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Assessment of personality and vocational interests:

Redundant versus complementary

by

Marilla Lou Fox

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY

Department: Psychology
Major: Psychology

Approved:

Signature was redacted for privacy.

In Charge of ~~Major Work~~

Signature was redacted for privacy.

For the Major Department

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For the Graduate College

Iowa State University
Ames, Iowa

1995

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TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	v
LIST OF FIGURES	vii
ABSTRACT	viii
INTRODUCTION	1
LITERATURE REVIEW	6
Holland's Model of Vocational Personality	6
Holland's Vocational Personality Themes	6
Realistic	7
Investigative	8
Artistic	8
Social	8
Enterprising	9
Conventional	9
Measurement of Holland's Vocational Personality	9
Holland's Hexagon	9
Congruence and Holland's Basic Theoretical Assumptions	13
Holland's Secondary Theoretical Assumptions	16
Differentiation	17
Consistency	17
Calculus	18
Identity	18
General Evaluation of Holland's Model	19
Five Factor Model of Personality	20
Personality Theory Development and Definitions	21
Emergence of five factor theory	23
Development of the factors	24
Criticism: Number of factors	26
Criticism: Data source	28
Factor Definitions	30
Relationship of Five Factor Model to Other Personality Models	33
Relationship of Holland's Model to the Five Factor Model	35
Summary	41

METHOD	43
Participants	43
Procedure	43
Assessment Instruments	44
Strong Interest Inventory	44
Adjective Check List	46
ANALYSIS	50
Effectiveness of the ACL Marker Scales	50
Testing the Hypotheses	51
Hypothesis One	51
Hypothesis Two	52
Hypothesis Three	53
Hypothesis Four	54
RESULTS	55
Effectiveness of the ACL Marker Scales	55
Hypothesis One: The Big Five Factor Model and Holland's Model Overlap	62
Hypothesis One: Females	65
Hypothesis One: Males	71
Summary of Hypothesis One Results	76
Hypothesis Two: The Big Five Factors Predict Holland's Themes	76
Realistic Theme	78
Investigative Theme	79
Artistic Theme	80
Social Theme	81
Enterprising Theme	81
Conventional Theme	82
Summary of Hypothesis Two Results	82
Hypothesis Three: Clarity of Vocational Personality Effects Prediction	84
Differentiation	84
Females and differentiation	85
Males and differentiation	89
Summary of differentiation results	93
Consistency	94
Females and consistency	96
Males and consistency	99
Summary of consistency results	102
Hypothesis Four: Neuroticism Relates to Vocational Issues	102
DISCUSSION	105

REFERENCES	119
ACKNOWLEDGEMENTS	143
APPENDIX. DATA COLLECTION MATERIALS	144

LIST OF TABLES

	<u>Page</u>
Table 1. Five Factor Labels	23
Table 2. Summary of Names Assigned to Five Personality Factors	31
Table 3. John's (1990) ACL Marker Scales for the Big Five Factors	48
Table 4. Descriptive Statistics and Internal Consistency Estimates for the ACL Marker Scales for the Big Five Personality Factors, $n = 499$	57
Table 5. Intercorrelations and (Coefficients of Determination) Between the ACL Marker Scales for the Big Five Factors, $n = 499$	59
Table 6. Means and Standard Deviations for the Measures of the Holland Vocational Personality Themes and the Five Personality Factors	63
Table 7. Correlations Between Holland Vocational Themes (SII-GOT) and the Big Five Personality Factors (ACL Marker Scales), 286 Females	66
Table 8. Canonical Analysis of Measures of Holland Vocational Personality Themes and Big Five Personality Factors, 286 Females	67
Table 9. Structural Correlation Coefficients for Holland Themes and Five Factors, 286 Females	69
Table 10. Correlations Between Holland Themes (SII-GOT) and the Big Five Personality Factors (ACL Marker Scales), 204 Males	71
Table 11. Canonical Analysis of Measures of Holland Vocational Personality Themes and Big Five Personality Factors, 204 Males	73
Table 12. Structural Correlation Coefficients for Holland Themes and Big Five Factors, 204 Males	74
Table 13. Hypothesized Prediction of Holland Themes with Five Personality Factors	77
Table 14. Multiple Regressions of Holland Themes on Five Personality Factors	77
Table 15. Correlations Between Holland Themes and Five Personality Factors, for Females with High and Low Differentiation	86

Table 16.	Multiple Regressions of Holland Themes on Five Personality Factors, for Females with High and Low Differentiation of Holland Theme Scores	87
Table 17.	Correlations Between Holland Themes and Five Personality Factors, for Males with High and Low Differentiation	90
Table 18.	Multiple Regressions of Holland Themes on Five Personality Factors, for Males with High and Low Differentiation of Holland Theme Scores	91
Table 19.	Correlations Between Holland Themes and Five Personality Factors, for Females with High and Low Consistency	97
Table 20.	Multiple Regression of Holland Themes on Five Personality Factors, for Females with High and Low Consistency	98
Table 21.	Correlations Between Holland Themes and Five Personality Factors, for Males with High and Low Consistency	100
Table 22.	Multiple Regression of Holland Themes on Five Personality Factors, for Males with High and Low Consistency	101
Table 23.	Correlations Between Neuroticism and Issues in Career Counseling	104

LIST OF FIGURES

Figure 1.	Holland's Hexagonal Model of Vocational Personality/Interests	<u>Page</u> 11
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ABSTRACT

The value to vocational counselors of using a broad perspective in assessing personality was examined. The overlap between two models of personality was explored. The first model was Holland's (1985a) vocational personality approach, most commonly assessed in terms of vocational interests. The second model was the Big Five factor approach (Digman, 1990), which purports to be a comprehensive model of personality. Particular attention was paid to the Neuroticism factor's role in the overlap between the models and its relationship to issues that come up in vocational counseling. Data were collected from 286 female and 204 male college students, using the 1994 Strong Interest Inventory (Harmon, Hansen, Borgen, & Hammer, 1994) and the Adjective Check List (Gough & Heilbrun, 1983) marker scales developed by John (1990). The psychometrics of John's ACL marker scales for the Big Five factors were examined and it was concluded that the marker scales were an adequate but not optimum measure of the factors. Canonical correlation analysis of the data found the overlap of the two models involved four independent sources of covariation in female participants and three in males. However, the redundancy indices showed that each of the models accounted for less than 10% of the variation in the other model. The Neuroticism factor did not enter into the overlap between the models in the female sample but did in the males. Multiple regression analyses were used to test hypotheses about how the five factors should predict the Holland vocational personality themes. Limited support was found for predicting each of the Holland themes with more than one of the five factors. Prediction improved slightly when the clarity of vocational personalities was controlled. The simple

correlations were not significant between the Neuroticism factor and inconsistency or differentiation of vocational personality. Only the Neuroticism scale's correlation with dissatisfaction with females' college majors was significant. It was concluded that assessment of both vocational interests and personality factors such as neuroticism can deepen the understanding of vocational counselors and their clients. It was also recommended that further research focus on the gender differences in the links between personality and vocational interests.

INTRODUCTION

The training and practice of counseling psychologists have traditionally focused heavily on vocational counseling. However, compared to other counseling or therapy, vocational counseling is an anomaly. Often the assumption of counseling is that something within a troubled client needs to change. Borgen (1986) pointed out that vocational counseling, on the other hand, operates under a different assumption. Typically, if an individual is troubled about a vocational situation, it is assumed the required change is very likely one outside the client, namely a change in work environment.

The premise of the present study was that psychologists should take a comprehensive approach to assessing personality when they undertake vocational counseling. Probably the most basic assumption of vocational counseling is the idea that it is possible and desirable to measure similarities between personalities and work environments in order to achieve congruence or a fit (Betz, Fitzgerald & Hill, 1989; Zytowski & Borgen, 1983).

The desirability of arriving at a fit between the individual's personality and a work environment has been recognized by a wide variety of career counseling theories, including vocational personality theories (Holland, 1985a; and Roe, 1956), psychodynamic theory (Bordin, 1980), work adjustment theory (Lofquist & Dawis, 1969), the inter-domain model (Lowman, 1993), career development theory (Super, 1953), and person-environment fit theory (Pervin, 1987).

As Walsh and Holland (1992, p. 55) said, "If an individual possesses an accurate perception of self and reality he or she is more likely to select and enter environments congruent with his or her personality type... Furthermore, it is assumed that congruent person-environment relations should tend to stimulate achievement, satisfaction, personal adjustment, and the reinforcement of successful coping behaviors." It is therefore important to know how to most effectively and efficiently assess important variables in the individual that could fit a work environment.

Currently, the fit between an occupation and a client's personality is judged primarily on the basis of the client's vocational interests. If vocational interests do not provide a comprehensive explanation of personality differences, then important information may be omitted from counseling regarding career decisions. As Borgen (1986) said, "Given the centrality of Holland's position in current interest assessment and conceptualizing, the field is in big trouble if there is not a demonstrable link between interests and personality" (p. 107).

For several decades, John Holland (1959, 1966, 1973, 1985a) has been the most influential theorist and researcher on the role that matching personality and work environment plays in careers. According to Borgen's (1991) survey of trends in research topics covered in the *Journal of Vocational Behavior* from 1971 to 1990, congruence had received constant and gradually increasing attention. Holland's theory (1985a) identifies

six vocational personalities themes (i.e., Realistic, Investigative, Artistic, Social, Enterprising, and Conventional) , which he said are reflected in personalities and parallel work environments. Holland said that work environments and the people found in them have parallel themes because "many of the psychologically important features of the environment are transmitted by the people in it" (Holland, 1966, p.60.).

In application, Holland's *personality* themes are used to categorize results of vocational *interest* tests. Hence, in career counseling, the distinction between the concepts of vocational interest and personality is sometimes fuzzy. Holland's contention that vocational interests are an expression of personality is a departure from earlier approaches which treated vocational interests and personality as independent of each other (Holland, 1985a). The question of whether personality and vocational interest should be treated as separate concepts remains controversial. Ten years ago Hansen (1984) surveyed the evidence and concluded that measures of vocational interest and personality were not strongly related. At the same time, a study by Costa, McCrae, and Holland (1984) led to the opposite conclusion and, the following year, Holland (1985a) used existing empirical evidence to make an argument in favor of equating interest measurement with personality measurement. Borgen (1986) pointed out that these conflicting conclusions were based on similar statistical evidence.

The controversy flared up more recently, when Lowman (1993) proposed an inter-

domain model of career counseling, maintaining that personality, interests, and abilities should each be assessed separately. Spokane (1993) questioned Lowman's differentiation of vocational interests from personality primarily on the basis of the study by Costa, McCrae and Holland (1984) but also from a pragmatic position. Spokane suggested that clients are best served when assessments and explanations are as simple as possible. The goal then is parsimony in assessment and counseling, without impoverishing the information used to provide appropriate counseling.

While there is widespread agreement that the Holland system is parsimonious (e.g., Borgen, 1986; Hackett, Lent, & Greenhaus, 1991; Weinrach & Srebalus, 1990), it is not clear whether it reflects a comprehensive view of personality when compared to other general personality typologies. In fact, after more than three decades, Holland himself acknowledged that questions remain about how his own theory relates to other typologies (Walsh & Holland, 1992). The lack of clarity exists despite the fact that the relationship between Holland's theory and other personality theories has been studied since the 1960s. A bibliography compiled by Holland and Gottfredson (1990) lists approximately 20 studies comparing measurements of Holland's vocational interest/personality with various other aspects of personality. Bolton (1986) was particularly troubled by the fact that many of the studies did not study personality from a multivariate perspective. The continuing controversy surrounding the lack of clarity cannot be discounted.

One explanation for the persistently unsettled state of affairs could be framed in terms of "multiple personality disorder." That is, the field has been in a state of disorder in which multiple theories of personality were each operationalized by separate tests, with no mechanism for integrating the disparate theories under an overarching system for conceptualizing personality. What was needed was a personality taxonomy under which specific attributes could be categorized (John, 1990; Goldberg, 1993; Rorer, 1990). Recently such a parsimonious and integrative theory of personality was suggested. It has been increasingly recognized that personality characteristics can be summarized by five factors (Digman, 1990, Goldberg, 1993, McCrae & John, 1992, Wiggins & Pincus, 1992). Digman (1990) said, "At a minimum, research on the five-factor model has given us a useful set of very broad dimensions that characterize individual differences. These dimensions can be measured with high reliability and impressive validity. Taken together, they provide a good answer to question of personality *structure*" (p. 436).

Gelso and Fassinger (1992) suggested that the five-factor model is a potentially useful approach to increasing the understanding of how Holland's vocational personality theory relates to global personality. Research to that end began with studies by Gottfredson, Jones, and Holland (1993) and by Tokar and Swanson (1995). It was the aim of the present study to replicate and extend this recent study, sampling a different population and using different measures of both Holland's and the five-factor model of personality.

LITERATURE REVIEW

The following review of pertinent literature is divided into four sections. First, Holland's theory is reviewed. Second, the five-factor approach to personality is examined. Third, research that has previously examined the relationship of Holland themes to the five-factor model of personality is reviewed. Finally, a summary explains how the review of previous research has informed the present study.

Holland's Model of Vocational Personality

John Holland introduced his theory of vocational choice in 1959. Holland later acknowledged (Gottfredson, Jones, & Holland, 1993) the impact on his theory of the organization of the early versions of the Strong (1943) and Kuder (1960) interest inventories, and Roe's (1956) vocational interest dimensions. Contemporaneously with the development of Holland's theory, Guilford was using factor analysis to study categories of human interests (Guilford, Christensen, Bond, & Sutton; 1954). Holland (1985a) said that he was "impressed and reassured" (p. 6) to note that six of the factors analyzed by Guilford were very similar the six vocational personality themes in his inventory.

Holland's Vocational Personality Themes

The vocational personality themes in Holland's (1985a) theory are: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. Originally, Holland (1966) said that a personality or an environment could be characterized by one of the types. In

more recent statements of his theory, Holland (1973, 1985a) characterized personalities and environments by codes which incorporate traits of more than one vocational personality theme. Codes are designated by two or three letters, corresponding to the first letters of the themes on which an individual has the highest scores. Thus, an individual characterized by a SEC code would be expected to have traits associated with the Social, Enterprising and Conventional interests, in that order of interest.

Several studies, implementing large and varied samples, have yielded lists of personality traits corresponding with each of the Holland themes (Holland, 1985a, Walsh & Holland, 1992; Weinrach and Srebalus, 1990). Typically, the early research was longitudinal with one- to four-year intervals. Holland vocational personality themes were identified according to an interest inventory score, or choice of vocation or college major. Other characteristics of the individuals were assessed by administering other assessments of academic aptitudes and interests, extracurricular activities and achievements, and personality. Correlations were then examined to find what traits were associated with the Holland vocational personality themes. The six themes are described as follows (Holland, 1985a; Walsh & Holland, 1992).

Realistic. The Realistic personality is associated with mechanical and athletic ability but a relative lack of social skills. Realistic people value concrete things and tangible qualities (e.g., money, power, and status). Traits listed for the Realistic type are asocial,

conforming, frank, genuine, hard-headed, honest, materialistic, modest, natural, normal, persistent, practical, self-effacing, inflexible, stable, thrifty, un insightful, and uninvolved. An electrician might have Realistic traits.

Investigative. The Investigative personality involves a scholarly orientation, with strong mathematical and scientific abilities but less leadership ability. Investigative people value a scientific approach to problem solving. Traits listed for the Investigative theme are: analytical, cautious, critical, complex, curious, independent, intellectual, introspective, introverted, methodical, pessimistic, precise, rational, reserved, retiring, unassuming, and unpopular. A person with Investigative qualities might be a chemist.

Artistic. The Artistic personality is characterized by abilities in music, acting, writing, and/or acting. Artistic people value esthetic qualities. Traits listed are: complicated, disorderly, emotional, expressive, idealistic, imaginative, impractical, impulsive, independent, introspective, intuitive, nonconforming, open, original, and sensitive. Interior decoration is an occupation that might be held by an individual who exemplified the Artistic personality theme.

Social. The Social personality is associated with people who have abilities to help and understand others but lack mechanical or scientific abilities. Social people value ethical behavior. Traits listed for the Social theme are: ascendent, convincing, cooperative, patient, friendly, generous, helpful, idealistic, insightful, empathetic, kind, persuasive,

responsible, sociable, tactful, understanding, and warm. Social personalities are common among teachers.

Enterprising. The Enterprising personality is associated with people who have leadership and speaking abilities but less scientific ability. They usually value political and economic achievement. Traits listed for Enterprising personalities are: acquisitive, adventurous, agreeable, ambitious, domineering, energetic, exhibitionistic, excitement-seeking, extroverted, flirtatious, impulsive, optimistic, pleasure-seeking, popular, self-confident, sociable, and talkative. Enterprising occupations include sales and management.

Conventional. The Conventional personality is characterized by clerical and numerical abilities but not by artistic ability. Conventional people value business and economic achievement. Traits include: careful, conforming, conscientious, conservative, defensive, efficient, inflexible, inhibited, methodical, obedient, orderly, persistent, practical, prudish, self-controlled, thrifty, and unimaginative. A stenographer or accountant might have Conventional traits.

Measurement of Holland's Vocational Personality

Holland's vocational personality theory is operationalized by tests of vocational interests. Three of the best known interest tests, the Strong Interest Inventory, (SII, Harmon, Hansen, Borgen, & Hammer, 1994), the Vocational Preference Inventory (VPI, Holland, 1985b), and the Self-Directed Search (SDS, Holland, 1985c), use the Holland

organizational scheme. The SII, VPI, and SDS put Holland's theory of personality in operation using similar but not identical approaches. In each of the three inventories, the individual is asked to indicate whether she/he likes or dislikes (i.e., is interested or disinterested in) a list of occupations. Each of the occupational titles and other activities are categorized according to the RIASEC themes. By tallying the responses to the occupations and activities, the inventories report level of interest in each of the themes.

Holland's Hexagon

Certain pairs of the six vocational personality themes are more highly correlated than other pairs, indicating differences in similarity of the themes (Cole, Whitney, & Holland, 1971). The varying similarity of the themes (i.e., number of shared traits) is depicted by arranging the themes on the points of a hexagon (Figure 1). The depiction has come to be known as the RIASEC hexagon (Holland, 1985a). The letters in the RIASEC acronym stand for the six vocational interests/personality themes and are arranged around the hexagon in the order of how closely they are related. This arrangement signifies, for example, that the Realistic theme is most closely related to the Investigative and Conventional themes because it is situated between them on the hexagon. At the other extreme, the Realistic theme shares the fewest traits with the Social theme, as indicated by the greatest possible distance between them on opposite sides of the hexagon.

Holland (1985a, p. 94) cited "relatively clear and positive support" for a hexagonal structure explaining the relationships between the RIASEC themes. The support hasn't been unqualified, however. Holland (1985a) admitted that the use of multidimensional scaling on ratings of similarity of the RIASEC themes has found that their ordering is as predicted by the RIASEC hexagon for both males and females, but the hexagon is more misshapen for females. A possible explanation for this gender difference is that studies have not used samples in which all interest types were equally well represented in females

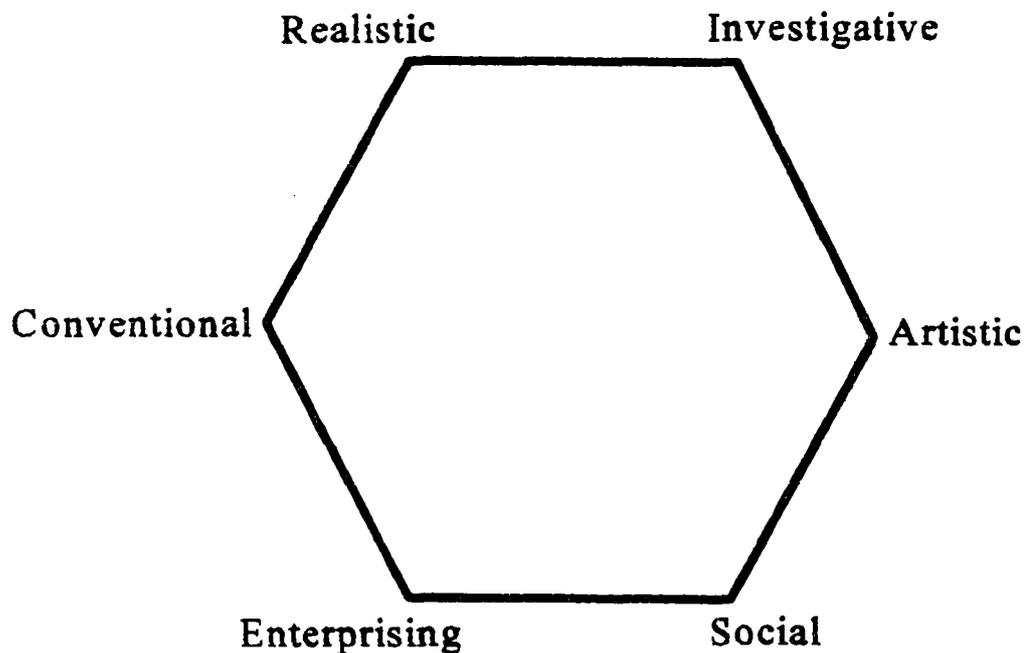


Figure 1. Holland's Hexagonal Model of Vocational Personality/Interests

and males. However, when Hansen, Collins, Swanson, and Fouad (1993) controlled the equality of interest themes across genders, their multidimensional scaling analysis still found men's interests more nearly resembled the hexagon than did the structure of women's interests. For women, the Realistic and Investigative interests were more closely related than they were for men. In addition, the Social interest was pulled in toward the middle of the configuration for women so that it was nearly equidistant from all five of the other themes.

Other recent structural analyses of multicultural data (Fouad & Dancer, 1992; Hansen, 1992; Swanson, 1992), collected with an earlier version of the SII (Hansen & Campbell, 1985), also indicate differences in interest/personality structure. Tracey and Rounds' (1993) also reported that Holland's model is more predictive in English-speaking, U. S. populations than for other populations and suggested this may be due to inadequacies in the measurement instruments used with other populations.

A persistent challenger of the Holland hexagonal structure of vocational interests has been Gati (1979, 1982, 1991). Gati (1979) incorporated the RIASEC themes in a hierarchical three-group partition model based on cluster analysis. Gati's model retains Holland's ordering of the themes but splits them into three pairs/clusters (i.e., R and I, A and S, and E and C). Gati asserted that correlations between themes in the same cluster will be higher than the correlations of themes in different clusters. Gati's claim for his

model's superiority was undermined by a recent structural meta-analysis by Tracey and Rounds (1993). As a result of their analysis of 104 RIASEC matrices, Tracey and Rounds concluded that: (a) Holland's model did a better job of predicting the order of how high correlations would be between pairs of themes; (b) the circumplex structure of Holland's hexagonal model provided a more parsimonious and adequate fit for the data than any of Gati's alternate structures, and (c) the clusters of Gati's three-group partitioned model incorrectly clustered A and S in the same cluster and that the so-called clusters were not discretely partitioned.

More recently, Tracey and Rounds (1995) have developed a circumplex rather than hexagonal model of vocational interests. Tracey and Rounds contended that it is arbitrary to limit the number of points around the circle to six. Their model of concentric circles has increasing numbers and specificity of interests in each succeeding outer circles. Rather than supplant Holland's model, the new model incorporates it in an inner circle.

Congruence and Holland's Basic Theoretical Assumptions

Recent statements of Holland's theory (Holland, 1985a; Walsh & Holland, 1992) list three basic assumptions, which illustrate the centrality of congruence. The basic assumptions are: (a) An individual can be described by one or more of the personality themes listed above, (b) individuals tend to inhabit environments that are characterized by demands and opportunities for expression of their personality, and (c)

person-environment congruence is associated with "productivity, creativity, personal stability, and vocational stability and satisfaction" (Walsh & Holland, 1992, p. 43).

However, Walsh and Holland cautioned against viewing incongruence as a negative state that must always be avoided. Rather, they said that incongruence is a state that stimulates change and development.

According to Hackett and Lent (1992, p. 426), "Holland's congruence hypothesis appears to be the most widely studied and debated aspect of his theory in recent years." Congruence versus incongruence has typically been determined by comparing an individual's Holland personality code with the Holland code for a work environment or college major environment (Walsh & Holland, 1992). Usually if the first letter of the personality code and environmental code match, they are considered congruent. However, Walsh and Holland (1992) also reviewed several more comprehensive indices of congruence based on mathematical combinations of all six personality themes.

Empirical evidence for the role congruence plays in career variables, such as career choice, adjustment, work satisfaction, achievement, and stability, has been uneven (Gottfredson & Holland, 1990). Spokane (1985) provided a narrative review of congruence research and found, at best, moderate correlations (mostly .25 to .35) with career performance, satisfaction, and stability, but concluded they were sufficient evidence to use congruence as a predictor. More recent reviewers (Hackett & Lent, 1992; Walsh &

Holland, 1992) and meta-analysts (Assouline & Meir, 1987) agree that congruence is predictive of career choice and career satisfaction, especially when congruence is measured with a specific occupational speciality rather than a general category. Assouline and Meir (1987) found a mean correlation of .21 for congruence with satisfaction overall, and .42 when congruence was measured between individuals and their occupational specialties. Congruence has received less support as a predictor of career stability or career achievement. The meta-analysis of Assouline and Meir (1987) found an effect size of only .15 for congruence 's influence on career stability. The mean correlation between congruence and achievement was .06, according to Assouline and Meir (1987).

Borgen (1986) offered a yardstick that may be used to evaluate the meaning of correlations between measures that are theoretically related (i.e., the meaning of validity coefficients). He said that correlations approximating .30 should not be considered so low as to threaten the validity of the theory. Validity coefficients cannot exceed the reliabilities of the individual measures. Therefore, validity coefficients of approximately .70 would indicate that all the predictable variance in job satisfaction was explained by congruence, an obviously unrealistic explanation. Correlations of .30 should not cause us to assume that congruence has no role in job satisfaction, according to Borgen (1986), but it should lead us to acknowledge that congruence cannot be used in isolation as the only predictor of job satisfaction.

Holland's Secondary Theoretical Assumptions

Holland's theory (1985a) also includes four secondary assumptions: differentiation, consistency, identity, and calculus. The first three (i.e., differentiation, consistency, and identity) are "techniques for defining the clarity and focus of a person or environment" (Walsh & Holland, 1992, p. 44). These three concepts are hypothesized to predict vocational outcomes, such as degree of career stability and satisfaction.

In his latest statement of his theory, Holland (1985a) concluded that consistency and differentiation had received, at best, mixed support as predictors. As a result, he now assigns less importance to consistency and differentiation than he does to congruence (Holland, 1985a; Walsh & Holland, 1992). Hackett and Lent (1992) reviewed recent research and came to the same conclusion (i.e., consistency and differentiation have received disappointingly inconsistent empirical support).

Hackett and Lent (1992) pointed out, however, that most existing reviews, including their own, have not fulfilled Holland's (1985a, 1987) caveat that empirical findings be evaluated on the basis of design quality. Weinrach and Srebalus (1990) judged four studies of consistency to be well-designed. These studies endorsed consistency as a predictor of: (a) persistence in a college major, (b) occupational stability, (c) grade point average, and (d) seeking vocational counseling. Thus, differentiation and consistency are have not been eliminated as important variables.

Differentiation. Degree of differentiation of a personality or environment depends on whether the highest and lowest RIASEC scores are nearly equal (undifferentiated) or there is considerable difference (differentiated). Differentiation is highest when a score on one of the themes is much higher than scores for the other themes, and lowest when scores for the six themes are about equal. The vocational interest profile of a highly differentiated personality would have a few relatively high peaks, while an undifferentiated profile would be relatively flat. In other words, the well differentiated personality would be much more interested in activities fitting one or two of the themes than in activities fitting the other themes. Differentiation is operationalized as the numerical value derived from subtracting the lowest RIASEC scale score from the highest scale score (Holland, 1985a).

Consistency. Consistency of a personality refers to the ease of integrating the themes of interest reflected in a RIASEC code. A personality or environment is said to have more or less consistency depending how closely correlated are the RIASEC themes incorporated in the code. The RIASEC themes included in a consistent personality are harmonious and few of the characteristic interests would seem contradictory. For instance, it would be more likely that an individual could satisfy both Realistic and Conventional interests in an occupation; while it would be less likely that one occupation would fulfill both Realistic and Social interests.

Calculus. The calculus assumption refers to the method used to operationalize consistency. Consistency can be calculated by applying the hexagonal model to two-letter codes, in order to judge how closely related are the themes subsumed by a code (Holland, 1985a). As it is usually applied, Holland's calculus produces a trichotomous measure, with a high value (e.g., 3) being assigned if the letters are adjacent on the hexagon, a middle value (e.g., 2) if the letters are separated by one other letter, and a low value (e.g., 1) if they are separated by two letters. Another more sophisticated operationalization of consistency has been developed by Strahan (1987). Strahan's method, based on conditional probabilities, will be discussed more fully in the Method chapter.

Identity. Identity is similar in conceptualization to consistency and differentiation (Walsh & Holland, 1992). Identity also evaluates the clarity and stability of vocational interests and personality. The concept of identity is a relative recent addition to the theory. Whether it adds meaning to the theory is not clear. Holland (1985a) operationally defined identity as a score on the 18-item Identity Scale of My Vocational Situation (MVS, Holland, Daiger, and Power, 1980). The MVS can be used to determine whether clients require interventions that will facilitate self-assessment and exploration of options versus interventions that merely require information and reassurance about vocational decisions that have already been formulated. Tinsley, Bowman, and York's (1989) meta-analysis

and Hackett and Lent (1992) pointed out that identity bears a strong resemblance to career decidedness.

General Evaluation of Holland's Model

Brown (1987) rated Holland's theory as the best current theory of vocational choice. Using criteria based on the philosophy of science, Brown commended the theory on several strengths: (a) the hexagon is effective in clarifying the concepts of consistency and differentiation; (b) the theory explains important phenomena, such as career choice and job satisfaction; (c) the theory has stimulated research; and (d) the theory explains new data.

Brown faulted Holland's theory for: (a) lack of clarity about the new identity construct as it applies to the organizational structure of vocational environments, (b) insufficient statements about the development of personality and vocational interests, (c) lack of differential hypotheses for subgroups according to age, race, ethnicity, or gender, and (d) failure to address how personality impacts the career decision-making process. In regard to this final criticism, it is interesting to note that Walsh and Holland (1992), in reviewing empirical evidence, concluded that measures of decision-making and problem-solving were not related to person-environment congruence.

Holland has been commended by reviewers for his openness to criticism and negative research evidence, which has resulted in an ongoing process of revision (Hackett, Lent, Greenhaus, 1991). The integrity of the theory has not been lost, however. Weinrach and

Srebalus (1990) said, "While continually open to revision based on empirical evidence, Holland's theory has successfully resisted the kinds of modification intended to satisfy prescriptive cultural and political pressure" (p. 48).

One of the pivotal questions that remains to be resolved is whether it is valid to assert, as does Holland, that measures of vocational interests capture the central aspects of personality. One way to address this question is to examine the relationship between Holland's theory and another theory of personality that purports to be comprehensive. The five-factor personality model fits that description.

Five-Factor Model of Personality

The purpose of the present study was to enhance the application of personality theories to the practice of psychological counseling. Personality psychology and counseling psychology not only have a symbiotic relationship (Gelso & Fassinger, 1992), but have common roots in individual differences psychology (Dawis, 1992; and Betz, Fitzgerald, & Hill, 1989). Gelso and Fassinger (1992) pointed out that personality psychology concepts contribute to both the research and the practice of counseling psychology, by furnishing convenient ways of conceptualizing client variables. At the same time, counseling psychology research contributes to personality psychology by validating its concepts. Dawis (1992) traced the roots of counseling psychology as follows: "from individual

differences psychology through psychological testing, vocational counseling, and student personnel work, to counseling psychology" (p. 7).

In preparation for a discussion of five-factor theory of personality, a brief description of the developments in personality theory follows.

Personality Theory Development and Definitions

Two perspectives, individual differences and organismic, have been assumed in defining personality (Pervin, 1990). In accord with the former perspective, Jensen (1958, p. 295) said, "The concept of personality is a result of our observation of individual differences in human behavior." Klein, Barr, and Wolitzky (1967) defined personality from the organismic perspective as "the interlocking, the architectural totality rather than the sheer generality of one or more traits" (p. 469).

Rorer (1990) said the goal of personality assessment is to arrive at a description of a person that does not relate to "physical appearance or physiological functioning, or behavior as such ... rather, it relates to a person's manner of behaving, his or her moods, and the situations and behaviors he or she chooses as opposed to the ones he or she avoids" (p. 693). Qualities associated with personality, according to Gelso and Fassinger (1992) are durable traits, values, attitudes, beliefs, needs and dispositions. Personality psychology involves not only identifying the characteristics of individuals, but the stability, origins, and consequences of those characteristics (Gelso & Fassinger, 1992).

The individual differences approach to personality theory is traced back to the late nineteenth century when Sir Francis Galton, James McKeen Cattell, and Wilhelm Wundt pioneered the development of experimental measurements of differences in sensory and motor capabilities (Betz, Fitzgerald, & Hill, 1989). In 1905, Alfred Binet and Theodore Simon introduced the first test that tapped individual differences in higher level intelligence. The Woodworth Personal Data Sheet was developed for personality testing for military recruitment purposes during the First World War. Personality testing and the assessment role of psychologists were further developed for the same purpose during the Second World War.

Controversy, attacking the legitimacy of personality testing, dominated personality psychology during the latter part of the Twentieth Century (Pervin, 1990). The growing emphasis on construct validity (Cronbach & Meehl, 1955) and the multitrait-multimethod approach to testing (Campbell & Fiske, 1959) brought into question the meanings of various measurements of personality constructs. In addition, the person-situation debate called into question whether personality existed at all. Ultimately, research reaffirmed the place of personality in psychology. Rather than claiming behavior is dominated by only internal personal traits or external situations, it was proposed that behavior is a factor of an interaction between personality and situation (Endler & Magnusson, 1976; Magnusson & Endler, 1977).

Emergence of five factor theory. A recent focus in personality psychology has been the question of how to insure that a measure of personality taps the full spectrum of personality variables. This focus has led directly to the development of the five-factor theory, which has been called by Goldberg (1993, p. 26) "a scientifically compelling taxonomy of personality traits." By way of

communicating the breadth of the factors, their replicability, and perhaps the monumental nature of their development,

Goldberg (1981) coined the term the

"Big Five" and Digman (1990) refers to the

"Five Robust Factors" of personality. The factor labels suggested by John (1990) will be used for the present study (see Table 1). John also suggested the mnemonic EACNO as an aid to remember the names and their order.

The five-factor model of personality has not received universal acceptance. McAdams (1992, p. 353) calls the five-factor model "psychology of the stranger," meaning that the model can provide only a sketchy description of an individual and cannot be used to predict specific behaviors, explain personality development, or understand individuals in the context of their lives. As might be expected, the developers of the multiple theories of personality and/or personality assessment instruments that are presently being marketed

Table 1. Five Factor Labels

I. Extraversion
II. Agreeableness
III. Conscientiousness
IV. Neuroticism
V. Openness

Note: According to John (1990)

have not abandoned their individual perspectives in favor of the five-factor approach. On the other hand, McCrae and John (1992) and Gottfredson, Jones and Holland (1993) were able to systematically analyze how many of the other prominent approaches to personality relate to the factors of the Big Five.

Development of the factors. A personality taxonomy should subsume all possible dimensions of personality. One way to achieve this is suggested by the lexical hypothesis (Goldberg, 1993; John, 1990; Rorer, 1990). The hypothesis says that "the most important individual differences in human transactions will come to be encoded as single terms in some or all of the world's languages" (Goldberg, 1993, p. 26). Early efforts to compile comprehensive lists of trait-descriptors include an 1884 publication by Galton, Thurstone's (1934) list of commonly used adjectives, and Allport and Odbert's (1936) list of 4,500 personal traits culled from the second edition of Webster's Unabridged Dictionary.

The next step was to apply factor analysis to the lists. Thurstone (1934) applied a precursor of factor analysis to his sixty adjectives and found five factors. Although Thurstone found five factors, his relatively brief list of adjectives did not cover all the personality dimensions of the Big-Five. Cattell (1946) subjected the Allport-Odbert list to a semantic reduction process, yielding 35 variables. He had judges rank order adult males on the 35 variables and then factor analyzed the results. Cattell (1943) reported that he found at least a dozen oblique factors. He later added four more factors based on

questionnaire data in developing the Sixteen Personality Factors Questionnaire (16 PF, Cattell, Eber, & Tatsuoka, 1970). Reviewers of independent studies of Cattell's variables have reported that his complex system has not been replicable (Digman, 1990; Goldberg, 1993; John, 1990).

Norman (1963) is often said, erroneously according to Goldberg (1993), to have fathered the Big-Five structure. Although Norman (1963) confirmed the five-factors with Cattell's variables, he believed a more representative list of the English personality-trait lexicon would produce more than five personality dimensions. Toward that end, Norman (1967) spent much time compiling such a list but never factor analyzed it (Goldberg, 1990).

John (1990) and Goldberg (1993) give credit for the origin of the Big-Five Model to Fiske's (1949) studies using Cattell's variables and to the 1954 and 1961 studies of Tupes and Christal (1992). Fiske's (1949) five factors (confident self-expression, social adaptability, conformity, emotional control, and inquiring intellect) have been replicated with samples of self-ratings, observer ratings, and peer ratings (Goldberg, 1993). Tupes and Christal (1992) analyzed a number of studies that used Cattell's variables and found five replicable factors. Their Air Force studies included examinations of the factor structures across time, response modes, and diverse samples.

Criticism: Number of factors. Critics of the five-factor model have been split on whether they think five is too few or too many factors. Like Norman (1967), Digman wanted to show that personality is made up of more than five factors. Digman (1963, 1965, 1972) found from seven to 10 factors when he analyzed Cattell's matrices of teachers' ratings of children's personality variables. Later, Digman and Takemoto-Chock (1981) found clerical errors in two of Cattell's matrices. When these errors were corrected, they found corresponding factors in a number of classic studies when they rotated five factors but not when they rotated six or more. As a result, Digman has become a supporter of the five-factor model (Digman, 1990; Digman and Inouye, 1986).

Mathews and Oddy (1993) studied the factor structure of self-ratings on 144 traits by a sample of 1,210 subjects, aged 16-65. They found that replicable factors were related not only to the five factor model but also a six factor model. They concluded that a 10-factor solution distorted the factors less than fewer factors.

Eysenck, on the other hand, has maintained since 1970 that three factors (i.e., neuroticism, extroversion, and psychoticism) are sufficient. The first two Eysenck factors (i.e., neuroticism and extroversion) correspond to Factors IV and I, respectively, of the Big Five. Eysenck placed intellect, which parallels Factor V, outside the whelm of his focus on temperament. Considering these explanations of Factors I, IV, and V, Digman (1990) and John (1990) proposed that Eysenck's theory is compatible with the Big Five,

because Factors II (agreeableness) and III (conscientiousness) can be subsumed under Eysenck's psychoticism. This solution also helps to resolve the objection of critics (e.g., Block, 1977) to Eysenck's interpretation of his psychoticism factor.

Peabody and Goldberg also originally believed that fewer than five factors could be used to explain variance in personality. Peabody published a series of articles and a book (e.g., 1967, 1978, 1985) espousing a personality structure with three factors, including evaluation, assertiveness and impulse expression. Goldberg (1982), at first, was an advocate of Peabody's three-factor structure. However, Goldberg (1993) currently admits that the analyses of the data he collected from 1975 to 1985 kept producing "some variant of the Big-Five factors, no two analyses exactly the same, no analysis so different from the rest that I couldn't recognize the hazy outline of the five domains" (p. 29). Finally, Peabody and Goldberg (1989) came to the conclusion that five orthogonal factors were evident when individuals were rated on Goldberg's representative set of bipolar trait scales. However, when the adjectives themselves were rated for semantic similarity, they found six orthogonal factors. Goldberg (1993) is now attempting to determine the exact position of the factor axes in five-dimensional space. This task is complicated by such research design variants as heterogeneity between samples, heterogeneity within samples, sample size, what set of trait-variables is used, and whether the trait-variables are presented as unipolar or bipolar scales.

Criticism: Data source. Another important criticism of the five-factor research is that it has been over-reliant on data based on judges' ratings of subjects on Cattell's list of traits. The five-factor model must also be validated with data based on self-ratings and on lists of variables that were derived independently from Cattell's. Norman's (1967) developed an independent list of 2,800 stable traits from the unabridged 1961 *Webster's Third New International Dictionary*. Later Norman reduced the list to 1,600 terms and sorted them into 75 categories (see Goldberg, 1981, 1990). However, Norman never analyzed his list to see if he would get more than five factors, as he predicted in 1967.

When Goldberg (1990) further refined Norman's list and used both self-ratings and peer-ratings of college students on Norman's 75 categories as data, he found the first five factors to coincide with the Big Five. The five factors remained intact when more than five were rotated, and no additional factor was consistent across the four samples included in the study. The self-ratings and peer-ratings yielded virtually identical five-factor structures.

In addition to the studies discussed above, which are based on the variable sets compiled by Cattell and by Norman, several studies have been based on another variable set selected by Peabody (1987). Peabody's 57 bipolar adjective scales were semantically selected to represent what he considered to be distinguishable groups of adjectives. Studies using the bipolar adjective scales have in general yielded the five factors (John, 1990).

John (1990) lists ten studies done during the 1980s that identified the five factors using sets of variables from sources other than Cattell. Such studies have included an analysis of trait ratings by a large sample of dating couples in the 1930s and 1970s (Conley, 1985), from which the first four factors emerged as expected but the fifth factor (intellect) was derived only from the males in the sample. In another study, interviewer ratings on 35 characteristics of elderly participants in the Berkeley Guidance Study were used as data by Field and Millsap (1989). They found four of the expected factors but their fifth factor was Energy rather than Conscientiousness. Other studies have confirmed the five factors using combined lists of variables from previous studies or original lists (e.g., Digman & Takemoto-Chock, 1981; Botwin & Buss, 1989).

Digman (1990) said in his review of the five-factor model, "The five-factor model is robust, not only across different studies and languages in the rating field, but across languages and different inventories, as well" (p.430). Studies yielding five factors were also reviewed by John (1990), McCrae and John (1992), and Wiggins and Pincus (1992).

While strong substantiation of the Five-Factor personality theory exists in research using English and related languages (e.g., German and Dutch), it remains to be seen if the theory is generalizable across non-Western cultures (Digman, 1990; John, 1990). One recent cross-cultural study implemented both translations of a verbal personality inventory (i.e., Jackson's Personality Research Form, Jackson, 1974) and a new non-verbal

personality inventory that uses line drawings of persons engaged in trait-related behaviors (Paunonen, Jackson, Trzebinski, & Forsterling, 1992). Paunonen and his colleagues found that the factor structure of personality in Canadian, Finish, Polish, and German samples confirmed the Big Five structure with both verbal and non-verbal measures of personality.

Factor Definitions

Not only the semantic titles but the numerical titles of the factors are invested with meaning, according to John (1990). The factors are numbered in the order of their relative size. In other words, Factor I - Extraversion accounts for the largest percentage of variance in personality ratings. The semantic meaning of the factors is clarified by tables compiled by Digman (1990) and by John (1990), which list titles assigned to each of the five factors in more than a dozen studies beginning with Fiske in 1949. The tables provide useful comparisons of the convergence and divergence among the defining labels assigned to the factors by a variety of researchers. Table 2 on the following page is an abbreviated version of the Digman and John tables, which give more extensive citations under each variation.

John drew a parallel between the factors and natural categories, which typically have "fuzzy and partially overlapping definitions" (John, 1990, p. 78). John set out to help clarify the meaning of the natural category/factors, with a study in which he looked for prototypical exemplars of each factor, culled from the Adjective Check List (Gough &

Table 2. Summary of Names Assigned to Five Personality Factors

Factor I	Factor II	Factor III	Factor IV	Factor V
Extraversion (McCrae & Costa, 1985a)	Agreeableness (McCrae & Costa, 1985a)	Conscientious- ness (McCrae & Costa, 1985a)	Neuroticism (McCrae & Costa, 1985a)	Openness to Experience (McCrae & Costa, 1985a)
Confident Self- Expression (Fiske, 1949)	Social Adaptability (Fiske, 1949)	Conformity (Fiske, 1949)	Emotional Control (Fiske, 1949)	Inquiring Intellect (Fiske, 1949)
Surgency (Goldberg, 1981)	Likeability (Borgatta, 1964)	Dependability (Tupes & Christal, 1961)	Emotionality (Borgatta, 1964)	Culture (De Raad et al., 1988)
Assertiveness (Borgatta, 1964)	Friendly Compliance (Digman & Takemoto- Chock, 1981)	Task Interest (Borgatta, 1964)	Ego Strength (Digman & Takemoto, 1981)	
Power (Peabody & Goldberg, 1989)	Love (Peabody & Goldberg, 1989)	Will to Achieve (Digman & Takemoto- Chock, 1981)	Dominant- Assured (Botwin & Buss, 1989)	
		Impulse Control (Conley, 1985)	Satisfaction (Field & Millsap, 1989)	
		Work (Peabody & Goldberg, 1989)	Affect (Peabody & Goldberg, 1989)	

Heilbrun, 1983). Johns' prototypes were used as markers of the five factors in the present study and they are discussed in detail in the Method section.

Costa and McCrae (1985) spoke of factor heterogeneity and incorporated various facets of each factor in their NEO Personality Inventory. Their facets of Factor I - Extraversion are Warmth, Gregariousness, Assertiveness, Activity, Excitement-Seeking, and Positive Emotions. Facets of Factor II - Agreeableness are: Trust, Straightforwardness, Altruism, Compliance, Modesty, and Tender-Mindedness. Facets of Factor III - Conscientiousness are: Competence, Order, Dutifulness, Achievement Striving, Self-Discipline, and Deliberation. Facets of Factor IV - Neuroticism are: Anxiety, Angry Hostility, Depression, Self-Consciousness, Impulsiveness, and Vulnerability. Finally, facets of Factor V - Openness are: Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values.

The meaning associated with Factor V has been the most controversial. The early label of Culture by Norman (1963) was used to denote sophisticated, polished and well-educated. Currently, the strongest argument is in favor of interpreting Factor V as Openness to Experience or Intellectual Interests. This interpretation better reflects the adjectives, such as intelligent, imaginative, and original, which have the highest loadings on the factor (Goldberg, 1990; John, 1990, McRae & Costa, 1987).

Relationship of Five Factor Model to Other Personality Models

The five-factor instrument that has been the most widely utilized was originated by Costa and McCrae. Their instrument originally measured only Eysenck's two factors Neuroticism and Extraversion, plus Openness (NEO, Costa and McCrae, 1980; McCrae & Costa, 1983). Costa and McCrae (1976) found the third factor, Openness, when they factored the 16 PF. Subsequently, they recognized Agreeableness and Conscientiousness (McCrae & Costa, 1985b) as major domains and revised their inventory to include five factors (NEO-PI, Costa, McCrae, & Dye, 1991).

The team of Costa and McCrae have used the NEO-PI to compare the five-factor model to the factor structure of several other personality inventories. They have found that the five-factor model was evident in the Edwards Personal Preference Schedule (EPPS, Edwards, 1959; Piedmont, McCrae & Costa, 1992), the Eysenck Personality Inventory (EPI, Eysenck & Eysenck, 1964; McCrae & Costa, 1985b), the Jackson Personality Research Form (PRF, Jackson, 1974; Costa & McCrae, 1988), the Myers-Briggs Type Indicator (MBTI, Myers & McCauley, 1985; McCrae & Costa, 1989a), and the California Q-Sort (Block, 1961; McCrae, Costa & Busch, 1986).

In the analyses of other personality inventories, one or more of the factors was poorly represented. An analysis of the Minnesota Multiphasic Personality Inventory (MMPI,

Hathaway & McKinley, 1951) found only four of the factors, with Conscientiousness being missing (Costa, Busch, Zonderman & McCrae, 1986).

The California Psychological Inventory (CPI, Gough, 1987) also failed to fully represent all the factors (McCrae, Costa & Piedmont, 1993). A rational analysis of the CPI items indicated an absence of Openness or Agreeableness content. An empirical analysis of correlations between NEO-PI factors and CPI scales, on the other hand, found only the Agreeableness factor to be relatively absent.

In at least one instance, the emergence of the five-factor model has resulted in the revision of a personality inventory. McCrae and Costa (1989b) factored the NEO Personality Inventory jointly with the Interpersonal Adjective Scales (Wiggins, 1979) and found the expected correspondence between the Big Five's Extraversion factor and Wiggins's Dominance dimension, and between the Big Five's Agreeableness factor and Wiggins's Nurturance dimension. Subsequently, Trapnell and Wiggins (1990) extended the Interpersonal Adjective Scales to include the other three factors of the Big Five.

The relationship of the Big-Five to the Adjective Check List (ACL, Gough & Heilbrun, 1965, 1983) is of particular interest in the present study. John (1990) arrived at prototypical lists of adjectives for each of the factors using the ACL, and as a consequence provided markers for the five factors. John asked 10 judges to independently sort the 300 adjectives in the ACL into one of the five factors. The 112 adjectives on which there was

90% agreement were then subjected to factor analysis, using data consisting of psychologists' ACL ratings of 280 participants. Thus John (1990) used a combination of rational and empirical approaches to arrive at a list of prototypical adjectives for each factor.

Piedmont, McCrae, and Costa (1991) also looked at the factor structure of the ACL. However, they factored the 35 scales of the 1983 version of the ACL rather than the adjective-items, because the scales "may possess properties and reflect attributes of people that single adjectives do not" (p. 631). Piedmont's team did two studies. One study collected self-rating data from college undergraduates, using as five-factor markers the ACL adjectives identified by John (1990). The factors were clearly defined in the first study by the ACL scales which loaded on them. The other study used community volunteers, aged 19 to 93, and markers used were the NEO-PI scales and bipolar adjective scales (McCrae and Costa, 1987). The second study included self-ratings, peer-ratings, and spouse-ratings. Most of the scales had the highest loading on the same factor in both studies, although the loadings were in general lower. The highest loadings were uniformly significant across rating methods (i.e., self, peer, and spouse-ratings).

Relationship of Holland's Model to the Five Factor Model

A handful of researchers have investigated the relationship of the six vocational interest dimensions of Holland's hexagon and general personality factors. Two studies

during the 1980's were seminal to the present study. Two more recent studies bear directly on the investigation undertaken here. The earliest study was a collaboration between proponents of each of the personality approaches, Costa, McCrae, and Holland (1984). At the time, Costa and McCrae were still using a three-factor model of personality, including Neuroticism, Extraversion and Openness, as measured by the NEO. Self-report data was collected from 241 men, aged 25 to 89, and 153 women, aged 21 to 86, using the NEO and the Self-Directed Search to tap Holland's vocational interest themes. Spouses of a subset of subjects also rated the subjects on the NEO. When self-ratings of the six vocational interest dimensions and the three personality factors were correlated, the Neuroticism personality factor was not significantly related to any of the vocational interests. Self-rated Extraversion was positively related to Enterprising interests for men and women, and negatively related to Investigative interests for men and to Conventional interests for women. Self-rated Openness was positively related to Artistic interests and negatively related to Conventional interests for men and women. Spouse-ratings of personality resulted in similar correlations between personality factors and vocational interests, with the exception that husbands did not rate wives who were more interested in Enterprising vocations as more Extraverted or women who were more interested in Conventional vocations as less Extraverted.

As a result of the 1984 study, Costa, McCrae, and Holland concluded that there were substantial relations between the NEO measure of personality and the SDS measure of vocational personality. They also noted that none of the three NEO personality factors had a strong positive relationship with Realistic or Conventional interests. They speculated about whether these interests would be better explained by adding a Conscientiousness factor to the NEO. In addition, the NEO Extraversion factor was not strongly related to SDS Social vocational interests when a correction was used for a bias in favor of Liked responses. It was suggested that adding another new NEO factor, Agreeableness, might better distinguish between Enterprising and Social vocational interests. On the other side, Holland's hexagon, as represented by the SDS, did not reflect the NEO Neuroticism personality factor. While the authors (Costa et al., 1984) conceded that Neuroticism may simply not play a role in occupational preferences as indicated by the SDS, they asserted that Neuroticism may relate to job dissatisfaction and help explain why a person is seeking counseling despite apparent congruence between vocational interests and a job or a college major. Thus, it may be important to measure neuroticism in addition to vocational interests.

Kassera and Russo (1987) investigated common factors of vocational interests and personality found five factors when the SII (Hansen & Campbell, 1985) measure of vocational interests and the EPPS measure of personality were used. Although the number

of factors coincided with the Big Five model, the composition of the factors bore limited resemblance to the Big Five. The loadings on the Kasser-Russo Factor I may be indicative of a positive response bias to SII items, which altered the outcome of the study. Factor I included loadings by none of the EPPS scales but by all of the SII scales except Indifference, with especially high loadings by SII Dislike (-.88) and SII Like (.80).

Tokar and Swanson (1995) used discriminant analysis to find whether they could discriminate between Holland vocational personality themes with Big Five factors, in a sample of employed adults. They found that Openness and Extraversion were effective discriminators in the male sample. The centroid plot of the Holland themes for males placed Conventional and Realistic themes in the low Extraversion/low Openness quadrant. Investigative and Artistic themes were located in the high Openness quadrant, near the borderline between high and low Extraversion. The Artistic theme fell well into the high Openness quadrant and showed a moderate level of Extraversion. The Enterprising theme fell far into the high Extraversion/low Openness quadrant.

Females had a slightly different profile, according to Tokar and Swanson (1995). Openness was one of the discriminators. In addition, Agreeableness combined with Extraversion to form a "friendliness" discriminator in the female sample. Most female vocational themes fell closer to the central axis of the centroid plot, with only the Investigative theme being better predicted. Investigative females fell farther along the low

Extraversion/Agreeableness dimension than did the males. The researchers were particularly puzzled by the evidence that the Artistic theme was identified by Agreeableness and speculated about whether this outcome was an artifact of their sample. They concluded that their ability to discriminate Holland's themes with the Big Five factors lent support to the validity of portraying the vocational themes in terms of personality traits.

A 1993 study published by Gottfredson, Jones, and Holland used the NEO-PI to measure the Big Five model of personality and the VPI to provide data on Holland's six dimensions of vocational personality, with a sample of 479 male and 246 female U.S. Navy trainees. In general Gottfredson, Jones and Holland reported that the correlations between the VPI vocational personality dimensions and the NEO-PI factors were "too low to suggest that either form of assessment is a dependable substitute for the other" (p. 518), but "the results imply that the personality variables represented by the five factors are related to Holland's six personality dimensions" (p. 523).

The recent study (Gottfredson et al., 1993) used canonical correlation analysis to assess the significance of common factors in general personality and vocational personality/interests. This analysis revealed that five canonical factors were significant for the entire sample. With the loss of power related to reduced sample size, the male sample revealed four significant canonical factors and the female sample had two significant factors. Male factors in order of size were, first, Open personality related to Artistic and Investigative

interests; second, Extraverted personality related to Social, Enterprising, and Conventional interests; third, an Agreeable, Conscientious personality related to a high level of interests in all but the Enterprising vocations, and fourth, Neurotic personality negatively related to Investigative interests. In women the factors in order of size were: first, Open personality related to Artistic and Investigative interests; and second, Conscientious personality related to Conventional, Realistic, and Investigative interests.

Correlations between NEO Personality Inventory Scales and Vocational Preference Inventory Scales were also reported (Gottfredson et al., 1993). Correlations were in general quite low, rarely exceeding .20. However, even when the correlations were below .20, the trends were toward predictable relationships between personality factors and vocational interests. One clear trend was that the Neuroticism personality factor had low negative correlations with almost every vocational interest for both men and women. Otherwise, the personality-interest correlations exceeding .20 for women were: Openness-Investigative (.25), and Openness-Artistic (.22). For men they were: Openness-Artistic (.34), Openness-Investigative (.25), Conscientious-Conventional (.25), and Extraversion-Enterprising (.23).

In addition, Gottfredson, Jones, and Holland (1993) reviewed and analyzed the pattern of findings of several studies that correlated Holland's vocational interest themes with markers of the five-factor model derived from a variety of personality measures. Again,

the summary showed consistently low correlations, seldom exceeding .20. According to the analysis, Realistic and Artistic interests have not been consistently shown to be strongly connected to any of the five personality factors. The Openness-Investigative link had a median correlation of .20. The Extraversion-Social median correlation was .26. The Extraversion-Enterprising median correlation was .30. The Conscientious-Conventional median correlation was .18.

Summary

The overall question that the present study will address is whether measuring personality as indicated by Holland's vocational interest themes provides an adequate personality conceptualization on which to base vocational counseling. As exemplified by the debate between Lowman (1993) and Spokane (1993), this is an important question because counselors desire to keep assessment procedures as simple as possible, without impoverishing the amount of useful information yielded by the assessment.

Several suggestions have been made about how the assessment of the five factors could enrich vocational counseling. First, the Big Five Neuroticism factor may explain vocational dissatisfaction (Costa et al., 1984). Two other Big Five factors may be useful as predictors of vocational success. The meta-analysis of Barrick and Mount (1991) found that Factor III, Conscientiousness, predicted job proficiency in five occupational groups. Tett, Jackson, and Rothstein (1991) reported that their meta-analysis found Factor II,

Agreeableness, to be a particularly good predictor of job performance. Considering that Holland's theory has been a poor predictor of vocational achievement (Assouline & Meir, 1987; Hackett & Lent, 1992; Walsh & Holland, 1992), using the five-factor approach to measuring personality might provide valuable additional information in order for vocational counselors to facilitate both job satisfaction and success.

In order to clarify whether assessment of personality, specifically the Big Five factors, should be undertaken separately from assessment of the Holland vocational themes, several questions were be addressed by the present research. First, to what degree do the two models of personality overlap and what is the nature of the overlap if present? Does the Big Five Neuroticism factor play more than a minimal role in any overlap of the models? Second, can Holland themes be predicted by measurement of the Big Five factors? Third, is the prediction effected by controlling the level of clarity of vocational personality? Last, is Neuroticism related to lack of clarity of the vocational personality or to dissatisfaction during the process of vocational preparation?

METHOD

Participants

Participants were 538 students in lower level psychology courses at Iowa State University. They were recruited for two sessions of data collection, with the understanding that they would earn extra-credit in their psychology course by participating. Recruitment posters explained the research pertained to studies of the "Interaction of Personality and Career." The two main instruments used in this study were administered in separate sessions. Seventeen participants did not complete both questionnaires, bringing the total sample down to 521, including 296 females, 215 males, and 10 who did not indicate gender. During the data analysis, as explained below, the sample of responses was further reduced to 499, including 286 females, 204 males, and 9 who did not indicate gender. Participants ranged in age from 17 to 37, averaging 19.63 years.

Procedure

Self-report data were collected for this study and several other studies using packets of questionnaires. Standardized general directions were included in the packets and were read aloud before each session began. At the beginning of sessions, participants were reminded that their participation was voluntary and they were free to withdraw at any time, but they were asked to return for the second testing session if possible. They were asked not to write their names on any of the testing materials in order to insure confidentiality of their

responses. The only record of subjects' participation was their signatures on informed consent statements, which were collected and kept separate from their testing materials. See the Appendix for copies of the informed consent statement and the oral directions given to participants. Guidelines for the treatment of human subjects, as outlined by the American Psychological Association and the university, were followed. Approval for the data collection was given by the Human Subjects committees of the psychology department and the university.

Assessment Instruments

Two self-report questionnaires were used. The Strong Interest Inventory (SII, Harmon et al., 1994) was administered to provide data reflecting Holland's six vocational personality themes. The Adjective Check List (ACL, Gough & Heilbrun, 1983) was used to provide markers of the Big-Five personality factors.

Strong Interest Inventory

As mentioned in the introduction, Holland's theory of personality is operationalized in tests of vocational interest. Data collected with the SII have been found to fit the Holland model as well as data collected with any of the other major RIASEC measures (Tracey & Rounds, 1993). The SII contains 317 items, divided into eight parts. It takes 20 minutes to one hour to complete, depending on reading speed (Hansen & Campbell, 1985). Items in five of the various parts ask the respondents to designate their level of liking

(Like/Indifferent/Dislike) for occupational titles, school subjects, activities, or types of people as follows:

(L) (I) (D) Accountant,

(L) (I) (D) Sociology,

(L) (I) (D) Making a speech,

Other SII items ask about preferences between two work activities or two types of vocational focus. These items are presented in pairs and one is asked to choose the right hand item (R), indecision (=), or the left hand item (L), using the following format:

Airline pilot (L) (=) (R) Airline ticket agent.

The final type of SII item asks one to characterize her/himself by indicating whether descriptive phrases apply, as follows:

(Y) (?) (N) Win friends easily.

Scoring of the SII is reported for three sets of scales. However, only one set of scales, the General Occupational Themes (GOT) will be used in this study, since only the GOT scales fully operationalize Holland's RIASEC themes.

The SII test manual (Harmon et al., 1994) reports the following reliability support for the SII. The 3-6 month test-retest reliabilities for the GOT scales range from .919 for the Realistic scale down to .841 for the Enterprising scale. The GOT scales show a high level of internal consistency. Coefficient alphas for the general reference sample of 18,951

women and men were all .900 or better, ranging from .938 for Artistic to .900 for Social. The evidence cited in the manual for the validity of the Strong GOT scales includes high median correlations (i.e., .765) with the same-named scales on the Vocational Preference Inventory (VPI, Holland, 1985b). Other validity studies cited in the manual include correlations of the GOT scales with Edwards Personal Preference Schedule (EPPS) personality characteristics (Utz & Korben, 1976), and with chosen avocational and leisure activities (Varca & Shaffer, 1982).

Adjective Check List

The ACL is a list of 300 adjectives. Items are presented with a "bubble" in which to make a mark if one considers the adjective to be self-descriptive, as shown below:

- absent-minded,
- active,
- adaptable.

The ACL manual (Gough & Heilbrun, 1983) does not state average administration times, but at one item every 3 seconds it would take 20 minutes to complete the ACL and this would seem to be enough for a relatively slow reader. Efficient use of time makes the use of the ACL an attractive option as compared to the NEO PI-R, which requires up to 40 minutes to complete for slow readers (Costa & McCrae, 1992).

Standard scoring of the ACL provides a profile on 37 scales. The raw score on each scale is the total of positively-keyed, "indicative" adjectives that have been checked, minus the number of negatively-keyed "contraindicative" items checked. Raw scores can then be converted to standard scores with the help of tables in the ACL manual (Gough & Heilbrun, 1983).

The ACL manual (Gough & Heilbrun, 1983) recommends that the number of adjectives checked be considered before interpreting scores, in order to control invalid results due to positive and negative responses biases. Between 20 and 250 checked items are considered to provide an unbiased score. For purposes of the present study, 112 selected adjectives were used to form marker scales for the Big Five personality factors. As a result the standard cutoff for the number of items checked was not used, as will be explained in the Results chapter.

Selection of adjectives for the marker scales was based on a two-part study by John (1990), in which John first asked 19 expert judges to independently sort the 300 adjectives in the ACL into the five factors. The judges were in 90% agreement on 112 of the adjectives. The number of items assigned to each factor varied from 18 adjectives related to Neuroticism to 28 adjectives related to Agreeableness. In the second part of the study, John analyzed the factors of the 112 adjectives using psychologists' assessments of 280 participants. (See Table 3.)

Table 3. John's (1990) ACL Marker Scales for the Big Five Factors

Factor I Extraversion	Factor II Agreeableness	Factor III Conscientious- ness	Factor IV Neuroticism	Factor V Openness
Positive	Positive	Positive	Positive	Positive
Talkative	Sympathetic	Organized	Tense	Wide interests
Assertive	Kind	Thorough	Anxious	Imaginative
Active	Appreciative	Planful	Nervous	Intelligent
Energetic	Affectionate	Efficient	Moody	Original
Outgoing	Soft-hearted	Responsible	Worrying	Insightful
Outspoken	Warm	Reliable	Touchy	Curious
Dominant	Generous	Dependable	Fearful	Sophisticated
Forceful	Trusting	Conscientious	High-strung	Artistic
Enthusiastic	Helpful	Precise	Self-pitying	Clever
Show-off	Forgiving	Practical	Temperamental	Inventive
Sociable	Pleasant	Deliberate	Unstable	Sharp-witted
Spunky	Good-natured	Painstaking	Self-punishing	Ingenious
Adventurous	Friendly	Cautious	Despondent	Witty
Noisy	Cooperative		Emotional	Resourceful
Bossy	Gentle	Negative		Wise
	Unselfish	Careless	Negative	Logical
Negative	Praising	Disorderly	Stable	Civilized
Quiet	Sensitive	Frivolous	Calm	Foresighted
Reserved		Irresponsible	Contented	Polished
Shy	Negative	Slipshod	Unemotional	Dignified
Silent	Fault-finding	Undependable		
Withdrawn	Cold	Forgetful		Negative
Retiring	Unfriendly			Commonplace
	Quarrelsome			Narrow interest
	Hard-hearted			Simple
	Unkind			Shallow
	Cruel			Unintelligent
	Stern			
	Thankless			
	Stingy			

The efficacy of John's ACL marker-scales was supported by a study published by Piedmont, McCrae, and Costa (1991), which used self-report data from college students. The 5 marker scales plus 35 of the ACL scales were factor analyzed using a principal-component extraction with varimax rotation. Factor loadings for the marker scales reported by Piedmont and his colleagues (1991) were: Neuroticism - .74, Extraversion - .90, Openness - .58, Agreeableness - .88, Conscientiousness - .79. Information about the reliability of the ACL marker-scales has not been found in the literature to date but will be investigated in the present study.

In the present study, responses to the marker adjectives were totalled to form scale scores, with points added or subtracted according to whether the adjectives had positive or negative loadings on the factor. As a result, a high score on the marker scale each factor will indicate a high level of the trait described by the factor. For instance, a high score on Factor IV will indicate a high level of Neuroticism.

ANALYSIS

The first step of the analysis was to trim invalid and/or incomplete data from the set of 521 sets of responses to the ACL and SII. At the same time, the effectiveness of the ACL marker scales for the Big Five Factors was fine-tuned. The trimmed data set was then used for analyses of the four hypotheses.

Effectiveness of the ACL Marker Scales

Gough and Heilbrun (1983) recommended that ACL scores should not be interpreted if there is positive or negative response biases, as evidenced by an excessively high or low number of adjectives checked. Response biases were controlled in the present study by eliminating data that fell outside 2 sd of the mean number of adjectives checked on the ACL marker scales. (Gough & Heilbrun, 1983).

Item responses were examined to see if elimination of some items would improve internal consistency of the scales, paying particular attention to the difference between the full scales and scales made up of only positively-keyed adjectives. Cronbach's coefficient alpha (Cronbach, 1951) was used as an index of internal consistency. According to the manual of the Statistical Package for the Social Sciences (SPSS, Norusis, 1993), Cronbach's alpha is used by the computerized SPSS system as the equivalent to the Kuder-Richardson 20 formula. Either can be used (Allen & Yen, 1979) to examine internal consistency with dichotomous items such as those used in the ACL.

Discriminant validity of the ACL marker scales for the Big Five Factors was also considered. Claims to discriminant validity are supported by low correlations between scores on scales that purport to measure different traits. Both internal consistency and discriminant validity were considered before deciding what items to include in the marker scales for purposes of further analysis.

Testing the Hypotheses

Four hypotheses were developed in order to address the questions that grew out of the literature review. In general the questions seek to increase understanding of how closely the Big Five and Holland's model correspond to each other, and what, if anything, assessment of the Big Five factors could do to enhance services to vocational counseling clients.

Hypothesis One

The first hypothesis was that the Big Five and Holland models overlap but that as a comprehensive approach to personality, the Big Five model is more explanatory of the Holland model than vice-versa. In addition, it was expected that the Big Five Neuroticism factor contributed minimally, if at all, to the overlap. This hypothesis was tested from a multivariate perspective using canonical correlation analysis. Canonical analysis elaborates on the understanding provided by simple correlations, since it provides an index of the overall relationship between two multivariate sets and also reveals how many independent

dimensions were involved in the relationship and to what degree each variable contributed to the relationship. In addition, canonical correlation analysis provides asymmetric redundancy indices, which reveal how much of the variance in one model is explained by the other and vice-versa.

Hypothesis Two

The second hypothesis said that the Holland GOT scales should have predictable relationships with the Big Five factors. The relationships were hypothesized by the author as follows on the basis of this researcher's judgement of how many of the trait words listed for each of the RIASEC themes (Walsh and Holland, 1992) fit a Big-Five factor.

(a) Realistic vocational interests should be correlated with Extraversion, Agreeableness, Neuroticism (all moderate, negative correlations), and Conscientiousness (moderate, positive);

(b) Investigative vocational interests should be correlated with Openness (moderate, positive), Extraversion (moderate, negative), Conscientiousness (weak, positive), Agreeableness (weak, negative);

(c) Artistic vocational interests should have relationships to Openness (strong, positive), Neuroticism (weak, positive), Conscientiousness (weak, negative);

(d) Social vocational interests should be related to Agreeableness (strong, positive), Extraversion, and Conscientiousness (weak, positive);

(e) Enterprising vocational interests should be related to Extraversion (strong, positive), and the Neuroticism (weak, negative);

(f) Conventional vocational interests should be related to Conscientiousness (strong, positive) and to Openness (weak, negative).

The second hypothesis was tested with a simultaneous multiple regression analysis for each Holland scale. It was expected that the hypothesized positive and negative nature of the relationships between the five factors and the Holland scales would receive the strongest support. However, testing whether there was a difference in the strength of the relationships should also yield valuable information.

Hypothesis Three

The third hypothesis suggested that the relationship between the Big Five factors and the Holland themes would be stronger when individuals had more focused Holland personalities, as indicated by differentiation and consistency of the themes incorporated in individuals' Holland codes. Testing the third hypothesis involved re-running the multiple regression tests on data from subgroups determined to be either high or low in differentiation or consistency. The level of differentiation was operationalized in terms of the mean individual difference between the high and low Holland scale scores (Holland, 1985a). The level of consistency was operationalized using Strahan's (1987) conditional probability tables for two-point codes of college males and females. In comparison to

Holland's dichotomous or tricotomous indices, Strahan's method had the advantages of providing gender-specific consistency measurements and recognizing the differences between two codes that incorporate the same two letters but in opposite sequences.

Distributions of the probabilities were examined for females and males. It was determined at what probability the groups could be divided into high and low consistency subgroups of approximately equal numbers. Data from the high and low consistency subgroups were then subjected to separate multiple regression analysis to see whether the regressions differed across the groups.

Hypothesis Four

The fourth, and final, hypothesis was that the Big Five Neuroticism factor is related to dissatisfaction with college majors and to differentiation and consistency of vocational personality. Satisfaction was measured by a question on the SII (i.e., How satisfied are you with your choice of school major or concentration?). Differentiation and consistency were operationalized in the same manner as described above under the third hypothesis. However, the differentiation and consistency indices were entered into analysis as continuous variables rather than being dichotomized. The relationships between Neuroticism and the vocational personality problems were evaluated in terms of the significance levels of simple correlations.

RESULTS

Before the hypotheses were tested, the effectiveness of John's (1990) Adjective Check List marker scales in measuring the Big Five personality factors was analyzed and fine-tuned.

Effectiveness of the ACL Marker Scales

The validity of the measurement of the Big Five factors was optimized by winnowing out the scores that reflected positive and negative response biases. ACL developers (Gough & Heilbrun, 1983) suggested that scores resulting from exceptionally low or high numbers of adjectives being checked are contaminated by negative or positive response biases, respectively. Such scores are invalid for purposes of interpretation, according to Gough and Heilbrun (1983). Their recommended cutoffs in the acceptable number of adjectives checked were not appropriate for this study, since only 112 of the 300 ACL adjectives were incorporated in the marker scales. Instead, subjects' data were removed if the number of checked adjectives fell two standard deviations or more from the mean of 60 checked adjectives. The 2 standard deviations cutoff eliminated data that fell outside a range of 38 to 102 checked adjectives. As a result, the sample of 521 was reduced to 499 for purposes of data analyses.

The sample of 499 subjects' responses to the ACL was used to assess the internal consistency and discriminant validity of the marker scales for the Big Five personality

factors. Internal consistency refers to the extent to which the items on a scale measure a single construct, as indicated by the items' intercorrelation. Cronbach's coefficient alpha (Cronbach, 1951) was used as an index of internal consistency. According to the manual of the Statistical Package for the Social Sciences (SPSS, Norusis, 1993), Cronbach's alpha is used by the computerized SPSS system as the equivalent to the Kuder-Richardson 20 formula. Either formula can be used (Allen & Yen, 1979) to examine internal consistency with dichotomous items such as those used in the ACL.

An item analysis was done to see what impact deleting each adjective would have on the internal consistency of its marker scale. The deletion of no single adjective made a substantial difference. However, the internal consistencies were changed by deleting all the adjectives that were negatively keyed. Therefore, particular attention was paid to the alpha coefficients of the full scales (i.e., including both positively and negatively keyed adjectives) versus alpha coefficients of abbreviated versions of the scales composed of only positively keyed adjectives (Table 4).

The correlations between the full and positive scales for each of the personality factors exceeded .90. The correlation between the full and positive scales for Factor I (Extraversion) was .92; Factor II (Agreeableness) was .96, Factor III (Conscientiousness) was .94; Factor IV (Neuroticism) was .95, and Factor V (Openness) was .99. These high correlations indicate that the full and positive scales measure the same trait.

In every case, the abbreviated scales had higher alpha coefficients than the full scales. See Table 4. Alpha coefficients for the longer full scales ranged from .83 for Agreeableness down to .70 for Neuroticism. This compares to alpha coefficients for the abbreviated, positive scales, which range from .86 for the Agreeableness scale down to .76 for the Neuroticism scale. Reliability is expected to decrease rather than increase when a scale is shortened (Allen & Yen, 1979). Therefore, the higher reliability of the briefer

Table 4. Descriptive Statistics and Internal Consistency Estimates for the ACL Marker Scales for the Big Five Personality Factors, $n = 499$

Big Five Factor ACL Marker Scales	Number of Items	Scoring Range	<i>M</i>	<i>SD</i>	Cronbach's Alpha
<u>I - Extraversion</u>					
Full	21	-5 to 14	5.60	3.71	.76
Positive	15	0 to 14	7.02	3.16	.77
<u>II - Agreeableness</u>					
Full	28	-6 to 18	11.41	4.55	.83
Positive	18	0 to 18	12.21	4.29	.86
<u>III - Conscientiousness</u>					
Full	20	-5 to 13	5.05	3.32	.75
Positive	13	0 to 13	5.95	2.95	.77
<u>IV - Neuroticism</u>					
Full	18	-4 to 13	2.53	2.97	.70
Positive	14	0 to 13	3.91	2.81	.76
<u>V - Openness</u>					
Full	25	-2 to 19	7.86	4.56	.81
Positive	20	0 to 19	8.40	4.47	.84

Note. Factor I = Extraversion, Factor II = Agreeableness, Factor III = Conscientiousness, Factor IV = Neuroticism, Factor V = Openness

scales is noteworthy. This relatively low internal consistency of the full scales is due, however, to the inclusion of negatively keyed items. Such items have lower item/test correlations than positive items and "internal-consistency reliability ... is maximized when item/test correlations ... are maximized" (Allen & Yen, 1979, p. 125).

The alpha coefficients of the ACL scales, as shown above in Table 4, can be compared to those reported as follows in the NEO PI-R manual (Costa & McCrae, 1992) for the analogous scales: Factor I. Extraversion - .89, Factor II. Agreeableness - .86, Factor III. Conscientiousness - .90, Factor IV. Neuroticism - .92, Factor V. Openness - .87. The NEO PI-R items' Likert format, versus the checklist format of the ACL, probably explains the NEO PI-R's superior internal consistencies.

However, Rosenthal and Rosnow (1991, p. 50) said, "For purposes of clinical testing, reliability coefficients of approximately .85 or higher may be considered as indicative of dependable psychological tests, whereas in experimental research, instruments with much lower reliability coefficients may be accepted as satisfactory." With that in mind, it would appear that both the positive and full ACL scales will perform adequately, with the Neuroticism full scale's alpha coefficient of .70 being the most questionable.

Discriminant validity of the scales supported the superiority of the full scales. Discriminant validity refers to whether scales measure different constructs. Claims to discriminant validity are supported by low correlations between scores on scales that

purport to measure different traits. Low correlations are especially meaningful when the same method (e.g., a self-report questionnaire) is used to assess the traits (Campbell & Fiske, 1959). Therefore, the marker scale that has relatively low correlations with marker scales for other personality factors has better discriminant validity. The superior discriminant validity of the full scales is illustrated in Table 5, listing intercorrelations followed by coefficients of determination (r^2) in parentheses. Coefficients of determination indicate the proportion of shared variance. Intercorrelations for the full scales are above the diagonal. Positive scales are below the diagonal. The effectiveness of

Table 5. Intercorrelations and (Coefficients of Determination) Between the ACL Marker Scales of the Big Five Factors, $n = 499$

Factors	I - E	II - A	III - C	IV - N	V - O
I - E	--	.22**(.05)	.19**(.04)	.02(.0004)	.43**(.18)
II - A	.42**(.18)	--	.55**(.30)	-.05(.003)	.48**(.23)
III - C	.38**(.14)	.63**(.40)	--	-.12(.01)	.58**(.34)
IV - N	.23**(.05)	.22**(.05)	.17*(.03)	--	-.03(.0009)
V - O	.53**(.28)	.57**(.32)	.68**(.46)	.14**(.02)	--

Note: E = Extraversion, A = Agreeableness, C = Conscientiousness, N = Neuroticism, O = Openness.

Coefficients above the diagonal are for the full marker scales.

Coefficients below the diagonal are for the positive marker scales.

* $p < .05$. ** $p < .01$.

the ACL scales was supported by the fact that the scales' internal consistencies, as measured by their Cronbach alphas, were substantially higher than the intercorrelations between scales, as can be seen by comparing the data reported in Table 4 and Table 5.

Table 5 shows the correlations were lower and thus the discriminant validity was better for the full scales than for the positive scales. Most of the correlations, even some that were relatively low, were statistically significant. Statistical significance is partly a factor of sample size. Since the sample size here was quite large (i.e., $n = 499$), it makes more sense to examine the conceptually more meaningful squared correlations, indicating the proportion of shared variance. Among the full scales, the Neuroticism scale was the most clearly discriminated from the other scales. It shared 1% or less of its variance with any other full scale. Using a cut-off of 25% shared variance, the Extraversion full scale also had good discriminant validity. The Agreeableness and Conscientiousness full scales were only moderately well discriminated from each other, with nearly a third of their variance (30%) being shared. The Openness full scale shared over a third of its variance (34%) with Conscientiousness and shared only slightly less than a fourth of its variance (i.e., 23%) with Agreeableness.

The pattern of scale intercorrelations for the ACL scales was nearly the opposite from the pattern of intercorrelations between the scales of the NEO PI-R (Costa & McCrae, 1992). Costa and McCrae's Neuroticism scale had the highest correlations with other

scales, whereas the corresponding ACL full scale had the lowest correlations with other scales in the present study. Agreeableness was one of the ACL full scales with the highest correlations with other scales but the NEO PI-R Agreeableness had relatively low correlations with other scales in its inventory. The highest intercorrelation between the NEO PI-R scales was $-.53$, between Neuroticism and Conscientiousness. This compared to the highest correlation of $.58$ between Openness and Conscientiousness for the full ACL scales in the present study. The next highest intercorrelation for the NEO PI-R was $.40$ between Extraversion and Openness. The NEO PI-R matrix listed four other intercorrelations in the $.20$ to $.30$ range. All other NEO PI-R scale intercorrelations were less than $.05$. The only intercorrelations reported by Costa and McCrae (1992) were for their Adult Form of the NEO PI-R. A College-Age Form of the NEO PI-R is also published, but intercorrelations for its scales were not reported in the manual. Since data were collected from college students in the present study, it may not be appropriate to compare the patterns of intercorrelation derived here with those reported in the NEO PI-R manual.

As can be seen above, the scales' alpha coefficients and their discriminant validities supported opposite conclusions about whether the full scales or positive scales would be better measures of the Five Factor Model. However, the slightly higher internal consistencies of the positive scales was due to the impact of the relatively low item/test

intercorrelation of negatively keyed items in the full scale. Even though full scales' alphas were lower, they were adequate for research (Rosenthal & Rosnow, 1991), and the discriminant validities and multicollinearity were substantially better for the full scales. For that reason, the full scales were used for the purposes of the remaining analyses.

The means and standard deviations for the ACL (Gough & Heilbrun, 1983) full marker scales of the Big Five personality factors and the SII-GOT (Harmon et al., 1994) scales for the six Holland vocational personality themes are reported by gender in Table 6. Gender differences in the data made it advisable to do most of the analyses separately for males and females. The means for the Holland theme scores showed expected gender differences. Males scored considerably higher on Holland's Realistic theme, with male scores averaging 52.58 and female scores averaging 40.69. The difference was well over one standard deviation. The next biggest gender discrepancy in the Holland themes was between the relatively high female Social mean (54.98) in comparison to the males (47.38). Among the Big Five personality factors, the biggest gender differences were the females higher scores on Agreeableness (12.56 vs. 10.02) and Neuroticism (2.93 vs. 1.91).

Hypothesis One: The Big Five Factor Model and Holland's Model Overlap

The first hypothesis stated that the Big Five model of personality and Holland's vocational personality typology overlapped but that the Big Five Neuroticism factor would

Table 6. Means and Standard Deviations for the Measures of the Holland Vocational Personality Themes and the Five Personality Factors

Personality Variables	286 Females		204 Males	
	<i>M</i>	<i>SD</i> (Range)	<i>M</i>	<i>SD</i> (Range)
Holland vocational themes				
Realistic	40.69	7.27 (33 to 66)	52.58	10.09 (33 to 73)
Investigative	42.17	8.94 (29 to 68)	46.82	9.68 (28 to 67)
Artistic	47.36	9.50 (27 to 69)	41.97	10.10 (28 to 70)
Social	54.98	10.31 (30 to 74)	47.38	10.33 (28 to 70)
Enterprising	53.48	11.07 (33 to 78)	52.00	10.83 (34 to 80)
Conventional	50.72	10.83 (34 to 80)	50.03	9.87 (34 to 76)
Big Five personality factors				
I- Extraversion	5.94	3.67 (-4 to 14)	5.11	3.68 (-5 to 14)
II- Agreeableness	12.56	3.83 (0 to 18)	10.02	4.84 (-6 to 18)
III- Conscientiousness	5.31	3.22 (-3 to 12)	4.79	3.34 (-3 to 13)
IV- Neuroticism	2.93	2.98 (-3 to 12)	1.91	2.85 (-4 to 13)
V- Openness	7.56	4.48 (-1 to 19)	8.33	4.60 (-2 to 19)

Note. Measures used were the Strong Interest Inventory for the Holland themes and the Adjective Checklist Marker Scales for the Big Five personality factors.

not contribute substantially to the overlap. Analysis of the data found that the overlap was statistically significant but small. Neuroticism did not contribute to the overlap in females but did in males.

The possible number of canonical factors is limited to the number of variables in the smaller set, in this case, the Big Five personality factors. Of the five possible canonical factors, four were statistically significant ($p = .000$) in the entire sample. However, interpretation of these factors was not undertaken, since the results for the genders differed from each other. Instead, the canonical analysis of the overlap of the two models' variance was done separately for the 286 females and 204 males (9 of the 499 participants did not indicate gender).

Statistical significance is only one consideration when interpreting canonical factors. Unfortunately, considerable inconsistency exists in policies used to establish when interpretation of canonical factors is recommended. According to Stevens (1992), low subject/variable ratios do not provide sufficient reliability in determining which variables are most important in the factors. He suggested a 20/1 ratio when interpreting only the largest canonical correlation and a 40/1 ratio when interpreting the two largest canonical correlations. The present study measured 11 variables, including the Big Five personality factors and Holland's six vocational personality themes. The resulting ratio for the 286 females is 26/1 for the 204 males is 19/1. However, several respected researchers (e.g.,

Fassinger & Richie, 1994; Gottfredson et al, 1993; Sharpe & Heppner, 1991) have recently interpreted all significant factors with far lower subject/variable ratios. Fassinger and Richie 's (1994) two-part canonical analysis had 8/1 and 5/1 ratios and interpreted 2 and 3 variables, respectively. Gottfredson and his colleagues (1993) had ratios of 18/1 for males and 9/1 for females and interpreted four for males and two factors for females. Sharpe and Heppner (1991) had a 17/1 ratio and interpreted two of three significant factors, saying the third factor accounted for too little of the total variance and the structural correlation coefficients did not give it clear meaning. Sharpe and Heppner (1991) set a cutoff of a .30 for structural correlation coefficients in interpreting the meaning of the canonical factors.

In the present study, it was decided to interpret significant factors, since the subject/variable ratios surpassed the above studies. As a precaution, however, the cutoff for using structural correlation coefficients for purposes of interpretation was raised to .45 (cf. Sharpe & Heppner, 1991). In addition, interpretation was undertaken only when there was a clear pattern of relatively high and low structural correlation coefficients.

Hypothesis One: Females

A small but statistically significant overlap of the two models of personality was found in the females' responses. As predicted, the Big Five Neuroticism scale did not contribute significantly to the overlap. A preliminary look at the simple correlations between the two

sets of variables (Table 7) provides a preview of the relationship between the models. Significant correlations included the Extraversion personality factor with the Enterprising vocational personality theme (.16, $p < .01$), the Agreeableness factor with the Social vocational theme (.25, $p < .01$), the Conscientiousness factor with the Investigative (.19, $p < .01$) and Conventional vocational (.25, $p < .01$) themes. The Openness factor correlated significantly with Investigative (.22, $p < .01$), Artistic (.26, $p < .01$), and Enterprising (.11, $p < .05$) themes, which is not surprising. The correlation between the Openness factor and the Realistic theme would be surprising in the general population of

Table 7. Correlations Between Holland Themes (SII-GOT) and the Big Five Personality Factors (ACL Marker Scales), 286 Females

Holland Themes	Big Five Personality Factors				
	I-E	II-A	III-C	IV-N	V-O
R	.03	.08	.07	-.05	.26**
I	.06	.06	.19**	-.10	.22**
A	.06	.11	-.04	.06	.26**
S	.07	.25**	.09	-.05	.05
E	.16**	.01	.08	.01	.11*
C	-.03	.09	.25**	-.04	.12

Note. Big Five Factors: Holland themes (measured by Strong Interest Inventory-General Occupational Themes): R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional. Big Five factors (measured by Adjective Check List): I - E = Extraversion, II - A = Agreeableness, III - C = Conscientiousness, IV - N = Neuroticism, V - O = Openness.

* $p < .05$. ** $p < .01$.

males but is less so in females. Females are probably more likely to have an interest in the traditionally male-dominated Realistic occupations if they have the imagination and wide interests associated with Openness. As expected, Neuroticism did not relate to the vocational personality model in females.

The overlap between the two models was found to be significant ($p < .001$) by a canonical correlation analysis, using the Wilks's lambda procedure (see Table 8). Four statistically significant factors were involved in the overlap. In other words, the Holland and Big Five conceptualizations of personality shared four independent sources of

Table 8. Canonical Analysis of Measures of Holland Vocational Personality Themes and Big Five Personality Factors, 286 Females

Factor	R_c	R^2	Wilks's Lambda	Chi Square	df	P	Redundancy indices
1	.42	.17	.64	126.89	30	.000	7.20 ^a 7.60 ^b
2	.32	.10	.77	73.22	20	.000	-----
3	.30	.09	.86	42.64	12	.000	-----
4	.22	.05	.95	15.90	6	.014	-----
5	.09	.01	.99	2.26	2	.323	-----

Note. R_c = canonical correlation coefficient. Holland vocational personality themes were measured by the Strong Interest Inventory. The Big Five personality factors were measured by Adjective Check List marker scales.

^a Percent of variance in Big Five personality factors accounted for by the Holland vocational personality themes.

^b Percent of variance in Holland vocational personality themes accounted for by Big Five personality factors.

variation. Summing the squared canonical correlations of the four significant canonical factors indicated that the four factors shared 41% of their variance. When considering the total variance in the two sets of variables, however, the overlap is less impressive. As Stevens (1992, p.426) said, "A squared canonical correlation only tells us the amount of variance that the two canonical (factors) share, and does not necessarily indicate considerable overlap between the two sets of variables. The canonical (factors) are derived to maximize the correlation between them, and thus we can't necessarily expect each canonical (factor) will extract much variance from its set."

The proportion of the total variance accounted for is reflected by the redundancy indices. According to Lambert, Wildt, and Durand (1988), redundancy analysis provides asymmetric indices of the predictive capacity between two multivariate sets. This is accomplished by assessing the linear correlations between orthogonal linear combinations of Set A and the individual variables in Set B, without transforming Set B into orthogonal linear combinations. The process is then repeated, reversing which set is treated as Set A and Set B. In each step, the proportion of variance extracted from Set B is maximized. According to the redundancy indices, the five personality factors accounted for 7.6% of the variance in the Holland vocational personality themes; while the Holland vocational personality themes accounted for 7.2% of the variance in the Big Five personality factors. In this case, overlap (or redundancy) was small and nearly symmetric.

A criterion of .45 was used as the cutoff for deciding what structural correlations coefficients (Table 9) to use in attributing meaning to the factors. For females, the largest factor is associated with Realistic and Artistic vocational interests and the Openness personality factor. Tradition discourages an interest in Realistic occupations for women; Artistic occupations are associated with creatively breaking traditions, and Openness is

associated with originality and foresightedness. In sum, the

first canonical factor is

associated with the degree to

which female participants saw

themselves as ground-breakers.

The second canonical

factor in the female data has

the largest structural

correlation coefficients with

Investigative and Conventional

vocational themes and with the

Conscientiousness personality

Table 9. Structural Correlation Coefficients for Holland Themes and Five Factors, 286 Females

	Canonical Factors			
	1	2	3	4
<u>Holland Themes</u>				
Realistic	-.67	-.31	-.23	.16
Investigative	-.28	-.67	-.09	.39
Artistic	-.82	.16	-.24	.16
Social	.13	.25	-.65	.70
Enterprising	-.10	-.19	.23	.62
Conventional	.11	-.71	-.35	.14
<u>Five Factors</u>				
I-Extraversion	-.13	.09	.35	.90
II-Agreeableness	-.05	.05	-.85	.52
III-Conscientiousness	.14	-.79	-.41	.40
IV-Neuroticism	-.10	.23	.10	-.31
V-Openness	-.70	-.44	-.23	.50

Note. Four canonical factors were significant for females .

factor. This canonical factor reflects the shared emphasis on conscientious attention to detail required by Investigative and Conventional vocational themes and by the Conscientiousness personality factor and could be called methodicalness.

The third significant canonical factor for females had high structural correlation coefficients with the Social vocational theme and the Agreeableness personality factor. This would seem to be a factor that reflects the participants' sense of social connectedness or the lack thereof and corresponding career interests.

The meaning of the fourth canonical factor is less clear-cut than the first three. It has relatively high loadings on five of the eleven variables. Its three highest loadings are the Extraversion personality factor and the Social and Enterprising vocational themes. Considering the content of the Extraversion personality factor, this factor may be associated with the level of social influence participants attributed to themselves. The idea of social influence is also supported by this factor's moderate structural correlations with the Agreeableness and Openness personality factors, since social warmth and intellectual insight play in social influence.

In summary, the canonical correlation analysis of the relationship of the Holland vocational personality themes and the Big Five personality factors found that for females the overlap between the models was statistically significant and was explained by four independent factors that shared 41% of their variance. However, when the total variance

in the models was considered, each model explained less than 8% of the variance in the other model. As predicted, none of the significant factors included a loading by the Neuroticism personality factor.

Hypothesis One: Males

Correlations between the Holland vocational personality variables and the Big Five personality factors (Table 10) fell into an expected pattern for the most part, with two surprising exceptions. The Extraversion personality factor and Enterprising vocational personality theme correlation was significant and the relationship was stronger for males (.24, $p < .01$) than it was for females (.16, $p < .01$). In contrast, the significant

Table 10. Correlations between Holland Themes (SII-GOT) and the Big Five Personality Factors (ACL Marker Scales), 204 Males

Holland Themes	Big Five Personality Factors				
	I-E	II-A	III-C	IV-N	V-O
R	.01	.08	.18**	.06	.16*
I	-.03	.07	.18**	-.01	.24**
A	-.09	.07	.04	.19**	.23**
S	.09	.14*	.16*	.18**	.14*
E	.24**	.03	.07	.07	.09
C	.08	.04	.20**	.05	.09

Note. Holland themes (measured by Strong Interest Inventory-General Occupational Themes): R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional. Big Five factors (measured by Adjective Check List): I - E = Extraversion, II - A = Agreeableness, III - C = Conscientiousness, IV - N = Neuroticism, V - O = Openness.

* $p < .05$. ** $p < .01$.

relationship between the personality factor Agreeableness and the Social vocational personality theme was at a lower level for males (.14, $p < .05$) than it was for females (.25, $p < .01$). The Conscientious personality factor showed a more complex pattern of correlations in males than in females, having significant relationships not only with Conventional (.20, $< .01$) and Investigative (.18, $< .01$) vocational personality themes, but also with Realistic (.18, $< .01$) and Social (.16, $< .05$). The Openness personality factor correlated significantly with Investigative (.24, $p < .01$) and Artistic (.23, $p < .01$) vocational themes. Openness also correlated (.16, $p < .05$) with Realistic vocational themes, which is harder to explain for males than it was for females. While females were somewhat likely (.11, $p < .05$) to attribute both Openness and Enterprising qualities to themselves, males were somewhat likely (.14, $p < .05$) to attribute Openness and Social qualities to themselves.

The unexpected correlations for males were with the Neuroticism personality factor. Although Holland's vocational personality model was not expected to vary with Neuroticism, two vocational themes, Artistic (.19, $p < .01$) and Social (.18, $p < .01$), correlated significantly with it. Apparently, interest in those two occupational categories is more associated with anxiety and self-doubt for males than for females. Although the correlations between Neuroticism and the Artistic vocational personality for males (.19) and females (.14) were not much different, males who identified themselves with the

traditionally more female dominated Social vocational personality were more likely to attribute Neuroticism to themselves (.18 vs. .09).

The canonical correlation analysis (Table 11) found a statistically significant relationship between the two models of personality in males ($p < .001$). Table 11

Table 11. Canonical Analysis of Measures of Holland Vocational Personality Themes and Big Five Personality Factors, 204 Males

Factor	R_c	R^2	Wilks's Lambda	Chi Square	df	P	Redundancy indices
1	.45	.21	.63	90.77	30	.000	6.80 ^a 5.90 ^b
2	.31	.10	.80	45.21	20	.001	
3	.27	.07	.88	25.38	12	.013	-----
4	.22	.05	.95	11.08	6	.086	-----
5	.09	.01	.99	1.67	2	.435	----- -----

Note. R_c = canonical correlation coefficient. Holland vocational personality themes were measured by the Strong Interest Inventory. The Big Five personality factors were measured by the Adjective Check List marker scales.

^a Percent of variance in Big Five personality factors accounted for by the Holland vocational personality themes.

^b Percent of variance in Holland vocational personality themes accounted for by Big Five personality factors.

indicates that only three factors were statistically significant ($p = .013$) for males. The difference between males and females in the number of significant factors is probably due to the smaller sample of male subjects, since the canonical correlations for the fourth factors for males and females are very similar, rounding off to .22 for both. The three

significant canonical factors shared 38% of their variance (i.e., the sum of the three R^2). The redundancy indices indicate that the two sets of variables explain little of each others' total variance, however. The Big Five factors accounted for 7.6% of the variance in the Holland vocational personality themes; while, the Holland vocational personality themes accounted for 7.2% of the variance in the Big Five personality factors.

For males, the structural correlations (Table 12) show that the largest canonical factor is negatively associated with Investigative and Artistic vocational themes and the Openness personality factors. On the other hand, it is positively related to Extraversion. This factor associates creative thinking, as contained in the

Table 12. Structural Correlation Coefficients for Holland Themes and Big Five Factors, 204 Males

	Canonical Factors			
	1	2	3	4
<u>Holland Themes</u>				
Realistic	-.28	.30	.44	.37
Investigative	-.52	.15	.23	.77
Artistic	-.82	-.24	.39	-.13
Social	-.12	.20	.89	-.19
Enterprising	.23	-.23	.73	.39
Conventional	.03	.45	.55	.50
<u>Five Factors</u>				
I-Extraversion	.48	-.43	.66	.39
II-Agreeableness	-.13	.13	.48	-.10
III-Conscientiousness	-.13	.62	.54	.46
IV-Neuroticism	-.25	.00	.63	-.57
V-Openness	-.51	.15	.57	.51

Note. Three canonical factors were significant for males .

Investigative, Artistic, and Openness variables, with a tendency to be more introverted than extraverted. It might be called creative introspection.

The second significant canonical factor in the male sample has its highest loading by the Conscientiousness personality factor, followed distantly by the Conventional vocational personality theme. These two variables measure the male participants' tendencies to approach tasks in a methodical manner. Unlike the similar second canonical factor in the female sample, it did not include a heavy loading by the Investigative theme.

Interpretation of the males' third significant canonical factor is questionable, since it has high loadings by all the Big Five personality factors and three (nearly four) of Holland's vocational personality themes. Under the circumstances, it is difficult to know how to interpret the relatively high loading (.63) by Neuroticism.

In males, 38% of the variance incorporated in the three significant canonical factors (the sum of the squared canonical correlations) overlapped. A much lower proportion of the total variance in the two sets of variables was accounted for by the significant canonical factors. The Holland vocational personality typology accounted for 6.8% of the variance in the Big Five personality factors, while the Big Five personality factors accounted for nearly one percent less of the variance in the Holland typology variance (i.e., 5.9%). The third, virtually uninterpretable factor had a substantial loading by Neuroticism, which was contrary to the prediction of the first hypothesis.

Summary of Hypothesis One Results

The two models of personality overlapped in both females and males, although the redundancy in their variances was only between 5.9% and 7.6%. The two models shared four significant independent factors in females and three in males. The Neuroticism personality factor did not enter into the shared canonical factors for females but it did play a role in the least significant factor for males.

Hypothesis Two: The Big Five Factors Predict Holland's Themes

The second hypothesis said that specific factors of the Big Five model would predict each of the Holland vocational themes. The hypothesis was developed using a list of traits attributed by Walsh and Holland (1992) to each of the vocational personality themes. The present author evaluated how many of those traits fell into each of the factors of the Five Factor personality model and made predictions about whether each factor was a negative or positive predictor, and whether it was a strong, moderate, or weak predictor (Table 13). The hypothesis was then tested with a simultaneous multiple regression of each Holland theme on the five personality factors (Table 14). The strength of prediction was defined by a statistical significance of at least .05 and the effect size associated with the standardized beta weight of the personality factor. Strong predictors were defined by statistical significance and having large effect sizes, moderate predictors by significance and having medium effect sizes, and weak predictors by significance and having small effect sizes.

Table 13. Hypothesized Prediction of Holland Themes with Five Personality Factors

Holland Themes	Big Five Personality Factors				
	I - Extrav.	II - Agree.	III - Consc.	IV - Neur.	V - Open
Realistic	--	--	++	--	
Investigative	--	-	+		++
Artistic			-	+	+++
Social	+	+++	+		
Enterprising	+++			-	
Conventional			+++		-

Note. Effect sizes (ES) of positive predictors: +++ (Large), ++ (Medium), + (Small). ES of negative predictors: --- (Large), -- (Medium), - (Small).

Table 14. Multiple Regressions of Holland Themes on Five Personality Factors

Holland Themes	Standardized β s for Big Five Factors					<i>R</i>	<i>F</i>	<i>p</i>
	I-E	II-A	III-C	IV-N	V-O			
Females, <i>n</i> = 286, <i>df</i> = 5, 280								
R	-.13*	-.03	-.14	-.06	.41***	.31	5.93	.0000
I	-.04	-.11	.11	-.09	.22**	.26	4.20	.0011
A	-.10	.08	-.31***	.03	.44***	.36	8.21	.0000
S	.06	.30***	-.01	-.01	-.12	.27	4.31	.0009
E	.13*	-.07	.07	.02	.05	.18	1.81	.1114
C	-.07	-.04	.28**	.00	.01	.26	4.08	.0014
Males: <i>n</i> = 204, <i>df</i> = 5, 198								
R	-.07	-.07	.15	-.06	.14	.21	1.89	.0980
I	-.15*	-.14	.08	-.01	.34**	.30	3.86	.0023
A	-.25**	-.06	-.16	.18**	.47***	.40	7.33	.0000
S	.03	.06	.11	.18**	.01	.25	2.72	.0211
E	.23**	-.05	.06	.06	-.01	.25	2.59	.0271
C	.06	-.11	.28**	.05	-.05	.23	2.28	.0478

Notes. * $p < .05$. ** $p < .01$. *** $p < .0001$. β of $|.13 \text{ to } .35|$ = small effect size. β of $|.36 \text{ to } .50|$ = medium effect size. β of $|.51 \text{ to } .99|$ = large effect size.

Cohen's (1992) formula for the effect size, f^2 , corresponding to the standardized betas or multiple partial correlations (i.e., $f^2 = R^2/1-R^2$) was used. Cohen's formula and definition of effect sizes (1992), indicate that betas of .13 to .35 have small effect sizes (i.e., $f^2 \geq .02$), betas of .36 to .50 have medium effect sizes (i.e., $f^2 \geq .15$), and betas of over .50 have large effect sizes (i.e., $f^2 \geq .35$).

According to Wampold and Freund (1987), the 286 females and the 204 males whose data were used in the multiple regression analyses resulted in power of .90 in obtaining a significant finding when multiple regression coefficients were at least .30. An explanation of the simultaneous multiple regression tests of the hypothesized predictors for each Holland theme follows.

Realistic Theme

Only one of the hypothesized personality factors played a significant role in the linear combination predicting the Realistic theme. For females, Extraversion's weight (standardized $\beta = -.13$, $t = -2.06$, $p = .0399$, $f^2 = .02$) qualified it as a weak, negative predictor rather than a moderate, negative predictor, as hypothesized. Otherwise, the only significant predictor of the Realistic theme in females was Openness (standardized $\beta .41$, $t = 5.18$, $p < .0001$, $f^2 = .20$), by definition a moderate, positive predictor. This relationship between Openness and the Realistic vocational personality was found only in females and cannot be explained according to Holland's description of the Realistic theme.

Other hypothesized predictors of the theme, namely Agreeableness and Neuroticism (moderate, negative predictors) and Conscientiousness (a weak, negative predictor) were not supported by the multiple regression. The linear combination of the personality factors was not significant for males, explaining only 2% of the variance (adjusted $R^2 = .02$, $F = 1.89$, $p = .0980$). Females' Realistic vocational personalities were somewhat more predictable on the basis of the Big Five personality factors, explaining 8% of the variance (adjusted $R^2 = .08$, $F = 5.95$, $p < .0001$).

Investigative Theme

Half of the hypothesized predictors were found to be statistically significant by the multiple regression, but again the outcome differed by gender. According to the hypothesis, this theme should be predicted by Openness (moderate, positive), Extraversion (moderate, negative), and Conscientiousness (weak, positive), and Agreeableness (weak, negative). For males, Openness was a weak, positive predictor of the Investigative theme (standardized $\beta = .33$, $t = 3.37$, $p = .0009$, $f^2 = .12$) and Extraversion was a weak, negative predictor (standardized $\beta = -.15$, $t = -2.02$, $p = .0445$, $f^2 = .02$). For females, only Openness was significant (standardized $\beta = .22$, $t = 2.76$, $p = .0060$, $f^2 = .05$), which is defined as weak and positive. The Agreeableness and Conscientiousness factors did not carry enough weight in the multiple regression to be considered predictors of Investigative themes. The Big Five factors of personality

explained 5% of the variance in the Investigative theme for females (adjusted $R^2 = .05$, $F = 4.20$, $p = .0011$) and 7% for males (adjusted $R^2 = .07$, $F = 3.86$, $p = .0023$).

Artistic Theme

Personality factors that were expected to be predictive of Holland's Artistic theme were: Openness (strong, positive), Neuroticism (weak, positive), Conscientiousness (weak, negative). All three of the predictors were supported, but not in both genders. Openness was a predictor for both genders. Neuroticism was a predictor only in males, and Conscientiousness predicted the Artistic vocational personality only in females. According to the multiple regressions, Openness was a moderate, positive predictor of the Artistic vocational personality for both males (standardized $\beta = .47$, $t = 4.91$, $p < .0001$, $f^2 = .28$) and females (standardized $\beta = .44$, $t = 5.63$, $p < .0001$, $f^2 = .24$). Conscientiousness was a stronger negative predictor of the Artistic theme than expected for females (standardized $\beta = -.31$, $t = -4.13$, $p < .0001$, $f^2 = .11$). Neuroticism was a weak, positive predictor of the Artistic personality only for males (standardized $\beta = .18$, $t = 2.75$, $p = .0064$, $f^2 = .03$). An unexpected predictor of the Artistic theme for males was the weak, negative relationship to Extraversion (standardized $\beta = -.25$, $t = -3.41$, $p = .0008$, $f^2 = .07$). The five factors explained more of the variance in the Artistic theme than in any other vocational theme, for both males and females. Eleven percent of the

variance was explained in females (adjusted $R^2 = .11$, $F = 8.21$, $p < .0001$), and 13% was explained in males (adjusted $R^2 = .13$, $F = 7.33$, $p < .0001$).

Social Theme

The Social theme was predicted only in females by one of the hypothesized predictors. Agreeableness should have had a strong, positive predictive relationship with the Social vocational theme, but was only weakly predictive in females (standardized $\beta = .30$, $t = 4.23$, $p < .0001$, $f^2 = .10$). Extraversion and Conscientiousness should be weak, positive predictors, but they were assigned low, nonsignificant predictive weights. On the other hand, the theme was predicted by a personality factor that was unexpected in males. Neuroticism was a weak, positive predictor of the Social theme in the male sample (standardized $\beta = .18$, $t = 2.65$, $p = .0088$, $f^2 = .03$). The multiple regression coefficients were statistically significant at the .05 level for both genders. The personality factors explained 5% of the variance in Social themes for females (adjusted $R^2 = .05$, $F = 4.31$, $p = .0009$) and 4% for males (adjusted $R^2 = .04$, $F = 2.72$, $p = .0211$).

Enterprising Theme

The Enterprising vocational personality should be predicted by Extraversion (strong, positive) and Neuroticism (weak, negative). Neuroticism was not predictive of this vocational theme in either females or males. On the other hand, Extraversion predicted the Enterprising theme in both genders, but only weakly in males (standardized $\beta = .23$, $t =$

3.12, $p = .0021$, $f^2 = .06$) and females (standardized $\beta = .13$, $t = 2.08$, $p = .0384$, $f^2 = .02$). The linear combination of the Big Five personality factors did not reach statistical significance in the prediction of the Enterprising vocational theme for females (adjusted $R^2 = .01$, $F = 1.81$, $p = .1114$). The contribution of the Extraversion personality factor made the overall prediction of the Enterprising theme more significant for males (adjusted $R^2 = .04$, $F = 2.59$, $p = .0271$).

Conventional Theme

Conscientiousness was hypothesized to be a strong, positive predictor of the Conventional vocational personality. The multiple regression found it to be a weak predictor for both females (standardized $\beta = .28$, $t = 3.62$, $p = .0003$, $f^2 = .09$) and males (standardized $\beta = .28$, $t = 2.95$, $p = .0036$, $f^2 = .09$). Openness was expected to be a weak, negative predictor but this was not supported by the multiple regression tests for either gender. The linear combination of the Big Five personality factors explained 5% of the variance in the Conventional vocational theme for females (adjusted $R^2 = .05$, $F = 4.08$, $p = .0014$) and 3% for males (adjusted $R^2 = .03$, $F = 2.28$, $p = .0478$).

Summary of Hypothesis Two Results

Regressing the Holland vocational themes on the Big Five personality factors revealed that none of the predictions were accurate in terms of strength of prediction (i.e., effect size of the beta weights). On the other hand, the positive or negative character of the

predictors was usually accurately stated by the hypotheses. However, in four of the six vocational personality themes, no more than one hypothesized personality factor was a significant predictor. More personality factors were significantly involved in predicting the Artistic vocational personality theme than any other theme. The Artistic theme was predicted by Openness and Conscientiousness for females and by Openness and Neuroticism for males. Two hypothesized personality factors were significantly involved in predicting the Investigative vocational theme for males (i.e., Openness and Extraversion), but only Extraversion negatively predicted the Investigative theme for females. In both genders, only one personality factor significantly predicted the Enterprising vocational theme (i.e., Extraversion) and the Conventional vocational theme (i.e., Conscientiousness). None of the hypothesized factors predicted the Social theme in males, although it was predicted by Agreeableness in females. The Realistic vocational theme was not well predicted by any of the hypothesized personality factors, but was unexpectedly predicted by Openness in females.

The adjusted squared multiple regression coefficients indicated that those linear combinations that achieved significance explained up to 15% of the variance in the Holland themes. Two of the linear combinations did not achieve statistical significance. The Enterprising Holland theme in women (adjusted $R^2 = .01$, $F = 1.81$, $p = .11$) and the

Realistic Holland theme in men (adjusted $R^2 = .02$, $F = 1.88$, $p = .10$) were not significantly predicted by the Big Five personality factors.

Hypothesis Three: Clarity of Vocational Personality Effects Prediction

The third hypothesis proposed that the Big Five personality factors would be more predictive of the Holland themes in individuals with comparatively more clarity of vocational personality. Two definitions of clarity were used in testing this hypothesis. First, clarity was examined in terms of differentiation between high and low scores on the RIASEC vocational personality theme scales. Next, clarity was defined by the degree of consistency (i.e., the similarity) of the two themes with the highest scale scores.

Differentiation

Differentiation between the high and low scores on the Holland vocational personality theme scales ranged from 5 to 48, with a mean of 24, in the total sample of 499 participants. However, as with the rest of the analyses, a gender specific approach was taken to testing this hypothesis. Each gender's data were split into high and low differentiation groups, using the mean differentiations as cutoffs. Using the means as cutoffs resulting in four subgroups, with fairly even numbers within the genders. For each group, simultaneous regressions were run for each of the six Holland vocational personality themes on the five factors. It was then possible to compare the level of significance of the multiple regressions in the high and low differentiation groups within the genders.

Females and differentiation. For the 286 females, differences between high and low scores on the RIASEC scales ranged from 5 to 48. The mean of 26 was used as the cutoff between the high and low differentiation groups, resulting in 149 females in the high group and 137 in the low group. These sample sizes yielded power of between .70 and .90 to find multiple regressions of at least .30 to be significant at the .05 level. Correlations between the scales for the five personality factors and the Holland themes are listed in Table 15. As can be seen in Table 15, in the low differentiation subgroup, the Agreeableness, Conscientiousness, and Openness personality factors are all three correlated with the Social vocational personality theme at the .01 level. Since Conscientiousness and Openness did not have this relationship with the Social theme when the level of differentiation was not controlled (Table 7) or when its level was high (Table 15), it would seem likely that the multicollinearity in the measurement of these three personality factors is exaggerated in a sample with low differentiation. In general, the pattern of correlations for the high differentiation females is more in keeping with Holland's descriptions of the vocational themes (Table 13). The high differentiation group correlations between Neuroticism and Artistic and between Extraversion and Enterprising are significant while they are not in the low differentiation group. On the other hand, Neuroticism has a weak, negative correlation with the Enterprising vocational theme for

Table 15. Correlations Between Holland Themes and the Five Personality Factors, for Females with High and Low Differentiation

Holland Themes	Five Personality Factors				
	I - Extrav.	II - Agree.	III - Consc.	IV - Neur.	V - Open.
Females with High Differentiation, $n = 149$					
Realistic	.01	.08	.01	-.02	.32***
Investigative	.01	.08	.17*	-.03	.22**
Artistic	.07	.08	-.13	.23**	.26**
Social	.11	.19*	-.06	-.01	-.11
Enterprising	.26**	-.03	.07	.08	.15
Conventional	-.06	.06	.26**	-.05	.06
Females with Low Differentiation, $n = 137$					
Realistic	.03	.12	.14	-.05	.24**
Investigative	.09	.08	.24**	-.14	.26**
Artistic	.05	.13	.06	-.15	.25**
Social	.04	.28**	.24**	-.16	.23**
Enterprising	.08	-.03	.06	-.17*	.01
Conventional	.02	.07	.24**	-.11	.16

Notes. High differentiation ≥ 26 . Low differentiation < 26 .

* $p < .05$. ** $p < .01$. *** $p < .0001$.

low differentiation females, a predicted relationship that was not found in either the high differentiation group or the entire female sample.

The simultaneous regressions of the Holland types on the five personality factors are reported in Table 16. Linear combinations of personality factors were significantly predictive for five of the six Holland themes in the high differentiation group. By contrast, in the low differentiation group, only three of the Holland themes were significantly

Table 16. Multiple Regressions of Holland Themes on Five Personality Factors, for Females with High and Low Differentiation of Holland Theme Scores

Holland Themes	Standardized β s for Big Five Factors					<i>R</i>	<i>F</i>	<i>p</i>
	I	II	III	IV	V			
Females with High Differentiation, $n = 149$, $df = 5, 143$								
R	-.19*	-.03	-.24*	-.07	.54***	.41	5.79	.0001
I	-.10	-.06	.07	-.04	.26*	.26	2.00	.0825
A	-.09	.10	-.38**	.19*	.43***	.46	7.47	.0000
S	.22*	.35**	-.08	.03	-.31**	.36	4.38	.0010
E	.24**	-.10	.08	.07	.05	.29	2.64	.0257
C	-.06	-.06	.32**	-.02	-.05	.28	2.54	.0310
Females with Low Differentiation: $n = 137$, $df = 5, 131$								
R	-.11	.01	-.03	-.01	.30*	.26	1.86	.1065
I	-.01	-.13	.15	-.08	.23	.30	2.67	.0246
A	-.11	.05	-.24*	-.15	.40**	.33	3.20	.0092
S	-.09	.19	.05	-.09	.12	.32	3.00	.0135
E	.10	-.10	.07	-.17	-.06	.21	1.22	.3028
C	-.04	-.10	.25*	-.04	.07	.26	1.86	.1055

Notes. Five personality factors: I = Extraversion, II = Agreeableness, III = Conscientiousness, IV = Neuroticism, V = Openness. Holland themes: R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional. High differentiation ≥ 22 . Low differentiation < 22 .

* $p < .05$. ** $p < .01$. *** $p < .0001$.

predicted by a linear combination of personality factors. Several of the hypothesized personality factors were statistically significant predictors in the high differentiation group but not in the low differentiation group. These included the prediction of: the Realistic theme by Extraversion (negative), the Social theme by Extraversion and Agreeableness

(both positive), the Enterprising theme by Extraversion (positive). The apparent superiority of Openness in predicting the Investigative theme in the high differentiation group ($\beta = .26$, $t = 2.36$, $p = .0196$, $f^2 = .07$) as opposed to the low differentiation group ($\beta = .23$, $t = 1.86$, $p = .0656$, $f^2 = .06$) is probably due only to decreased power with the lower sample size of the low differentiation group ($n = 149$ and $n = 137$, respectively). Two other significant predictors were not hypothesized, namely Conscientiousness's negative prediction of the Realistic theme, and the negative relationship between the Openness factor and Social vocational theme. Both were found only in the high differentiation group.

As was stated earlier, beta weights with absolute values of .13 to .35 have small effect sizes (i.e. f^2 of .02 to .14), beta weights with absolute values of .36 to .50 have medium effect sizes (i.e., f^2 of .15 to .34), and beta weights with absolute values of .51 and over have large effect sizes (i.e., f^2 of .35 and over). Although more of the hypothesized predictors were statistically significant in the the highly differentiated participants, none of the beta weights of the personality factors achieved an effect size that met the criterion for the predicted strength of prediction. Only one prediction, (i.e., prediction of the Realistic theme by the Openness factor) met the criterion of a strong predictor ($\beta = .54$, $T = 5.27$, $p < .0001$, $f^2 = .41$) and, ironically, it was not a hypothesized relationship. Only two other predictors achieved effect sizes in the medium range. The Openness factor was a

moderate, positive predictor of the Artistic theme ($\beta = .43$, $T = 4.35$, $p < .0001$, $f^2 = .23$), but was hypothesized to be a strong, positive predictor. Conscientiousness was a moderate, negative predictor of the Artistic theme ($\beta = -.38$, $T = -4.08$, $p = .0001$, $f^2 = .17$), but was hypothesized to be a weak, negative predictor. All the other statistically significant beta weights for the five personality factors had small effect sizes, or by definition, weak predictive qualities.

Males and differentiation. For the 204 males, the range of differentiation between high and low score on the vocational personality scales was from 7 to 43, with a mean difference of 22. The mean was used as the cutoff between high and low differentiation groups, resulting in a high differentiation group of 108 males and a low group of 96. Therefore, in testing for regression coefficients of at least .30, the power of the analyses of the multiple regressions was at the .70 level in the high differentiation group and only .50 to .70 in the low differentiation group.

See Table 17 for correlations between the scales for the five personality factors and the Holland themes. Two things are noteworthy about the pattern of correlations. First, the high differentiation group's pattern of correlations is more in keeping with the predictions. The high group has two predicted, significant correlations that are missing in the low group (i.e, between Extraversion and Enterprising and between Neuroticism and Artistic). On the other hand, the low group has two significant correlations that are not expected

Table 17. Correlations Between Holland Themes and the Five Personality Factors, for Males with High and Low Differentiation

Holland Themes	Five Personality Factors				
	I - Extrav.	II - Agree.	III - Consc.	IV - Neur.	V - Open.
Males with High Differentiation, $n = 108$					
Realistic	.06	.05	.15	.04	.16
Investigative	.06	-.05	.14	-.02	.21*
Artistic	-.01	.05	.02	.42***	.20*
Social	.10	.13	.18	.23*	.12
Enterprising	.28**	.03	.04	.11	.03
Conventional	.08	-.05	.14	-.02	-.02
Males with Low Differentiation, $n = 96$					
Realistic	-.13	.11	.18	.04	.13
Investigative	-.10	.21*	.22*	.01	.28**
Artistic	-.08	.12	.12	.02	.36***
Social	.09	.16	.15	.11	.18
Enterprising	.10	.01	.08	-.05	.14
Conventional	.04	.15	.24*	.10	.20*

Notes. High differentiation ≥ 22 . Low differentiation < 22 .

* $p < .05$. ** $p < .01$. *** $p < .0001$.

according to the hypothesis (i.e., between Agreeable and Investigative and between Openness and Conventional). Second, the low differentiation group showed a stronger relationship between Openness and the Investigative theme and between Openness and the Artistic theme.

The simultaneous multiple regressions of the Holland vocational personality themes on the Big Five personality factors is reported in Table 18. It is immediately apparent that

Table 18. Multiple Regressions of Holland Themes on Five Personality Factors, for Males with High and Low Differentiation of Holland Theme Scores

Holland Themes	Standardized β s for Five Factors					<i>R</i>	<i>F</i>	<i>p</i>
	1	2	3	4	5			
Males with High Differentiation, <i>n</i> = 108, <i>df</i> = 5, 102								
R	-.01	-.07	.10	.03	.14	.19	0.74	.5925
I	-.04	-.26*	.06	-.05	.33*	.30	2.04	.0793
A	-.20*	.01	-.16	.41***	.36**	.49	6.48	.0000
S	.06	.10	.20	.25*	-.11	.32	2.26	.0539
E	.35**	.02	.10	.08	-.21	.32	2.39	.0428
C	-.16	-.12	.31**	-.02	-.23	.26	1.51	.1917
Males with Low Differentiation: <i>n</i> = 96, <i>df</i> = 5, 90								
R	-.21	-.06	.20	.03	.12	.27	1.45	.2156
I	-.24*	.00	.09	.01	.31*	.36	2.76	.0227
A	-.24*	-.18	-.08	-.04	.61***	.46	4.77	.0007
S	.03	.04	.04	.12	.12	.22	0.95	.4504
E	.06	-.16	.06	-.02	.19	.19	0.68	.6384
C	-.04	-.11	.25	.12	.14	.29	1.60	.1696

Notes. Five personality factors: I = Extraversion, II = Agreeableness, III = Conscientiousness, IV = Neuroticism, V = Openness. Holland themes: R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional. High differentiation ≥ 22 . Low differentiation < 22 .

* $p < .05$. ** $p < .01$. *** $p < .0001$.

many more of the beta weights assigned to the predictors are significant in the highly differentiation group than in the low differentiation group. However, fewer of the vocational personality themes were significantly predicted even in the highly differentiated group than the five statistically significant predictions in the overall group. At least in the

high differentiation group, this lack of significant prediction is undoubtedly partly due to the smaller sample sizes and lack of power. Statistical significance is achieved in the high differentiation group in the prediction of only three themes, Artistic ($R = .49$, $F = 6.48$, $p < .0001$), Social ($R = .32$, $F = 2.26$, $p = .0539$), and Enterprising theme ($R = .32$, $F = 2.26$, $p = .0428$). Only two themes are significantly predicted in the low differentiation group, the Artistic theme ($R = .46$, $F = 4.77$, $p = .0007$), and the Investigative theme ($R = .36$, $F = 2.76$, $p = .0227$). In the high differentiation group, the prediction of one more of the vocational personality theme (i.e., Investigative) approaches significance, with a probability of .0793. None of the other personality themes are predicted in the low differentiation group with a probability that is better than .16.

The Artistic theme was significantly predicted in both the high and low differentiation groups of males. However, the hypothesized Neuroticism predictor was found to be significant only in the high differentiation group ($\beta = .41$, $t = 4.68$, $p < .0001$, $f^2 = .20$), qualifying it as a moderate, positive predictor. Extraversion, which was an unexpected negative predictor of the Artistic theme in the entire male group (Table 14), continued to appear as a weak, negative predictor in both the high ($\beta = -.20$, $t = -2.02$, $p = .0462$, $f^2 = .04$) and low differentiation ($\beta = -.24$, $t = -2.33$, $p = .0219$, $f^2 = .06$) groups.

Summary of differentiation results. The hypothesis that increased clarity of vocational personality themes would enhance prediction of the themes by the Big Five personality factors was supported when clarity was defined in terms of differentiation. The superiority of the prediction in the high differentiation groups was more clear-cut for the females than for the males. This was partly due to the smaller sample size of males.

In the high differentiation group of females, five of the vocational personality themes were significantly predicted, while only three were significantly predicted in the low differentiation group. This difference between the female groups was due to the fact that several of the hypothesized personality factors were predictive of the vocational personality themes in the high differentiation group but not in the low differentiation group.

Prediction in the high differentiation group also compared favorably to the entire female group, since Extraversion, an expected predictor of the Social vocational personality theme, was significant in the high group but not in the entire group.

In the males' high differentiation group, prediction of three and approaching four of the vocational themes were significant at the .05 probability level. Only two of the vocational themes were significantly predicted in the males' low differentiation group. In the high differentiation group of males, the Artistic theme was predicted by three of the expected personality factors, as opposed to two in the low differentiation group.

Consistency

Consistency, as it is used in this study, refers to the similarity of the two Holland themes on which individuals received the highest scales scores. The most similar themes are said to be adjacent to one another in the hexagonal RIASEC arrangement (Holland, 1985a). Therefore, according to Holland, an individual's vocational personality was most consistent if her/his highest RIASEC scale scores were for themes adjacent on the hexagon. However, the applicability of this conceptualization of consistency to females has been questioned (Holland, 1985a). Therefore, consistency was operationalized in this study using a gender-specific method for evaluating the consistency of the two highest scale scores, which was developed by Strahan (1987). Strahan provides a table of conditional probabilities for each of the 30 possible combinations of the two highest RIASEC scale scores. The conditional probabilities were calculated from data provided in the SDS manual (Holland, 1985c). In addition to being gender-specific, Strahan's method has several other advantages. It recognizes that the probabilities of two RIASEC themes being paired in the two possible orders differ. Strahan also provides an index that is specific to college students.

When any of the highest three scale scores for an individual are equal, assignment of a consistency value becomes problematic. A method must be found to resolve this problem or the data for individuals with equal scales must be eliminated. Strahan and Severinghaus

(1992) recommended assigning individuals the average of the two or more applicable probabilities. In exploring this possibility, it was found that many of the participants had one (or more) probability that fell into the high consistency category and another probability that fell into the low consistency category. It was decided not to include these participants in the samples used to explore the effects of high and low consistency. As a result, 35 females' data were eliminated from the sample, bringing the female subsample down to 251. Similarly, elimination of 34 of the males' data brought the male subsample down to 170. The distributions of the conditional probabilities of the female and male subsamples were examined and cutoffs between high and low consistency were selected in order to have approximately equal high and low groups.

Female conditional probabilities of scoring highest on their top two RIASEC scales ranged from .80 to .00. A cutoff at the .20 probability divided the females into groups of 144 with high and 107 with low consistency. The 33 females who had the .20 probability were placed in the high group, since their placement in the low group would have made the groups only marginally more equal. The numbers in both high and low groups provided power of at least 70% to find multiple regression coefficients in the expected .30 range (Wampold & Freund, 1987). It was recognized that the cutoffs were low enough to make it questionable whether all the participants in the high consistency group could really be

considered to have high consistency. In addition, the power provided by the reduced sample size was less than ideal.

Male conditional probabilities of scoring highest on their top two RIASEC scales ranged from .63 to .04. A cutoff of .13 divided the males into groups of 87 with high consistency and 83 with low consistency. The number of participants in each group yielded power in only the 50% to 70% range to find multiple regressions as low as .30 range (Wampold and Freund, 1987). The consistency cutoff and power used in the male sample are obviously even less ideal than in the female sample. For that reason, the consistency test of the third hypothesis was undertaken with reservations about its potential meaningfulness.

Females and consistency. The correlations between the scales for Holland's vocational personality themes and the five personality factors are listed in Table 19, according to high and low consistency. The patterns of correlations do not clearly support the superiority of either high or low consistency, as it was defined in this study. More of the predicted correlations were significant in the low consistency females (i.e., five) than in the high consistency females (i.e., four). Significant, predicted correlations in the high consistency group were: Artistic with Openness, Social with Agreeableness, Extraversion with Enterprising, and Conscientiousness with Conventional. In the low consistency group of females, the significant, predicted correlations were: Agreeableness with Social,

Table 19. Correlations Between Holland Themes and the Five Personality Factors, for Females with High and Low Consistency

Holland Themes	Five Personality Factors				
	I - Extrav.	II - Agree.	III - Consc.	IV - Neur.	V - Open.
Females with High Consistency, $n = 144$					
Realistic	-.02	.10	.01	-.05	.27**
Investigative	-.03	-.03	.09	-.06	.11
Artistic	.07	.07	-.04	.06	.27**
Social	.03	.19*	.03	.00	.02
Enterprising	.22**	.05	.06	.09	.15
Conventional	.05	.18*	.21**	.03	.12
Females with Low Consistency, $n = 107$					
Realistic	.06	.18	.16	-.05	.27**
Investigative	.14	.20*	.33***	-.23*	.31**
Artistic	.09	.12	-.00	.06	.30**
Social	.13	.32**	.22*	-.18	.10
Enterprising	.02	-.07	.05	-.12	.03
Conventional	-.11	.11	.24*	-.12	.07

Notes. High consistency (probability) $\geq .20$. Low consistency (probability) $< .20$.
 * $p < .05$. ** $p < .01$. *** $p < .0001$.

Conscientiousness with Investigative, Conscientiousness with Conventional, Openness with Investigative, and Openness with Artistic. All of the significant correlations in Table 19, except those mentioned above, were unpredicted. The low consistency group's unpredicted significant correlations numbered four as opposed to two in the high consistency group. Hence the evidence provided by the predicted correlations supports the greater effectiveness of the low consistency group but the unpredicted correlations

undermines the conclusion that the Big Five factors predict the vocational themes more accurately when consistency is low.

The simultaneous multiple regression of the Holland themes on the five personality factors (Table 20) does little to clear up the question about whether relatively high

Table 20. Multiple Regressions of Holland Themes on Five Personality Factors, for Females with High and Low Consistency

Holland Themes	Standardized β s for Five Factors					R	F	p
	I	II	III	IV	V			
Females with High Consistency, $n = 144$, $df = 5, 138$								
R	-.21*	-.02	-.18	-.07	.45**	.36	4.02	.0020
I	-.11	-.12	.07	-.08	.18	.20	1.12	.3549
A	-.09	.01	-.23*	.05	.42**	.35	3.77	.0031
S	.03	.24*	-.03	.04	-.09	.21	1.28	.2749
E	.19*	-.00	.00	.10	.06	.25	1.80	.1173
C	-.00	.12	.18	.05	-.02	.24	1.69	.1400
Females with Low Consistency, $n = 107$, $df = 5, 101$								
R	-.07	.05	-.10	-.04	.33*	.29	1.80	.1204
I	.02	-.13	.15	-.08	.23	.30	2.67	.0246
A	-.10	.04	-.42**	-.01	.60**	.42	4.31	.0013
S	.13	.35**	.15	-.11	-.26	.39	3.69	.0041
E	-.01	-.15	.07	-.11	.06	.17	0.62	.6841
C	-.13	.03	.29*	-.06	-.10	.29	1.91	.0983

Notes. Five personality factors: I = Extraversion, II = Agreeableness, III = Conscientiousness, IV = Neuroticism, V = Openness. Holland themes: R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional. High consistency $\geq .20$. Low consistency $< .20$.

* $p < .05$. ** $p < .01$. *** $p < .0001$.

consistency enhances prediction of the vocational themes. As can be seen, three of the vocational themes are significantly predicted in the low consistency group, while only two of the themes are significantly predicted in the high consistency group. However, the significant multiple regression coefficient for the Investigative theme in the low group does not incorporate any significant beta weights for the Big Five factors. Altogether, consistency, as it was defined here, played an inconsistent role in females for the prediction of vocational personality themes by the Big Five personality factors.

Males and consistency. The low power of the sample size was evident in correlations and multiple regressions on the high and low consistency male groups. However, the high consistency correlations (Table 21) showed a pattern of significance that was often in keeping with the hypothesis, while the low consistency group's correlations were more often unpredicted by the hypothesis or even in the reverse of the hypothesis. Two of the significant correlations in the high consistency group were not predicted by the hypothesis. The correlation between Neuroticism and the Social vocational theme was not expected to be significant, and neither was the correlation between Openness and the Social theme.

In the low consistency group the following three correlations were significant, as predicted: Extraversion with Enterprising, Conscientiousness with Realistic, and Openness with Investigative. It is interesting to note that none of the predicted, significant

Table 21. Correlations Between Holland Themes and the Five Personality Factors, for Males with High and Low Consistency

Holland Themes	Five Personality Factors				
	I - Extrav.	II - Agree.	III - Consc.	IV - Neur.	V - Open.
Males with High Consistency, $n = 87$					
Realistic	-.11	-.06	.05	.02	-.00
Investigative	-.10	-.05	.07	.04	.10
Artistic	-.22	-.01	.07	.31**	.27*
Social	.04	.09	.22*	.30**	.24*
Enterprising	.19	.08	.14	.15	.11
Conventional	.04	.03	.21*	.20	-.01
Males with Low Consistency, $n = 83$					
Realistic	.15	.23*	.34**	.25*	.32**
Investigative	.08	.09	.18	-.02	.31**
Artistic	-.12	.09	-.01	.21	.11
Social	.06	.16	.07	-.03	-.04
Enterprising	.33**	.08	.12	.12	.10
Conventional	.25*	.08	.18	-.03	.17

Notes. High consistency (probability) $\geq .13$. Low consistency (probability) $< .13$.
 * $p < .05$. ** $p < .01$. *** $p < .0001$.

correlations are duplicated across the high and low consistency groups. Three of the low consistency group's correlations are unpredicted and one is correlated in the reverse direction as the hypothesis. The unpredicted correlations include: Extraversion with Conventional, Neuroticism with Realistic, and Openness with Realistic. The reverse direction correlation is the positive correlation between Agreeable and Realistic.

The multiple regression analysis of the males' high and low consistency groups (Table 22) provides little support for the hypothesis that clarity of vocational identity relates to prediction of the vocational themes. Two of the vocational personality themes are predicted significantly in the high consistency group, Artistic ($R = .54$, $F = 6.80$, $p <$

Table 22. Multiple Regressions of Holland Themes on Five Personality Factors, for Males with High and Low Consistency

Holland Themes	Standardized β s for Five Factors					R	F	p
	1	2	3	4	5			
Males with High Consistency: $n = 87$, $df = 5, 81$								
R	-.15	-.14	.13	-.01	.06	.18	0.51	.7659
I	-.19	-.20	.11	-.02	.22	.24	1.02	.4110
A	-.40**	-.21	-.01	.23*	.44**	.54	6.80	.0000
S	-.06	-.07	.15	.25*	.17	.38	2.67	.0278
E	.19	.05	.07	.15	-.06	.26	1.20	.3151
C	.05	-.03	.31*	.20	-.21	.33	1.98	.0907
Males with Low Consistency: $n = 83$, $df = 5, 77$								
R	-.00	-.08	.28	.25*	.16	.44	3.63	.0053
I	-.06	-.23	.00	-.04	.50**	.36	2.30	.0532
A	-.25*	.08	-.17	.21	.27	.34	1.96	.0946
S	.10	.32*	.07	-.04	-.35	.27	1.25	.2946
E	.35**	-.05	.15	.08	-.13	.35	2.17	.0665
C	.24	-.12	.17	-.06	-.03	.30	1.48	.2075

Notes. Five personality factors: I = Extraversion, II = Agreeableness, III = Conscientiousness, IV = Neuroticism, V = Openness. Holland themes: R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional.

High consistency $\geq .13$. Low consistency $< .13$.

* $p < .05$. ** $p < .01$. *** $p < .0001$.

.0001) and Social ($R = .38$, $F = 2.67$, $p = .0278$). Only one theme's prediction achieves significance in the low consistency group, Realistic ($R = .44$, $F = 3.63$, $p = .0053$). However, the prediction of two additional themes in the low consistency group approaches significance at the .05 level, Investigative ($R = .36$, $F = 2.30$, $p = .0532$) and Enterprising ($R = .35$, $F = 2.17$, $p = .0665$). Further confusing the matter is the fact that one of the high consistency group's significant multiple regression coefficients depends heavily on the contribution of an unexpected predictor. Neuroticism is not expected to predict the Social vocational theme.

Summary of consistency results. Consistency was not well-supported in this study as having an influence on the effectiveness of the prediction of the Holland vocational personality themes by the Big Five personality factors. In both the females and males, the high and low consistency groups showed little difference in the number of vocational personality themes that were significantly predicted or in the number of hypothesized personality factors that were involved in the significant predictions.

Hypothesis Four: Neuroticism Relates to Vocational Issues

It was predicted that Neuroticism was related to problems with career planning and preparation that sometimes motivate college students to seek career counseling. The problems that were tapped in the present study were: lack of differentiation and consistency

between the Holland codes that comprise an individual's vocational personality, and dissatisfaction with college major.

Holland code differentiation and consistency were operationalized in the same way for this hypothesis as they were in the third hypothesis . The range of differentiation and consistency indices in the genders was reported in the last section, which reported the results of tests of the third hypothesis.

Satisfaction with college majors was assessed by a question on the SII. It asked, "How satisfied are you with your choice of school major or concentration?" and offered 4 response options (i.e., very satisfied, somewhat satisfied, somewhat dissatisfied, very dissatisfied). The range of responses for both genders was from 1 (very satisfied) to 4 (very dissatisfied). The mean for females was 1.62 and for males was 1.66.

In the case of each of the four career preparation issues, its relationship to Neuroticism was evaluated by running a Pearson product-moment correlation coefficient (Table 23) for each gender, and testing it for significance. Only one of the resulting correlations was significant and only in females. Neuroticism had a .19 correlation with the measurement of satisfaction with college majors in the female participants, indicating the two variables share approximately 4% of their variance. As can be seen in Table 23, Neuroticism does not have a significant relationship with the degree of satisfaction with college majors for males ($r = .10, p = .195$). The sample sizes listed for the correlations of Neuroticism

with satisfaction vary from the full samples of males and females because not all participants answered the question that assessed satisfaction.

Neither the consistency nor the differentiation of Holland codes for vocational personality were correlated significantly with Neuroticism. The males' correlation of consistency with Neuroticism was .11 ($p = .161$) and for differentiation with Neuroticism was $-.00$ ($p = .988$).

The females' correlation of consistency with Neuroticism was .07 ($p = .250$) and of differentiation with Neuroticism was .02 ($p = .694$).

Table 23. Correlations Between Neuroticism and Issues in Career Counseling

Career Preparation Issues	Females	Males
Holland Code Differentiation	$r = -.02$ $p = .694$ $n = 286$	$r = -.00$ $p = .988$ $n = 204$
Holland Code Consistency	$r = -.07$ $p = .250$ $n = 251$	$r = .11$ $p = .250$ $n = 170$
Satisfaction with Major	$r = .19$ $p = .002$ $n = 273$	$r = .10$ $p = .175$ $n = 195$

DISCUSSION

The several parts of the study accomplished two main goals. First, the study evaluated the effectiveness of Adjective Check List (Gough & Heilbrun, 1983) marker scales, developed by John (1990) for the Big Five personality factors. Second, it examined the relationship of the Big Five factor model of personality and Holland's (1985a) model of vocational personality, as it differs for females and males. Particular attention was paid to how much the two models overlapped, in other words how much of the variance in each of the two models was explained by the other model. Another important focus was on the roles played by the Neuroticism factor in the relationship between the two models and in some of the issues that bring students to a vocational counselor. Ultimately it was the aim of the study to gain a better understanding of how to do the most effective job of assessing personality for purposes of vocational counseling.

The ACL marker scales for the Big Five factor model of personality were selected for use in this study in order to take a multi-method approach in comparison to other similar studies (Gottfredson et al., 1993; Tokar & Swanson, 1995). The previous studies have used the NEO PI-R (Costa & McCrae, 1992). The ACL marker scales were found to perform adequately, if not outstandingly. The full scales, which included all the adjectives that John (1990) assigned to each scale, were found to be superior to abbreviated scales using only the positively keyed adjectives. The superiority was based on the full scales'

lower scale intercorrelations or multicollinearity. The adequacy of the ACL marker scales was supported by the fact that the Cronbach alpha indices of internal consistency were higher in every case than any of the scale intercorrelations. The Cronbach alphas ranged from .83 for the Agreeableness scale down to .70 for the Neuroticism scale. While adequate, the ACL marker scales did not appear to be the optimum method of assessing the five factors. The Openness scale showed multicollinearity (correlations were between .43 and .58) with all the other scales except Neuroticism ($r = -.03$). The Agreeableness and Conscientiousness scales also had a .55 correlation. In general, the ACL marker scales for the five factors did not measure up to the psychometrics reported for the NEO PI-R (Costa & McCrae, 1992). As a result, serious consideration should be given to further study of the ACL marker scales and the possibility that they would perform better with a Likert response format.

The first hypothesis predicted that the two models of personality would overlap. The first step in testing this hypothesis was a canonical correlation analysis, which replicated work done by Gottfredson and his associates in 1993. Different assessment instruments were used, and a different population was sampled, in order to see if the findings would generalize. In the 1993 study, two canonical factors were found to be significant for female Navy recruits ($n = 246$) and four for male Navy recruits ($n = 479$). In the present study, four canonical factors were found to be significant for female college students ($n =$

286) and three for male college students ($n = 204$). Most of the canonical factors in the present study were easily interpreted, in contrast to all but the first factor in the 1993 study of Gottfredson and his associates. The Realistic vocational personality theme was not well represented in the factors shared by the two models of personality, which was unexpected. It was expected that the Neuroticism personality factor would not play a large role in the relationship between the models, and this was confirmed.

The first canonical factor was similar but not identical across genders and across studies. It usually included loadings by the Artistic, Investigative, and Openness variables, reflecting an intellectually curious and creative personality and vocational interests. In the present study, the first canonical factor was also associated with the Realistic vocational theme in females and negatively related to the Extraversion personality factor in males. Apparently for the females sampled, intellectual curiosity and creativity were connected to an interest in traditionally masculine occupations, while, for the males, they were connected to being more introverted than extraverted. The second canonical factor did not generalize across studies but was similar across genders in the present study. It included loadings by the Conventional vocational personality theme and the Conscientiousness factor in both females and males. However, in females the Investigative vocational personality theme loaded on this factor rather than the first one, leading to the conclusion that the female sample was more likely to view Investigative occupations as

detail-oriented than as related to curiosity and creativity. The third canonical factor was related to social orientation in both genders. For females, the third factor included loadings by the Social and Agreeableness variables. For males, the third factor had an extraordinarily high loading by the Social vocational personality theme (i.e., .89), and also included high loadings by all five of the personality factors, including Neuroticism. This outcome in the males may be a result of multicollinearity of all the factors except Neuroticism. Neuroticism's lack of multicollinearity and the fact that Neuroticism and Extroversion are not ordinarily associated make this factor doubly difficult to interpret. Finally, the females' fourth significant factor, was interpreted as a different social-orientation. Rather than having a loading by Agreeableness, its loadings were by Social and Enterprising vocational themes, and the Extraversion personality factor. If the third female factor could be said to manifest social connectedness, the fourth female factor was more connected to social influence.

The interpretation of the canonical factors revealed that the two models of personality clearly were related in ways that supported their congruent validity. It did not tell us, however, **whether** one of the models did a better job of explaining the variance in the other model. This raises a question that has not previously been addressed (e.g., by Gottfredson et al., 1993). The redundancy indices that were reported in the Results chapter were designed to answer the question. The indices did not support the reasonable assumption

that the Big Five factor model, reputed to be a comprehensive approach to personality (Digman, 1990), would explain more of the variance in Holland's vocational personality model than vice versa. In both females and males, less than 8% of the variance in one model was explained by the other. The two models explained nearly equal proportions of variance in the other model, in the data collected from females. The Big Five personality factors explained 7.6% of the variance in the Holland vocational personality themes, while the reverse prediction was of 7.2% of the variance, for females. In males, the Big Five factors explained 5.9% of vocational personality theme variance, while the reverse prediction was higher, 6.8%. Therefore, not only was the redundancy of measurement of the two model quite low, the Big Five factors did not do a more comprehensive job of explaining the variance in the vocational personality model. The results supported the conclusion of the earlier study (Gottfredson et al., 1993). It should not be assumed that the assessment of one model of personality can be substituted for the assessment of the other. In other words, both models have something unique to offer in understanding an individual.

The second hypothesis predicted that Holland's vocational personality themes could be predicted by the Big Five factor model. All Big Five personality factors that subsumed traits previously attributed to the vocational personality themes (Walsh & Holland, 1992) were expected to contribute to prediction of the themes. Multiple regressions of each

vocational personality theme on the five factors tested the hypothesis separately for females and males. All but one of the vocational personality themes were significantly predicted by at least one of the expected personality factors in each gender. Exceptions that were not significantly predicted were the Enterprising theme in females and the Realistic theme in males.

In the sample of college students used in this study, Holland's vocational themes were not typically predicted by complex combinations of personality factors. Of the ten significant multiple regressions, six included only one of the expected factors, two included two expected predictors, and one included three expected predictors. The remaining significant multiple regression was based on an unexpected predictor.

Thirty-six predictions (18 for each gender) were made about what Big Five factors should be involved in multiple regressions for the vocational personality themes. None of the predictions about the strength of prediction was supported by the effect sizes of the beta weights assigned to the five factors. None of the personality factors proved to be strong predictors of the vocational themes; only one (i.e., Openness's prediction of the Artistic theme) qualified as a moderate predictor; and the remaining significant beta fell into the weak predictor category. However, thirteen of the predictions were generally supported by statistical significance and the valence of the beta weights assigned to the personality factors. Twenty-three of the hypothesized personality factors did not significantly predict

the appropriate vocational personality theme. In sum, the study supported simplified definitions of the Holland vocational personality themes. It may be risky to assume that an individual is incongruent with a particular vocational theme because her/his personality profile differs from what has been predicted (e.g., by Walsh & Holland, 1990). For instance, the predicted positive relationship between Agreeableness and the Social vocational personality theme was not found in the overall group of males. It should be particularly noted that the predictions were not consistently supported across genders. While Agreeableness did not predict the Social theme in males, it was a strong, positive predictor in females.

The third hypothesis suggested that increased clarity of vocational personalities would result in an increase in the effectiveness of the Big Five personality factors' prediction of the themes. Clarity was examined in two contexts, differentiation of the high and low scores on the vocational personality theme scores, and consistency of the two themes on which individuals scored the highest. High differentiation resulted in a clear advantage over low differentiation in the female sample. Again none of the predictions about strength of prediction was borne out by the effect sizes of the beta weights. However, the multiple regressions were significant for five of the six vocational personality themes in the high group of females and only three were significant in the low group of females. Some of the advantage of the high differentiation group may have been because of its larger size, but

the 149 females in the high group versus the 137 females in the low group probably did not account for all the improved power of prediction. Strong support is given to the advantage of high differentiation by the fact that the high differentiation group also compared favorably with the entire group of females. Two hypothesized predictive relationships (i.e., Extraversion predicted Social, and Conscientious negatively predicted Realistic) were significant in the high differentiation group that were not significant in the entire group. The male high differentiation group had significant multiple regression coefficients for three of the vocational personality themes and one more approached significance, while the low differentiation group had only two. It would seem logical that it would be easier to predict the personality factors associated with relatively clear-cut vocational personality themes and that hypothesis was supported in the comparisons of multiple regressions on high and low differentiation groups.

The use of an index of consistency to examine differences of prediction in high and low clarity groups met with less success. The lack of success was probably not due to the index of consistency itself but to other methodological problems. The sample sizes were too low to provide adequate power. In addition, the cutoff point between the high and low groups had to be set so low in order to have nearly equal groups that it is doubtful whether the groups adequately represented different degrees of consistency.

Finally, the fourth hypothesis examined the possible connection between the Big Five Neuroticism factor and issues that may arise for college students in vocational counseling. The issues investigated were level of satisfaction with college major and levels of consistency and differentiation in vocational personality. Neuroticism's only significant correlation was with the females' satisfaction with college majors. Although the relationship was statistically significant in females, the two variables shared only 4% of their variance.

This study generalized the main conclusion of two recent studies (Costa et al., 1984; Gottfredson et al., 1993) by using a different population sample and different assessment instruments. Holland's model of vocational personality was related in predictable ways to the reputedly more comprehensive Big Five factor model of personality. A more unexpected conclusion in the present study was that the Big Five model's comprehensive nature did not mean it explained more of the variance in the Holland model than vice versa. While this brought into question the Big Five claim to comprehensiveness, it confirms earlier recommendations by the above researchers that personality should be assessed using both approaches.

Several of the present findings bear confirmation in replication studies, since they would indicate that vocational counselors should expect different connections between personality and vocational interests in males and females. Differences have been found

recently (Costa et al., 1984; Gottfredson et al., 1993; Tokar & Swanson, 1995). Holland (1985a) also acknowledged he found the expected personality characteristics for the vocational themes more often in males than in females as long ago as the 1960s. However, this has been a specific focus of very few studies. In their 1990 annotated bibliography of research on Holland's theory, Holland and Gottfredson mentioned only one study (i.e., Turner & Horn, 1975) that focused specifically on testing gender differences in the correspondence of personality and vocational interest themes.

A gender difference found in the canonical correlation analysis and the multiple regression analysis was that the Openness personality factor was related to interests in the Realistic vocational theme in females but not in males. This is not a finding that was expected here or reported in previous studies. It may, in fact, be an artifact of the population sampled, rather like Tokar and Swanson's (1995) finding that Agreeableness unexpectedly could be used to discriminate between the Artistic theme and the other themes. Tokar and Swanson attributed this anomaly to having an Artistic group that heavily represented teachers and dance instructors, who combine Agreeableness with Artistic interests. It would be valuable to focus research on instances when a particular population might be expected to display "unexpected" combinations of personality and vocational interest themes.

A second gender difference was that the Neuroticism personality factor was related to the Social and Artistic vocational themes in males but not females. The prediction was that Neuroticism would be a weak predictor of the Artistic theme and would not be a predictor of the Social theme. It is interesting to note that interests in some traditionally masculine occupations (i.e., the Realistic theme) was related to Openness in females, while an interest in some traditionally feminine occupations (i.e., the Social and Artistic themes) was related to Neuroticism in males. The latter observation may be partly explained by a finding of Hansen and her colleagues (1993) in a study of the SII reference groups of Men in General and Women in General. Their multidimensional scaling analysis of the structure of vocational interest themes found the Artistic type was further from the center of the hexagon than any other theme for males but not for females. As a result, they conjectured that the group of men "appears to view the Artistic type as most different from the other types" (Hansen et al., 1993). Males' anxiety about interests in traditionally feminine occupation also undoubtedly reflects a cultural perspective that male activities are more prestigious than female activities, and that it is somehow shameful for a man to appear "womanish". It would be interesting to investigate whether this anxiety is also partly developmental and diminishes with age.

Another gender difference of interest is the association of the Investigative vocational theme with the Openness personality factor for males but with the Conscientiousness

personality factor for females. If this is replicated, it could mean that females are more likely to view Investigative careers as requiring fastidiousness and attention to detail, but that males are more likely to see them as involving intellectual curiosity.

The other main aim of this study was to illustrate the importance of assessing Neuroticism when students seek career counseling. This assumption received mixed support and should be investigated further. Neuroticism was found to relate to some vocational themes in males, as described above. Neuroticism had a statistically significant but low correlation with dissatisfaction with college majors for the female sample and no meaningful relationship with differentiation in the level of interest in vocational themes or in the consistency of the vocational themes in which an individual is most interested. It would be worth further research to clarify the relationship of Neuroticism to variables associated with vocational counseling. For instance, is Neuroticism related to career or major decidedness? to whether or not a student seeks vocational counseling? to interest in careers that are non-traditional to one's gender?

Another focus of further research could be the relationship between gender levels of scores on specific Big-Five personality factors, such as Agreeableness, and tendencies to show interest in traditionally gender-specific careers. Studies of the relationship between the Openness personality factor and indices of self-confidence, self-efficacy, and ability would also be valuable.

Implications of the present study for vocational counselors should not be overstated. Several of the findings, such as the relationship between Openness and the Realistic vocational interests in females, must be replicated before they are generalized. However, this study supports the findings of at least three previous studies (Costa et al., 1984; Gottfredson et al., 1993; and Tokar & Swanson, 1995) that indicate that indices of vocational personality share little overlap with general indices of personality, including the Big-Five approach. Counselors should avoid over-reliance on tests of vocational interest to the exclusion of inventories that tap other relevant variables, such as ability, self-efficacy, and neuroticism. It may be particularly important to explore with male clients whether an interest in traditionally female occupations is associated with anxiety. With female clients, who show abilities in Investigative fields and high Conscientiousness but who are reluctant to pursue such careers, it may be important to explore whether a lack of self-confidence (i.e., a failure to attribute Openness characteristics to themselves) explains their reluctance. Another implication of this and other recent similar studies is that while

The present study had several limitations. First, the ACL marker scales for the Big Five personality factors proved to be less than optimum. The multicollinearity of the five factors as measured by the marker scales may have skewed some of the results. This became more apparent as the sample sizes were reduced. The sample size was too small to provide high power in the tests of the effects of high and low differentiation and

consistency. The findings cannot be generalized to populations other than college students. Most particularly, the relationship between the Openness personality factor and the Realistic vocational personality theme in women may not generalize outside a university of science and technology, where agriculture is a strongly represented major.

In conclusion, this study adds one more vote to the call for the use of multiple assessments of personality variables when an individual seeks vocational counseling and it supports continued research into gender differences in how personality relates to vocational interest themes.

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APPENDIX. DATA COLLECTION MATERIALS

INFORMED CONSENT STATEMENT

The purpose of this statement is to give you information to help you decide whether you wish to participate in a research project investigating vocational interests, personality, and self-confidence. You will be asked to respond to a number of paper and pencil questionnaires that are consistent with information assessed when helping an individual in establishing a career choice.

Upon completion of the materials, you will receive two extra credit points applicable towards the designated class and the researcher will gain useful data, therefore making the time spend beneficial to both parties.

There are no known risks to you and all of your responses will be treated with strict regard for confidentiality. Your name will not appear on any answer sheets and will not be connected with any part of the information coming out of the research. Summaries of the results of the research will report group data only.

Your participation in this research is completely voluntary and you may withdraw at any time without penalty or loss of extra credit you have earned. If questions arise about any of the materials presented, ask the experimenter for clarification.

I HAVE READ AND UNDERSTAND THE ABOVE INFORMATION AND AGREE TO PARTICIPATE IN THIS RESEARCH.

Signature

Print your full name

Date

Explanation of the study "Interaction of Personality and Career"

The study that you have just participated in has no hidden purpose. We are interested in the individual differences that are found in career decision making. If you are uncertain about your own career choice, we recommend that you take advantage of the career counseling available at Student Counseling Service. The service is located on the third floor of the Student Services Building, and is available on a walk-in basis Monday through Friday from 8 a.m. to 5 p.m. We thank you for helping us in our research efforts.