared on twenty-two dependent variables, which included competencies, life goals, self-report ratings, attitudinal, and personality variables. Holland’s investigation of his theory consisted of two series: 1) longitudinal data; and 2) cross-sectional data. Simple ANOVA results showed a pattern of substantial differences across the types. Significant differences across subtypes were also found. Even when closely related subtypes were compared, some differences emerged. The results of Holland’s 1968 monograph study strongly suggested that people with similar codes have similar characteristics (as cited in Holland, 1985). As Holland moved from comparisons across types to comparisons of subtypes, he observed an obvious increasing similarity of personalities. He noticed that the $F$ tests decreased dramatically in size from comparisons across types to comparisons within types (as cited in Holland, 1985).

Results of his studies provide strong support that statistically significant relationships exist between the personality types and choice phenomena, both educationally and vocationally (Holland, 1985). The results indicate that these vocational behaviors remain stable over time. Holland’s research has also demonstrated that statistically significant relationships exist between personality and environment (Crites, 1969). However, most of Holland’s test samples had high aptitude. It is unknown whether he would have achieved the same results with other populations.

Although many studies involve college students, other populations have been studied by researchers. For example, Holland’s theory found support in a sample of nonprofessionals. Specifically, Salomone and Slaney (1978) classified 470 male and 447 female nonprofessional
workers in the northeastern region by their personality orientation and by the Holland type which
categorized their current job. Salomone and Slaney (1978) reported that their study extended
Holland’s theory to include blue collar workers and that it supported the use of the VPI with
noncollege populations. Their results indicated that many nonprofessionals chose occupations
which provided a high level of congruence between personality and job (Salomone & Slaney,
1978). Salomone and Slaney (1978) found that a large number of the noncollege participants “…
selected self-descriptions which matched their vocational personalities …” (p. 71). Overall,
agreement was found between the workers’ personalities and their jobs (Salomone & Slaney,
1978).

Although some cross-cultural study reviews regarding Holland’s model have found “that the
relations among RIASEC types support the hexagon” (p. 379), the literature suggests that
uncertainties still exist as to the cross-cultural applicability of the RIASEC model (Hesketh &
Rounds, 1995). A study of 156 self-identified Native Hawaiians, which investigated Holland’s six
types regarding their construct validity, found strong support for the order of the RIASEC
hexagonal structure. Oliver and Waehler (2005) found evidence that their investigation of culture-
specific validity with Native Hawaiians strongly supported the construct validity of Holland’s six
types. Oliver and Waehler (2005) measured General Occupational Theme (GOT) scores derived
from the Strong Interest Inventory (SII) individual profiles to provide the overall measure of
his/her interest in each of Holland’s RIASEC types. As reported by Rounds in 1995, the finest
operational definition available to date for the Holland typology is the Strong Interest Inventory (as
cited in Oliver & Waehler, 2005). Oliver and Waehler (2005) reported their findings of a circular
order in the arrangement of the Holland types in this way: “Our results support the universality of
Holland’s RIASEC order hypothesis” (p. 450). Furthermore, their findings suggest that cultural influences have an indirect impact upon occupational interests.

Results from the study by White and colleagues (1989) suggest that gender bias may be present in the Holland RIASEC typology. Specifically, White et al. (1989) reported their findings which indicated “… that the six Holland occupational types differ in the sex typing they elicit” (p. 296). According to White et al., occupational sex typing can be found in the Holland typology. Interesting research findings have also emerged regarding ethnic minority samples. One such finding is that Holland’s theory surpasses all other major vocational theories in research productivity with African American participants (Bingham & Ward, 2001). Moreover, African Americans tend to be overrepresented in Social vocations in Holland’s hexagonal model (Bingham & Ward, 2001). Brown and Pinterits (2001) point out that for African American vocational counseling clients, the social cognitive approach may be equally or even more effective as a means of generating higher expectations regarding careers. For example, this approach could equip African Americans with mentors, role models, and empowering messages which reinforce that success is both possible and attainable.

Researchers hypothesized that Holland’s vocational theory would work as well in an Asian culture as in Western culture. They recruited 312 Taiwanese undergraduate college students in four Taiwanese universities to examine the influence of personality and self-efficacy on their major choice (Larson, Wei, Wu, Borgen, & Bailey, 2007). The researchers sought to determine if Holland’s RIASEC hexagon was a viable predictor of students’ major choices in Taiwanese culture. They examined whether Costa and McCrae’s Big Five personality traits and self-efficacy across the RIASEC, both separately and combined, could differentiate among college majors in Taiwan (Larson et al., 2007).
The four majors represented were finance, counseling and guidance, mechanical and electrical engineering, and pharmacy (Larson et al., 2007). Larson et al. (2007) used the social cognitive career theory model (SCCT) to distinguish between choice actions and choice goals. The researchers used the Skills Confidence Inventory (SCI) to measure the six General Confidence Themes (GCTs) which comprise self-efficacy across the RIASEC (Larson et al., 2007). The NEO-FFI was used to assess the students’ personality traits. These college students were also asked questions regarding which jobs they desired following their graduation. The job options were divided into seven career aspiration clusters (Larson et al., 2007).

Results from this Taiwanese study indicated that certain personality traits are unique to specific cultures. Taiwanese women showed significantly less Extraversion than do U.S. women by comparison (Larson et al., 2007). Gender differences were also apparent. Female students showed more Agreeableness than did male students. However, male students demonstrated more confidence and more of the Realistic and Enterprising personality traits (Larson et al., 2007). For both men and women the six GCTs alone significantly differentiated the students’ college majors. Likewise, both predictor sets collectively differentiated college major for both genders in a significant manner (Larson et al., 2007).

Results demonstrated that the five NEO-FFI personality factors separately and the six GCTs separately discriminated among the seven career aspirations (Larson et al., 2007). These findings provided some support for the researchers’ first hypothesis that personality traits contribute to choice of major. Results indicated that the Big Five and confidence across the RIASEC significantly discriminated among college majors and career aspirations (Larson et al., 2007). The Taiwanese college students chose vocational domains in which they felt confident. This finding
supports the researchers’ second hypothesis that Holland’s RIASEC model works equally well in an Asian culture (Larson et al., 2007).

Furthermore, the researchers found that self-efficacy is a greater determinant of major choice and career aspirations than is personality alone. The Taiwanese study confirmed what previous research had shown: namely, that the combination of self-efficacy and personality traits significantly discriminate college majors in both Asian and American cultures (Larson et al., 2007). Since Taiwanese students mapped onto the RIASEC model in a similar fashion as Western students do, this indicated that Holland’s theory is not limited by ethnicity or culture. It demonstrated strength in its cross-cultural applicability.

A limitation of this study was that only four majors were used. Ideally, in future studies a broad range of majors should be represented. Even so, the utility of this study is that it demonstrates that academic counselors can confidently use the RIASEC model in advising students regarding appropriate career choices. As this study demonstrates, the RIASEC model has the advantage of organizing clients’ strengths and weaknesses into clusters. Larson et al. (2007) concluded that the finding of low confidence levels in the self-efficacy of Taiwanese university women demonstrated a need for career counselors to find strategies to boost female students’ confidence in male-dominated fields.

In the research literature, studies of college students have consistently supported Holland’s theory (Pike, 2006). One such study recruited 631 college freshmen in 2000 at a research university in the Midwest in order to examine the relationships between students’ personality types, expectations about college, and intended majors. Pike (2006) hypothesized that students’ college major choice is often related to their expectation that their chosen academic environment will match their personality type. Pike tested the possibility that students’ college expectations play
an important role in the process underlying Holland’s self-selection concept. The results indicated that students’ college expectations are involved in the process of initially selecting a major consistent with the students’ personality types (Pike, 2006). For example, Investigative students expected to be involved in science and math-related activities; whereas, Artistic students expected to be involved in artistic projects and cultural activities. The Pike study also validated Holland’s theory of congruence. Pike (2006) found that regarding the person-environment fit, congruence is greater when the distance between a personality type and an environment type is shorter.

In another congruence study, Morrow administered the VPI and a questionnaire regarding college major satisfaction to junior and senior mathematics and sociology majors at a major southeastern university (Morrow, 1971). Morrow sought to test the ability of Holland’s theory to predict students’ satisfaction with their college major choices. Morrow hypothesized that students who had made congruent college major choices would demonstrate more college major satisfaction than would students who had made incongruent choices (Morrow, 1971). Morrow interpreted a high score on the Investigative scale as indicating congruence for mathematics majors and “all other high point codes incongruent for that group” (as cited in Osipow, 1973, p. 67).

Morrow’s prediction of congruence-satisfaction was supported for mathematics majors by the finding of a significant relationship between college major satisfaction and personality type among mathematics majors (Morrow, 1971). However, Morrow (1971) found no significant congruence-satisfaction relationship among sociology majors. Yet another congruence study with positive findings was reported in 1972. Walsh and Lewis administered the Omnibus Personality Inventory and “found that congruent male students exhibit more satisfaction with their academic programs, more personal stability, and more stable college choices, than do incongruent students” (as cited in Osipow, 1973, p. 68).
Summary of Role of Vocational Interests and Abilities in Career Decision-Making

This study examined the contributions of Parsons, Super, Osipow, Guilford, and Holland to career development theory and practice. Parsons (1909) stressed the importance of good fits between vocational interests and abilities and occupations. Parsons applied his principle of adaptation to the task of vocational decision-making. Trait-factor theory laid the foundation for the first major psychometric testing movement (Osipow, 1973). The objective measurement of traits has proven useful in studies which predict future job success (Hogan & Ones, 1997).

Super’s career theory stresses the importance of the self-concept in career development (Super, 1957). According to Super, the self-concept changes as new vocational behaviors are learned throughout the individual’s career. The contribution of the self-concept to career choice is supported by research findings (Osipow, 1968). Super’s career theory is consistent with Holland’s belief that certain attitudes and values are attached to specific types of occupations. Super (1957) espoused a developmental model of career theory in which occupational choice defines the individual’s lifestyle. Like Parsons, Super believed that occupation means far more to an individual than simply making a living. An individual’s occupation also has a social aspect in that it defines his/her role in the community.

Guilford’s factor analysis study, which was reported in 1954, provided the foundation for Holland’s typologies. Holland developed the Vocational Preference Inventory first and later published the Self-Directed Search in 1970. Both are practical vocational interest inventories. The SDS was used in this study to ascertain the vocational interests of the 61 participants. As a rationale for the development of these interest inventories, Holland (1973) theorized that the interaction between an individual’s personality pattern and his/her environment determines the individual’s vocational behavior. In testing Holland’s self-selection career theory, H2 expects to
find a significant difference in the mean Investigative scores obtained by science and humanities majors; whereas, $H_3$ and $H_4$ expect to find significant differences between the mean Social and Enterprising scores respectively.

Holland (1973) conceptualized two main constructs in the RIASEC model. The construct of congruence refers to the degree to which the individual’s personality traits and his/her environment match each other. This compatibility is highest when individuals and environments belong to the same type. Holland’s hexagonal model is a clockwise, circular representation of the following six personality types: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC). According to Holland (1973), the greater the distance between personality types and environments on the hexagon, the less congruence there is. The construct of consistency refers to the amount of similarity between the primary and secondary personality types (Holland, 1966). The literature indicates that individuals with consistent personality patterns tend to have stable career paths; whereas, individuals with inconsistent codes tend to be job-changers (Holland, 1966). Consistent codes are also associated with greater job satisfaction.

The cross-cultural applicability of Holland’s theory was tested in a study of Taiwanese undergraduate college students and in a study of Native Hawaiians. The results of the Taiwanese cross-cultural study revealed that self-efficacy influences the choice of a college major in a greater capacity than does personality per se. Larson et al. (2007) found that the combination of vocational self-efficacy and personality traits together significantly discriminated the college majors for both Asian and American students. The construct validity of Holland’s RIASEC typology was supported in the Native Hawaiian study (Oliver & Waehler, 2005).

Holland’s longitudinal and cross-sectional studies on his theory indicated that significant relationships exist between the personality types and vocational choice (Holland, 1985). The
Holland RIASEC model has proven itself as a practical, utilitarian tool to assist with career selection. Researchers expect that the trait-factor model will continue to work well in ever-changing occupational environments. However, Tinsley (2000) pointed out that the RIASEC types may be less effective than career assessment systems administered by computers “… because of their limited capacity to depict the complexity of the individual and the work environment” (p. 347). According to Tinsley (2000), the simplicity inherent in Holland’s model is not needed by the nanocomputers which will administer interest inventories. Another weakness of the Holland taxonomy found in the vocational literature is that Holland’s theory explains little about the role personality development plays in career choice (Osipow, 1968). Therefore, more empirical research is needed on developmental hierarchies regarding Holland’s theory (Osipow, 1973).

A “new look” perspective of trait-and-factor theory espouses that occupational groups have become too heterogeneous in their tasks and functions to identify the traits and factors which differentiate them. These “new look” critics contend that an individual does not simply make one single occupational choice; rather, an individual makes consecutive choices in stages before actually entering an occupation (Crites, 1969). A third criticism is that vocational decisions change over the life span with the acquisition of new information and increased maturity. Despite these criticisms, future use and broad application of the RIASEC model are expected to continue.

*Role of Self-Efficacy in Career Decision-Making*

Bandura’s social learning theory was instrumental in shifting the focus away from traditional behaviorism. In 1977, Bandura identified the self-efficacy personality variable as a key component of his social learning theory. The concept of self-efficacy refers to one’s beliefs about one’s capability to determine the events which impact one’s life (Bandura, 1997). General Self-Efficacy (GSE) refers to the broad and stable belief in one’s competence to effectively manage a variety of
challenging situations (Schwarzer, 1992). Self-efficacy refers to a belief system which enables a sense of control over one’s circumstances and environment. This belief system enables individuals to have a sense of self-confidence in meeting the challenges of difficult situations.

According to Schwarzer, self-efficacy has emerged as an important variable in personality psychology (Schwarzer, 1992). This viewpoint is consistent with that of Bandura, who posits that beliefs regarding self-efficacy expectancies are a central aspect of personality (Derlega et al., 2005). Individuals differ in the way they feel, think, and act according to their level of self-efficacy (Schwarzer, 1992). Low self-efficacy is associated with learned helplessness. High self-efficacy is associated with perseverance and goal achievement.

As defined in the book chapter “Theoretical Perspectives,” self-efficacy is associated with an individual’s beliefs that he/she can obtain desired outcomes and avoid unwanted outcomes (Bandura, 1997). Self-efficacy beliefs are comprised of beliefs regarding the personal capabilities one has for specific tasks, activities, and challenges (Bandura, 1995). Haycock, McCarthy, and Skay (1998) describe outcome expectations in this way: “Outcome expectations refer to beliefs about the likelihood that certain behaviors will result in desired outcomes” (p. 318). Bandura (1997) espoused in his social cognitive model that an individual’s behavior is a major determinant in his/her outcomes. Individuals anticipate outcomes according to their personal beliefs regarding the effectiveness of their performance in given situations. They continually improvise on cognitive, social, emotional, and behavioral subskills to meet the demands of constantly fluctuating and often unpredictable situations (Bandura, 1997). Bandura’s self-efficacy theory stresses the importance of role models in vicarious learning which aid in developing strong beliefs about one’s behavioral capabilities (Betz & Fitzgerald, 1987).
According to Bandura, “Perceived self-efficacy refers to beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (Bandura, 1997, p. 3). In other words, perceived self-efficacy is an individual’s belief about what he/she can do in a variety of circumstances and situations with whatever skills the individual has available to him/her at that time. Betz et al. (1996) point out that Bandura’s concept of perceived self-efficacy is domain-specific. Perceived self-efficacy contributes substantially to career development in four distinct ways: 1) It predicts the range of career options considered attainable; 2) It predicts enrollment in courses needed to supply the training for these chosen careers; 3) It predicts academic success and persistence to continue when difficulties arise; and 4) It predicts the choice of vocational milieu and occupational environment in which one desires to work (Bandura, 1997). According to Scholz, Dona, Sud, and Schwarzer (2002), perceived self-efficacy involves personal action and personal agency. An individual’s optimistic beliefs enable him/her to manage challenging situations by “taking adaptive action” (Scholz et al., 2002, p. 242).

Perceived self-efficacy has important applications for academic behavior. For example, McCarthy, Meier, and Rinderer (1985) conducted two studies regarding freshmen college students’ assessment of their writing ability. Their step-wise regression analyses indicated that the strength of perceived efficacy stood out alone among four possible predictors in yielding a statistically significant effect (McCarthy et al., 1985). This finding indicates a connection between writing ability self-evaluation and the actual quality of written work. McCarthy et al. (1985) found that students’ perceived self-efficacy regarding their writing ability is related to the quality of their actual writing output and that students perform according to their self-evaluations. A strong relationship was found between the writers’ self-evaluations of their writing proficiencies, which
was operationally defined as a “self-efficacy” (p. 465) assessment, and the general quality of their written output (McCarthy et al., 1985).

Perceived self-efficacy can also be applied to the academic behavior of procrastination. Bandura’s social cognitive self-efficacy construct implies that strong efficacy beliefs can generate initiative and persistence in completing a task (Haycock et al., 1998). For example, Haycock et al. (1998) asked a sample of 141 Midwestern college students to rate their efficacy in skills needed to successfully complete a major project. Haycock et al. (1998) examined the relationship between efficacy expectations regarding the project and procrastination. The bivariate correlations indicated that efficacy expectations and anxiety individually were found to be significantly related to procrastination; whereas, the multiple regression analysis indicated that students who had strong efficacy expectations reported a lower amount of procrastination (Haycock et al., 1998). The Haycock et al. (1998) study found that cumulative efficacy strength stood alone in its ability to significantly predict procrastination. Efficacy expectations significantly predicted the phenomenon of procrastination in college students (Haycock et al., 1998).

As these two studies illustrate, the self-efficacy literature indicates a link between self-efficacy beliefs and academic perseverance and success. Bandura (1997) espoused that efficacy beliefs figure more predominantly in students’ academic performance and perseverance in their chosen field than do students’ actual ability and career interests. Bandura’s observation converges with that of Schwarzer (1992), who found likewise that self-efficacy contributes substantially to academic achievement. Confidence in academic ability appears to result in a greater level of academic success as contrasted with weak academic self-efficacy beliefs.

Although they are completely separate constructs, it is plausible that a high level of self-efficacy can increase college students’ self-esteem. Elion, Slaney, Wang, and French (2012)
reported their results regarding a study with 219 African American college students which examined the relationship of perfectionism to the constructs of self-esteem, depression, academic achievement, and racial identity. In this sample, adaptive and self-criticizing maladaptive perfectionists were compared with nonperfectionists, as measured by the Discrepancy subscale in the Almost Perfect Scale-Revised (APS-R). Of the three groups, adaptive perfectionists demonstrated the highest self-esteem scores and the lowest depression scores. In terms of academic achievement, higher GPAs were achieved by adaptive perfectionists as compared with nonperfectionists (Elion et al., 2012). However, the GPAs of adaptive and maladaptive perfectionists were not significantly different (Elion et al., 2012). These findings imply that adaptive perfectionism demonstrated by an individual may indicate that he/she has a high level of self-efficacy. A possible association between the two constructs merits future research investigation.

_Contribution of Self-Efficacy to Career Decision Making_

The vocational literature suggests that the self-efficacy personality variable is related to the range of career options which individuals consider. Efficacy expectations refer to the control which individuals believe they have in shaping specific outcomes (Derlega et al., 2005). Haycock et al. (1998) describe them this way: “Efficacy expectations are beliefs about one’s capabilities to accomplish specific tasks” (p. 318). Efficacy beliefs can even predict occupational considerations when differences in ability, academic performance, and vocational interests are controlled (Bandura, 1995). Bandura’s observation is consistent with Hackett’s (1985) finding that self-efficacy expectations surpass ability or performance as significant predictors of career choice vocational behavior. Self-efficacy has been shown to actually influence the “cultivation” of work interests (Hackett, 1995, p. 251).
Occupational self-efficacy has been found to be highly predictive of the vocational fields which individuals choose. According to Betz and Hackett (1986), occupational self-efficacy refers to individuals’ self-efficacy regarding “… the educational requirements and job duties of a variety of … occupations …,” (p. 280). Furthermore, occupational self-efficacy can now be operationalized by the use of an empirical measure. Rooney and Osipow reported in 1992 that their Task-Specific Occupational Self-Efficacy Scale (TSOSS) was useful as a career assessment tool (Hackett & Watkins, 1995, p. 204). Designed for career counseling use, it has the ability to identify the sources where general self-efficacy is low (Hackett & Watkins, 1995).

The vocational literature points to a strong relationship between self-efficacy and vocational choice. According to Bandura (1995), individuals’ personal self-efficacy beliefs have a large impact on their career paths. The level of self-efficacy can affect whether individuals expand or restrict their range of career options. Individuals tend to eliminate entire vocational fields because of low self-efficacy beliefs about their competence in these fields. Self-efficacy beliefs actually predict the career options which individuals consider as possibilities for themselves. According to Bandura, efficacy expectations even influence which behaviors individuals will attempt and their persistence in these behaviors in the face of discouraging experiences. Bandura’s finding is consistent with that of Betz (1994a), who found that for female students efficacy expectations can affect performance outcomes. For example, a female student with high self-efficacy expectations who fails a math test is nonetheless likely to persist in her mathematical pursuits (Betz, 1994a).

Research interests are increasingly focusing upon the importance of math self-efficacy because math skills are crucial for technical and scientific careers. According to Hackett (1985), math self-efficacy is operationally defined as “… a more specific estimate of confidence in one’s ability to perform well with regard to particular mathematics tasks or in particular math and math-
related courses” (p. 48). Betz and Hackett (1986) operationally defined math self-efficacy as the assessed expectancies regarding the following three math domains: 1) common math tasks; 2) problems involving math; and 3) math-oriented college courses. The Mathematics Self-Efficacy Scale (MSES) measures these three mathematical domains (Betz and Hackett, 1986). Betz and Hackett (1986) reported that their regression analysis yielded a significant relationship between mathematics self-efficacy expectations and math-related college major choice. Mathematics self-efficacy proved itself to be “the strongest predictor of choice of a math-related major” (Betz & Hackett, 1986, p. 283). Betz and Hackett (1986) found that college males demonstrated stronger math self-efficacy and were more likely to choose math/science college majors.

The Betz and Hackett (1986) finding regarding the predictive power of math self-efficacy is consistent with Bandura’s belief. As Bandura explains in his book chapter entitled “Career Development and Pursuits,” mathematical efficacy affects students’ academic performance in mathematics courses and this, in turn, affects their preparation for math-related occupations (Bandura, 1997). Students with low math efficacy tend to exclude themselves early on from scientific careers. The Betz and Hackett (1986) finding converges with that of Hackett (1985), in which path analysis evidence was found indicating that math self-efficacy is “…predictive of both math anxiety and math-related major choices” (p. 53). Mathematics self-efficacy was found to play a central mediational role in math-related career trajectories (Hackett, 1985). According to Hackett (1985), self-efficacy expectations surpass measured ability and performance in significantly predicting career choice vocational behavior. The Mathematics Self-Efficacy Scale (MSES), developed by Betz and Hackett, was used in Hackett’s (1985) path analysis study to measure math self-efficacy expectations.
Contribution of Self-Efficacy to Career Paths

According to Bandura’s self-efficacy theory, the following four major processes regulate human functioning and usually achieve this regulation synergistically: 1) cognitive; 2) motivational; 3) affective; and 4) selection (Bandura, 1995). This study is concerned primarily with the selection process in self-efficacy. The present investigation seeks to determine whether students’ levels of general self-efficacy influence their choice for either a science or a humanities major. Bandura posits that individuals seek environments in which they feel confident. By their selection processes, individuals select environments which match their perceived efficacy of their coping capabilities. Moreover, by selecting certain environments, they actually strengthen their competencies and interests. They also expand their social networks. Efficacy beliefs nurture the development of vocational interests. This in turn contributes to the pursuit of specific career paths. Bandura’s (1995) belief that career interests are related to self-efficacy is consistent with that of Nauta, Kahn, Angell, and Cantarelli (2002), who point out the importance of this finding: “… the positive correlation between these variables has been one of the most robust findings in vocational psychology in recent years” (p. 290). Nauta et al. (2002) reported that their study found support for a reciprocal relationship between self-efficacy and career interests.

According to Bandura (1995), individuals influence their life paths by selecting and creating their environments. Individuals choose their associates, friends, activities, affiliations, mentors, interests, careers, vocations, avocations, hobbies, and leisure pursuits based upon their beliefs about their personal capabilities (Bandura, 1995). Self-efficacy beliefs affect career paths through choice-related processes. For example, interest in a career domain motivates an intentional exposure to it, such as enrolling in related educational courses (Lent, Lopez, & Bieschke, 1991).
Research Findings on Self-Efficacy’s Role in College Major Selection and Career Choice

Self-efficacy has proven itself to be a strong predictor of career choice (Rotberg, Brown, & Ware, 1987). In fact, research studies demonstrate that self-efficacy is a more viable predictor of career choice than are other career-related variables (Hackett, 1995). The role of self-efficacy was studied in the assessment of 152 community college students in central North Carolina who were enrolled in a college transfer program. Both career interests and career self-efficacy were found to be related to the range of career choice. The self-efficacy model of career choice and development was supported (Rotberg et al., 1987). The results indicated that college major selection is related to a student’s self-efficacy. The findings suggested that students may limit their options to only those careers for which they have high expectations of self-efficacy. The researchers recommended that career counselors raise or modify an individual’s specific career self-efficacy expectations in order to expand the individual’s range of career options (Rotberg et al., 1987).

A theme which was consistently encountered in the vocational literature was the low self-efficacy female college students have regarding science and mathematics studies. The research literature found that females tend to underestimate their capability for mathematical learning even when their performance is equal to that of males. For example, regarding a self-efficacy study reported in 1981, Betz and Hackett found “that 70% of college men but only 30% of equally able college women believed they could complete the educational requirements of an engineering degree” (as cited in Fitzgerald et al., 1995, p. 96). Because of such low self-efficacy, females tend to avoid careers which require quantitative skills (Bandura, 1997). Weakness in math background remains a major obstacle to women’s career development. Multiple research studies support the finding that the acquisition of mathematical ability is depressed in female students. Low math self-efficacy appears to prevent females from entering math-oriented careers (Betz & Hackett, 1981).
The vocational literature indicates that wide gender disparities continue to affect career decision making. According to Bandura, this male/female disparity is further reinforced by parents’ stereotypes, classroom teachers, school counselors, the peer system, and persistent gender-role stereotypes which are modeled in the culture (Bandura, 1997). According to Cordero, Porter, Israel, and Brown (2010), female students experience a lack of role models in science, technology, engineering, and mathematics (STEM) college majors and careers. Cordero et al. (2010) pointed out that domain-specific math self-efficacy interventions, especially those comprised of math-related performance accomplishments, may be helpful in attracting females to STEM college majors and occupations.

In a mathematics-related study, researchers who tested undergraduate students at four campuses of the University of California on mathematical and verbal subtests of the Scholastic Aptitude Test (SAT) found that mathematical ability influences the choice of a scientific versus nonscientific major (Goldman & Hewitt, 1976). An additional finding was that physical science fields were composed of more mathematically capable students (Goldman & Hewitt, 1976). Given that by college age a male-female gap in mathematical ability is obviously apparent, Goldman and Hewitt (1976) suggested that female students should be encouraged early in their lives to study math so that they can acquire the quantitative skills needed for success in scientific careers. Early exposure to math may build stronger self-confidence and self-efficacy in mathematical ability. Interestingly, the researchers found that academic success appears to be influenced more by verbal ability; whereas, academic career choice is influenced more by mathematical ability (Goldman & Hewitt, 1976).

The career development literature indicates that researchers are now applying Bandura’s social learning theory, especially self-efficacy career theory, to both career development and career
choice. For example, self-efficacy theory has helped to explain the underrepresentation of females in science and math occupations (Hackett, 1995). Weak self-efficacy beliefs in science and math are a barrier for females to high-status, nontraditional occupations. This pattern may be partially due to cultural stereotypes and traditional gender-role beliefs. Socialized patterns of interest may be contributing to females’ underrepresentation in science and engineering (Betz, 1994b).

According to Hackett (1985), although gender-related occupational stereotypes are decreasing, sex role socialization still indirectly contributes to females’ low math self-efficacy.

Minority women especially have experienced gender discrimination. African American women perceive gender as a barrier to their career development. An interesting finding is that African American men often experience race as a discriminating factor; whereas, African American women often experience both gender and race as discriminating factors in career advancement (Byars, 2001; Ward & Bingham, 2001). Race and gender are realistic barriers experienced by African American women in their career paths. According to Constantine and Parker (2001), the combined factors of racial discrimination and gender-role socialization affect the manner in which African American women view their career options. Their perception of these two factors as career development barriers can restrict their career choices or result in avoidance of many career possibilities altogether (Constantine & Parker, 2001). According to Ward and Bingham (2001), the African American women who achieve the most career success, despite the negative impact of race and gender discrimination on their work lives, have strong, supportive families; high self-efficacy; and wholesome self-concepts.

In a stepwise regression analysis study, Betz and Hackett (1981) examined gender differences regarding the effect of sex-role socialization on Bandura’s four sources of self-efficacy information. Participants reported their capabilities regarding the educational qualifications and job
performance requirements of a list of 10 “traditional” occupations and 10 “nontraditional” occupations. In the “traditional” jobs, two-thirds or more of the workers were women. The “nontraditional” jobs were composed mostly of men. Betz and Hackett (1981) found that women had lower self-efficacy expectations than did men for “nontraditional” occupations; however, women’s self-efficacy expectations for “traditional” occupations were significantly higher than those of the male workers. Men’s occupational self-efficacy showed no difference between traditionally male and traditionally female occupations (Betz & Hackett, 1981). Occupational self-efficacy was found to be the major contributor which accounted for the gender differences in traditional and nontraditional occupations. The results indicate that occupational self-efficacy mediates the process of career choice (Betz & Hackett, 1981).

Another study examined how much college students thought they knew and actually knew about gender traditional and nontraditional occupations. Yanico and Hardin (1986) examined students’ estimated and actual knowledge regarding 36 occupations and how their occupational knowledge related to gender stereotyping. Overall, both sexes in the sample of 202 college students at a Midwestern university presented inaccurate predictions regarding their knowledge of 18 male-dominated and 18 female-dominated occupations (Yanico & Hardin, 1986). In terms of estimated knowledge, female college students saw themselves as being less knowledgeable about nontraditional and male-dominated occupations. Female students significantly overestimated their knowledge about female-dominated occupations and underestimated their knowledge about nontraditional occupations (Yanico & Hardin, 1986). According to Yanico & Hardin (1986), females’ inaccurate occupational perceptions regarding traditional and nontraditional occupations may contribute to their self-efficacy expectations.
Overall, college males rated themselves as being equally informed regarding traditional and nontraditional occupations for men (Yanico & Hardin, 1986). Yanico and Hardin (1986) found no difference between male and female students in their actual, measured knowledge about traditional and nontraditional occupations. No relationship of any substance existed between predicted and actual scores for either males or females. Results of this study indicated that actual and predicted occupational knowledge was not found to be related to occupational gender-stereotyping (Yanico & Hardin, 1986). This may suggest that attitudes are changing regarding work and gender.

The vocational literature indicates that gender-stereotyping appears to be decreasing. Consistent with Yanico and Hardin’s (1986) finding is that of White, Kruczek, and Brown (1989) that although stereotyping by college students remains present, it is now less robust than before. White et al. (1989) examined college students’ gender-based occupational stereotypes by having them rate 106 occupations contained in the Strong Interest Inventory. White et al. (1989) found that the Strong Interest Inventory includes “… occupations that are biased in favor of stereotypically masculine fields” (p. 297). Males and females’ perceptions of occupations yielded no differences. This finding suggests that culture influences occupational stereotypes as well as sex roles (White et al., 1989).

Researchers have investigated to what degree sex-role self-concept and persistence in male-dominated careers are related to career development. An ANOVA comparison study was conducted by Yanico and Hardin (1981) on the three status groups of persisters, changers, and dropouts in a sample of 77 female engineering and 77 female home economic majors. They reported on their 3-year follow-up to a former study in which differences in sex roles in the two curricula were analyzed by self-report ratings regarding how satisfied with and unchangeable freshmen were about their college major choice. Yanico and Hardin (1981) found that engineering
students outscored home economics students in their level of masculine characteristics. Yanico and Hardin (1981) found a relationship between math ability and persistence in the engineering field in that engineering persisters outperformed both changers and dropouts in college entrance SAT math scores. Further, the engineering students who switched majors selected a second major which was also nontraditional and male-dominated (Yanico & Hardin, 1981). Contrary to their expectation, however, sex role was not related to either persistence or change in home economics versus engineering fields (Yanico & Hardin, 1981). Yanico and Hardin (1981) concluded that it is difficult to predict college women’s persistence in specific career fields.

*Summary of Role of Self-Efficacy in Career Decision-Making*

Self-efficacy is conceptualized as a belief system which provides the individual with a sense of control over his/her circumstances and environment (Schwarzer, 1992). Self-efficacy beliefs enable one to navigate challenges in the process of achieving one’s desired goals. The concept of self-efficacy as an important personality variable has made an important contribution to both personality and vocational psychology. Links have been found between self-efficacy and vocational efficacy as well as self-efficacy and academic performance. Specifically, mathematical efficacy determines either the orientation toward or the avoidance of math-related vocations (Bandura, 1997). The overall pattern of a self-efficacy deficit in female college students in science and math accounts for their underrepresentation in science and math-related occupations (Hackett, 1995). This present study does not differentiate self-efficacy by gender. Rather, H3 expects to find a significant difference in the mean General Self-Efficacy Scale (GSES) scores of science and humanities majors. It expects to find a stronger demonstration of self-efficacy in science majors.
Hypotheses

The rationale for the five following hypotheses is based largely upon the previous findings of the Goldschmid (1967) regression equations analyses study regarding five personality clusters related to freshmen college students’ educational choice. The two continua of science and humanities were used to scale 55 academic disciplines. Science and humanities regression equations were analyzed. A comparison of the personality characteristics of science and humanities majors was examined. The results concluded that specific personality patterns demonstrate a strong association with educational choice (Goldschmid, 1967). The hypothesis in the Goldschmid (1967) study expected to find a covariance of significant personality traits with the selected college major. Although the present study uses a different methodology, overall the expectation in this study is similar to the hypothesis found in the Goldschmid (1967) study.

H1: The NEO-FFI-3 will yield a significant difference between the mean Extraversion scores obtained by the science and humanities majors. The two groups are expected to demonstrate different levels of the Extraversion trait. The characteristic of effective communication skills and social gregariousness associated with Extraversion is often found to be lacking in science majors. Overall, science majors tend to be reticent, retiring, and introspective (Holland, Powell, & Fritzsche, 1997). This is consistent with Goldschmid’s finding that students who scored high on the science regression equation are constricted in emotional expression and lacking in spontaneity (Goldschmid, 1967).

Humanities majors, on the other hand, tend to be sociable, enthusiastic, outgoing, and friendly. Overall, humanities majors demonstrate a high level of interpersonal connection and actively seek social engagement. The humanities independent sample in this study included three
broadcast media majors and one corporate communication major. These majors in particular are expected to yield a high score on the Extraversion trait. Humanities majors are expected to be assertive; whereas, science majors are expected to be reserved. Goldschmid (1967) found that freshmen who scored high on the humanities equation demonstrated their inclination to express their emotions. Their high scores indicated adept social skills and assertiveness in social settings (Goldschmid, 1967). The present study is expected to yield Extraversion scores which are similar to the pattern found in previous research findings. Therefore, it is expected that the mean Extraversion scores obtained by the two groups will be significantly different.

H2: The Holland Self-Directed Search (SDS) will yield a significant difference between the mean Investigative scores obtained by the science and humanities majors. In general, science majors enjoy activities which involve exploration, prediction, precise methodology, and problem-solving. Goldschmid (1967) found that freshmen who majored in science demonstrated a logical, analytical cognitive style which featured critical thinking and a problem-solving orientation to cognitive tasks. The findings imply that science majors tend to be critical thinkers who display an impersonal cognitive style (Goldschmid, 1967).

Overall, humanities majors, especially those in art and music, do not demonstrate the same strength in analytical skills as science majors do (Pike, 2006). On average, neither do humanities majors share the same degree of critical thinking and skepticism. The findings of Goldschmid’s (1967) regression analyses indicated that humanities majors are subjective, personalized, and tend toward an intuitive style of cognitive functioning. The cognitive style of humanities majors was more creative and imaginative than that for science majors (Goldschmid, 1967). Given these differences in the cognitive styles of science and humanities majors found in the research
literature, it is expected in the present study that the mean Investigative scores obtained by the two groups will be significantly different.

H₃: The Holland Self-Directed Search (SDS) will yield a significant difference between the mean Social scores obtained by the science and humanities majors. The rationale for this expectation is that science and humanities majors differ in their patterns of social interaction and in their social skills. Science majors are often characterized as analytical and asocial. Science majors often use technology and laboratory equipment to achieve their goals; whereas, humanities majors use communication, empathy, nurturance, and extraversion as the means to achieve their goals. According to Goldschmid, freshmen who scored high on the science regression equation demonstrated social introversion and showed a low level of interest in making social contacts. In social settings they tended to be reserved (Goldschmid, 1967).

Humanities majors prefer activities which require a higher level of interpersonal communication skills than those demonstrated by science majors. Humanities majors are often involved in humanitarian and educational endeavors. Goldschmid (1967) found that humanities majors scored high on the regression equation in gregariousness. They indicated their enjoyment of social networking and social activities (Goldschmid, 1967). This is consistent with Holland’s finding that individuals of the Social type demonstrate a responsible, humanistic social orientation (Holland, 1959). The implication of these previous research findings is that science and humanities majors demonstrate different social orientations and use different methods to achieve their goals. Therefore, it is expected that the mean Social scores obtained by the two groups in this study will be significantly different.

H₄: The Holland Self-Directed Search (SDS) will yield a significant difference between the mean Enterprising scores obtained by the science and humanities majors. Enterprising individuals
tend to avoid the scientific and intellectual pursuits into which science majors channel their energy. They avoid situations wherein lengthy, arduous, and sustained intellectual effort is expected (Holland, 1959). They much prefer to persuade and lead others in order to achieve their goals (Pike, 2006; Holland, 1959). They demonstrate self-confidence and strong leadership ability.

Because humanities majors tend to be energetic and outgoing, they are expected to have a strong interest in enterprising activities. The independent sample for humanities majors in this study included five business management majors. These majors are expected to have high scores on the Enterprising trait. The findings in this study are expected to converge with those of Pringle, DuBose, and Yankey (2010), who measured five personality traits in 899 business administration majors. These researchers found that international business majors ranked highest in achievement motivation compared to seven other undergraduate business majors, including marketing and computer information systems. They were also found to rank second lowest in conformity (Pringle et al., 2010).

The findings in this study are also expected to converge with those of Goldschmid (1967), who found that freshmen who score high on the science regression equation showed a personality characteristic of avoidance for new and unfamiliar ventures. High scorers on the science equation were not dominant and assertive; they were retiring in social settings. On the other hand, high scorers on the humanities equation were persuasive, assertive, ambitious, and politically active (Goldschmid, 1967). Based upon these previous research findings, the Enterprising characteristics of self-confidence, competitiveness, and assertiveness are expected to be especially prominent in the humanities majors in this present study. Therefore, it is expected that the mean Enterprising scores obtained by the two groups will be significantly different.
H₅: The General Self-Efficacy Scale (GSES) will yield a significant difference between the mean GSES scores obtained by the science and humanities majors. The General Self-Efficacy Scale (GSES) measures the individual’s belief in his/her self-efficacy. Goldschmid (1967) found that freshmen who scored high on the science equation demonstrated a problem-solving style of cognitive functioning. The attribute of resourcefulness in these science majors can be inferred from this problem-solving strength. In terms of personal adjustment, they demonstrated self-confidence; a sense of positive well-being; and self-assurance (Goldschmid, 1967). In contrast, Goldschmid (1967) found that freshmen who scored high on the humanities equation had a tendency to complain about their physical limitations. High scorers on the humanities equation were also found to be impatient, more prone to anxiety, and less adept at managing tension (Goldschmid, 1967). It can be inferred from these research findings that the high scorers on the science equation had a high level of self-efficacy beliefs; whereas, the high scorers on the humanities equation had weaknesses in their self-efficacy beliefs. Similarly, it is expected in this study that the mean GSES scores obtained by the science and humanities groups will be significantly different.

The research literature indicates that career and college major choices are influenced by self-efficacy beliefs. Self-efficacy can predict the choice of college major and academic achievement (Lent et al., 1991). According to Bandura, neither experiences nor skills by themselves influence academic achievement and career choice. Rather, self-efficacy beliefs which are formed from past experiences do (Bandura, 1997). The two Lent et al. studies provide support for the role of the self-efficacy personality variable as a key determinant of career choice. Lent and colleagues in 1989 reported their finding of a reciprocal relationship between career interests and self-efficacy beliefs (as cited in Bandura, 1997). Specifically, Lent et al. found that the higher the level of perceived efficacy that individuals had to satisfy the academic requirements for science and engineering
programs of study, the more their interest in these occupational fields intensified. In other words, their strong perceived efficacy beliefs fueled their rising interest level in science and engineering occupations (as cited in Bandura, 1997).

This finding is similar to that of Lent et al. (1991), who found that the interests of college students in mathematics-related courses mediated the effects of mathematical self-efficacy on science-based career choice. The effect of mathematics self-efficacy upon math interest indirectly affected math career choice. In their regression equation study, Lent et al. (1991) found a significant relationship between self-efficacy and interest in math college courses. It can be inferred from their study that domain-specific self-efficacies, such as mathematics efficacy, may indirectly contribute to the level of general self-efficacy and affect GSES scores. If so, this would mean that science majors would be expected to have high mathematics efficacy and, consequently, higher GSES scores; whereas, humanities majors would be expected to have low mathematics efficacy and, consequently, lower GSES scores. Given that the Lent et al. study (1991) may have implications for general self-efficacy as measured in this study, the mean GSES scores are expected to be significantly different for humanities and science majors.
CHAPTER 3
METHODOLOGY

Participants

The participants in this study were 61 undergraduate students at a Midwestern university. Approximately 60% were females and 40% were males. Participants consisted of 24 males and 37 females. All participants were at least 18 years of age or older. The mean age for all participants was 20.50. The mean age for Science majors was 21. The mean age for Humanities majors was 20. The participants ranged in age from 18 to 30 ($M = 20.50$ years, $SD = 1.86$). One participant forgot to report his age and was assigned a missing value. The participants were required to be at least in their sophomore year or above. The participants consisted of 46 Science and 15 Humanities majors. The Science and Humanities categories were operationally defined according to the College in which they were found. For example, the single photography major was assigned to the Science category because photography is found in the College of Science and Technology.

The Science field was so broad that it was divided into Social Science and Natural and Life Science. The Natural and Life Science category was composed of the following 20 specific majors in the following specialties: 6 Nursing; 5 Biology; 3 Dietetics 2 Chemistry; 2 Exercise Science 1 Geology; and 1 Actuarial Science. The remaining three majors in the Science field were 2 Safety Management (found in the Safety Science department) and 1 Photography major (found in the Science/Technology department). All of the 23 Social Science majors were psychology majors. The Nursing specialty consisted of two pediatric nursing and one anesthetic nursing major. Majors in the Humanities field consisted of 3 Media Broadcasting; 5 Business Management; 2 Graphic Arts; 1 Corporate Communication; 1 Criminal Justice; 1 Fashion Merchandising; 1 History Education; and 1 Public Relations.
The Sona internet based signup system was the method used for voluntary recruitment of participants. Two flyers were also used to recruit voluntary participants in the science and humanities fields. These flyers are found in Appendix D, which is the research study announcement. Flyer 1. was used to recruit science majors. Flyer 2. was used to recruit humanities majors. Both flyers contain figures. Benefits received for participation included extra credit or fulfilling a course requirement. The Sona-System study announcement is found in Appendix E.

**Materials**

*NEO Five-Factor Inventory-3*

The NEO Five-Factor Inventory-3 (NEO-FFI-3), which is a shortened version of the NEO Personality Inventory-Revised (NEO PI-R), was administered. Developed by Costa and McCrae, who extensively researched the Big Five model, this is a 60-item test which assesses the participants’ personality traits in the following five distinct domains: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (OCEAN). The test booklet also contains three validity items which elicit responses of yes or no. The NEO-FFI-3 consists of five 12-item categories of statements with responses ranging along a continuum from “strongly agree” to “strongly disagree” in a Likert-type scale for each of the five domains of personality. Each item has five possible responses. Low raw scores in a particular domain indicate a weak expression of that particular personality trait. Likewise, high raw scores indicate a strong expression of the trait being measured.

The NEO inventories have been widely used and translated into more than 50 languages. The NEO-FFI-3 form used in this study is essentially a self-report instrument which is designed for adults. All of the items in the NEO-FFI-3 ask in a direct manner about the characteristics which they seek to measure. The resulting personality scale scores allow for interpretation in three major
ways: 1) Viewing them as an estimate “of what the individual is really like” (p. 8); 2) Viewing them as a representation of his/her self-concept; and 3) Viewing them as a representation of how the individual wants others to view them (Costa & McCrae, 1992).

Analyses of the reliability and factor structure of the NEO-FFI-3 indicate that internal consistency across the 48-item NEO-PI-3 and the 12-item NEO-FFI-3 domain scale “ranged from .72 to .88 in the Adolescent and Adult samples, with a median of .82” (McCrae & Costa, 2007, p. 118). The Middle School sample yielded a lower median value of .76 (McCrae & Costa, 2007, p. 118). With regard to observer ratings of Openness in middle school children, estimates ranged from values of .66 to .88 (McCrae & Costa, 2010, p. 83). The NEO-FFI-3 scales are shorter in length and explain approximately 90% as much variance as do the full NEO-PI-3 scales (McCrae & Costa, 2010, p. 83). The equivalence coefficients or correlations between the shortened NEO-FFI-3 scales and the corresponding full NEO-PI-3 scales range from values of .87 to .95 (McCrae & Costa, 2010, p. 83), which indicates good approximations of the NEO-FFI-3 scales to the full domain scales.

The NEO-FFI-3 is a newer shortened version, and to date there are no available data on the short-term retest reliability of the NEO-FFI-3 (McCrae & Costa, 2010). Costa and McCrae found that the Cronbach coefficient alphas ranged from .68 (Agreeableness) to .86 (Neuroticism) in their U.S. working adult sample (as cited in Larson et al., p. 398). The structure of the NEO-FFI-3 has been found to be generalizable across genders (McCrae & Costa, 2007).

**Self-Directed Search**

The Self-Directed Search (SDS), which was published in 1970 and revised in 1994, is often used by school and career counselors to help students match their interests to specific jobs. It is a vocational inventory based upon Holland’s theory of six environmental models and six vocational
personality types. It is used for both individual and group career counseling. In addition to high school and college students, it is used by people seeking a second career, returning to school, or questioning the suitability of their current jobs (Holland et al., 1997). The SDS inventories are appropriate for use with most individuals aged 12 to 13 years or older. However, the SDS is not a normed, standardized interest inventory and uses raw rather than normed scores (Hackett & Watkins, 1995). It serves much like a self-help tool for high school students and adults engaged in career planning. The SDS, based on Holland’s (1985) vocational theory, is a self-administered, self-scored, and self-interpreted assessment (Hackett & Watkins, 1995).

The SDS measures respondents on four domains: 1) activities; 2) skills; 3) jobs; and 4) rating abilities. In most SDS instruments the respondent’s three-digit Holland code (Holland, 1985) is identified by combining the scores for all four sections (as cited in Hackett & Lonborg, 1994). However, in this study, form E was used. Form E uses two-letter rather than three-letter Summary Codes (Holland et al., 1997). The SDS measures the participant’s interest in each of six interest areas. These six categories provide a measure of fit between the participant’s interests and his (her) chosen work environment. The six environments and the six vocational personality types measured are summarized in the acronym RIASEC. The elements of RIASEC are the following: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional.

In the SDS Assessment Booklet respondents were asked to circle in yes or no columns their preferred activities, skills, and job interests, and to rate their abilities on a scale from 1 to 7. The SDS contains an occupational classification booklet named the Job Finder which lists over 400 occupations (Osipow, 1973). In the current study specifically, Form E was used. Respondents were asked to refer to the Form E Jobs Finder to select from a list of occupational titles those vocations which appealed to them. The participants wrote all their responses in the SDS Form E Fourth
The SDS vocational inventory consists of scales which measure the six types of Realistic, Intellectual, Social, Conventional, Enterprising, and Artistic. When combined together for easy identification, the six types form the acronym RIASEC. The participants’ scores on the six scales were scored and profiled. The higher a participant’s score on a scale, the more he (she) resembled the type which that scale represents. According to Holland’s scoring system for the SDS, the participant’s “highest score represents his dominant personality type” (Holland, 1966, p. 36). The pattern of the participant’s personality is determined by his/her profile of scores. This could be obtained by ranking the scale scores from highest to lowest (Holland, 1966).

According to the research data, the SDS has sound psychometric properties. However, predictive validity is often found to be problematic with interest measures. Holland (1985) addressed possible concerns about the test in the Self Directed Search Manual (Hackett & Watkins, 1995). The literature indicates that in spite of a few limitations, the SDS continues to be supported by research and to demonstrate its value in career planning and assessment. An additional benefit is that the SDS can provide a preliminary screening of the respondent’s career-related self-efficacy (Hackett & Lonborg, 1994).

*General Self-Efficacy Scale*

In addition, the General Self-Efficacy Scale (GSES), a standardized 10-item self-report measure, was administered. The GSES, which was revised in 1981 and again in 2000, has been adapted to over 25 languages (as cited in Scholz et al., 2002). This standardized 10-item self-report measure provides scaled scores which range from 1 to 4 for each of the 10 items and yields a maximum score of 40 (Schwarzer & Jerusalem, 1995). The German version of the GSES was
created by Matthias Jerusalem and Dr. Ralf Schwarzer in 1979 (Schwarzer & Jerusalem, 1995; Scholz et al., 2002). Dr. Ralf Schwarzer is a professor of Psychology at the University of Berlin in Germany. He grants permission to use the GSE scale in research studies as long as credit is given to the developer(s) of the instrument. Dr. Schwarzer’s letter of permission for using the GSES in research studies is added to the GSES sources in Appendix A.

The GSES scale assesses beliefs about perceived self-efficacy in dealing with the challenges of life. Individuals who have stronger beliefs in their self-efficacy have higher scores. It is versatile both in ethnicity and in its coverage of a wide span of age ranges. It is frequently used around the world to assess elderly populations, young adults, adolescents, and minorities. It has high reliability, stability, and construct validity. Samples from 23 nations yielded a range from .76 to .90 in Cronbach’s alphas; and the majority of the Cronbach’s alphas were found to be in the high .80s (Schwarzer & Jerusalem, 1995, p. 35). In numerous research projects the GSE scale has “typically yielded internal consistencies between alpha = .75 and .91” (Scholz et al., 2002, p. 243). Research studies conducted on the GSES confirmed that general perceived self-efficacy is a universal construct. The examination of the psychometric properties of the GSE scale supports this assumption (Scholz et al., 2002). Empirical analyses confirm “that the GSE scale is reliable, homogeneous, and unidimensional across 25 nations” (Scholz et al., 2002, p. 249).

Other materials used include an informed consent form for voluntary participation and a brief self-report questionnaire, which asked participants to state their college majors. The researcher also verbally explained to all of the participants that the opportunity was provided to them that if they so desired, they could review and discuss all of their test results with the researcher. If they were interested in receiving feedback about their test results, the opportunity for them to do so was made available to them on a one-on-one, confidential basis. Each participant was advised to keep
track of his/her assigned identifying number, which was written on their test materials. If they
desired feedback, they were advised to contact the researcher by email; identify themselves by
their assigned number; indicate their interest in reviewing their test results; and make an
appointment for this purpose with the researcher. The researcher believed that by receiving
feedback, they could obtain useful insights concerning their college major choices.

Design

Participants’ scores on the NEO-FFI-3, SDS, and the GSES provided the quantitative basis
for this empirical quasi-experimental study. The NEO-FFI-3, SDS, and the GSES were
administered to 61 voluntary participants in order to determine the differences between the average
group scores obtained by science and humanities majors. The independent group variable was the
two fields of the college majors: science and humanities. The dependent variables were the
participants’ scores on the NEO-FFI-3, SDS, and GSES. Independent samples t-tests were
conducted on the participants’ scores on the NEO-FFI-3, SDS, and GSES to determine whether
there were any significant differences between the mean scores obtained by science and humanities
majors.

Procedure

Participants were greeted and given an informed consent form to read and sign. They were
given the opportunity to ask questions regarding their participation in this study. Information was
given to the participants about their rights as voluntary research participants. After carefully
reading and signing the informed consent form, participants were administered the NEO-FFI-3,
Self-Directed Search (SDS), and General Self-Efficacy Scale (GSES). The participants also
indicated their college major on a brief self-report questionnaire. Most of the participants finished
within 45 minutes. Upon completion of the two inventories, self-efficacy instrument, and one self-
report questionnaire, the participants turned in to the researcher their bundled and paper-clipped set of test materials. The participants were then thanked for their research study contribution.
CHAPTER 4
RESULTS

In this study all of the assumptions for independent samples $t$-tests were observed. Interval data were analyzed. The sample ($N$) was at least 30. All twelve histograms indicated normal distribution. All observations were independent. None of the Levene’s tests were significant. Therefore, homogeneity of variance was assumed in all twelve independent samples $t$-tests.

Descriptive Analysis

Means, standard deviations, and ranges for all of the twelve scores are displayed in Table 1. The highest possible raw score for each of the five domains in the NEO-FFI-3 is 48. No participant achieved this in any of the five factors measured. The participants’ mean scores on the NEO-FFI-3 were highest on Openness with a mean score of 33.44 and lowest on Neuroticism with a mean score of 21.74. The maximum scores for Openness and Agreeableness were identical at 47.00. The highest possible Summary score for each of the six types measured in the Self-Directed Search (SDS) is 39. The participants’ mean scores on the SDS were highest on the Social type with a mean score of 24.02. They were lowest on the Conventional type with a mean score of 14.59. The minimum scores for Enterprising and Conventional were identical at 3.00. The maximum scores for Social and Enterprising were identical at 39.00. The maximum scores for Realistic and Conventional were identical at 38.00. Artistic had the lowest maximum score at 35.00. Minimum scores of .00 for Realistic and Investigative indicated that one or more participants demonstrated no orientation to these two types. The highest possible score on the General Self-Efficacy Scale (GSES) is 40, which was obtained.
Table 1

Means, Standard Deviations, Standard Errors, and Ranges of Scores for Participants on the NEO-FFI-3, SDS, and GSES Measures

<table>
<thead>
<tr>
<th>Personality Traits and Self-Efficacy</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extraversion</td>
<td>33.00</td>
<td>6.25</td>
<td>.80</td>
<td>12-46</td>
</tr>
<tr>
<td>Investigative</td>
<td>19.80</td>
<td>10.38</td>
<td>1.33</td>
<td>0-37</td>
</tr>
<tr>
<td>Social</td>
<td>24.02</td>
<td>8.52</td>
<td>1.10</td>
<td>4-39</td>
</tr>
<tr>
<td>Enterprising</td>
<td>18.43</td>
<td>9.98</td>
<td>1.28</td>
<td>3-39</td>
</tr>
<tr>
<td>General Self-Efficacy</td>
<td>33.28</td>
<td>3.86</td>
<td>.49</td>
<td>23-40</td>
</tr>
<tr>
<td>Realistic</td>
<td>14.80</td>
<td>10.29</td>
<td>1.32</td>
<td>0-38</td>
</tr>
<tr>
<td>Artistic</td>
<td>17.48</td>
<td>9.61</td>
<td>1.24</td>
<td>1-35</td>
</tr>
<tr>
<td>Conventional</td>
<td>14.59</td>
<td>9.63</td>
<td>1.23</td>
<td>3-38</td>
</tr>
<tr>
<td>Openness</td>
<td>33.44</td>
<td>7.35</td>
<td>.94</td>
<td>15-47</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>33.38</td>
<td>7.56</td>
<td>.97</td>
<td>18-45</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>32.23</td>
<td>6.65</td>
<td>.85</td>
<td>13-47</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>21.74</td>
<td>8.21</td>
<td>1.05</td>
<td>3-38</td>
</tr>
</tbody>
</table>

*Note.* n = 61; NEO-FFI-3 = NEO Five-Factor Inventory-3; SDS = Self-Directed Search; GSES = Generalized Self-Efficacy Scale.
Primary Analyses of T-Tests Related to Hypotheses

After the results of all of the twelve independent t-tests were analyzed and recorded, comparisons between the participants’ mean scores obtained on the NEO-FFI-3, Self-Directed Search, and GSES by the science and humanities groups were examined. The confidence interval for all twelve independent samples t-tests was 95%. Beginning with the hypotheses, significant differences and effect sizes were compared.

As shown in Table 2, the results of the t-test for independent samples did not indicate a statistically significant difference, $t(59) = -1.59, p = .117, r^2 = .04$, between the mean Extraversion scores of science ($M = 32.28, SD = 6.16$) and humanities ($M = 35.20, SD = 6.20$) majors. Therefore, Hypothesis 1, which expected that the NEO-FFI-3 would yield a significant difference between the mean Extraversion scores obtained by science and humanities majors, was not supported.

Table 2

Comparison of Raw Mean Extraversion Scores on NEO-FFI-3 Measure

<table>
<thead>
<tr>
<th>Field</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>$t$</th>
<th>df</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>46</td>
<td>32.28</td>
<td>6.16</td>
<td>-1.590</td>
<td>59</td>
<td>.117</td>
</tr>
<tr>
<td>Humanities</td>
<td>15</td>
<td>35.20</td>
<td>6.20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. *$p < .05.$
As shown in Table 3, the results of the *t*-test for independent samples indicated a statistically significant difference, $t(59) = 2.421, p = .019, r^2 = .09$, between the mean Investigative scores of science ($M = 21.59, SD = 9.47$) and humanities ($M = 14.40, SD = 11.48$) majors. Therefore, Hypothesis 2, which expected that the Self-Directed Search would yield a significant difference between the mean Investigative scores obtained by science and humanities majors, was supported.

Table 3  

*Comparison of Mean Investigative Summary Scores on SDS Measure*

<table>
<thead>
<tr>
<th>Field</th>
<th>n</th>
<th>$M$</th>
<th>$SD$</th>
<th>$t$</th>
<th>df</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>46</td>
<td>21.59</td>
<td>9.47</td>
<td>2.421</td>
<td>59</td>
<td>.019</td>
</tr>
<tr>
<td>Humanities</td>
<td>15</td>
<td>14.40</td>
<td>11.48</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. *$p* < .05*

As shown in Table 4, the results of the *t*-test for independent samples indicated a statistically significant difference, $t(58) = -2.781, p = .007, r^2 = .12$, between the mean Social scores of science($M = 25.69, SD = 7.50$) and humanities ($M = 19.00, SD = 9.64$) majors. Therefore, Hypothesis 3, which expected that the Self-Directed Search would yield a significant difference between the mean Social scores obtained by science and humanities majors, was supported.

Table 4  

*Comparison of Mean Social Summary Scores on SDS Measure*

<table>
<thead>
<tr>
<th>Field</th>
<th>n</th>
<th>$M$</th>
<th>$SD$</th>
<th>$t$</th>
<th>df</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>45</td>
<td>25.69</td>
<td>7.50</td>
<td>-2.781</td>
<td>58</td>
<td>.007</td>
</tr>
<tr>
<td>Humanities</td>
<td>15</td>
<td>19.00</td>
<td>9.64</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. *$p* < .05; missing value for one participant in Science.*
As shown in Table 5, the results of the \( t \)-test for independent samples indicated a statistically significant difference, \( t(59) = 2.926, p = .005, r^2 = .13 \), between the mean Enterprising scores of science (\( M = 16.41, SD = 9.11 \)) and humanities (\( M = 24.60, SD = 10.31 \)) majors. Therefore, Hypothesis 4, which expected that the Self-Directed Search would yield a significant difference between the mean Enterprising scores obtained by science and humanities majors, was supported.

Table 5

*Comparison of Mean Enterprising Summary Scores on SDS Measure*

<table>
<thead>
<tr>
<th>Field</th>
<th>( n )</th>
<th>( M )</th>
<th>( SD )</th>
<th>( t )</th>
<th>( df )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
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<td>9.11</td>
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<td>59</td>
<td>.005</td>
</tr>
<tr>
<td>Humanities</td>
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<td>24.60</td>
<td>10.31</td>
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<td></td>
</tr>
</tbody>
</table>

*Note.* *\( *p < .05."

As shown in Table 6, the results of the \( t \)-test for independent samples did not indicate a statistically significant difference, \( t(59) = -1.625, p = .109, r^2 = .04 \), between the Generalized Self-Efficacy Scale (GSES) scores of science (\( M = 32.83, SD = 3.86 \)) and humanities (\( M = 34.67, SD = 3.64 \)) majors. Therefore, Hypothesis 5, which expected that the General Self-Efficacy Scale would yield a significant difference between the mean GSES scores obtained by science and humanities majors, was not supported.

Table 6

*Comparison of Mean GSES Summary Scores for Science and Humanities Majors*

<table>
<thead>
<tr>
<th>Field</th>
<th>( n )</th>
<th>( M )</th>
<th>( SD )</th>
<th>( t )</th>
<th>( df )</th>
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</thead>
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<tr>
<td>Science</td>
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<td>32.83</td>
<td>3.86</td>
<td>-1.625</td>
<td>59</td>
<td>.109</td>
</tr>
<tr>
<td>Humanities</td>
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<td>34.67</td>
<td>3.64</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* *\( *p < .05."


Overall Comparison of Additional Raw Mean Domain Scores for NEO-FFI-3

Participants’ scores on the remaining four domains measured by the NEO-FFI-3 were also compared between science and humanities majors. As shown in Table 7, the results of the \( t \)-test for independent samples did not indicate a statistically significant difference, \( t(59) = .135, p = .893, r^2 = .00 \), between the mean Openness scores obtained by science (\( M = 33.37, SD = 7.49 \)) and humanities (\( M = 33.67, SD = 7.17 \)) majors.

Table 7

<table>
<thead>
<tr>
<th>Field</th>
<th>( n )</th>
<th>( M )</th>
<th>( SD )</th>
<th>( t )</th>
<th>( df )</th>
<th>( p )</th>
</tr>
</thead>
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<td>33.37</td>
<td>7.49</td>
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<td>.893</td>
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<td>33.67</td>
<td>7.17</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. *\( p < .05 \).

As shown in Table 8, the results of the \( t \)-test for independent samples did not indicate a statistically significant difference, \( t(59) = 1.197, p = .236, r^2 = .02 \), between the mean Conscientiousness scores obtained by science (\( M = 32.72, SD = 7.79 \)) and humanities (\( M = 35.40, SD = 6.67 \)) majors.

Table 8

<table>
<thead>
<tr>
<th>Field</th>
<th>( n )</th>
<th>( M )</th>
<th>( SD )</th>
<th>( t )</th>
<th>( df )</th>
<th>( p )</th>
</tr>
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<td>32.72</td>
<td>7.79</td>
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<td>.236</td>
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<td>15</td>
<td>35.40</td>
<td>6.67</td>
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<td></td>
</tr>
</tbody>
</table>

Note. *\( p < .05 \).
As shown in Table 9, the results of the $t$-test for independent samples did not indicate a statistically significant difference $t(59) = .963$, $p = .340$, $r^2 = .01$, between the mean Agreeableness scores obtained by science ($M = 31.76$, $SD = 6.73$) and humanities ($M = 33.67$, $SD = 6.41$) majors.

Table 9

<table>
<thead>
<tr>
<th>Field</th>
<th>$n$</th>
<th>$M$</th>
<th>$SD$</th>
<th>$t$</th>
<th>$df$</th>
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<td>31.76</td>
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<td>.340</td>
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<td>33.67</td>
<td>6.41</td>
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<td></td>
</tr>
</tbody>
</table>

*Note.* $p < .05$.

As shown in Table 10, the results of the $t$-test for independent samples did not indicate a statistically significant difference, $t(59) = -1.578$, $p = .120$, $r^2 = .04$, between the mean Neuroticism scores obtained by science ($M = 22.67$, $SD = 8.14$) and humanities ($M = 18.87$, $SD = 8.03$) majors.

Table 10

<table>
<thead>
<tr>
<th>Field</th>
<th>$n$</th>
<th>$M$</th>
<th>$SD$</th>
<th>$t$</th>
<th>$df$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
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<td>-1.578</td>
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<td>.120</td>
</tr>
<tr>
<td>Humanities</td>
<td>15</td>
<td>18.87</td>
<td>8.03</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* $p < .05$. 

Overall Comparison of Additional Mean Summary Scores for Self-Directed Search

Participants’ mean scores on the remaining three SDS measures of personality types were compared between science and humanities majors. As shown in Table 11, the results of the t-test for independent samples did not indicate a statistically significant difference, \(t(59) = -.371, p = .712, r^2 = .00\), between the mean Realistic scores obtained by science (\(M = 14.52, SD = 9.66\)) and humanities (\(M = 15.67, SD = 12.37\)) majors.

Table 11

*Comparison of Mean Realistic Summary Scores on SDS Measure*

<table>
<thead>
<tr>
<th>Field</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
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<td>46</td>
<td>14.52</td>
<td>9.66</td>
<td>-.371</td>
<td>59</td>
<td>.712</td>
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<tr>
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<td>15.67</td>
<td>12.37</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. \(^*p < .05.\)*

As shown in Table 12, the results of the t-test for independent samples did not indicate a statistically significant difference, \(t(58) = .455, p = .651, r^2 = .00\), between the mean Artistic scores obtained by science (\(M = 17.15, SD = 9.33\)) and humanities (\(M = 18.47, SD = 10.68\)) majors.

Table 12

*Comparison of Mean Artistic Summary Scores on SDS Measure*

<table>
<thead>
<tr>
<th>Field</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>45</td>
<td>17.15</td>
<td>9.33</td>
<td>.455</td>
<td>58</td>
<td>.651</td>
</tr>
<tr>
<td>Humanities</td>
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<td>18.47</td>
<td>10.68</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. \(^*p < .05;\) missing value for one participant in Science.*
As shown in Table 13, the results of the $t$-test for independent samples did not indicate a statistically significant difference, $t(59) = .127$, $p = .899$, $r^2 = .00$, between the mean Conventional scores obtained by science ($M = 14.50$, $SD = 9.12$) and humanities ($M = 14.87$, $SD = 11.41$) majors.

Table 13

*Comparison of Mean Conventional Summary Scores on SDS Measure*

<table>
<thead>
<tr>
<th>Field</th>
<th>$n$</th>
<th>$M$</th>
<th>$SD$</th>
<th>$t$</th>
<th>df</th>
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<tbody>
<tr>
<td>Science</td>
<td>46</td>
<td>14.50</td>
<td>9.12</td>
<td>.127</td>
<td>59</td>
<td>.899</td>
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<tr>
<td>Humanities</td>
<td>15</td>
<td>14.87</td>
<td>11.41</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* $p < .05$.
CHAPTER 5  
DISCUSSION

Twelve independent t-tests were conducted to determine whether there were significant differences between the mean scores obtained on the NEO-FFI-3, Holland Self-Directed Search, and the Generalized Self-Efficacy Scale by the science and humanities majors. The results of all the independent t-tests and the degree of significance between the scores obtained by the two groups were analyzed and evaluated.

Primary Analyses of T-Tests Related to Hypotheses

Each hypothesis was individually evaluated by the results of the data analyses. The results of three hypotheses provided support for Holland’s theory of self-selection regarding vocational choice and work environments. In the three hypotheses which were supported, a matching pattern was observed between the personality type examined and the participants’ choice for either the science or humanities field. For example, science majors scored high in Investigative. Social Science majors scored high in Social. Humanities majors scored high in Enterprising. These results indicated that in choosing either science or humanities fields, they selected vocational environments which were compatible with their personality traits. These findings provided support for Holland’s theory that individuals choose vocational environments which match their personality types (Holland, 1966).

This quasi-experimental study sought to explore and evaluate the findings for the following three research questions previously introduced on p. 2: 1) Do the various branches of science attract students who have a high level of intellectual curiosity? The results indicated that there was a significant difference between the mean scores obtained on the Investigative trait by science and humanities majors with an effect size of .09. Since science majors demonstrated a much higher level of the Investigative trait, it can be concluded that students who have a high level of
intellectual curiosity are attracted to the various branches of science. 2) Does the empirical evidence suggest a link between choosing a humanities major and having strong communication and leadership skills? The results indicated that there was a significant difference between the mean scores on the Enterprising trait obtained by science and humanities majors with an effect size of .13. Since humanities majors demonstrated a much higher level of the Enterprising trait, the results suggest that a positive relationship exists between the choice for a humanities major and having strong leadership skills. 3) Do students’ levels of general self-efficacy influence their college major selection? Humanities majors scored slightly higher than science majors on the GSES. The mean scores for both groups were in the high range. This indicates that both independent samples had a substantial level of general self-efficacy. Although results are inconclusive, they do suggest that the students’ self-efficacy may have contributed to their college major selection. In domain-specific studies definitive results have been found. For example, Hackett reported in 1985 a finding that perceived efficacy for mathematics and science was the main predictor of students’ choice of math/science college majors (as cited in Hackett, 1995). Further research on self-efficacy studies is needed to learn more about the relationship.

The NEO-FFI-3 was expected to yield a significant difference between the mean Extraversion scores obtained by the science and humanities majors. The results indicated that humanities majors scored slightly higher on Extraversion than did science majors. This difference was not significant. However, a very small effect size of .04 was found. Sociability, friendliness, assertiveness, and positive emotionality are all features of Extraversion. This may account for why Extraversion is associated with jobs in sales (Costa et al., 1984). The meta-analytic review reported by Barrick and Mount in 1991 found that Extraversion validly predicted job performance for sales representatives and managers (as cited in Mount, Barrick, & Strauss, 1994). The implication of this
meta-analytic finding, according to Mount et al. (1994), is that success in sales and management jobs is increased for individuals who display high levels of the Extraversion dimension. Because humanities majors deal with the full range of human experience and are socially active, it is plausible to expect that they would be, in a manner similar to the sales representatives and managers in the study cited above, much stronger in the Extraversion dimension, more outgoing, and more assertive than science majors. However, $H_1$ was not supported.

Holland expected to find evidence supporting a correspondence between the personality types and other individual difference variables. Holland and other researchers have examined whether the RIASEC types overlap with the Big Five personality variables. Nauta (2010) summarized that the research literature finds support for a consistent relationship between the Extraversion domain and both the Social and Enterprising vocational interests. Likewise, Holland and Rayman (1986) reported that Extraversion is positively correlated with the Social and Enterprising SDS scales.

However, in a correlational study by Costa et al. (1984) of adults ranging in age from 21 to 89, a gender discrepancy was found between men and women on the Extraversion factor. When husbands rated their wives, they did not find that the Extraversion trait displayed by their wives was associated with Social or Enterprising vocational interests (Costa et al., 1984). In another study regarding self-reports and spouses’ ratings, McCrae (1982) found that self-descriptions by men who report being high in Extraversion were found to have very good correspondence with their wives’ ratings ($r = .72$); whereas, the corresponding coefficient for women ($r = .46$) was much less (p. 301). Possible explanations for this male/female discrepancy may be that women raters are more perceptive or that men’s self-reports are more accurate (McCrae, 1982). According to McCrae (1982), the research literature is increasingly showing convergence between self-reports
and ratings. These findings may provide some support for the use of self-reports on NEO Inventories, as was done in this study. However, McCrae (1982) pointed out that it should not be assumed that similar findings can be generalized to other sample populations. Nonetheless, researchers can be satisfied with the overall level of accuracy currently available in self-reports and ratings while continually striving for improvement (McCrae, 1982).

According to Goldberg, Extraversion is primarily defined as dominance and lively action (as cited in McCrae & Costa, 1987). Eysenck espoused his theory that the cause of this increased activity in individuals high in Extraversion was of a biological origin. The research literature revealed that in 1967 Eysenck reported his finding that extraverts display less global cortical arousal than do introverts. Eysenck reasoned that extraverts require more stimulation than do introverts in order to compensate for their cortical arousal deficit. According to Eysenck, extraverts were motivated to seek exciting activities in order to increase their cortical arousals (as cited in Derlega et al., 2005). Another interesting research finding is that most individuals score in the middle ranges on this trait and, consequently, are indistinguishable as either extraverts or introverts (Watson & Clark, 1997).

The Holland Self-Directed Search was expected to yield a significant difference between the mean Investigative scores obtained by the science and humanities majors. This difference was found to be significant with an effect size of .09. The mean Investigative score for science majors was much higher than that for humanities majors. The reason for this large difference in scores may be that science majors often utilize more analytical and mathematical problem-solving skills than do liberal arts majors. Another possibility is that the participants’ self-efficacy contributed to the difference in scores. This positive finding provides empirical support for Holland’s theory of vocational choice. H2 was supported.
Holland espoused that individuals have a set of accommodating orientations to the six occupational environments. These orientations are actually distinctive life styles. Individuals of the Investigative type have an intellectual orientation. They are typified by their preference for abstract intellectual work tasks, academic achievement, and avoidance of interpersonal social contacts (Holland, 1959). Holland found that the Investigative environment is the most conducive setting for academic achievement (Holland, 1966). The Investigative type tends to pursue disciplined, scholarly endeavors. According to Holland, experimental psychologists are believed to consist primarily of the Investigative type (Holland, 1966). Previous research findings provide support for the conclusion that personality factors demonstrate firm associations with vocational interests. For example, a personality and vocational interest study with adults was conducted to examine correlations between the Self-Directed Search (SDS) and the NEO Inventory scores. Large correlations of Investigative and Artistic scores with the Openness factor were found (Costa et al., 1984). This finding supports Holland’s viewpoint that the NEO Inventory complements the Holland taxonomy.

The Holland Self-Directed Search was expected to yield a significant difference between the mean Social scores obtained by the science and humanities majors. This difference was found to be significant with an effect size of .12. As noted beneath Table 4, a missing value was found for one participant. This participant neglected to respond to the four interest areas in the Social type either because of a possible oversight or because of inadvertently skipping all of page 9 in the SDS booklet. Except for reducing the independent sample size for the Science group from 46 to 45, this missing value made no difference in the outcome of the results.

Surprisingly, the results for the Social scores were the exact opposite from what was expected. It was expected that humanities majors would have higher mean Social scores than
science majors. Instead, the mean Social score of science majors yielded a sharp increase above that of humanities majors. Interestingly, the majority of the effect size was influenced by the Social scores of the 23 Social Science majors, all of whom were psychology majors. This finding provides support for the viewpoint that psychology is indeed a “social” science as well as a scientific discipline. It may be construed from this finding that psychology majors overall tend to be sociable and extroverted. Results of this study indicate that the discipline of psychology appears to have a stronger attribute of social connectedness and gregariousness than does Natural and Life Science.

This finding is consistent with that of Holland who reported that the branch of counseling psychology is believed to be primarily composed of the Social type (Holland, 1966). The finding in the present study concurs with that of Holland (1959) who observed that individuals of the Social type are attracted to educational or therapeutic roles which emphasize socialization. According to Holland, the Social type displays a supportive orientation in the supportive environment and is inclined to assume feminine roles which involve interpersonal social engagement (Holland, 1959). In other research findings, it appears that a possible relationship between Social interests and self-efficacy may exist. For example, Nauta et al. (2002) reported that at a modest level Social interests, as measured in the RIASEC typology, significantly predicted subsequent Social self-efficacy. H3 was supported.

The Self-Directed Search (SDS) was expected to yield a significant difference between the mean Enterprising scores obtained by the science and humanities majors. It is interesting to observe that humanities gained the dominant position in the mean scores for the Enterprising type. This difference was significant and yielded an effect size of .13. The Enterprising type is characterized by a willingness to embark upon new initiatives often in the pursuit of status and
recognition. The implication for this finding of higher mean Enterprising scores for humanities majors may be that science majors direct much intellectual energy into academic endeavors and problem-solving activities which require time-consuming experiments, research studies, and investigations. Such pursuits would be difficult, if not impossible, in the Enterprising environment. According to Holland, it is very difficult for academic achievement to be maintained in the Enterprising environment (Holland, 1966).

The Enterprising environment nurtures social engagement, competition, leadership, and opportunities for risk-taking. Humanities majors may have more liberty and inclination to take on risky new ventures. Industriousness *per se* would not account for this large difference in scores because other personality variables, such as Investigative and Conscientiousness, likewise share a dominant characteristic of industriousness. Therefore, the large difference in these scores may be due to a higher level of initiative in humanities majors as compared to science majors. According to Holland, the Enterprising type, who is identified with the persuasive orientation, is more driven than the Conventional type to acquire power and status. Enterprising individuals view themselves as being strong and persuasive masculine leaders (Holland, 1959). H₄ was supported.

The General Self-Efficacy Scale (GSES) was expected to yield a significant difference between the mean GSES scores obtained by the science and humanities majors. The results indicated that humanities majors had a slightly higher mean score for General Self-Efficacy than did science majors. This difference was not significant. However, a very small effect size of .04 was found. What was unexpected in the results was the direction of the difference in General Self-Efficacy mean scores. It was expected that science majors would score higher on the GSES because science majors are assumed to have confident beliefs in their abilities to apply analytical problem-solving skills to cognitive tasks.
According to Goldschmid’s (1967) regression analyses findings, students who scored high on the science equation were not hindered by self-doubt and displayed a positive sense of well-being (Goldschmid, 1967). Goldschmid (1967) found that students who scored high on the humanities equation displayed ambitiousness and a desire to be successful in their lives. A possible explanation for why the science/humanities difference in the mean GSES score was not significant may be that students’ perceived self-efficacy in a specific domain, such as mathematics or science, may be a more significant factor in college major choice than students’ general or overall self-efficacy. In other words, domain-specific self-efficacy may demonstrate more predictive power in forecasting the choice of a college major than general self-efficacy. The results of the GSES mean scores suggest that humanities majors are equally confident in their beliefs regarding their adeptness in problem-solving skills. The findings imply that self-confidence, perceived self-efficacy, and beliefs in one’s coping abilities are not stronger in science majors, as was expected. H5 was not supported.

The research literature corroborates that perceived self-efficacy contributes to the development of career path trajectories, especially those which are related to math and science. Perceived self-efficacy can predict the range of career options, and consequently college majors, which college students will consider as feasible possibilities. For example, Lent et al. reported their results in 1993 regarding how much self-efficacy beliefs and expected outcome beliefs contributed to mathematical skills development (as cited in Bandura, 1997). Even after controlling for the effects of actual math ability on the outcome, Lent and colleagues found that perceived mathematical efficacy influenced the prediction of mathematical interests for and success in mathematics and science courses. Perceived mathematical efficacy also contributed to the planning of enrollment in mathematics and science courses. Personal efficacy beliefs even influenced the
grades for the science and math courses (as cited in Bandura, 1997). Although the outcome expectations did not predict course grades, they did predict mathematical interests for and intent to enroll in math and science courses (as cited in Bandura, 1997).

**Overall Comparison of Additional Raw Mean Domain Scores for NEO-FFI-3**

The mean scores indicated that humanities majors scored slightly higher on Openness than did science majors. This difference was not significant and the effect size was .00. The results indicated that the humanities and science majors represented in this study varied only slightly in their expression of the Openness trait. Although it could reasonably be expected that college students who score high in Openness to Experience would find a liberal education, (hence, humanities major), the most congenial, the results indicated that overall humanities majors have no stronger Openness orientation than do science majors. The research literature found that Openness on the NEO was associated with Artistic and Investigative interests on the Self-Directed Search (Costa et al., 1984; Holland & Rayman, 1986; Nauta, 2010). Furthermore, the relationship of Openness to intelligence has been studied. Psychometric measures of intelligence and Openness have yielded correlations of .30 between the two (McCrae & Costa, 1987, p. 88). However, even though they may complement each other, Openness and intelligence are clearly separate entities.

The mean scores for Conscientiousness indicated that humanities majors scored higher than did Science majors. This difference was not significant. The effect size was very small at .02. The literature regarding recent studies indicated that an individual’s level of Conscientiousness is a strong predictor of career success. The result of the review of 144 meta-analysis studies reported by Barrick and Mount in 1991 corroborates the predictive validity of the Conscientiousness personality variable (as cited in Hogan & Ones, 1997). The occupational groups which were investigated were professionals, managers, sales, and skilled/semiskilled workers. They were
evaluated regarding three types of criteria, which consisted of proficiencies in both job and training along with the data of the personnel (Walsh & Eggerth, 2005). Using meta-analytic procedures, they examined the validity of the Big Five for each occupational group, for all three criterion types, and for objective/subjective criteria. Over the span of years from 1952 to 1988, Barrick and Mount identified 117 studies suitable for inclusion into their meta-analysis reviews (Walsh & Eggerth, 2005). They found that Conscientiousness scales outperformed the other scales in importance in that they served as valid predictors for all of the occupational groups evaluated (as cited in Hogan & Ones, 1997).

The results of these meta-analytic reviews found consistent validity across all three job-related criterion types for Conscientiousness (as cited in Hogan & Ones, 1997; as cited in Mount, Barrick, & Strauss, 1994). Conscientiousness was found to be consistently valid for all five occupational groups. Conscientiousness measures stand alone in their ability to validly predict job performance across all jobs (Hogan & Ones, 1997; Walsh & Eggerth, 2005). The researchers found that Conscientiousness contributes to job success for all jobs. A low level of conscientiousness has been associated with job-related productivity deficits (Hogan & Ones, 1997). This finding suggests that if college students score high in Conscientiousness, as measured by the NEO-FFI-3, then they are likely to be productive in their career. In this study, the mean Conscientiousness score for humanities majors was relatively high. The implication of these research findings for the current study is that humanities majors, and to a lesser extent science majors, demonstrated a sufficient level of Conscientiousness to perform well in their careers.

The results indicated that humanities majors had a higher mean score for Agreeableness than did science majors. This difference was not significant. The effect size was very low at .01. An explanation for why humanities majors scored higher on Agreeableness than did science majors
may be that most liberal arts specialties are more socially oriented than are most branches of science. Like Extraversion, the demonstration of Agreeableness often occurs in a social context. Some branches of science, such as chemistry and microbiology, require less social contact. It may be that humanities majors scored higher on the Agreeableness dimension because humanities studies are related to culture and have a social orientation. According to McCrae and Costa (1987), individuals who score high in Agreeableness may be socially dependent. It appears that Agreeableness may be associated with a need for social support. A convergent finding in the research literature links higher levels of the Agreeableness trait with increased levels in the amount of social support which individuals perceive as being available to them (Swickert, 2009). The literature implies that perceived social support contributes to the expression of the Agreeableness dimension in individuals. This finding is consistent with that of Nauta (2010), who pointed out that a consistent relationship has been found between Agreeableness and Social interests.

The research literature indicated that like the Conscientiousness variable, the Agreeableness personality variable has implications for career success and satisfaction. For example, a study reported by Boudreau, Boswell, and Judge in 2001, which explored the relationship of the Five Factor Model (FFM) to extrinsic and intrinsic career success, found a negative relationship between Agreeableness and extrinsic success (as cited in Burch & Anderson, 2009). Similarly, a study reported by Seibert and Kraimer in 2001 found that career satisfaction and Agreeableness have a negative relationship (as cited in Burch & Anderson, 2009).

The results for Neuroticism indicated that the mean score of science majors was higher than that of humanities majors. This difference was not significant. A small effect size of .04 was found. Little if any evidence has been found in the research literature for a link between occupational preferences and differences in the level of Neuroticism (Costa et al., 1984). The
literature review indicates that empirically the Neuroticism and Self-Directed Search scales have yielded insignificant correlations (Holland & Rayman, 1986). However, the vocational literature indicates that career dissatisfaction is a common problem. Therefore, career dissatisfaction which may be associated with Neuroticism should be distinguished from vocational incongruence (Costa et al., 1984).

**Overall Comparison of Additional Mean Summary Scores for Self-Directed Search**

The results for the Realistic type indicated that the mean score obtained by humanities majors was higher than that of science majors. The direction of this difference was unexpected because students in the science field are expected to have a stronger technological orientation than are humanities majors. The Realistic type demonstrates technical interests such as those found in engineering jobs (Betz, 1994b). Perhaps the reason that humanities majors scored higher than science majors is because this independent sample of humanities majors was very well-rounded and included several participants with mechanical interests, particularly in automotive. Another reason may be that overall Social Science (psychology) majors scored low on the Realistic trait, which reduced the mean score for the science field. The difference between the mean Realistic scores obtained by the science and humanities groups was not significant. The effect size was .00.

According to Holland, individuals in the Realistic environment, who are of the motoric orientation, enjoy displaying their physical strength and high level of motor coordination (Holland, 1959). Overall, Realistic individuals prefer masculine roles. They lack communication skills and avoid interpersonal contacts. According to Holland, the Realistic environment encourages stability because it delivers immediate rewards (Holland, 1966). For example, a carpenter gets an immediate visual picture of his construction; and a farmer can immediately see that his field is plowed. Both of these vocations represent the Realistic type.
As expected, humanities majors had a higher mean score than did science majors on the Artistic type. This difference was not significant and had an effect size of .00. As noted beneath Table 12, a missing value was found for one participant. This participant neglected to respond to the four interest areas in the Artistic type either because of a possible oversight or because of inadvertently skipping all of page 9 in the SDS booklet. Except for reducing the independent sample size for the Science group from 46 to 45, this missing value made no difference in the outcome of the results for the mean Artistic scores.

Humanities majors, especially in art, are expected to be creative, esthetically oriented, and high in artistic ability. This expectation is consistent with Holland’s finding that the Artistic type, who seeks the esthetic environment, has a strong need for individualistic emotional expression in his/her work (Holland, 1959). Several of the humanities majors in this study planned to specialize in media broadcasting. This may suggest that these students were seeking an avenue for creative self-expression. This possible explanation is consistent with Holland’s finding that Artistic types prefer to use artistic media as a venue for communicating their ideas (Holland, 1959). According to Holland, the Artistic type has an esthetic orientation which tends to be intraceptive, feminine, and sometimes weak in ego strength (Holland, 1959). Holland further observed that the Artistic environment, along with the Social and Enterprising environments, does not encourage stability in career goals and occupational choice (Holland, 1966).

The results indicated that there was only a slight difference between the mean Conventional scores obtained by the science and humanities majors. The mean Conventional score for humanities majors was slightly higher than that for science majors. This difference was not significant. The effect size was .00. The independent sample of humanities majors contained five business majors. Business and economic majors tend to have a strong expression of the
Conventional trait (Holland, 1966). According to Pike (2006), Conventional types demonstrate a pattern of conformity. It may be that science students are less conforming because of their investigative curiosity to ask and answer novel, uncharted research questions which require an open-minded approach. According to Holland, the Conventional type has a conforming orientation characterized by extraception and self-control (Holland, 1959). In the hexagonal model, Conventional and Artistic interests are arranged as opposite pairs (Costa et al., 1984). Like the Extraversion type, the Conventional type identifies with power and status. However, the Conventional type differs from the Enterprising type, which seeks to dominate and lead others; whereas, the Conventional type prefers subordinate roles (Holland, 1959).

Limitations of Study

A limitation of this study was the size of the independent samples. Ideally, a vocational study should have a large number of participants. This study was also limited in that it did not evaluate comparisons based on age, gender, ethnicity, or socioeconomic status. Future studies should compare personality factor scores on these independent variables. The current study examines the relationship between self-efficacy and career choice but does not address gender differences in career choice. Therefore, it was beyond the scope of this study to investigate the often mentioned college major selection problem found in the vocational literature of gender disparity and underrepresentation of females in the science field. Another limitation is that this study only measured general self-efficacy. It did not measure domain-specific (such as math) self-efficacy.

Recommendations for Future Research

Holland (1973) acknowledged that although RIASEC theory has performed well in studying vocational choice stability, it has been weak in dealing with vocational change. In view of this weakness, new hypotheses and new studies need to be generated regarding the process of change
in vocational behavior. Moreover, the nature of work itself has changed. According to Tinsley (2000), “Today, over half of the labor force is employed in service (20%) and information technology (35%) occupations” (p. 343). Life span and length of time spent in the work force will increase along with temporary employment (Tinsley, 2000). To accommodate these changes, future research needs to design more detailed models which encompass the individual’s entire life span as it relates to the career development process (Tinsley, 2000).

In the next several decades new technological developments will change career assessment. According to Tinsley (2000), the combination of the emerging technologies of voice input and item response theory (IRT) will produce IRT models which will increase both precision and speed in career assessments. Automation of the career assessment process will produce more uniformity in reliability, validity, and accuracy of predictions (Tinsley, 2000). Both the administration of career assessments and interpretation of the results will be done by computers. Therefore, researchers should design new studies which measure the effectiveness of automated test interpretations. Tinsley (2000) still predicts, however, “… that Holland’s model will continue to be used as the interpretive interface between the computer and the individual” (p. 347). According to Tinsley (2000), the outcome of the measurement and analysis processes will still be translated into the RIASEC paradigm because it is easy to communicate RIASEC terminology to individual test recipients. The P-E fit model still ranks as the prevailing career choice model (Tinsley, 2000).

Tinsley’s (2000) predictions are consistent with Bandura’s (1997) observation that future research into the viability and utility of using computerized career guidance programs may indicate that interactive computer systems can help with career planning. According to Bandura, computerized career guidance can help build decisional self-efficacy (Bandura, 1997). Career counseling software will use decision-making models to assist clients in making career decisions.
(Tinsley, 2001). Computers will perform career assessment and interpret tests. According to Tinsley (2000), “Examinees will experience the career assessment process as a conversation with the computer about their goals and aspirations” (p. 345).

Future research is needed regarding the Openness factor as measured by the NEO inventories. Openness in particular is such an important and pervasive dimension of individual difference that it merits further study. Costa and McCrae (1988) pointed out that since longitudinal studies regarding Openness have rarely been conducted, new longitudinal studies should be designed which include baseline measures of Openness. They encouraged industrial and organizational psychologists to administer personnel selection batteries which included measures of Openness (McCrae & Costa, 1997a). Additionally, future research is needed to explore how Openness to Experience influences students’ college majors, career paths, job satisfaction, and even retirement planning (McCrae & Costa, 1997a).

Regarding the self-efficacy personality variable, new studies should be designed which, unlike the current study, specifically measure domain-specific mathematics and science self-efficacy scores in both genders and compare the results. Career self-efficacy can be examined by constructing models which would predict the career choice behavior of both genders (Betz & Hackett, 1986). Since the research literature indicates a consistent pattern of young women avoiding math in their educational path, new studies should examine gender disparities in math-related career choice so that effective methods to increase female college students’ math self-efficacy can be found (Betz & Hackett, 1986). More research is needed with ethnic minority samples regarding nontraditional career fields. In particular, research on African Americans in nontraditional careers has been very sparse. According to Hargrow and Hendricks (2001), an
investigation of the positive factors, such as support networks and mentors, which account for the retention of African Americans in nontraditional vocations merits future research study.

The relationship of domain-specific self-efficacies in science and math to college major choice is an important topic which merits further exploration. Cordero et al. (2010) pointed out the need for more math and science career choices by both genders in their observation: “As the National Academy of Science notes, it is imperative that efforts are increased to recruit more people to enter science, technology, engineering, and mathematics (STEM) majors and careers” (p. 362). Students’ self-efficacies in these fields must be increased in order to both attract and retain them in STEM careers (Cordero et al., 2010). Cordero et al. (2010) espoused that interventions which utilize math-related performance accomplishments should be developed which will increase domain-specific math/science self-efficacy and enable its long-term sustainability.

*Implications for Vocational Counselors*

This study focuses upon one of the most important decisions in a lifetime which college students must make: the choice of a college major. When students decide for a specific major, they are automatically deciding against a multitude of other possibilities. The desired outcome is that they will choose congruent majors and find congruent work environments which are appropriate to their individual personality types. This study provides empirical support for Holland’s theory that individuals select environments which are congruent to their personality types. Holland (1973) and Parsons (1909) both espoused that good fits between personality types and vocational environments can contribute to greater career satisfaction.

The desired outcome of a student’s college major selection is the most appropriate career path and occupation for which he/she is best suited. The economic and quality of life consequences which ensue from this choice are substantial. A good match between an individual student’s
personality type and a corresponding environment allows the student to feel supported and enables him/her to thrive (Hartung & Niles, 2000). Personality/environment congruence can translate into more positive attitudes toward work, greater success and satisfaction in life, and maximum career satisfaction outcomes. This study found support for Holland’s RIASEC typology. More research studies should be designed which examine personality/environment congruence. Continued research on college major selection expands the knowledge base in vocational psychology. This creates a win-win dynamic for both students and academic counselors.

This comparative study implies that the administration of instruments such as the NEO-FFI-3, SDS, and GSES could be used as part of a college entrance career assessment package to provide a clearer road map of appropriate career paths for individual students. Domain-specific self-efficacy instruments, such as those used to measure science and mathematics self-efficacy, would be useful in providing more specific information regarding students’ strengths and weaknesses in these areas. Self-knowledge about their individual personality traits can better enable college students to explore vocational environments which are congruent matches for them. Effective educational resources can help build students’ self-efficacy and empower them to find suitable vocational fields.

Career exploration programs could be developed and offered as optional educational resources for interested students. Their development may help students make better informed career decisions. According to Pike, if colleges had information about students’ Holland types, they could set standards for the quality of college experiences which meet or exceed students’ expectations (Pike, 2006). Hopefully, this study serves to demonstrate the practical utility and potential benefit of providing vocational interest inventories such as the Holland Self-Directed Search (SDS), and personality inventories such as the NEO-FFI-3, to undecided college students as
an optional educational resource. This could assist them in deciding an appropriate college major. The RIASEC typology, which was investigated in this study, is very useful as a resource to be used in college major selection. According to Nauta (2010), the RIASEC typology has the advantage of providing college students with “families of occupations” (p. 17) which can be explored for the purpose of making current and future career decisions.

This study demonstrates that the self-efficacy personality variable is proving itself to be a strong determinant and an influential personality factor. The literature review supports the viewpoint that self-efficacy beliefs contribute substantially to the college major decision in that they influence the career trajectories of college students. Included in this study was an examination of the differences in college students’ self-efficacy with regard to their college major selection in either the science or humanities field. Results from the present investigation suggest that college students’ domain-specific perceived self-efficacy may be a more significant factor in college major choice than students’ general self-efficacy, which was measured in this study. Therefore, since self-efficacy specificity may yield more definitive empirical results, vocational counselors should decide which domain-specific self-efficacies they want to measure and use self-efficacy instruments which specifically target them.
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Sources for Generalized Self-Efficacy Scale measure:

http://userpage.fu-berlin.de/~health/selfscal.htm


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Permission granted
to use the General Self-Efficacy Scale for non-commercial reseach and
development purposes. The scale may be shortened and/or modified to meet the
particular requirements of the research context.

http://userpageFu-berlin.de/~health/selfscal.htm

You may print an unlimited number of copies on paper for distribution to research
participants. Or the scale may be used in online survey research if the user group
is limited to certified users who enter the website with a password.

There is no permission to publish the scale in the Internet, or to print it in
publications (except 1 sample item).

The source needs to be cited, the URL mentioned above as well as the book
publication:

S. Wright, & M. Johnston, Measures in health psychology: A user’s portfolio. Causal and
control beliefs (pp.35-37). Windsor, UK: NFER-NELSON.

Professor Dr. Ralf Schwarzer
www.ralfschwarzer.de
APPENDIX B
SELF-REPORT QUESTIONNAIRE

Please answer the following question.

1. What is your college major?
APPENDIX C
INFORMED CONSENT FORM

Identification of Researchers: This research is being done by Sharon Imperial, a graduate student in Psychology at the University of Central Missouri.

Purpose of the Study: The purpose of this study is to evaluate the relationships between personality traits and selection of college majors.

Request for Participation: You are invited to participate in a study on personality traits and college major selection. By participating you may learn helpful information about your career interests. Participation is entirely voluntary, and there are no penalties for not participating or for withdrawing at any time. If you wish to withdraw your data at the end of the study, please notify the researcher before you turn in your materials. All test materials are identified by assigned numbers, not by names.

Exclusions: You must be at least 18 years of age or older to participate in this study.

Description of Research Method: This study involves completing a short, standardized personality assessment; a short vocational interest inventory; a brief questionnaire; and a 10-item Likert scale self-efficacy assessment. The NEO-FFI-3 personality assessment contains 60 items and will take a maximum of 15 minutes. The Holland Self-Directed Search vocational inventory takes a maximum of 30 minutes to complete. The questionnaire and Generalized Self-Efficacy Scale take approximately 5 minutes to complete. After completion of all of the above, an opportunity will be given for you to ask any questions you wish. By using numerical values to identify your test results, your confidentiality is ensured.

Privacy: All of the information collected by the researcher will be completely confidential. The researcher will not record your name, student number, or any personal information which could be used to identify you. After all data are collected and analyzed, you will be given the opportunity to confidentially review your test results and discuss them with the researcher and/or Faculty Advisor. Confidentiality is ensured by matching the number of the participant to his/her test results.

Explanation of Risks: The risks associated with participating in this study are similar to the risks of everyday life.

Explanation of Benefits: You will benefit from participating in this study by discovering more about your personality traits and occupational interests and how they may have contributed to your college major selection. You will also get firsthand experience in psychological research and the satisfaction of knowing that you contributed to the expansion of knowledge in this field. In addition, your instructor(s) may award extra credit for research participation.
**Questions:** If you have any questions about this study, please contact Dr. Jon Smith at jsmith@ucmo.edu or in the Department of Psychology, Lovinger 1141. Questions about your rights regarding participation in research are directed to the Human Subjects Protection Program at (660)-543-4621.

If you choose to participate, please sign a copy of this form and return it to the researcher. You may keep the other copy.

I have read this form and agree to participate.

Signature: ________________________________

Date: ________________________________
A study is being done which examines the relationships between college major selections and personality traits. You must be at least a sophomore, have a declared college major, and be 18 years of age or older to participate in this study. Participation is entirely voluntary and you may withdraw at any time with no penalties. Your confidentiality is ensured. Your instructor(s) may award extra credit for research participation. If you would like to volunteer to participate in this study, you may contact Sharon Imperial at sei44960@ucmo.edu. For questions or additional information about this study, you may contact Dr. David Kreiner at kreiner@ucmo.edu, or in person at Lovinger 1110, Department of Psychology, UCM.
College Major Selection and Personality Traits

- Are you a chemistry, physics, or mathematics major?
- Are you 18 years of age or older?
- Are you a sophomore or above?

If you answered yes to all of these questions, you are eligible to participate in an IRB approved minimum risk study which examines the relationships between college major selection and personality traits in science and humanities majors. The purpose of this research study is to compare students’ scores on two brief standardized personality assessments and a short self-efficacy scale to determine if significant differences exist between science and humanities majors. Research results may provide career counselors more knowledge in vocational psychology.

Test administration begins in February 2012. It is conducted in Seminar Room 2305 in JCKL on Mon., Wed., and Thurs. at 2:00 and 3:00 pm in small-group back-to-back sessions by appointment with researcher. The total time requirement is about 50 minutes or less. Confidentiality of all test results is ensured. As a benefit, your instructor(s) may award extra credit for research participation.

If you would like to volunteer to participate in this research study, please contact Sharon Imperial at sei44960@ucmo.edu or by phone at 660-298-3652. For questions or additional information about this study, you may contact Dr. David Kreiner, Psychology Department Chair, at kreiner@ucmo.edu. You may also inquire in person at Lovinger 1110, Department of Psychology, UCM.
College Major Selection and Personality Traits

- Are you a languages, fine arts, or history major?
- Are you 18 years of age or older?
- Are you a sophomore or above?

If you answered yes to all of these questions, you are eligible to participate in an IRB approved minimum risk study which examines the relationships between college major selection and personality traits in science and humanities majors. The purpose of this research study is to compare students’ scores on two brief standardized personality assessments and a short self-efficacy scale to determine if significant differences exist between science and humanities majors. Research results may provide career counselors more knowledge in vocational psychology.

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APPENDIX E
COLLEGE MAJOR SELECTION AND PERSONALITY TRAITS
SONA-SYSTEMS STUDY ANNOUNCEMENT

• **Standard Study:** There is only one part to the study in which participants will participate, and the study will take place at a specific place.

• **Study Name:** College Major Selection and Personality Traits

• **Brief Abstract:** Participants in the study are 61 students at UCM who understand that their participation is entirely voluntary and that they can withdraw at any time with no penalties. The instruments used in this study include the NEO-FFI-3, Holland Self-Directed Search, General Self-Efficacy Scale (GSES), and a brief questionnaire asking the student to report his (her) college major. Analysis of data will include independent t-tests conducted on students’ scores on all three instruments to determine significant differences in scores on the NEO-FFI-3, GSES, and Holland’s SDS for science and humanities majors. No names or any other identifying information will appear on test materials, thus ensuring confidentiality for the participants.

• **Detailed Description:** Comparisons will be made between students’ scores and their majors to determine whether significant differences are evident. The NEO-FFI-3 is a short, standardized personality assessment which contains 60 items and should take no longer than 15 minutes. The Holland Self-Directed Search vocational inventory is expected to take less than 30 minutes to complete. The brief questionnaire and GSES, a 10-item Likert scale with 40 possible points, together take only 5 minutes to complete.

• **Eligibility Requirements:** Participants must be at least 18 years of age or older. They also must be at least at the sophomore level of their academic program.

• **Duration:** The study will take approximately 50 minutes.

• **Credits:** 5

• **Preparation:** There is none required prior to participating in the study.

• **Researcher:** Sharon Imperial

• **Active Study:** IRB approved

• **Contact Information:** For any questions or for further details about this study, you may contact the researcher at sei44960@ucmo.edu or Dr. Kreiner at kreiner@ucmo.edu. You may also inquire about this study at Lovinger 1110, Department of Psychology, UCM.