The purpose of this study was to identify higher-order dimensions that explain the relationships among the Big 6 interest types and the Big 5 personality traits. Meta-analyses were conducted to identify an $11 \times 11$ true score correlation matrix of interest and personality attributes. Cluster analysis and nonmetric multidimensional scaling were used to identify 3 dimensions that explained relations among the 11 attributes: (a) Interests versus Personality Traits; (b) Striving for Accomplishment Versus Striving for Personal Growth, and (c) Interacting with People Versus Interacting with Things. Overall, results clarified the relationships among interests and personality traits by showing that 3 rather than 2 dimensions best explain the relationships among interests and personality traits.

Personality traits and vocational interests are two major, noncognitive individual difference domains in the field of psychology. Both sets of dispositional attributes are important because they influence numerous outcomes associated with work and life success. One common thread that links personality traits and vocational interests is that they influence behavior through motivational processes. That is, they influence choices individuals make about which tasks and activities to engage in, how much effort to exert on those tasks, and how long to persist with those tasks. Although psychologists have conducted hundreds of studies that investigate one or both topics, the precise nature of the linkages between the two domains remains ambiguous and controversial.

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The purpose of the present study is to investigate the nomological net of the relationships between attributes that comprise the two domains. Cronbach and Meehl (1955) developed the idea of the nomological, or lawful, network in order to provide construct validity evidence of measures. We seek to identify the higher-order dimensions that explain the relationships between vocational interests, as represented by the Big Six interest types (e.g., Holland, 1985), and personality traits, as represented by the Big Five personality dimensions (e.g., Digman, 1990). Identifying the lawful relationships that underlie these two individual difference domains has important practical and theoretical implications. In particular, we can gain a more comprehensive understanding of the fundamental nature of motivation by considering the two domains jointly, rather than studying discrete personality traits or interest types in isolation. In turn, understanding the nature of motivation should lead to the development of better theories and measures that help explain behavior that is under volitional control.

**Personality Traits—Definition and Structure**

*Definitions*

There are many definitions of personality. (See Saucier and Goldberg [2003] for a detailed discussion.) In fact, Allport (1937) called personality one of the most abstract words in our language and listed 50 distinct meanings that were derived from fields as diverse as theology, philosophy, sociology, law, and psychology. Although there is some disagreement among contemporary personality theorists about the meaning of personality, there is agreement that what people do is influenced by stable characteristics, that is, their personality. Hogan (1991) believes that personality has two different meanings and the failure to separate them leads to confusion. The first is a person’s social reputation, which refers to the way an individual is perceived by others; it is personality from the observer’s perspective and is public and verifiable. The second refers to the structures, dynamics, processes, and propensities that explain why a person behaves in a characteristic way; it is private and must be inferred. McCrae and Costa (1989) define personality as enduring emotional, interpersonal, experiential, attitudinal, and motivational styles that explain behavior in different situations. Funder (2001) defines personality as “an individual’s characteristic pattern of thought, emotion, and behavior, together with the psychological mechanisms—hidden or not—behind those patterns.” In sum, personality traits refer to the characteristics that are stable over time, provide the reasons for the person’s behavior, and are
Psychological in nature. They reflect who we are and in aggregate determine our affective, behavioral, and cognitive style.

**Five Factor Model Personality Dimensions**

The *five-factor model* (FFM) of personality describes the basic dimensions of the normal personality. Generally speaking, there is widespread agreement about the five personality dimensions and their content. (See Block [1995] for a contrarian view.) These dimensions (and prototypical characteristics) include: Extraversion (sociable, active, energetic), Agreeableness (cooperative, considerate, trusting), Conscientiousness (dependable, organized, persistent), Emotional Stability (calm, secure, unemotional), and Openness to Experience (imaginative, intellectual, artistically sensitive).

**Vocational Interests—Definition and Structure**

**Definition**

Researchers have provided numerous definitions of vocational interests over the past 50 years. (See Dawis [1991] and Savickas [1999] for a comprehensive discussion of these definitions.) For example, Strong (1960) defined interests as activities that are liked and disliked. Similarly, Kuder (1977) viewed interests as being manifested in preferences for activities. Others saw interests as constellations of likes and dislikes that lead to consistent patterns of behaviors (Berdie, 1944; Cole & Hanson, 1978). Although these definitions are quite different from those provided for personality, other definitions suggest that interests and personality are very similar. Carter (1944) saw interests as based on evaluative attitudes and as such reflect stable personality traits. Moreover, Holland (1973, p. 7) stated the following: “In short, what we have called ‘vocational interests’ are simply another aspect of personality . . . If vocational interests are expressions of personality, then it follows that interest inventories are personality inventories.” (See Holland [1999] for a detailed discussion of this issue.) Further, Bingham (1937) refers to an interest as a dispositional tendency, which has affective, behavioral, and cognitive components, with dimensions of intensity and duration. This definition is also very similar to the definition of personality. Taken together, interests reflect long-term dispositional traits inherent in the person that influence behavior primarily through one’s preferences for certain environments, activities, and types of people.
RIASEC Types

Holland’s (1959, 1966, 1973, 1997) theory of vocational personalities and work environments states that an employee’s satisfaction with a job as well as propensity to leave that job, depend on the degree to which his/her personality matches the occupational environment. Although not without its critics (e.g., Gati, 1991), Holland’s (1997) RIASEC typology has been widely studied in the vocational literature. The RIASEC typology has emerged repeatedly in large samples (Rounds & Tracey, 1993; Tracey & Rounds, 1993), and its generalizability has been supported with cross-cultural analyses (Day & Rounds, 1997). Realistic people prefer activities involving the systematic manipulation of machinery, tools, or animals. Investigative individuals tend to be analytical, curious, methodical, and precise. Artistic people tend to be expressive, nonconforming, original, and introspective. Individuals who are social enjoy working with and helping others. Enterprising individuals enjoy those activities that entail influencing others to attain organizational goals or economic gain. Finally, conventional individuals enjoy the systematic manipulation of data, filing records, or reproducing materials.

Several studies using Holland’s RIASEC typology have shown that congruence between interests and environment is associated with greater satisfaction (e.g., Assouline & Meir, 1987; Mount & Muchinsky, 1978; Spokane, 1985). As this suggests, vocational interests are broad, multifaceted orientations that are associated with behaviors that reflect an individual’s choice to engage in tasks and activities they like and to be in environments where they are surrounded by people who are similar to them. Furthermore, the outcome that is central to researchers and the one most likely influenced by these choices is the degree of satisfaction that results from the congruence between interests and the work environments.

Hypotheses

Dimensions Within RIASEC Types and Within FFM Traits

A useful starting point for exploring the possible higher-order dimensions that are common across the two domains is to examine the evidence pertaining to higher-order dimensions within each domain. Three conceptualizations of the higher-order dimensions of vocational interests have been discussed most prominently. Hogan (Hogan, 1983; Hogan & Blake, 1999) argues that the RIASEC vocational interests consist of two fundamental, bipolar dimensions, Conformity and Sociability. These two higher-order dimensions are centered at right angles to each other on the RIASEC circumplex. The Conformity dimension is aligned with the Conventional
type and Artistic type, and the Sociability dimension bisects two sets of interest types, ranging from Enterprising-Social types to Realistic-Investigative types. Prediger (Prediger, 1982; Prediger & Vansickle, 1992) proposed that interests and environments could be characterized by two somewhat different bipolar dimensions. These two higher-order dimensions are centered on the RIASEC circumplex 30 degrees counterclockwise from Hogan’s dimensions. The People/Things dimension characterizes differences between Social and Realistic types on opposite sides of the hexagon. The Data/Ideas dimension is defined by Enterprising and Conventional versus Investigative and Artistic types, respectively. Gati (1991) found support for a three-group partition model of the structure of interests whereby RIASEC types collapse into three clusters ([Realistic, Investigative], [Artistic, Social], and [Enterprising, Conventional]).

Regarding the structure and dimensionality of personality, Saucier and Goldberg (2003) state that although the Big Five factor solution is robust, other meaningful factor structures also emerge. A higher-order structure that has been supported empirically in several studies is a two-factor solution, which is related to positively valued, dynamic qualities associated with socialization and individual ascendancy. These two factors have been alternatively labeled Factors $\alpha$ and $\beta$ (Digman, 1997), Social Interest and Superiority Striving (Adler, 1939), Communion and Agency (Bakan, 1966), Maintaining Popularity and Gaining Status (Hogan, 1982), and Union and Individuation (Rank, 1945).

The Digman (1997) study is particularly informative because it was derived from correlations based on 14 samples that assessed personality using the FFM model personality instruments. He found support for two—and only two—higher-order factors. Factor $\alpha$ consisted of the FFM factors of Conscientiousness, Emotional Stability, and Agreeableness, whereas Factor $\beta$ consisted of the FFM factors of Extraversion and Openness to Experience. According to Digman (1997) Factor $\alpha$ pertains to impulse restraint, conscience, low hostility and aggression, and neurotic defense. Factor $\beta$ refers to actualization of the self, venturesome encounters with life, openness to new experiences, and use of one’s intellect. We examine whether the higher-order structure of a set of attributes that contains both personality and vocational interests is consistent with Digman’s (1997) Factors $\alpha$ and $\beta$, which were extracted from the FFM variables alone.

**Higher-Order Dimensions Between RIASEC and FFM Types**

The fact that the six RIASEC types and five FFM traits represent noncognitive dispositional attributes that influence recurring patterns of behavior suggests that they are similar. However, these two sets of
dispositional attributes also differ fundamentally both in their relationship to motivational processes and their relationship to outcomes (e.g., preferences versus implementation of intentions). The fundamental nature of this difference revolves around the fact that interests pertain to individuals’ preferences, which influence outcomes associated with satisfaction with choices made. On the other hand, personality traits pertain to self-regulatory and motivational processes, which influence outcomes associated with performance (or satisfactoriness) on chosen tasks. Consistent with these differences, Super (1973), Dawis (1980), and Hogan and Blake (1999) have discussed an underlying structure of these motivational constructs that differ fundamentally in the ways of dealing with the environment. Interests are regarded as driving preferences for the types of environments individuals like to work in. On the other hand, personality traits determine the ways of interacting in those environments and are likely to occupy a position at the opposite end on a dimension representing these motivational constructs.

Although the nature and magnitude of the relations between personality traits and interests have been systematically examined in numerous studies, there are four that are especially relevant to this study. Ackerman and Heggestad (1997) evaluated relations among personality traits, vocational interests, and intellectual abilities. They conducted an extensive meta-analysis of personality–intellectual ability correlations, reviewed literature on interest–intellectual ability correlations, and also gauged the overlap between personality and interests based on three diverse studies (but did not conduct a meta-analysis of personality–interest relationships). With respect to the personality–interest correlations, they observed some very small relations among some pairs of scales (e.g., neither Agreeableness nor Neuroticism was correlated with any of the six Holland types), moderate relations among some pairs of scales (e.g., Conscientiousness with Conventional interests, Extraversion with Enterprising and Social interests), and some moderate-to-substantial correlations (Openness with Investigative, Artistic and Social interests). Based on these analyses they highlighted four trait complexes across the three trait domains: social, clerical/conventional, science/math, and intellectual/cultural. They suggest that abilities, interests, and personality develop in tandem, such that the ability level and personality dispositions determine the probability of success in a particular task domain, and interests determine the motivation to attempt the task.

Sullivan and Hansen (2004) found that associations between personality traits and vocational interests can be accounted for by associations between lower-order personality traits and interests. For example, they found the following associations: the trait of Warmth (a facet of Extraversion) largely accounted for the association between and Social interests
and Extraversion; Assertiveness (a facet of Extraversion) largely explained the association between Enterprising interests and Extraversion; and, Aesthetics (a facet of Openness to Experience) largely accounted for the association between Artistic interests and Openness. Consistent with the conclusion of Ackerman and Heggestad (1997), Sullivan and Hansen (2004) view interests as representing individual differences in the types of activities that individuals find enjoyable and motivating, whereas personality reflects behavioral tendencies, which play a role in both motivation and determining success in particular activities.

Two meta-analytic studies examined the nature and magnitude of the bivariate correlations among the five-factor model (FFM) personality dimensions and Big Six Interests (Barrick, Mount, & Gupta, 2003; Larson, Rottinghaus, & Borgen, 2002). Although the two studies investigated the correlations between each of the Big Six and Big Five attributes, the results have important implications for understanding the higher-order dimensions as well. The Barrick et al. (2003) study was based on 21 studies, yielding 41 independent samples with a total sample size of 11,559. The Larson et al. (2002) meta-analysis was based on 24 samples with a total sample size of 4,923. Only studies that used the NEO-PI or its shortened version, the FFI, (Costa & McCrae, 1992) were included in the Larson et al. study. Although the instruments and samples differed somewhat, both meta-analyses yielded similar results. For example, of the 30 possible pairs of correlations, only four were greater than or equal to .25 in the Barrick et al. study (based on true score correlations): Investigative–Openness, Artistic–Openness, Social–Extraversion, and Enterprising–Extraversion. Similarly, only 5 of the possible 30 correlations were .25 or greater in the Larson et al. study (based on uncorrected correlations). They were the same four listed above for the Barrick et al. study, plus Conventional–Conscientiousness. Thus, the conclusion from these studies is that there are moderate correlations between some personality traits and some interest types, whereas in other cases the correlations are very small. Further, the results show that of the correlations greater than .25, most represent relationships between interests and Factor $\beta$ traits rather than Factor $\alpha$ traits. Collectively, this suggests that a higher-order dimension will emerge from the joint relationship of the RIASEC and FFM attributes that differentiate interests from personality traits.

**Hypothesis 1**: A higher-order dimension will emerge that distinguishes interests from personality traits. It will be defined by RIASEC interests at one end and by Factor $\alpha$ personality traits at the other end, with Factor $\beta$ traits falling in between.

This dimension is hypothesized to reflect fundamental differences among attribute types represented by personality traits and interest types.
However, the possible existence of this dimension does not preclude the possibility that other higher-order dimensions further explain relations between personality and interest domains. The additional dimensions may capture fundamental motives showing how interests and personality traits function jointly to influence behavior. Clearly, the dimensions identified by other researchers within the RIASEC types (e.g., Sociability and Conformity) and within the FFM traits (Factors $\alpha$ and $\beta$) provide a solid foundation for conceptualizing what these dimensions could be. An important issue that has not been addressed in the literature is whether these higher-order dimensions will emerge when both domains are considered jointly, and whether other meaningful dimensions will emerge as alternatives or in addition to them.

Based on the literature reviewed above and deductive reasoning, we believe that two additional higher-order dimensions will explain relations between RIASEC interest types and FFM dimensions. We conceptualize these two dimensions as representing broad-based motives that direct and energize behavior at a basic level. Because the two dimensions of Conformity and Sociability identified for interests by Hogan (1982) are compatible with FFM trait language, we derive the hypotheses using those dimensions. Both the Larson et al. (2002) and Barrick et al. (2003) meta-analyses showed moderate correlations between Conventional interests and Conscientiousness ($r = .25$ and $\rho = .19$, respectively). Thus, we expect these two attributes to form a cluster that defines one end of the dimension. The Larson et al. (2002) and Barrick et al. (2003) meta-analyses also showed moderately strong correlations between Artistic interests and Openness personality traits ($r = .48$, $\rho = .39$, respectively). Further, Digman’s (1997) research has shown a moderately strong correlation between Extraversion and Openness personality traits. This suggests that Extraversion and Openness personality traits and Artistic interests will form a cluster that defines the other end of a dimension. This dimension is similar to the Conformity dimension proposed by Hogan (1982). However, given that it is defined jointly by interests and personality traits, whereas Hogan’s analysis focused exclusively on interests, other interpretations may be warranted.

**Hypothesis 2:** A dimension will emerge that underlies RIASEC types and FFM interests that represent the broad motive of Conformity at one end and Nonconformity at the other. It will be defined by both RIASEC interests and FFM personality traits.

The Larson et al. (2002) and Barrick et al. (2003) meta-analyses also showed moderately strong correlations between Social interests and Extraversion personality traits ($r = .31$, $\rho = .29$, respectively), and Enterprising interests and Extraversion personality traits ($r = .41$, $\rho = .41$,
respectively). In addition, Holland’s circumplex predicts strong correlations between Social and Enterprising interests. We believe that these attributes will cluster together to form one end of a dimension similar to the Sociability dimension proposed by Hogan (1983). Holland’s circumplex shows that Realistic interests are the opposite of Social interests consequently, we expect that Investigative and Realistic interests will cluster together to form the other end of this dimension. These attributes represent the preference to work alone, and with data and things. We do not have an expectation regarding which FFM traits would define this end of the dimension. Collectively, this leads to the following hypothesis.

**Hypothesis 3**: A dimension will emerge that represents preferences for interacting with people at one end and preferences for interacting with data and things at the other. It will be defined by both RIASEC interests and FFM personality traits.

In summary, we propose that the framework of the nomological network of RIASEC interest types and FFM personality traits consists of three higher-order dimensions. The first dimension differentiates the attributes according to two types of attributes, interests versus personality traits. The second two dimensions show that certain personality traits and interests jointly influence two broad-based motives, the desire for conformity versus nonconformity, and desire for interacting with people versus interacting with things.

**Method**

**Meta-Analysis of FFM Traits and RIASEC Types**

In order to examine the dimensionality of the RIASEC and FFM attributes, we formulated an $11 \times 11$ matrix consisting of true score correlations among the FFM dimensions and RIASEC types followed by multidimensional scaling. The $11 \times 11$ matrix was formulated based on the results of three meta-analyses: (a) correlations between the FFM traits and RIASEC types, (b) intercorrelations among FFM types, and (c) intercorrelations among RIASEC types. The formulas developed by Hunter and Schmidt (1990) were used to conduct the meta-analyses. These procedures yield estimates of population relationships after correction for various statistical artifacts. They also yield estimates of variability in the inter study results that may be attributed to statistical artifacts such as sampling error, measurement error due to test unreliabilities, and range restriction.
Meta-Analysis of FFM-RIASEC Correlations

The correlations among the FFM traits and RIASEC types were obtained by updating the meta-analytic results obtained by Barrick et al. (2003) and Larson et al. (2002). As discussed earlier, both studies examined the same basic questions, and yielded similar results and conclusions. For example, the five highest correlations between 30 possible pairs of correlations between interest types and personality traits were the same in both studies: Investigative–Openness; Artistic–Openness; Social–Extraversion; Enterprising–Extraversion, and Conventional–Conscientiousness. Generally speaking, the rank order of the correlations between the different personality–interest pairs was also very similar in both studies.

The scope of the Larson et al. (2002) study was narrower than Barrick et al., as they restricted their studies to only one personality measure, the NEO-PI or the shortened version, the FFI (Costa & McCrae, 1992). The Barrick et al. study included multiple measures of personality, which increases the generalizability of the results, and their sample size was more than double that of Larson et al., which increases the robustness of the findings. We examined the overlap between the two meta-analyses and found that there were four studies in Larson et al. (2002) that were not included in Barrick et al. (2003). A search of the published literature in the vocational psychology journals and personnel psychology journals for studies that had been published since the Barrick et al. study yielded one additional study. Of the five studies, one did not report the necessary effect sizes and we were unable to obtain the other. Thus, we added three studies to the Barrick et al. (2003) data, which yielded a total of five new independent samples. This resulted in 46 studies that served as the basis of the updated meta-analysis.

The true score correlations among the FFM and RIASEC types are based on 46 independent samples (k) with 12,433 individuals. A majority of the samples used a Holland questionnaire (36 samples used the SDS or VPI) or a five-factor model personality questionnaire (31 samples). Furthermore, 22 of the 46 samples consisted of working adults, 16 consisted of college students, 4 consisted of military personnel, and 4 others consisted of both students and adults. We followed the criteria used by Barrick et al. to determine whether a study was included in the meta-analysis. The study had to report the minimum statistics necessary for conducting the meta-analyses such as zero-order correlations or the equivalent, and sample size. Further, the study had to include data on personality measures that could be classified into the FFM personality factors, and used occupational measures that reported results using Holland’s typology, or had to have a one-to-one correspondence with Holland’s six types.
Meta-Analysis of FFM Intercorrelations

The FFM intercorrelations were derived from a meta-analysis of correlation matrices from four frequently used personality inventories, each of which was designed with the purpose of assessing the FFM personality traits (or some close variant of it). The four inventories were the NEO-PI (Costa and McCrae, 1992), the HPI (Hogan & Hogan, 1995), the PCI (Mount, Barrick, & Callans, 1999), and Goldberg’s personality inventory derived from the International Personality Item Pool (IPIP; Goldberg, 1999)).

The NEO-PI-R is a measure of normal personality traits. It measures the FFM dimensions and six facets within each dimension. The normative sample used in this study was based on a composite of three subsamples: (a) a group of 405 men and women in the Augmented Baltimore Longitudinal Study of Aging (ABLSA) who completed the instrument in 1989 and 1990; (b) 329 ABLSA participants who completed the NEO PI-R by computer administration between 1989 and 1991; and (c) 1,539 employees who participated in a national study of job performance. To obtain a reasonably diverse normative sample, 500 men and 500 women were selected from these groups. They were first screened for validity and random responding and then selected to match the U.S. Census projections for 1995. Coefficients alpha for the five scales were: Neuroticism .92, Extraversion .89, Openness .87, Agreeableness .86, and Conscientiousness .90. Thus the matrix for the NEO-PI was based on a normative sample of 1000 adults.

The HPI assesses seven rather than five personality dimensions. The difference being that Extraversion is divided into two factors, Sociability and Ambition; in addition, there is a School Success scale (which was not used in this study). We used the average of the correlation between Sociability and Ambition with each of the five factors from the other inventories to represent the correlations with Extraversion. KR-20 coefficients for the scales were Adjustment .89, Ambition .86, Sociability .83, Likeability .71, Prudence .78, and Intellectance .78. The matrix for the HPI consisted of a normative sample of 11,000 adults who were tested between 1984 and 1992.

The matrix for the PCI consisted of a normative sample consisting of 4,140 adults (Mount et al., 1999). Coefficients alpha for the five scales were Neuroticism .92, Extraversion .89, Openness .87, Agreeableness .86, and Conscientiousness .90.

The matrix for Goldberg’s measure consisted of 486 adults. The IPIP is based on the lexically derived Big Five phenotypic model of personality attributes (Saucier & Goldberg, 1998). Workers rated each item on a 5-point, Likert-type scale (from 1 = very inaccurate to 5 = very accurate).
The meta-analysis was conducted across a total of 10 pairs of variables, each FFM personality factor with the other. The meta-analysis for each pair of variables proceeded as follows. Although the sample sizes differed across inventories, ranging from approximately 400 to 11,000, we weighted each inventory equally using a sample of 1,000. This avoided the potentially biasing effects associated with weighting a particular inventory more heavily than others. We then obtained the average observed correlations and the standard deviation ($SD_r$) for this value. Each observed correlation was corrected for measurement error in both variables using the artifact distribution based on the reliabilities reported by the test authors.

Meta-Analysis of RIASEC Correlations

In the vocational interest literature, a subset of 10 matrices has been frequently used as a normative sample. The use of these samples enhances the generalizability of structural analyses for the RIASEC types. Because of the possible nonindependence of the RIASEC matrices and the unequal representation of the RIASEC measures, two matrices per measure (one based on a female sample and one on a male sample) were chosen to represent the variety of measures used to assess the RIASEC types. When possible, the correlation matrix came from a normative sample to enhance the generalizability of the structural analyses. The 10 RIASEC samples include (a) VPI seventh revision matrices (Gottfredson, Holland, & Holland, 1978) based on accidental samples of employed adults and college students (378 females and 354 males); (b) SDS 1985 edition matrices (Holland, 1987) based on diverse, accidental samples, aged 14 to 74 years, used to revise the SDS (470 females and 297 males); (c) SII-GOT matrices (Hansen & Campbell, 1985) based on the women- and men-in-general samples: matching female ($N = 300$) and male ($N = 300$) samples (by occupational title) of employed adults, stratified according to level and Holland occupational classification, and randomly selected from samples used to construct the occupational scales; (d) CAI-enhanced matrices (Johansson, 1986) based on accidental samples of students and adults (703 females and 488 males); and (e) UNIACT matrices based on a national probability sample of 12th grade students (2,218 males and 2,427 females) that represents U.S. grade 12 enrollment in 1993 (American College Testing, 1995).

The meta-analysis for each pair of interest types followed the procedure for the personality measures described above. The sample sizes differed across inventories, ranging from 400 to 700, and consequently we chose to weight each one equally using a sample of 400. This avoids the potentially biasing effects associated with a particular inventory. We then obtained the
average observed correlations and the standard deviation ($SD_r$) for this value. Each observed correlation was corrected for measurement error in both variables using the artifact distribution based on reliabilities reported by the test authors.

**Cluster Analyses**

Using the $11 \times 11$ matrix of true score correlations, we conducted a cluster analysis to identify groups based on similarities among personality (Big Five) and vocational preference (Big Six) attributes. Although there are several clustering methods such as single linkage, complete linkage, within-group averaging, and Ward’s minimum variance method, a review of simulation research on clustering methods (Milligan & Cooper, 1987) reported that the complete linkage method was better at recovering clusters than were the group-averaging or single linkage methods. Thus, we used the complete linkage method, which identifies clusters by joining cases that are at the same level of similarity as all members of an existing cluster. The 11 attributes are grouped into a series of hierarchically related clusters in which members of each cluster are as similar to each other as possible and members of distinct clusters are as heterogeneous as possible. The resulting hierarchy can be represented by a dendrogram (tree structure). The PROC CLUSTER (Stat User’s Guide, 1990) was used to conduct the cluster analyses.

**Multidimensional Scaling Analyses**

We also conducted nonmetric multidimensional scaling (MDS) to examine the relationships among the 11 variables using the $11 \times 11$ true score correlation matrix. We used SAS PROC MDS (Stat User’s Guide, 1990) to conduct nonmetric MDS analyses. MDS is typically based on measures of dissimilarity between variables but can also be based on correlations, covariances, and other measures of similarity (Davison, 1985; Kruskal & Wish, 1978). MDS is a class of techniques that are useful for investigating the structure of data. Using data indicating the degree of similarity or dissimilarity between measures of various constructs, MDS attempts to locate points (representing each of the variables) in space in such a way that the proximities between points are monotonically related to the similarities between them. That is, points representing constructs that are most similar will be located closest together, and those that are less similar will be located farther apart. Although MDS has not been used as extensively as factor analysis, there are circumstances in which MDS is the superior approach. One is in the analysis of correlation matrices that have circumplex structures (Kluger & Tikochinsky, 2001).
Because empirical evidence supports the existence of Holland’s theorized circumplex of vocational interests, MDS is an appropriate method of analysis.

Property Vector Fitting

The technique of property vector fitting (Kruskal & Wish, 1978) was used to assist the process of labeling the dimensions created in the MDS analysis. The first step in property vector fitting is to obtain the set of coordinates from the MDS analysis that represent the underlying structure. The second step is to obtain scores on proposed characteristics or properties for each of the six interests and five personality attributes that may explain relationships among interests and personality traits. To do this we created a list of 16 characteristics or properties that have been used in the research literature to define relationships among interests and/or personality traits. These 16 characteristics were: (a) Data—preference for working with data-related tasks, for example, keeping records, organizing files and numeric data; (b) Ideas—preferences for working with ideas, for example, cognitive tasks such as thinking, creative mental activity, using knowledge and insight; (c) Things—preferences for working with things, for example, working with impersonal tasks such as dealing with machines, materials, and tools; (d) People—preferences for working with people, for example, interpersonal tasks such as thinking about others, taking care of others, teaching and directing others; (e) Conformity—preferences for conformity, for example, following rules, having a routine, enjoying structure, and have prescribed procedures; (f) Broad preferences—likes and dislikes for specific types of activities; (g) Personal style—enduring emotional, interpersonal, experiential, attitudinal, and/or motivational styles; (h) Reputation—how a person is perceived by others? (i) Identity—a person’s hopes, fears, ambitions, and dreams; (j) Socialization—incorporating the norms of society, to restrain impulses, and/or reduce angry hostility; (k) Personal growth—desire to engage in personal growth, enlargement of self, and/or self-actualization; (l) Accomplishment striving—desire to accomplish things, for example, to get things done in a timely, careful, efficient way; (m) Status striving—desire to get ahead, for example, to prevail or to gain social or material status in groups; (n) Communion striving—desire to get along with others, for example, to be accepted by the group, and the desire to promote and maintain harmony in groups; (o) Abstractness—where abstract means the domain of the attributes is not well defined, and concrete means the domain of the attribute is very well defined; (p) Performance-oriented motivation—engaging in goal setting, self-efficacy, and expectancy beliefs.
Nine PhD students who were enrolled in an OB/HR program and had completed coursework in which Holland’s theory and the FFM personality traits were discussed, and one faculty member (not associated with this study) served as raters. The 10 raters were presented with a packet that consisted of definitions of the 11 attributes (6 interests and 5 personality traits) and were asked to make ratings on a 7-point scale for each attribute on the 16 characteristics or properties. The next step is to use linear multiple regression to regress the score for each property derived from the average of the 10 raters’ ratings onto the coordinates obtained from the MDS analysis (discussed below) for the 11 attributes in order to assess the extent to which the property fits into the underlying structure. The salience of the structure is assessed by the variance accounted for (based on $R^2$). Characteristics that achieved a significant $R (p < .05)$ were included in the figures that are discussed below. The property vector is the line emerging from the origin of the MDS coordinate system that points in the direction of the strongest association between the characteristic and the attribute. By examining the location of the different property vectors in the interest structure, it is possible to identify the structure among these attributes.

Results and Discussion

Table 1 shows the meta-analytic results for the intercorrelations among the RIASEC attributes based on the 10 RIASEC samples. Most of the true score correlations are moderate in magnitude, with 11 of the 15 correlations greater than or equal to $\rho = .20$. We compared the average correlation between interest types that are adjacent to each other in Holland’s circumplex to the average correlation of those that are not adjacent to each other. Consistent with Holland’s theory, the correlations were higher ($\rho = .42$) for adjacent types than those farther apart on the circumplex ($\rho = .17$).

Table 2 shows the meta-analytic results for the intercorrelations among the FFM personality traits. Of the 10 correlations, four were moderately large, that is, exceeded $\rho = .30$. Three pairs of correlations are representative of Factor $\alpha$: Stability–Conscientiousness ($\rho = .52$), Stability–Agreeableness ($\rho = .42$), Conscientiousness–Agreeableness ($\rho = .39$). The other correlation is consistent with Factor $\beta$, Extraversion–Openness ($\rho = .45$).

Table 3 displays the $11 \times 11$ true score correlation matrix consisting of the Big Six interests and the Big Five personality traits, which was derived from the three meta-analyses. Correlations among RIASEC types and among FFM traits were obtained from the two meta-analyses described above. The other correlations in the matrix were obtained from the updated meta-analysis based on Barrick et al. (2003). Of the
### TABLE 1
Meta-Analytic Results for RIASEC Intercorrelations

<table>
<thead>
<tr>
<th>Correlate</th>
<th>$\rho$</th>
<th>$SD_\rho$</th>
<th>90% CV</th>
<th>% Var.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realistic–Investigative</td>
<td>0.45</td>
<td>0.11</td>
<td>(.31, .60)</td>
<td>14.1</td>
</tr>
<tr>
<td>Realistic–Artistic</td>
<td>0.25</td>
<td>0.06</td>
<td>(.17, .33)</td>
<td>40.1</td>
</tr>
<tr>
<td>Realistic–Social</td>
<td>0.18</td>
<td>0.10</td>
<td>(.05, .31)</td>
<td>20.8</td>
</tr>
<tr>
<td>Realistic–Enterprising</td>
<td>0.20</td>
<td>0.07</td>
<td>(.11, .30)</td>
<td>34.1</td>
</tr>
<tr>
<td>Realistic–Conventional</td>
<td>0.27</td>
<td>0.10</td>
<td>(.14, .40)</td>
<td>20.5</td>
</tr>
<tr>
<td>Investigative–Artistic</td>
<td>0.36</td>
<td>0.11</td>
<td>(.23, .50)</td>
<td>16.7</td>
</tr>
<tr>
<td>Investigative–Social</td>
<td>0.26</td>
<td>0.15</td>
<td>(.07, .44)</td>
<td>6.14</td>
</tr>
<tr>
<td>Investigative–Enterprising</td>
<td>0.09</td>
<td>0.12</td>
<td>(.07, .34)</td>
<td>8.1</td>
</tr>
<tr>
<td>Investigative–Conventional</td>
<td>0.17</td>
<td>0.11</td>
<td>(.04, .31)</td>
<td>11.4</td>
</tr>
<tr>
<td>Artistic–Social</td>
<td>0.39</td>
<td>0.14</td>
<td>(.21, .56)</td>
<td>7.6</td>
</tr>
<tr>
<td>Artistic–Enterprising</td>
<td>0.28</td>
<td>0.18</td>
<td>(.13, .43)</td>
<td>16.1</td>
</tr>
<tr>
<td>Artistic–Conventional</td>
<td>0.01</td>
<td>0.13</td>
<td>(.15, .31)</td>
<td>13.9</td>
</tr>
<tr>
<td>Social–Enterprising</td>
<td>0.51</td>
<td>0.10</td>
<td>(.39, .63)</td>
<td>.18</td>
</tr>
<tr>
<td>Social–Conventional</td>
<td>0.29</td>
<td>0.13</td>
<td>(.12, .46)</td>
<td>13.0</td>
</tr>
<tr>
<td>Enterprising–Conventional</td>
<td>0.53</td>
<td>0.13</td>
<td>(.36, .68)</td>
<td>10.6</td>
</tr>
</tbody>
</table>

**Note.** Number of samples in the analysis = 10; Total number of respondents across the samples = 3,760; $\rho$ = estimated true score correlation (corrected for sampling error and unreliability); $SD_\rho$ = estimated true standard deviation for the correlation; 90% CV = estimated 90% credibility value for true score correlation; % Var. = percent variance in correlations accounted for by statistical artifacts.

### TABLE 2
Meta-Analytic Results for Big Five Intercorrelations

<table>
<thead>
<tr>
<th>Correlate</th>
<th>$\rho$</th>
<th>$SD_\rho$</th>
<th>90% CV</th>
<th>% Var.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability–Extraversion</td>
<td>0.24</td>
<td>0.02</td>
<td>(.22, .27)</td>
<td>72.0</td>
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<tr>
<td>Stability–Openness</td>
<td>0.19</td>
<td>0.12</td>
<td>(.03, .34)</td>
<td>7.9</td>
</tr>
<tr>
<td>Stability–Conscientiousness</td>
<td>0.52</td>
<td>0.19</td>
<td>(.27, .73)</td>
<td>2.9</td>
</tr>
<tr>
<td>Stability–Agreeableness</td>
<td>0.42</td>
<td>0.13</td>
<td>(.26, .58)</td>
<td>7.8</td>
</tr>
<tr>
<td>Extraversion–Openness</td>
<td>0.45</td>
<td>0.00</td>
<td>(.45, .45)</td>
<td>368.1</td>
</tr>
<tr>
<td>Extraversion–Conscientiousness</td>
<td>0.17</td>
<td>0.11</td>
<td>(.04, .31)</td>
<td>10.5</td>
</tr>
<tr>
<td>Extraversion–Agreeableness</td>
<td>0.26</td>
<td>0.15</td>
<td>(.07, .44)</td>
<td>6.14</td>
</tr>
<tr>
<td>Openness–Conscientiousness</td>
<td>0.09</td>
<td>0.12</td>
<td>(.06, .23)</td>
<td>8.1</td>
</tr>
<tr>
<td>Openness–Agreeableness</td>
<td>0.17</td>
<td>0.11</td>
<td>(.04, .31)</td>
<td>11.4</td>
</tr>
<tr>
<td>Conscientiousness–Agreeableness</td>
<td>0.39</td>
<td>0.14</td>
<td>(.21, .56)</td>
<td>7.6</td>
</tr>
</tbody>
</table>

**Note.** Number of samples in the analysis = 4; Total number of respondents across the samples = 4,000; $\rho$ = estimated true score correlation (corrected for sampling error and unreliability); $SD_\rho$ = estimated true standard deviation for the correlation; 90% CV = estimated 90% credibility value for true score correlation; % Var. = percent variance in correlations accounted for by statistical artifacts.
### Table 3

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
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</tr>
<tr>
<td>2 Investigative</td>
<td>45</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>3 Artistic</td>
<td>25</td>
<td>36</td>
<td>–</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4 Social</td>
<td>18</td>
<td>26</td>
<td>39</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>5 Enterprising</td>
<td>20</td>
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<td>28</td>
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<tr>
<td>6 Conventional</td>
<td>27</td>
<td>17</td>
<td>01</td>
<td>29</td>
<td>53</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Conscientiousness</td>
<td>05</td>
<td>09</td>
<td>–06</td>
<td>07</td>
<td>08</td>
<td>19</td>
<td>–</td>
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<td>8 Agreeableness</td>
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<td>03</td>
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<td>–06</td>
<td>–01</td>
<td>39</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9 Openness</td>
<td>06</td>
<td>25</td>
<td>41</td>
<td>13</td>
<td>05</td>
<td>–10</td>
<td>09</td>
<td>17</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Extraversion</td>
<td>03</td>
<td>02</td>
<td>09</td>
<td>29</td>
<td>40</td>
<td>06</td>
<td>17</td>
<td>26</td>
<td>45</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>11 Emotional Stability</td>
<td>08</td>
<td>12</td>
<td>–02</td>
<td>04</td>
<td>08</td>
<td>03</td>
<td>52</td>
<td>42</td>
<td>19</td>
<td>24</td>
<td>–</td>
</tr>
</tbody>
</table>

**Note.** True score intercorrelations among the Big Five personality traits and among the Big Six interests are based on the meta-analytic results presented in Tables 1 and 2. Decimal points omitted.

30 possible true score FFM-RIASEC correlations ($\rho$), only 4 were greater than .20: Extraversion–Enterprising ($\rho = .40$), Openness to Experience–Artistic ($\rho = .41$), Extraversion–Social ($\rho = .29$), and Openness to Experience–Investigative ($\rho = .25$). Of the remaining correlations, 22 were $\rho = .10$ or less. Thus there are moderate correlations between some interest attributes and some personality attributes, but in general the correlations between interests and personality are low. As a general observation, correlations are highest for interest measures with other interest measures and for personality measures with other personality measures.

**Cluster Analysis**

The hierarchical structure resulting from cluster analysis is shown by the dendrogram in Figure 1. Considering the RIASEC interests first, three clusters emerged in the following order: Enterprising–Conventional, Realistic–Investigative, Artistic–Social. These clusters correspond to Gati’s (1991) three-group partition model of the structure of interests whereby RIASEC types collapse into three clusters ([E, C], [R, I], and [A, S]). The Realistic–Investigative and Artistic–Social clusters then formed a higher-order cluster, and then combined with the Enterprising–Conventional cluster to form the overall RIASEC interest cluster.

With respect to the FFM traits, Conscientiousness and Emotional Stability formed the first cluster and Openness and Extroversion formed the next cluster. The latter cluster is Digman’s Factor $\beta$. Then Agreeableness joins Conscientiousness and Emotional Stability to form a higher-order
cluster, which is Digman’s Factor $\alpha$. Then the Factor $\alpha$ and Factor $\beta$ clusters join to form an overall personality cluster. The interest cluster and the personality clusters then combine to form the final cluster. Overall, these results are consistent with Gati’s three-group partition model of vocational interests, and support Digman’s two-factor structure of personality traits, $\alpha$ and $\beta$. In general, the results of the cluster analysis show that interests and personality attributes are distinct categories of attributes, as none of the interest types clusters with any of the personality traits until the final step. The results also show which of the Big Six interests and which of the Big Five personality traits are most similar to each other.

**Spatial Analysis**

Determining the appropriate dimensionality of an MDS solution is much like that of factor analysis in that statistical measures must be used in conjunction with substantive considerations. We used Kruskal’s (1964) index of stress as well as interpretability to guide our choice of appropriate dimensionality. Stress is considered to be a “badness-of-fit” index with larger values indicating a poorer solution. $R^2$ values, indicating the correspondence between similarities and Euclidean distances between points in the solution, were used as well.
We conducted a series of two-, three-, and four-dimensional MDS analyses on the $11 \times 11$ RIASEC-FFM matrix of variables. The stress and $R^2$ indices for the three models were as follows: two-dimensional model (stress = .16, $R^2 = .81$), three-dimensional model (stress = .06, $R^2 = .94$), and four-dimensional model (stress = .04, $R^2 = .99$). The three-dimensional model fit the data well and provided a substantially better fit than the two-dimensional model. Although there was slight improvement from the three-dimensional model to the four-dimensional model, inspection of the coordinates revealed that the four-dimensional model was not easily interpretable. Further, Kruskal and Wish (1978) caution that when the ratio of objects to dimensions is much less than 4:1 (as is the case in the four-dimensional solution), there is increased risk of capitalizing on chance. Thus, we focused our attention on the interpretation of the three-dimensional model. Because of the difficulties in displaying a model in three-dimensional space, we present the results in two, two-dimensional figures. Figure 2 shows Dimensions 1 and 2 and Figure 3 shows Dimensions 2 and 3.

To facilitate the interpretation of the dimensions, we display the results of the vector fitting analysis in Table 4. The loadings for the vectors for the 16 properties across the three dimensions and the $R^2$ values are shown.
Figure 3: MDS Results for Dimensions 2 and 3.

TABLE 4

Property Vector Fitting Result

<table>
<thead>
<tr>
<th>Rating scale attributes</th>
<th>Dim 1</th>
<th>Dim 2</th>
<th>Dim 3</th>
<th>$R^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Data</td>
<td>.11</td>
<td>.82*</td>
<td>.19</td>
<td>.71</td>
<td>.03</td>
</tr>
<tr>
<td>2. Ideas</td>
<td>.24</td>
<td>-.76*</td>
<td>.19</td>
<td>.71</td>
<td>.03</td>
</tr>
<tr>
<td>3. Things</td>
<td>.33</td>
<td>.64*</td>
<td>.62*</td>
<td>.80</td>
<td>.01</td>
</tr>
<tr>
<td>4. People</td>
<td>-.11</td>
<td>-.34</td>
<td>-.85*</td>
<td>.84</td>
<td>.01</td>
</tr>
<tr>
<td>5. Conformity</td>
<td>-.12</td>
<td>.84*</td>
<td>-.10</td>
<td>.75</td>
<td>.01</td>
</tr>
<tr>
<td>6. Likes &amp; dislikes</td>
<td>.96*</td>
<td>-.09</td>
<td>-.01</td>
<td>.94</td>
<td>.0001</td>
</tr>
<tr>
<td>7. Styles</td>
<td>-.87*</td>
<td>-.26</td>
<td>-.21</td>
<td>.91</td>
<td>.0005</td>
</tr>
<tr>
<td>8. Reputation</td>
<td>-.85*</td>
<td>-.23</td>
<td>-.19</td>
<td>.86</td>
<td>.002</td>
</tr>
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<td>9. Identity</td>
<td>.13</td>
<td>-.19</td>
<td>-.27</td>
<td>.11</td>
<td>.83</td>
</tr>
<tr>
<td>10. Incorporating norms</td>
<td>-.78*</td>
<td>.54</td>
<td>-.05</td>
<td>.91</td>
<td>.0004</td>
</tr>
<tr>
<td>11. Personal growth</td>
<td>-.15</td>
<td>-.70*</td>
<td>-.11</td>
<td>.53</td>
<td>.13</td>
</tr>
<tr>
<td>12. Accomplish</td>
<td>-.13</td>
<td>.80*</td>
<td>.13</td>
<td>.66</td>
<td>.04</td>
</tr>
<tr>
<td>13. Getting ahead</td>
<td>-.03</td>
<td>-.08</td>
<td>-.66*</td>
<td>.44</td>
<td>.23</td>
</tr>
<tr>
<td>14. Getting along</td>
<td>-.39</td>
<td>.03</td>
<td>-.37</td>
<td>.34</td>
<td>.38</td>
</tr>
<tr>
<td>15. Abstract</td>
<td>.23</td>
<td>-.80*</td>
<td>.17</td>
<td>.72</td>
<td>.02</td>
</tr>
</tbody>
</table>

Note. Dim = Dimension; Values for Dimensions are Standardized beta-weights. *p < less than .05.
A total of 11 of the 16 properties achieved significant $R$ values ($p < .05$). We used these 11 characteristics to aid in the interpretation of the three dimensions. Figures 4 and 5 show the results of the vector fitting analyses.

**Dimension 1: Interests versus Personality Traits**

With respect to Dimension 1, Figure 2 shows that the 11 attributes comprise three distinct clusters, RIASEC interests, and two personality clusters. The six interest types appear in the top half of the dimension and are clearly distinct from the five personality traits, which occupy the bottom part of the dimension. With respect to the FFM traits Conscientiousness, Emotional Stability, and Agreeableness form one cluster, and Openness and Extraversion form the other. These results are consistent with Digman’s (1997) Factors $\alpha$ and $\beta$ and provide a type of validity check by showing that our meta-analytically derived FFM intercorrelations correspond to previous theory and research, even when derived from a larger set of individual difference attributes, which includes interests. Consistent with Digman’s terminology, and for ease of communication, we call the cluster of interest attributes Factor $\gamma$, to differentiate it from Factors $\alpha$ and $\beta$. 

![Figure 4: Vector Fitting Results for Dimensions 1 and 2.](image-url)
Figure 4 shows the results of the vector fitting analyses for Dimension 1. The six interest attributes cluster tightly together at the top of Dimension 1. This suggests that the variance shared by the six attributes is the desire to engage in activities that are liked and to avoid those that are disliked. As would be expected, the vector that clearly defines the top end of this dimension was the attribute category associated with the definition of interests “…attributes that refer to a set of likes and dislikes for specific types of activities.” The five personality traits cluster at the bottom end of Dimension 1. The vector that clearly defines the bottom of this dimension is personal style, which was associated with the definition of personality traits by McCrae and Costa (1989), “enduring emotional, interpersonal, experiential, attitudinal, and/or motivational styles.” The vector fitting results in Figure 4 also show that this dimension was also shown by Hogan’s (1982) conceptualization that personality traits define a person’s reputation, that is, how a person is perceived by others. There is also a vector that bisects Emotional Stability and Conscientiousness, which is consistent with Digman’s Factor α. Overall, the findings confirm Hypothesis 1 as the first dimension shows a clear separation of the 11 attributes into two domains. The RIASEC interests cluster together at one end of the dimension and represent broad preferences for engaging in specific types of reinforcing environments or for specific activities that individuals enjoy. The FFM attributes cluster together at the opposite end and collectively represent enduring personal styles that influence how individuals interact with the environment or activities that they have chosen. Within the cluster of FFM traits, the position of Factor β traits between RIASEC interests and Factor α traits suggests that the motivational properties of Factor β traits are more similar to interests than are Factor α traits.

A question raised by the results for Dimension 1 is what distinguishes the six interest attributes from the five personality traits? As discussed earlier, interests and personality traits are similar in that they both influence individuals’ motivation, for example, choices people make about which activities to engage in, how much effort to exert, and how long to persist with tasks. One possible substantive interpretation of Dimension 1 is that it differentiates the attributes according to how they motivate behavior. As shown in Figure 2, the six interest types, referred to earlier as Factor γ, cluster tightly together. This means that regardless of content, all interest types share something in common and these commonsalities are not shared by personality traits. The variance that is shared among all interests is the desire to engage in activities that are liked. When individuals are in environments that are congruent with their interests, they are more likely to be happy because their beliefs, values, interests, and attitudes are supported and reinforced by people who are similar to them (Dawis, 1991; Hogan
Thus, interests motivate people to engage in activities and tasks that they like and to avoid those they dislike.

At the opposite end of Dimension 1 are Factor $\alpha$ traits, which pertain to impulse restraint, conscience, reduction of hostility and aggression, and neurotic defense. They trigger motivational processes associated with self-regulation—attentional, emotional, and effortful control. The meta-analytic results of Judge and Ilies (2002) showed that Conscientiousness and Emotional Stability, two of the Factor $\alpha$ traits, were related to all three forms of performance-oriented motivation, goal-setting, self-efficacy, and expectancy beliefs. These traits are instrumental to an individual’s success at work and in life in general, as they influence the motivation to get along with others, willingness to incorporate the norms of society, and desire to be a productive, functioning member of society (Digman, 1997).

One final issue pertaining to the interpretation of Dimension 1 is the possibility that it reflects method variance associated with the types of measures used. If true, this suggests that one explanation for the results of the cluster analysis and the results for Dimension 1 of the MDS is that interests cluster together because they are measured using interest inventories, and that personality traits cluster together because they are measured using personality inventories. However, for several reasons we believe this explanation is incomplete. First, we deliberately used multiple interest inventories (SDS, VPI, UNIACT, SCII, CAI) and multiple personality instruments (Hogan, PCI, NEO-PI, and Goldberg’s IPIP) to mitigate this possibility. Moreover, several substantive findings are inconsistent with this idea. MDS results show that although $\gamma$ interests cluster tightly together, the personality traits do not. Two personality clusters emerged, Factors $\alpha$ and $\beta$, as distinct categories of personality traits, yet the five traits were measured by the same personality instruments. Such results are unlikely if the relationships were due only to method effects. However, because we cannot rule out this explanation completely, we acknowledge that Dimension 1 might represent an artifact or method factor.

Dimension 2: Striving for Personal Growth Versus Striving for Accomplishment

Figure 3 displays the relationships among the 11 attributes after controlling for differences in the two major types of attributes captured in Dimension 1, for example, whether the attributes are interests or personality traits. Taken together, Dimensions 2 and 3 clearly illustrate Holland’s model, as the RIASEC circumplex is visibly shown in the figure. Although verifying the circumplex was not a major purpose of our study, the fact that it was clearly reproduced provides a validity check that the 10 interest samples we used accurately capture Holland’s theory. The fact
that the circumplex was reproduced when analyzed jointly with personality traits illustrates the robustness of the model. The figure also shows the relationship of the FFM personality traits with the RIASEC model. Generally speaking, the personality traits occupy the middle portion of the circumplex and bisect it, thereby creating two distinct clusters of interests.

Both ends of Dimension 2 were defined by interest attributes and personality traits. The right side was defined primarily by Conventional interests and Conscientiousness personality traits and to a lesser degree by Enterprising and Realistic interests. The left side was defined primarily by Openness and Extraversion traits and Artistic interests. Figure 5 displays the results of the vector fitting analysis for Dimensions 2 and 3. Three vectors defined the right end of Dimension 2: desire to accomplish things (getting things done in a timely, careful, efficient way), conformity (following rules, having a routine, and preferring structure), and preferences for working with data (keeping records, organizing files, manipulating numeric data). The vector that defined the left end of Dimension 2 was the preference for working with ideas (cognitive activities such as thinking, creative mental activity, and knowledge and insights) and abstraction (attributes that are not well defined). Taken together, these results are consistent with the hypothesis that this dimension reflects Conformity versus Nonconformity.
However, upon further inspection there may be a more appropriate conceptualization of the dimension. Hogan’s view that this dimension reflected Conformity versus Nonconformity was based exclusively on his analysis of interests—Conventional at one end and Artistic at the other. The addition of Conscientiousness traits at one end along with Conventional interests changes the meaning somewhat of the right side of Dimension 2. The two main components of Conscientiousness are Achievement and Dependability. Conscientious people are hardworking, thorough, organized, punctual, and dependable. For this reason, we believe that this end of the dimension reflects more than conformity, although this is certainly a component. Rather, these attributes reflect the desire and motivation to get things done; hence, we refer to this end of the dimension as Striving for Accomplishment.

Collectively, the traits that represent the other end of the dimension are Digman’s (1997) Factor β, with Artistic interests added. Digman (1997) pointed out that Factor β is a very broad concept that is difficult to define. It is closely aligned with the perspective of personal growth theorists such as Rogers (1961) and Maslow (1950), and has also been associated with status (Hogan, 1982), power (McAdams, 1985), and agency (Wiggins, 1991). Collectively, the three attributes reflect a dynamic style of interacting with the environment, venturesome encounters with life, creative self-expression, an appreciation of aesthetics (e.g., Sullivan & Hansen, 2004), and openness to new ideas and thoughts. Figure 5 shows that the vector that defines the left-hand side corresponds to the desire to work with ideas, that is, to engage in creative mental processes using knowledge and insight, and with abstractness, that is, attributes that have domains that are ill-defined. Further, although the multiple R was not significant, the beta for personal growth (e.g., desire to engage in personal growth, enlargement of self, and/or self-actualization) was significant. Overall, this suggests that these attributes reflect more than nonconformity. Rather, we believe that this end of Dimension 2 represents the broad motive associated with Striving for Personal Growth as it reflects seeking new experiences, venturesome encounters with life, creative expression, and openness to new ideas.

**Dimension 3: Working with People Versus Working with Things**

As illustrated in Figure 3, Dimension 3 is defined at the top end by Realistic and Investigative interests and at the bottom end by Extraversion and Enterprising and Social interests. The common variance shared by the attributes that define the top end of Dimension 3 (Investigative and Realistic interests) appears to be the preference to work alone. For example, individuals with these attributes prefer to engage in activities where they
can fix, build, or plant things (Realistic), or investigate, study, or analyze (Investigative). These activities are generally engaged in with little opportunity or need for social interaction. Figure 5 shows that the vector that is most strongly associated with this end of the dimension is the preference to work with things. It is more closely aligned with Realistic interests than with Investigative interests.

The common variance tapped into by the attributes that define the bottom end of Dimension 3 (Enterprising and Social interests, and Extraversion personality traits) is social interaction. The vector that most strongly defines these attributes reflects the preference for working with people, as it bisects the space between Extraversion and Social interests. It should be noted that although each attribute pertains to interactions with others, the specific type of social activities may vary, such as leading, persuading, helping, mentoring, and/or nurturing. This is similar to Prediger’s (1982) conceptualization that one dimension of Holland’s circumplex represents working with people versus working with things and is also generally consistent with Hogan’s (1982) conceptualization of Sociability.

**General Discussion**

The most important contribution of this study is that it clarifies the relationships among personality traits and vocational interests. Previous research has identified the basic similarities and differences between the interest and personality domains, but the precise nature of the underlying structural relations among the attributes has eluded researchers for decades. Meta-analyses of these relations have been helpful, but they implicitly assume bivariate relationships among interests and personality traits. Our results show that the relationships cannot be explained adequately using only two dimensions. The MDS analyses, which account for multivariate relations among the attributes, showed that a two-dimensional representation of the relationships between interests and personality traits fits poorly. Rather, the similarities and differences among attributes representing the two domains are better explained using three dimensions. Stated succinctly, personality and interests comprise three distinctly different types of motivational constructs (Factors $\alpha$, $\beta$, and $\gamma$), which jointly influence two fundamental motives.

There are several implications of our findings. First, all models that seek to explain job performance contain components related to motivation and ability. One implication of our findings is the motivational component of these models should include the three distinct types of individual difference attributes (Factors $\alpha$, $\beta$, and $\gamma$) because each may influence behavior in unique ways. Further, models should include a component that accounts for the fundamental motives associated with Striving for
Self-Growth versus Accomplishment Strivings and Interacting with People versus Interacting with Things. Incorporating these components into models of job performance will help researchers to more fully account for the effects of behavior under volitional control.

The results also have practical implications for the development of new measures of noncognitive attributes. Dimensions 2 and 3 show that certain personality traits and interests can jointly influence the same fundamental motives. For example, Social Interests and Extraversion traits represent preferences for interacting with others. Both attributes direct effort and attention toward environments and activities that involve interactions with others. Similarly, Artistic interests and Openness personality traits represent the desire for personal growth. Together, they operate in similar ways to direct people to seek new experiences, to express oneself in artistic and creative ways, to use one’s intellect, and to challenge the status quo. This suggests that it may be useful to develop multifaceted measures that combine interests and personality traits for those sets of attributes where interests and personality traits have been found to cluster together (e.g., Openness personality traits and Artistic interests; Social interests and Extraversion traits). Such compound trait complexes may predict motivational and performance outcomes better than either attribute measured separately.

Another implication of the findings is that although interests and personality traits can influence the same basic motives, they may differ in how they do this. For example, even though Social interests and Extraversion personality traits influence the motive to interact with others, the motivational process by which they do this is different. Social interests motivate people to seek environments that involve social activities. Extraversion does this too, but it also refers to a particular style of operating in that environment. That is, extraverted people are sociable, active, energetic, bold, dominant, and status seeking. These traits go beyond describing what the person prefers to do, that is, engage in social activities, by defining how the person interacts with the environment. For example, the meta-analytic results of Judge and Ilies (2002) showed that Extraversion is related to the propensity to set goals. In contrast, we were unable to find any research that shows that people high in social interests are more likely to set goals than those low in social interests. In summary, although interests and personality traits can jointly influence the same basic motives, the motivational processes by which they do so may differ.

The results suggest several areas for future research. First, the results reported here are based on two specific sets of individual difference models—the RIASEC types and FFM traits. Although these models are widely accepted in their respective fields, they are not the only ways to classify these two sets of individual differences. For example, personality
has been organized at the highest levels using from one to seven factors (Saucier & Goldberg, 2003), and Gati (1991) has proposed a hierarchical structure for interests. However, because the Big Six and Big Five have been shown to be quite robust across different populations and because we used multiple instruments to measure interests and personality, we expect that our results are generalizable. Nonetheless, different results might have been obtained if relations had been examined using different classification schemes. In addition, future research might also examine whether the same underlying motives would be obtained when another set of noncognitive attributes, values, are also considered in addition to interests and personality.

Another area of future research is to consider nonlinear relationships among interests and personality traits. Hogan, Hogan, and Roberts (1996) encourage researchers to consider nonlinear relations that might exist between personality traits, and by extension, to interests. It is possible that one’s standing on other traits and interests may influence the way in which each trait operates. To examine the influence of these “profiles,” we would need to add information regarding the interactions among RIASEC and FFM variables. The nature of the meta-analytic data in this study restricted us to examining the main effects. Witt, Burke, Barrick, and Mount (2002) illustrate the value of such a configural approach, as they found that personality traits interact when predicting job performance. Specifically, they show that highly conscientious workers who lack interpersonal sensitivity (i.e., low on Agreeableness) are less effective, particularly in jobs requiring extensive cooperation or interaction with others. Although it is not possible to examine nonlinear relationships with meta-analytic data, future researchers could examine whether personality traits and interest types interact to influence individuals’ behavior.

There are several aspects of the study that strengthen the contributions. First, multiple measures of both interests and personality traits were used to mitigate the potential idiosyncratic effects associated with specific instruments. Further, the correlations analyzed in the study were based on large, diverse samples derived by meta-analyses, thereby reducing the effects of sampling error and measurement error. In addition, our results extend previous meta-analyses in this area because we obtained intercorrelations within the FFM attributes and within the RIASEC attributes, which allowed us to investigate the higher-order dimensions of personality and interests. Finally, the use of multidimensional scaling showed that relationships among interests and personality traits cannot be adequately explained by two dimensions. Although meta-analytic studies of the relations between interests and personality have advanced our understanding, they implicitly assume that the underlying structure is two dimensional. This explains, at least partially, why the precise nature of the relationship between interests and personality has eluded researchers for decades. This
study reveals that three rather than two dimensions best explain the underlying structure of interests and personality traits.

Summary

Personality traits and vocational interests are two major noncognitive individual difference domains in the field of psychology. Both play an important role in understanding human behavior because they influence motivation—choices individuals make about which tasks and activities to engage in, how much effort to exert on those tasks, and how long to persist on those tasks. Understanding the sources of common and unique variance among attributes that comprise these two domains provides a more complete understanding of basic human motives. Although the relationship between personality and interests has been generally understood, the precise nature of the structural relationship has eluded researchers for decades. Overall, results clarified the underlying structure among interests and personality traits by showing the ways in which interests and personality traits are both similar and different.

REFERENCES


