

## **META-ANALYSIS OF THE RELATIONSHIP BETWEEN THE FIVE-FACTOR MODEL OF PERSONALITY AND HOLLAND'S OCCUPATIONAL TYPES**

MURRAY R. BARRICK, MICHAEL K. MOUNT, RASHMI GUPTA  
Henry B. Tippie College of Business  
University of Iowa

The purpose of this study is to examine the nature and magnitude of the relationship between 2 widely accepted models for classifying individual differences—the 5-factor model of personality and Holland's RIASEC occupational types. Based on extensive meta-analyses, our results illustrate that there are meaningful relations between some FFM personality dimensions and some RIASEC types. The strongest relationships were obtained between the RIASEC types of enterprising and artistic with the FFM personality dimensions of Extraversion and Openness to Experience,  $\rho = .41$  and  $.39$ , respectively. Three other RIASEC types had moderate correlations with at least 1 FFM personality trait. In contrast, the realistic type was not related to any FFM personality traits. Multiple regression analyses in which each RIASEC type is regressed on the FFM scores (based on meta-analytic estimates), revealed a multiple  $R$  of .11 for realistic, .26 for investigative, .42 for artistic, .31 for social, .47 for enterprising, and .27 for conventional types. The overall conclusion from the study is that although FFM personality traits and RIASEC types are related, they are not merely substitutes for each other.

A review of the I-O psychology literature reveals that there are two widely accepted models for classifying personality and interests. For personality traits, the five-factor model (FFM) of personality has gained widespread acceptance, and for classifying vocational interests and preferences, Holland's RIASEC theory (Holland, 1978, 1985, 1996) has been extensively used. Both models are of substantial theoretical and practical interest to the field of personnel psychology. Each provides a useful classification scheme that facilitates the accumulation and communication of research findings. In fact, each model has been the focus of a great deal of research that has investigated how individual differences relate to outcomes at work.

---

The authors thank Dick Reilly and three anonymous reviewers for their helpful comments concerning an earlier draft of this paper.

Correspondence and requests for reprints should be addressed to Murray R. Barrick, Department of Management and Organizations, Tippie College of Business, University of Iowa, Iowa City, IA 52242-1000; mbarrick@uiowa.edu.

**Ann Marie Ryan served as guest editor for this article.**

Although the focus of these models is different, it is clear that personality traits and vocational interests are related to some degree. In fact, Holland (1978) has stated that vocational interests may actually be another aspect of personality. Given the central role that FFM and RIASEC models play in understanding work behaviors, it is important to understand the relationships between them. Although several studies have been conducted in the past decade that have investigated these relations (e.g., Ackerman & Heggestad, 1997; Costa, McCrae, & Holland, 1984; De Fruyt & Mervielde, 1997; 1999; Tokar & Swanson, 1995), the results have been somewhat equivocal. Therefore, the major purpose of the present paper is to systematically examine the nature and magnitude of these relationships by conducting a quantitative meta-analytic review of the correlations between the FFM personality traits and Holland's RIASEC types. Further, to more completely understand the relationship between these two models, we also investigate the joint relationship of FFM dimensions to each RIASEC type.

#### *FFM and Holland's RIASEC Typology*

The proposition that personality is related to vocational interests is apparent in the work of John Holland (Holland, 1978; 1985), who espoused the theory of vocational personalities and work environments that explicitly "infers the structure of personality from the clustering of vocational interests" (Costa et al., 1984, p. 391). The theory states that an employee's satisfaction with a job, as well as propensity to leave that job, depend on the degree to which the individual's personality matches his or her occupational environment. Recent studies of person-vocational fit, using Holland's (1985) RIASEC typology, consistently find that people are most satisfied if they pursue careers that have a "personality" similar to their own (e.g., Assouline & Meir, 1987; Spokane, 1985). Given the importance of personality in Holland's typology, it is surprising that relatively few studies have reported correlational relationships between Holland's (1985) RIASEC types and personality measures. In the following pages, we first briefly describe the FFM personality model and Holland's RIASEC typology, and then summarize prior research investigating linkages between the two. We then develop a series of hypotheses, which will be tested using data available in primary studies from the literature.

The FFM model of personality describes the basic dimensions of personality at a global level. Though not without its critics (e.g., Block, 1995), there is widespread agreement about the five personality dimensions and their content. 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). This taxonomy provides parsimony and fulfills an integrative function, as specific personality traits likely correlate substantially with at least one of the FFM traits. Because the FFM personality traits are broad constructs, each fundamentally consists of common variance, which enables them to exhibit high cross-situation reliability (Kenrick & Funder, 1991). Thus, these broad personality measures are more likely than narrow traits to be associated with the relatively broad constructs used to assess vocational interests.

Holland's theory states that vocational interests are an important expression of personality, and can be used to meaningfully categorize people and work environments in six types—realistic, investigative, artistic, social, enterprising, or conventional. Although Holland's (1985) RIASEC typology is not embraced by everyone (Gati, 1991), it has been widely validated in the vocational literature (Hansen & Campbell, 1985; Rounds & Tracey, 1993; Tracey & Rounds, 1993). For example, 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, 1998). The realistic person prefers 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 but avoid ordered, systematic activities involving tools and machinery. Enterprising individuals enjoy those activities that entail persuading and leading others to attain organizational goals or economic gain, but they tend to avoid symbolic and systematic activities. Enterprising people often lack scientific ability. Finally, conventional individuals enjoy the systematic manipulation of data, filing records, or reproducing materials. They tend to avoid artistic activities. As this suggests, these vocational interests are multi-level, dispositional traits that are associated with individual preferences for specific types of environments.

Two recent reviews (Ackerman & Heggstad, 1997; Holland, 1996) underscore the need to conduct a comprehensive meta-analysis of FFM and RIASEC relations. Ackerman and Heggstad (1997) assessed the relationship between Holland's RIASEC interests and the FFM by drawing on the results reported in three prior studies (Goh & Leong, 1993; Gottfredson, Jones, & Holland, 1993; Kanfer, Ackerman, & Heggstad, 1996). They found that neither Agreeableness nor Emotional Stability was related to any of the six Holland types. Conscientiousness was re-

lated to the conventional type, Extraversion was shown to be moderately related to the enterprising and social domain, and Openness to Experience was correlated with three Holland types (investigative, artistic, and social). However, no estimates of the true-score correlations were provided. Similarly, Holland (1996) suggested that the six RIASEC types have "strong to weak relationships with four of the Big Five factors" (p. 400). Again, however, no estimates of the magnitude of these relationships are provided.

Empirical differences also emerge if the results from one large scale, primary study (De Fruyt & Mervielde, 1999) are compared with those of Ackerman and Heggestad (1997). Although Ackerman and Heggestad (1997) report results showing Openness to Experience to be related to the investigative type, De Fruyt and Mervielde (1999) found a nonsignificant relationship ( $r = .09$ , between SDI-I and NEO-O,  $N = 335$  college students with a variety of majors). Furthermore, although De Fruyt and Mervielde (1999) found the enterprising type to be significantly related to Conscientiousness ( $r = .33$ ), Ackerman and Heggestad (1997) did not. Finally, De Fruyt and Mervielde (1999) also found Agreeableness was significantly related to the social type ( $r = .20$ ) and the enterprising type ( $r = -.25$ ) and Emotional Stability associated with the enterprising type ( $r = .32$ ) and the conventional type ( $r = .26$ ), and Ackerman and Heggestad (1997) reported no effects attributable to either Agreeableness nor Emotional Stability on any Holland types. We believe that an important contribution of our study will be to resolve these conflicting findings by conducting a comprehensive meta-analysis.

### *Expected Relations Between Personality Dimensions and RIASEC Types*

In the present study, we examine the relationship between the FFM model of personality and the six types in Holland's RIASEC typology. Ideally, theory would guide the development of our hypotheses. However, based on our review of the literature, we were unable to locate a comprehensive theory that describes the way personality traits and vocational interests relate to each other. Perhaps this is due to the belief that the linkage between these two sets of individual difference variables is so clear that it is unnecessary to develop a theory that accounts for their similarities and differences. This perspective is typified by Holland (1985), who argues that vocational interests are important expressions of a person's personality, which clearly suggests that personality traits and vocational interests are related. Recognizing that there is overlap between the two, however, provides little guidance about which specific personality traits are likely to be associated with which types of interests.

A useful starting point for understanding the interrelations among vocational interests and personality traits is to examine their respective definitions. Dawis (1991) stated that "interests are specific activities and objects through which to attain values and meet needs" (p. 838), and "personality traits are ways of acting to meet needs." Thus, interests reflect our preferences (likes and dislikes) and personality depicts our behavioral tendencies (ways we tend to feel, think, and act). Recognizing this distinction, we believe the relationship between personality and interests will be greatest when an individual's behavioral tendencies "match" their preferences. Having reviewed the content of the five broad clusters of personality traits and the six vocational types earlier, it is apparent that some behavioral tendencies (personality traits) will map more clearly on preferences (vocational interests) than they will on others. Obviously, the two paradigms are not isomorphic. The fact that there are five personality factors and six vocational types means that there will not be a clear match between the two paradigms. It also suggests that some personality traits may not clearly map on any vocational interests, whereas other personality traits will map on more than one vocational interest type. For example, Ackerman and Heggstad (1997) found moderate to substantial correlations between extraversion and enterprising types. This makes sense as people with a behavioral tendency to be active, bold, and adventurous (i.e., extraverted) are likely to be highly compatible in activities or jobs that require them to use their verbal skills to persuade and lead others (e.g., enterprising interests). When the behavioral tendencies represented by a particular personality type are congruent with or "match" the person's preferences for activities, the relationship between personality and interests will be stronger. In the vocational psychology literature, congruence is often used to refer to similarity between the person's vocational interests and the type of environment they work in. However, we believe that congruence between a person's personality and their vocational interests is also an important form of congruence, which has important implications for understanding work outcomes.

To derive our hypotheses, we use a construct-based approach and to a lesser extent, results of previous research to account for these congruence effects. Because the constructs in both the RIASEC model and the FFM are well defined and understood, we based our hypotheses on deductive reasoning regarding the degree of overlap in content between constructs in the two models. For ease of communication, all hypotheses are described from the perspective of the FFM constructs. First, we believe that extraverts should prefer enterprising and social jobs. Extraverts are social, assertive, active, bold, energetic, and adventurous

(Costa & McCrae, 1992; Goldberg, 1992). The desire to influence others and obtain organizational goals or economic rewards is also a basic motivation of extraverts (Gray, 1987). Two recent studies that set out to examine the relationship between personality traits and Holland types (Barrick & Gupta, 1997; De Fruyt & Mervielde, 1999) found the enterprising type was correlated with Extraversion ( $r = .57$  and  $.44$ ). Similarly, they found the social type was associated with Extraversion ( $r = .20$  and  $.26$ ). Ackerman and Heggstad (1997) also supported these relationships. People who are extraverted are thus predicted to have preferences for enterprising and social jobs.

*Hypothesis 1:* Extraversion will be positively related to vocational interest scores on enterprising and social types.

Agreeableness is centrally related to one's relations with others. People who score high on Agreeableness are altruistic, friendly, sympathetic, and eager to help others (Costa & McCrae, 1992). Goldberg (1992) found Agreeableness to be associated with tendencies toward kindness, unselfishness, generosity, and fairness. Moreover, agreeable people usually strive for cooperation rather than competition (Costa & McCrae, 1992). This suggests that Agreeableness is related to vocational interests associated with the social type. Recent studies (Barrick & Gupta, 1997; De Fruyt & Mervielde, 1999) also support this as they reported significant correlations ( $.34$  and  $.20$ ) between the social type and Agreeableness.

*Hypothesis 2:* Agreeableness will be positively related to vocational interest scores on the social type.

Conscientiousness is fundamentally related to impulse control and achievement striving (Digman, 1990; Watson, Clark, & Harkness, 1994). People who score high on Conscientiousness are dependable, orderly, self-disciplined, hardworking, and achievement striving. These traits have been shown to be related to performance in virtually all jobs (e.g., Barrick & Mount, 1991; Barrick, Mount & Judge, 2001) regardless of job content. However, in terms of the relationship to vocational interest type, we believe that Conscientiousness is most relevant for the conventional type, because these jobs involve methodical, procedural activities, such as filing, recording facts, and systematic procedures for assisting customers with goods and services. Support for Conscientiousness being positively related to conventional types ( $r = .16$  and  $.44$ ) is provided by two recent studies (Barrick & Gupta, 1997; De Fruyt & Mervielde, 1999). Ackerman and Heggstad (1997) also provide empirical evidence that Conscientiousness is related to the conventional type.

*Hypothesis 3:* Conscientiousness will be positively related to vocational interest scores on the conventional type.

Openness to Experience refers to traits such as imagination, intellectual curiosity, originality, and unconventionality. Conceptually, these characteristics are most relevant to artistic and investigative types because they involve tasks pertaining to abstraction, insight, nonconformity, and originality. Barrick and Gupta (1997) provide empirical support as they found Openness was significantly correlated with artistic types ( $r = .38$ ) and investigative types ( $r = .26$ ). Further support is provided by Ackerman and Heggestad (1997) who also found Openness was correlated to these two types.

*Hypothesis 4:* Openness to Experience will be positively related to vocational interest scores on the artistic and investigative types.

People who score low on Emotional Stability are anxious, hostile, envious, insecure, depressed, self-conscious, moody, impulsive, and vulnerable (Costa & McCrae, 1992; Goldberg, 1992). Individuals who are low on Emotional Stability are especially stress prone, which suggests that they would be attracted to jobs that are relatively stress free. However, stress can occur in virtually any job, and is caused by the situational characteristics within the job or by characteristics connected to tasks associated with a particular Holland type. Therefore, we believe that scores on Emotional Stability will not be related to any of the RIASEC types. This is supported by Barrick and Gupta (1997), who did not find a meaningful relationship between Emotional Stability and any RIASEC occupational types. Ackerman and Heggestad (1997) support this conclusion, as they found no relationship between any Holland type and Emotional Stability. Consequently, we expect a weak relationship between Emotional Stability and each of the six Holland types.

Review of our hypotheses reveals that no FFM personality trait is expected to be strongly related to the realistic type. This makes sense from a "congruence" perspective, as no FFM personality trait corresponds with preferences for activities requiring physical strength, aggressive action, or motor coordination and skill (i.e., realistic interests). Recent research (Barrick & Gupta, 1997; De Fruyt & Mervielde, 1999) did not find the realistic type to be significantly related to any personality dimension. Similarly, Ackerman and Heggestad (1997) also concluded that no FFM trait was related to the realistic Holland type.

Investigation of the above hypotheses helps our understanding of both the nature and the magnitude of the relationship between each FFM dimension and each RIASEC type. However, a full integration of these models must also investigate the joint effects of multiple personal-

ity traits on these vocational interest types. That is, vocational interests are not related to a single cluster of personality traits, but are more likely related to two or more broadly defined personality dimensions. This is consistent with the conceptualization of vocational types as broadly defined and measuring numerous constructs such as temperament, assessment of work conditions, values, preferences, skills, aptitudes, and abilities. Consequently, we believe there is value in examining the magnitude of the joint effects of FFM dimensions on each of the RIASEC types. A review of our hypotheses would suggest the largest joint relationships for the FFM variables to be with the social type, followed by the artistic, conventional, investigative, and enterprising types. Finally, we expect very low relationships between the FFM personality traits and the realistic type. However, because there has not been prior empirical work examining the joint effects of personality on vocational types, no formal hypotheses are proposed.

### *Method*

#### *Literature Search*

We searched the literature to identify all published empirical research on the relationship between personality and Holland's occupational types. Computer searches of Psychological Databases (1967–1999) were conducted. Because nearly all of the empirical works pertaining to the RIASEC model occur after 1967, no attempt was made to conduct a search for articles prior to 1967. The articles found were checked for further cross-referenced articles. In addition, unpublished studies were collected over the past few years by the primary authors.

Using the selection criteria outlined below, we found 21 studies, yielding 41 independent samples with a total sample size of 11,559. Of these 21 studies, 13 were published in peer-reviewed journals and 8 were unpublished or simply reported in various test manuals (31 of the 41 independent samples were from the published studies). A majority of the samples used a Holland questionnaire (32 samples used the SDS or VPI) or a five-factor model personality questionnaire (26 samples). Furthermore, 20 of the 41 samples consisted of working adults, 13 consisted of college students, 4 consisted of military personnel, and 4 others consisted of both students and adults. Finally, a majority of the samples (31 of 41) reported results by gender (there were 16 male and 15 female samples).

#### *Study Selection*

We included a study if it met the following criteria: (a) it reported sample size and correlation matrices between personality measures and



occupational type measure, (b) it used interest or occupational measures (e.g., SDS, VPI, GOT, SCII, etc.) that reported results using Holland's typology or the scales had a one-to-one correspondence with Holland's six types, and (c) it used FFM personality measures or personality measures with facets that corresponded to important components of one of the FFM personality factors. To make the present review as comprehensive as possible but clear, and to also facilitate interpretation, the following criteria were used to delete the studies. First, articles that did not report correlations (Ahadi, 1991; Banikotes & McCabe, 1972; Martin & Bartol, 1986; Walsh, 1974) or sample sizes for relationships of interest (Broday & Sedgwick, 1991) or were not based at least in part on empirical data were excluded (Hogan, Hogan, & Roberts, 1996; Holland, 1996). Second, articles that used biodata measures of personality (Ebenhardt & Muchinsky, 1982; Neiner & Owens, 1985), or were based on vocational schemes other than Holland's categories (Costa, Fozard, & McCrae, 1977) were excluded because the aim of the present review is to specifically investigate the correspondence between Holland's occupational interests and personality factors as identified by the FFM model. In addition, studies conducted on psychiatric patients (Loughhead & Reardon, 1989), or reported in journals in languages other than English (Jin, 1991; Montag & Schwimmer, 1990) were also excluded. Because most of the studies were from refereed journals or test manuals, no additional methodological or statistical requirements were imposed. The following numbers of studies and samples were included: 18 studies containing 37 samples for Agreeableness, 19 studies with 38 samples for Conscientiousness, 20 studies with 38 and 40 samples, respectively, for Extraversion and Openness to Experience, and 21 studies containing 39 samples for Emotional Stability.

### *Meta-analytic Procedures*

Several meta-analytic techniques are available in the literature (Hunter & Schmidt, 1990). We used the formula developed by Hunter and Schmidt (1990) for several reasons. First, it yields unbiased estimates of population relationships after correction for various statistical artifacts. Second, it allows for estimation of variability in the interstudy results that may be attributed to statistical artifacts such as sampling error, measurement error due to test unreliabilities, and range restriction. Finally, this approach is often used and well understood in the literature.

Meta-analysis was conducted for a total of 30 pairs of variables: Each FFM personality factor as identified in the FFM model with Holland's six occupational types. The meta-analysis for each pair of variables proceeds in several steps: (a) determination of the average observed cor-

relations weighted by the sample size, as well as the standard deviation ( $SD_r$ ) for this value, (b) correction of each observed weighted correlation for individual unreliabilities in the criterion and predictor, (c) determination whether range restriction corrections were applicable, and, finally, (d) determination of the plausibility whether the strength of a relationship varies as a function of a third, moderator variable.

All the studies included in the meta-analysis provided the sample size. One study (Blake & Sackett, 1999) conceptually replicated the relationships by administering two measures of personality, CPI and MBTI, to the same sample and reporting their respective correlations with vocational categories. This violates the assumption of statistical independence of samples. Thus, a composite correlation was computed using the formula reported in Hunter & Schmidt (1990). In addition, a number of studies reported the correlations separately for genders but not for the overall sample. Subgrouping decreases the power of a study and increases the probability of capitalization on chance. However, because statistically, outcome values for nonoverlapping groups have the same properties as values from different studies, and as covariance structures could not be determined, these were treated as independent samples.

Only a subset of the studies reported the reliabilities. We corrected for unreliability in both the personality trait and Holland measure by creating separate artifact distributions. The reliabilities in our sample of studies were augmented by reliability estimates from the inventory manuals from the tests of personality (CPI, MBTI, NEO, NEO-PI) and occupational choices (VPI, SDS), as these tests are well established and have been extensively used in studies in the educational and career and management literatures. The artificial distribution for the personality questionnaire had a mean reliability of .89, and the occupational inventories had a mean reliability of .92.

Another issue that may have a significant effect on the true-score correlations is range restriction. The studies included a heterogeneous group of samples. Because a minority of samples (12 of 41) were clearly diverse geographically and occupationally, they should be broadly representative of the population. Such samples are likely to be relatively unaffected by range restriction. In contrast, seven of the samples consist of participants from just one occupation (e.g., sales applicants) or training setting (e.g., undergraduate psychology or business students). These studies (and others) are likely to be affected by range restriction to some unknown extent. To correct for range restriction, we compared sample specific standard deviations (reported in 14 of the 41 samples) with national norms as provided in the test manuals. Overall samples, the distribution of  $u$  values had a mean of .93 (with a range from .90 to .98 across RIASEC types). We also conducted corrections adjusting for

participant status (college students or working adults), and found the distribution of  $u$  values had a mean of .88 for college students (range from .81 to .95) and .96 for working adults (range from .93 to 1.0). To evaluate the effect of range restriction on the true-score correlations, we compared correlations corrected for range restriction as well as the other statistical artifacts (measurement error and sampling error) with those obtained when only correcting for the other statistical artifacts (excluding range restriction).

Finally, an important contribution of meta-analysis is the identification of moderators that might account for interstudy differences (Hunter & Schmidt, 1990). The studies in the database were coded in terms of four potential moderators: gender, participant status (students or working adults), type of questionnaire (FFM-level or lower level personality test [e.g., 16PF]; and Holland [e.g., SDS, VPI] vs. non-Holland measures [e.g., GOT, SCII] of RIASEC types). Prior research has suggested there are substantial differences in vocational choices and interests due to gender (Benbow, 1988; Hansen, Collins, Swanson, & Fouad, 1993; Lubinski & Benbow, 1992). Of the samples included in this meta-analysis, 16 of the samples were based on responses from males and 15 were from female participants.

The literature also suggests the strength of the relationship between traits and interests may differ if the sample is of college students as opposed to a sample of working adults. For example, Goh and Leong (1993) found low to moderate correlations (only 1 of 15 correlations exceeded .30) between personality (using Eysenck's three factors) and RIASEC. They speculated that one reason for the low to moderate correlations is because the sample was made up of college students, not older adults who could be expected to have more highly differentiated vocational interests. Within samples of students, we also examined whether "type" of student (national merit finalist or not) moderated the relationships. Extant literature shows that differences in personality factors can be expected for smart or high academic achievement students (Dauber & Benbow, 1990; Goff & Ackerman, 1992); such differences have also been demonstrated for vocational choices of intelligent students as opposed to average students (Lubinski & Benbow, 1992). Intelligent students have been found to primarily sort themselves into the realistic and investigative categories (Benbow & Stanley, 1982; Dauber & Benbow, 1990). Of the samples included in this meta-analysis, 13 contained college students, with 4 of these including national merit finalists. Twenty other samples contained working adults as participants.

The final set of moderators revolved around the measures of the constructs being investigated. For personality, it was examined whether relations were stronger for broader (FFM level) measures than "nar-

rower" (non-FFM) scales. Similarly, we examined whether the effects were comparable for those found using Holland's measures (e.g., the SDS, VPI) contrasted with other career interest measures (e.g., GOT, SCII). Twenty-six of 41 samples used FFM questionnaires, and 32 of the samples relied on Holland measures of the RIASEC types.

### *Results*

The results of the meta-analyses are summarized in Tables 1 through 5. Each table presents the results of the meta-analyses for a specific FFM dimension with each RIASEC type. The first six columns of each table contain, respectively, the number of studies on which each distribution was based, the total sample size, the average observed correlation across all studies and the estimated true correlation ( $\rho$ ) corrected for measurement error, the estimated true residual standard deviation ( $SD_\rho$ ) and the 90% credibility value for each distribution, based on its true correlation and  $SD_\rho$  estimates. The last column in each table reports the percentage of observed variance that was accounted for by the statistical artifacts.

The nature of the data in the present study raised several issues pertaining to how or whether to correct for range restriction. For example, nearly one in four of the samples consists of participants from different occupational categories or interests. These samples are quite representative of the general working population and therefore, it is not necessary to correct for range restriction. In contrast, nearly half of the studies do appear to be narrower and less representative of the population, and therefore should be corrected for range restriction because attempting to estimate the true-score correlations for the unrestricted population with data from a restricted population may underestimate the magnitude of this relationship. Yet, as previously stated, a majority of the studies do not include information on sample means and standard deviations. Due to missing variance estimates, it is not clear "how much" these samples should be adjusted. Moreover, if interests are like personality, the effect due to range restriction will be quite small. For example, in a recent meta-analysis of personality-performance relationships, Hurtz and Donovan (2000) reported a mean  $u$  value of .92 across the FFM personality traits. Consequently, it appears that some of these studies should not be corrected for range restriction, although others may need to be corrected, but the amount of the correction is unknown.

This leads one to question how or whether any of the data in our study should be corrected for range restriction. One way to address this issue is to determine what the "maximum" effect due to range restriction, would be, if *all* of the samples were adjusted (even those previously labeled broad and representative) for range restriction, based on the variance data available. By doing this, we can examine how large  $\rho$

TABLE 1  
*Meta-Analytic Results for Correlations Between  
 Extraversion and Holland's Six Occupational Types*

Correlate	<i>K</i>	<i>N</i>	Mean obs <i>r</i>	$\rho$	$SD_{\rho}$	90% C.V.	% Var.
Realistic	39	10,382	.03	0.03	0.06	(.10, -.04)	59.2
Investigative	39	10,382	.01	0.02	0.05	(.08, -.05)	12.6
Artistic	39	10,382	.08	0.09	0.11	(.21, -.05)	30.5
Social	39	10,382	.25	0.29	0.16	(.45, .07)	14.6
Enterprising	39	10,382	.35	0.41	0.21	(.61, .13)	9.4
Conventional	37	9,988	.05	0.06	0.09	(.16, -.06)	35.6

*K* = number of samples in the analysis.

*N* = total number of respondents across the *K* samples.

Mean Obs *r* = the average observed correlation from all studies.

$\rho$  = estimated true score correlation (corrected for sampling error and unreliability).

$SD_{\rho}$  = estimated true standard deviation for the correlation.

90% C.V. = estimated 90% credibility value for true score correlation.

% Var. = percent variance in correlations accounted for by statistical artifacts.

TABLE 2  
*Meta-Analytic Results for Correlations Between  
 Agreeableness and Holland's Six Occupational Types*

Correlate	<i>K</i>	<i>N</i>	Mean obs <i>r</i>	$\rho$	$SD_{\rho}$	90% C.V.	% Var.
Realistic	37	10,879	.00	0.01	0.08	(.09, -.08)	43.9
Investigative	37	10,879	.01	0.01	0.07	(.09, -.07)	49.0
Artistic	37	10,879	.02	0.02	0.10	(.13, -.09)	33.4
Social	37	10,879	.13	0.15	0.12	(.28, .00)	23.7
Enterprising	37	10,879	-.05	-0.06	0.12	(.08, -.19)	25.2
Conventional	35	10,485	-.01	-0.01	0.05	(.05, -.07)	62.5

*K* = number of samples in the analysis.

*N* = total number of respondents across the *K* samples.

Mean Obs *r* = the average observed correlation from all studies.

$\rho$  = estimated true score correlation (corrected for sampling error and unreliability).

$SD_{\rho}$  = estimated true standard deviation for the correlation.

90% C.V. = estimated 90% credibility value for true score correlation.

% Var. = percent variance in correlations accounted for by statistical artifacts.

would be if all of the studies were corrected for range restriction. After making the correction in all analyses, we found the average true-score correlation increased .005. The largest increase across all samples was an increase of .01 in the true-score correlation for enterprising types across all FFM traits and between Extraversion and all RIASEC types. This finding demonstrates that even under the "maximum" conditions when correcting for restriction, the effect on the true-score correlations in this study is trivial.

To ensure that these results are not an artifact of "averaging" range restriction affects from only a subset of these studies, we also compared

TABLE 3

*Meta-Analytic Results for Correlations Between  
Conscientiousness and Holland's Six Occupational Types*

Correlate	<i>K</i>	<i>N</i>	Mean obs <i>r</i>	$\rho$	<i>SD</i> $\rho$	90% C.V.	% Var.
Realistic	38	11,079	.05	0.05	0.06	(.12, -.02)	56.9
Investigative	38	11,079	.07	0.07	0.03	(.10, .04)	85.7
Artistic	38	11,079	-.05	-0.06	0.07	(.03, -.15)	43.1
Social	38	11,079	.06	0.07	0.10	(.18, -.05)	30.3
Enterprising	38	11,079	.07	0.08	0.17	(.27, -.12)	13.6
Conventional	36	10,685	.17	0.19	0.13	(.33, .03)	20.3

*K* = number of samples in the analysis.

*N* = total number of respondents across the *K* samples.

Mean Obs *r* = the average observed correlation from all studies.

$\rho$  = estimated true score correlation (corrected for sampling error and unreliability).

*SD* $\rho$  = estimated true standard deviation for the correlation.

90% C.V. = estimated 90% credibility value for true score correlation.

% Var. = percent variance in correlations accounted for by statistical artifacts.

TABLE 4

*Meta-Analytic Results for Correlations Between  
Emotional Stability and Holland's Six Occupational Types*

Correlate	<i>K</i>	<i>N</i>	Mean obs <i>r</i>	$\rho$	<i>SD</i> $\rho$	90% C.V.	% Var.
Realistic	39	10,684	.07	0.08	0.09	(.18, -.03)	38.0
Investigative	39	10,684	.11	0.12	0.08	(.20, .02)	45.4
Artistic	39	10,684	-.01	-0.01	0.05	(.05, -.06)	68.6
Social	39	10,684	.04	0.04	0.16	(.22, -.14)	16.3
Enterprising	39	10,684	.07	0.09	0.20	(.31, -.16)	10.4
Conventional	37	10,290	.03	0.04	0.14	(.19, -.13)	20.1

*K* = number of samples in the analysis.

*N* = total number of respondents across the *K* samples.

Mean Obs *r* = the average observed correlation from all studies.

$\rho$  = estimated true score correlation (corrected for sampling error and unreliability).

*SD* $\rho$  = estimated true standard deviation for the correlation.

90% C.V. = estimated 90% credibility value for true score correlation.

% Var. = percent variance in correlations accounted for by statistical artifacts.

the results of two meta-analyses conducted on a subset of samples that were broad and representative, and the other conducted on a subset of samples judged to be narrow and restricted studies. This comparison revealed that the true-score correlation only increased by .01 on average, across all analyses. Specifically, of the 30 correlations examined, 14 increased (mean increase in  $\rho$  = .04, ranging from .01 to .10), 8 decreased (mean decrease in  $\rho$  = .04, ranging from .01 to .08), and 8 did not change. Taken together, these results demonstrate that the true-score correlations do not appear to be affected by restriction in the range of scores found in the various samples. Given the uncertainty regarding

TABLE 5  
*Meta-Analytic Results for Correlations Between Openness  
 to Experience and Holland's Six Occupational Types*

Correlate	<i>K</i>	<i>N</i>	Mean obs <i>r</i>	$\rho$	$SD_{\rho}$	90% C.V.	% Var.
Realistic	40	11,440	.05	0.06	0.10	(.18, -.07)	27.3
Investigative	40	11,440	.21	0.25	0.14	(.38, .06)	18.9
Artistic	40	11,440	.34	0.39	0.17	(.55, .16)	12.3
Social	40	11,440	.10	0.12	0.20	(.34, -.12)	10.4
Enterprising	40	11,440	.05	0.05	0.16	(.25, -.15)	13.4
Conventional	38	11,046	-.10	-0.11	0.12	(.05, -.25)	20.5

*K* = number of samples in the analysis.

*N* = total number of respondents across the *K* samples.

Mean Obs *r* = the average observed correlation from all studies.

$\rho$  = estimated true score correlation (corrected for sampling error and unreliability).

$SD_{\rho}$  = estimated true standard deviation for the correlation.

90% C.V. = estimated 90% credibility value for true score correlation.

% Var. = percent variance in correlations accounted for by statistical artifacts.

the appropriateness of adjusting for range restriction and because the maximum effect is so small, the results reported in this study were not corrected for range restriction.

Table 1 reports the findings for the relationship between Extraversion and the RIASEC types. This analysis reveals a moderately strong positive relationship between Extraversion and the Enterprising type ( $\rho = .41$ ,  $SD_{\rho} = .21$ , 90% C. V.  $.13 \leq .41 \leq .61$ ), and a smaller positive relationship between Extraversion and the Social type ( $\rho = .29$ ,  $SD_{\rho} = .16$ , 90% C. V.  $.07 \leq .29 \leq .45$ ). Thus, Hypothesis 1 was supported. However, statistical artifacts accounted for only 9% and 15% of the variance in these correlations, respectively, across the studies. These results indicate the possibility that these relationships might be affected by the presence of moderators.

Table 2 shows the results for Agreeableness. There is a low positive correlation between Agreeableness and the social type ( $\rho = 0.15$ ,  $SD_{\rho} = .12$ ; 33% variance accounted for) as hypothesized (Hypothesis 2). However, the 90% credibility value did include zero ( $.00 \leq .15 \leq .28$ ) indicating the effect is small.

Table 3 shows results for Conscientiousness. There was a moderate positive correlation between Conscientiousness and the conventional type ( $\rho = 0.19$ ,  $SD_{\rho} = .13$ ; 20% variance accounted for; 90% C.V.  $.03 \leq .19 \leq .33$ ), thereby supporting Hypothesis 3. Further, the percent variance accounted for by the statistical artifacts was low enough to suggest the possibility of moderators. There was also a very small positive correlation between Conscientiousness and the investigative type ( $\rho = 0.07$ ,  $SD_{\rho} = .03$ ; 86% variance accounted for, 90% C. V.  $.04 \leq .07 \leq .10$ ).

Table 4 presents the results for Emotional Stability. The overall analysis indicated a moderate relationship between Emotional Stability and the investigative type ( $\rho = .12$ ,  $SD_{\rho} = .08$ ; 45% variance accounted for, 90% C. V.  $.02 \leq .12 \leq .20$ ). Across analyses there was a large amount of unexplained variance remaining, thereby indicating the possibility of moderators.

Table 5 presents the results for Openness to Experience. Results revealed a moderately strong positive relationship between Openness to Experience and the artistic type ( $\rho = .39$ ,  $SD_{\rho} = .17$ ; 12% variance accounted for, 90% C. V.  $.16 \leq .39 \leq .55$ ). Again, there was a substantial amount of variance unexplained by the statistical artifacts. Thus, it is plausible that this relationship is moderated by other variables. In addition, a moderately strong positive correlation was found for Openness to Experience and the investigative type ( $\rho = .25$ ,  $SD_{\rho} = .14$ ; 19% variance accounted for, 90% C. V.  $.06 \leq .25 \leq .38$ ). Thus, Hypothesis 4 was supported.

Gender was not found to be an important, consistent moderator across Holland types. On average, across all personality traits and RIASEC types, the difference in correlations for samples of men and samples of women was less than .02. In fact, the largest difference reported in these analyses was between Extraversion and the conventional type, which showed a small positive relationship for men ( $\rho = 0.12$ ; 90% C. V.  $.03 \leq .12 \leq .22$ ) and a very small negative correlation for women ( $\rho = -.01$ ; 90% C. V.  $-.06 \leq -.01 \leq .03$ ). Although this difference is significantly different, the magnitude of these effects is not large. Furthermore, the variance explained by these analyses generally failed to exceed the 75% rule proposed by Hunter and Schmidt (1990), similar to prior analyses. This suggests the existence of other potential moderators.

The results of the moderator analysis for participant status also revealed a small moderator effect. Across all analyses, relationships between personality and interests were somewhat stronger (mean  $\rho$  increase = .07) when participants were from a working sample rather than from a student sample. However, correlations between personality traits and the Enterprising types (mean  $\rho$  increase = .12) and RIASEC types with Openness to Experience (mean  $\rho$  increase = .10) are somewhat larger consistently for working adults than for college students. Thus, these relationships may be moderated by participant status. Consequently, there is some evidence that the results reported in the omnibus analyses may be somewhat larger if respondents are currently working rather than in college, particularly when they are from the enterprising type or are high in Openness to Experience. However, this moderator does not explain all of the variance in correlation coefficients.



The results of the moderator analyses for type of inventory used for assessing personality (FFM level vs. lower level) and interests (Holland vs. non-Holland measures) indicated a small moderator effect for both measures. The magnitude of the relationship between FFM level scores and Holland types was slightly higher than between non-FFM level scales and non-Holland types (the average correlation increased by .04 for Holland measures and .09 for FFM questionnaires). However, these effects were noticeably larger for three sets of analyses of FFM versus non-FFM moderator analyses. For both enterprising and social types, the average correlation across personality traits increased by .15 when assessed with an FFM questionnaire, with the largest effects between Openness and enterprising types ( $\rho$  increases by .24) and emotional stability and social types ( $\rho$  increases by .24). In addition, the average correlation between Openness and all RIASEC types was .14 larger when FFM questionnaires were used rather than facet level inventories, with the largest increase in correlations reported between social types ( $\rho$  increased by .24). Nevertheless, the average variance explained by these analyses failed to exceed the 75% rule in a majority of cases. Taken together, the results from all of these moderator analyses illustrate that these are possible moderators, but their effects are relatively small and inconsistent, and do not effect the omnibus analyses reported in Tables 1 to 5.

One final moderator analysis was conducted. Previous research with the RIASEC model (Prediger, 1982; Tracey & Rounds, 1993) suggests that to obtain a circumplex structure, a general response set factor should be removed from the RIASEC scores. The results from such computations are ipsatized RIASEC scores. For eight of the samples ( $n = 2,243$  participants) correlations are based on the ipsatized RIASEC scores. Across all analyses reported in Tables 1 through 5, the estimated mean true-score correlations and standard deviations were very similar when the ipsatized samples were dropped from these analyses. Consequently, the ipsatized scores were not found to be an important nor consistent moderator of the relations reported in these tables.

### *Multiple R Between FFM Dimensions and RIASEC Types*

Table 6 reports the multiple  $R$ s from regressions that simultaneously accounted for all FFM dimensions for each of the RIASEC types. These analyses are based on the meta-analytic derived true-score correlations ( $\rho$ ) between each FFM personality dimension and each RIASEC type that was obtained in this study. Thus, each correlation used in the analysis has been corrected for measurement error and sampling error. Estimation of the joint effects of the FFM dimensions with RIASEC types requires information about the interrelation among the FFM dimensions.

TABLE 6  
*Regression Results (Multiple R): FFM Personality Traits Regressed Across Holland RIASEC Types*

RIASEC type	Ave. <i>N</i>	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness	Mult. <i>R</i>
Realistic	10,881	.02(.03)	.08 (.01)	.02 (.05)	.10 (.08)	.03 (.06)	.11
Investigative	10,881	-.09(.02)	-.06 (.01)	.02 (.07)	.10 (.12)	.27 (.25)	.26
Artistic	10,881	-.03 (.09)	-.02 (.02)	-.10 (-.06)	-.06 (-.01)	.44 (.39)	.42
Social	10,881	.26(.29)	.15 (.15)	.04 (.07)	-.14 (.04)	-.01 (.12)	.31
Enterprising	10,881	.52(.41)	-.24 (-.06)	.05 (.08)	.06 (.09)	-.15 (.05)	.47
Conventional	10,519	.09 (.06)	-.01 (-.01)	.23 (.19)	-.04 (.04)	-.21 (-.11)	.27

*Notes:* Estimates reported in columns 3 to 7 are Standardized Regression Coefficients (meta-analytically derived  $\rho$  estimates are in parentheses). Those estimates underlined were hypothesized to be related to the Holland type. Ave. *N* = Harmonic Mean across analyses.

Therefore, we used the meta-analytically derived true-score intercorrelations among the FFM dimensions reported by Ones (1993). The larger these intercorrelations, the smaller the increases in multiple  $R$ .

Table 6 presents the results from these regression analyses. The second column reports the average sample size used in the regressions, based on the harmonic mean of the sample sizes reported between each of the FFM dimensions and the Holland type (see Tables 1–5). The next five columns report the meta-analytically derived standardized regression coefficient for each of the FFM dimensions (with the original  $\rho$ s reported in parentheses). The final column reports the multiple  $R$  (correlation) for personality.

Although the multiple correlations for all FFM dimensions (the last column) were larger than the single largest zero-order correlations for the predictor hypothesized to be relevant for each analysis (as would be expected), the differences were small. In fact, the average increase in prediction of the regression with all FFM dimensions compared to the largest zero-order true-score estimate was .04 (mean multiple  $R = .31$  vs. the mean correlation of the largest predictor for each RIASEC type,  $\rho = .27$ ). Thus, including multiple personality traits consistently improved the prediction of vocational interests, but only slightly. Not surprisingly, the majority of the gain in prediction can be attributed to the FFM traits that were hypothesized to be relevant to that prediction.

Inspection of the last column in Table 6 illustrates only two of the multiple correlations for all personality traits exceeded .40 (multiple  $R = .42$  for the artistic type, .47 for the enterprising type), with three others exceeding .25 (multiple  $R = .26$  for the investigative type, .31 for the social type, .27 for the conventional type). For the realistic vocational type, even after accounting for all FFM personality traits, the multiple correlation is only .11. Thus, the magnitude of the multiple  $R$ s are only moderately large, even when true-score correlations among FFM and RIASEC measured are used.

### *Discussion*

Two widely used models for classifying individual differences are the FFM personality dimensions and Holland's RIASEC model of vocational interests. Both models share the common goal of attempting to predict and explain individuals' work behaviors. However, they are different in that FFM personality dimensions focus on individuals' characteristic ways of acting, thinking, and feeling, whereas RIASEC types focus on individuals' interests and preferences. Nevertheless, considerable overlap between the two models would be expected. Therefore, the fundamental questions we addressed in this study were which constructs in the two models are related and how strong are the relationships. Al-

though there have been a few primary studies that have examined the relationships among FFM traits and RIASEC types, the results have been inconclusive because of conflicting results in some cases. The use of meta-analysis provides a systematic, quantitative way of estimating the nature and magnitude of the relationships across studies.

The meta-analytic results revealed that some of the vocational interest types are moderately related to personality traits, particularly the enterprising and artistic types. Thus, these vocational interests and preferences appear to meaningfully overlap with personality. Other vocational types were found to only overlap somewhat with personality (social types, conventional types, and investigative types). However, the realistic interest type shows a very small relationship with personality variables. Ackerman and Heggestad (1997) support this as they conclude the realistic interests are primarily associated with abilities, including math reasoning, visual perception, and crystallized intelligence.

Taken together, these findings demonstrate that, although, vocational types and FFM personality traits share common variance, the two types of measures tap into different constructs. Even in the best of cases the true-score correlations are less than .50, and in many cases the relationships are quite small. Thus, given these are true-score correlations, it is apparent that the RIASEC vocational types are not simply "alternative" measures of these five broad personality constructs (or vice versa).

Nonetheless, certain of the hypothesized relationships were meaningfully related and these relations appear to be determined by "congruence" between individuals' natural behavioral tendencies (personality traits) and preference for activities (interests). As expected, when there was congruence between personality and interests, we found larger correlations. For example, the two vocational types with the largest social component (enterprising and social) were correlated with Extraversion, and the social type was also related to Agreeableness. These results underscore the role of congruence, as people with a tendency towards sociability and reward-seeking behavior (i.e., extraverts) were found to prefer to engage in occupations and work environments where there is frequent social interaction, particularly when these activities provide opportunities to attain positions of leadership, influence, and material rewards. Furthermore, those who are cooperative, considerate, and sympathetic to others (i.e., highly agreeable people) prefer those activities or work environments where there is considerable social interaction of a cooperative nature (i.e., from the social type). Thus, both extraverted and agreeable people prefer social environments, but the specific nature of the social activities differs.

Similarly, one's predisposition towards Openness to Experience is moderately related to interest in artistic and investigative occupational

types. This makes sense as those high on Openness tend to be imaginative, unconventional, and artistically sensitive, which is associated with activities such as creativity (artistic types) and discovery (investigative types). Finally, traits associated with Conscientiousness correlate with interest in jobs from the conventional domain. Given that these jobs are highly task oriented and impersonal, it makes sense that Conscientiousness, which focuses in part on being detail oriented and highly organized, would be associated with interest in these types of jobs. Finally, although two personality traits (Conscientiousness and Emotional Stability) had true-score correlations with the investigative type that differed from zero, in both instances the magnitude of effects were quite small (i.e.,  $\rho < .10$ ).

One unexpected finding from this study was that the statistical artifacts assessed in this meta-analysis did not account for a large proportion of the variance in correlations across studies. This suggests there may be important moderators to examine in these relationships. However, our results did not lend support to gender as an important moderator of these relationships, even though the extant literature in vocational choices shows major differences for gender (Benbow, 1988; Lubinski & Benbow, 1992). Furthermore, our findings did not indicate consistent differences in the nature of these relationships due to using a broader, FFM-level personality inventory, nor due to using Holland's measures rather than other measures to assess vocational interests.

Another finding of interest is that the magnitude of the relations between personality and vocational interests was slightly larger for responses obtained from adults currently working compared to students, particularly for enterprising types with the FFM and for Openness to Experience with the RIASEC types. Although these were not large moderator effects, they are consistent enough to warrant further consideration. Drawing a distinction between samples of college students and working adults may be important because educational experience may act as a moderator by making certain vocational opportunities more feasible than others. Similarly, lack of education may result in paucity of awareness about the various vocational choices available to one. Furthermore, some of Holland's vocational categories may require more educational experience than other categories. Jobs in the realistic category, such as farmer, truck driver, carpenter, and rancher, are less likely to require formal education than jobs in some other category, such as the investigative type that includes jobs like physicist, anesthesiologist, geologist, and psychologist. Another factor to investigate might be the complexity of jobs within each typology. For these reasons, we encourage future researchers to examine the effect of participant status on these relationships.

Taken together, one would conclude that these moderator effects were relatively unimportant. Although generally true, there nevertheless were a few notable exceptions. First, correlations between enterprising types and FFM traits were consistently larger when assessed using an FFM inventory (e.g., NEO), rather than a facet-level inventory (e.g., GZTS) and when the participants were working adults rather than college students. Similarly, the correlations between social types and FFM traits were larger when FFM questionnaires were used. Finally, correlations between Openness to Experience and the RIASEC types were larger when working adults rather than students were assessed.

Although we were not able to assess other moderators due to the variables reported in the primary data, one particularly promising moderator future researchers might also consider is socioeconomic status (SES). SES has been found to be a predictor of educational level and encompasses the construct of "available opportunities" probably more broadly than education. Thus, alternatively SES could also be tested as a potential moderator.

### *Future Research*

The results of the present study have implications for both theory and practice. The major conclusion from our study is that personality traits and vocational interests are only modestly related, even in the best of cases. The multiple regression results revealed that the percentage of variance accounted for by the block of FFM traits ranged from a low of 1.2 percent for the realistic type to a high of 22.1 percent for the enterprising type. Although FFM traits and vocational interests are related, clearly they are not identical constructs and are not mere substitutes for each other.

Having addressed the issue of the correlation between vocational interests and personality traits, we turn our attention to directions for future research. We discuss two areas of research that may further our understanding of relationships between personality and vocational interests. The first pertains to whether there is a higher order structure that explains relationships among FFM traits and RIASEC interests. The second explores the processes of "how" normal personality traits and interest types are jointly related to work outcomes.

*Structural relations among FFM traits and RIASEC types.* Prior research has shown that both the FFM traits and the RIASEC types can be explained by higher order factors. For example, Digman (1997) examined 14 samples that assessed individuals' personality traits using inventories specifically developed to measure the FFM traits. Factor analyses revealed two, and only two, higher order factors, which he provisionally

labeled Factor  $\alpha$  and Factor  $\beta$ . Factor  $\alpha$  consists 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), one possible explanation for Factor  $\alpha$  is that it represents the socialization process that personality theorists have long written about. It pertains to impulse restraint, conscience, and the reduction of hostility aggression, and neurotic defense. On the other hand, one possible explanation for Factor  $\beta$  is that it refers to personal growth versus personal constriction. It refers to actualization of the self, venturesome encounters with life, openness to new experiences, and use of one's intellect. Digman (1997) argues that both of these factors provide links between the atheoretical FFM model and traditional contemporary theories of personality.

Similarly, the RIASEC types have been shown to consist of higher order factors or dimensions, although there is some disagreement over the exact composition of each. Hogan (1983) and Hogan and Blake (1999) argue that the RIASEC vocational interests consist of two fundamental, bipolar dimensions, which were labeled conformity and sociability. An alternative 2-dimensional representation of RIASEC relations has been proposed by Prediger (1982) and Prediger and Vansickle (1992). It relies on a 30° counterclockwise rotation of Hogan's two dimensions, which Prediger labeled data/ideas and people/things. In Hogan's conceptualization, conformity is aligned with the conventional type and artistic type and sociability bisects two sets of interest types, ranging from enterprising-social types to realistic-investigative types.

Analyses of vocational interests and personality traits at the higher order level may show that the personality factors of  $\alpha$  and  $\beta$  have counterparts in vocational interest. For example, sociability (whether we strive for status interpersonally or prefer nonpersonal tasks) represents preferences for social activities and may be closely related to Factor  $\alpha$ , which Digman (1997) called socialization. Further, nonconformity (whether we strive to conform or be nonconventional) may be more closely related to Factor  $\beta$ , which refers to personality traits that represent preferences for nonconventional activities, personal growth, and openness to new experiences. We believe that future research that examines the relations among these higher order factors of personality and vocational interests may be useful in understanding structural relations among personality traits and vocational interests. In the present study, we were unable to examine these structural relations because the analyses require correlations among FFM factors and among RIASEC types, as well as correlations between FFM factors and RIASEC types.

*RIASEC types, FFM traits, and motivational processes.* The second area for future research to explore is how congruence between person-

ality traits and vocational interests relate to motivational processes and to job performance. As stated earlier, the concept of congruence is well established, particularly in the vocational and personnel psychology literature, and is traditionally defined as the similarity between vocational interests and job types (or job environments). In fact, the basic tenet of person-job congruence is that people whose interests are congruent with the requirements and demands of the job will be more motivated, that is, they will be more satisfied and stay on the job longer. Congruence does not typically include the potential effects of personality traits (unless personality is implicitly assumed to be the same as vocational interests). This is significant in view of our findings, which show that personality traits and vocational interests measure largely different constructs. For this reason, we believe the congruence construct as typically operationalized is underspecified. We expect that congruence will be a more useful psychological construct if it is defined in terms of fit among personality traits, vocational interests, and job content.

Understanding vocational interests is important to the field of personnel psychology because of the implications for understanding work motivation. Both personality traits and vocational interests are believed to represent distal individual difference variables that influence both job choice and job performance through mediating motivational processes. Campbell (1991) theorizes that motivation consists of the choice to exert effort, the choice of level of effort to exert, and choice to persist at a particular level of effort. As we discuss below, congruence between vocational interests and personality traits is likely to influence these choice behaviors.

Recent meta-analyses have shown that two FFM traits, Conscientiousness and Emotional Stability, are consistently related to job performance (Barrick et al., 2001; Hurtz & Donovan, 2000; Salgado, 1997). Furthermore, a recent meta-analysis (Judge & Ilies, 2002) has shown that these same two personality traits are related to performance-oriented motivational measures—goal setting, expectancy beliefs, and self-efficacy. This pattern is not surprising because the motivational processes are the likely mechanisms by which the two personality dimensions predict performance. Thus, individuals who are conscientious and emotionally stable are likely to work harder and to persist at the chosen task, and in turn, to perform better overall, regardless of the person's interests or the content of the job.

On the other hand, the other FFM traits (Agreeableness, Extraversion, and Openness) show a pattern similar to each other, but different from the other two FFM traits. Their relationship with the three motivational processes has been shown to be much weaker and less consistent. Stewart and Barrick (in press) argue that this is because these



traits relate to performance only when the situation is relevant. Thus, Agreeableness is only associated with motivation when the job contains cooperative demands and teamwork. Similarly, Extraversion is related to motivation only when the job emphasizes competitive demands and advancement through a hierarchy.

Interestingly, the relationship of the FFM traits to vocational interests follows a similar pattern. Traits associated with Agreeableness, Extraversion, and Openness are moderately associated with at least one vocational interest type, whereas Conscientiousness and Emotional Stability are not (one exception is that Conscientiousness showed a weak, but nonzero association with conventional interests.) Generally speaking, the characteristic ways that extraverted, agreeable, and open people act, think, and feel lead them to engage in activities characteristic of specific types of jobs. By this we mean that agreeable people engage in social activities, open people engage in investigative or artistic activities, and so forth. We believe that these traits will relate to motivation only when interests and demands from the job are congruent.

On the other hand, the ways that conscientious and emotionally stable people act, think, and feel are not associated with activities that are specific to the content of a particular job. Rather these characteristics lead them to engage in activities and tasks that direct and sustain effort expenditure, which are motivational processes that lead to good performance in all jobs.

Another way that congruence among personality traits, vocational interests, and job environments affects motivation and performance is through job knowledge. Those whose personality and interests are congruent with the job in question will be more motivated to acquire both declarative knowledge and procedural knowledge (McCloy, Campbell, & Cudek, 1994), which in turn leads to higher job performance. Furthermore, we expect that when personality and interests are congruent with actual job duties, people will like their jobs better. Such individuals are likely to be more motivated as evidenced by higher satisfaction and longer job tenure. A recent meta-analysis by Judge, Thoresen, Bono, and Patton, (2001) shows when people perform jobs they like, they tend to be higher performers ( $\rho = .30$  between job satisfaction and performance). Studies of person-organization fit assume people will be more motivated when their personality traits or interests match the job, work team, or organizational context than when they do not. For example, Schneider's (1987) attraction-selection-attrition model posits that people with similar personalities tend to be attracted to, selected by, and retained in a work environment. Thus, congruence enhances the person's motivation to work in those settings. Consequently, we expect that when people choose jobs they prefer to engage in, they will be more motivated

and satisfied at work, which in turn, will lead to higher performance. It should be noted, however, that in one study of college graduates ( $N = 401$ ), De Fruyt and Mervielde (1999) found the RIASEC types did not explain incremental variance in the employability of an applicant over and above the effects due to the FFM traits. This suggests RIASEC types may not add much to predictions regarding work performance or effectiveness. However, future research must examine this issue and the relationship between interests and performance motivation more carefully.

From a theoretical perspective, the preceding discussion suggests that the motivational processes associated with the joint relationship between personality and vocational interests most likely proceeds along one or both of the following paths. One path pertains to Extraversion, Agreeableness, and Openness. For these traits, motivation levels are contingent upon the degree of congruence between personality traits, individuals' preferences for certain activities, and the demands of the job. Thus, an extraverted person with congruent interests will be motivated when the job also emphasizes competitive demands and advancement through a hierarchy. For example, an extraverted person is more likely than an introverted person to be motivated in a door-to-door sales job that requires frequent interactions with others and involves persuasion.

The other path pertains to Conscientiousness and Emotional Stability. For these traits, motivation levels are derived from self-regulatory processes associated with goal setting, expectancy beliefs, and self-efficacy. Thus, motivation levels are not contingent on whether there is congruence between the personality traits and preferences for different types of work environments.

Practically, these results suggest that higher performance can be obtained across all jobs if one hires employees who are highly conscientious and emotionally stable. Whether other personality traits (Extraversion, Agreeableness, and Openness to Experience) result in higher performance depends on whether these traits are congruent with the person's interests and actual job activities. The role of personality and vocational interests is more complex in such situations, however, as the effect obtained from the "contingent" traits and interests are dependent on the personality and interests of other employees in the work environment. This is a fundamentally different approach to selection than that typically conducted.

In conclusion, the meta-analytic findings reported here demonstrate that, although there are some substantive relationships between vocational interests and personality traits, the two models of individual differences are not interchangeable. As expected, the strongest relations occur when the person's behavioral tendencies, captured by their per-

sonality traits, are compatible with the person's preferences for activities, as assessed by one's interests. These results demonstrate which constructs from each model are related as well as the magnitude of the relationships. Future research that examines structural relations among personality and vocational interests using higher order factors, and the motivational processes by which personality traits and vocational interests jointly relate to outcomes such as job and career choice and performance and satisfaction would be beneficial. Furthermore, the potential existence of additional, unexplored moderators of the relationship between RIASEC types and FFM traits suggests the importance of investigating the nature of the relationship between these two sets of basic individual differences across different settings.

## REFERENCES

- Ackerman PL, Heggstad ED. (1997). Intelligence, personality, and interests: Evidence for overlapping traits. *Psychological Bulletin*, 121, 219–245.
- Ahadi SA. (1991). The use of API career factors as Holland occupational type. *Educational and Psychological Measurement*, 51, 167–173.
- Assouline M, Meir EI. (1987). Meta-analysis of the relationship between congruence and well-being measures. *Journal of Vocational Behavior*, 31, 319–332.
- Banikotes PG, McCabe SP. (1972). Interest and personality measurement: Relationship between self-directed search and Eysenck Personality Inventory scores. *Psychological Reports*, 30, 158.
- Barrick MR, Gupta R. (1997). *Examining the relationship between Big Five personality factors and Holland's occupational types*. Working paper, the University of Iowa.
- Barrick MR, Mount MK. (1991). The Big Five personality dimensions and job performance: A meta-analysis. *PERSONNEL PSYCHOLOGY*, 44, 1–26.
- Barrick MR, Mount MK, Judge TA. (2001). The FFM personality dimensions and job performance: Meta-analysis of meta-analyses. Invited submission to a special "selection" issue of *International Journal of Selection and Assessment*, 9, 9–30.
- Benbow CP. (1988). Sex differences in mathematical reasoning ability in intellectually talented preadolescents: Their nature, effects, and possible causes. *Behavioral and Brain Sciences*, 11, 169–232.
- Benbow CP, Stanley JC. (1982). Consequences in high school and college of sex differences in mathematical reasoning ability: A longitudinal perspective. *American Educational Research Journal*, 19, 598–622.
- Blake RJ, Sackett SA. (1995). *Holland's typology and the five-factor model: A rational-empirical analysis*. (unpublished manuscript).
- Broday SF, Sedgwick C. (1991). The relationship between the SCII introversion–extroversion scale and occupational scales. *Educational and Psychological Measurements*, 51, 175–179.
- Campbell JP. (1991). Modeling the performance prediction problem in industrial and organizational psychology. In Dunnette MD, Hough LM (Eds.), *Handbook of industrial and organizational psychology* (pp. 687–732). Palo Alto, CA: Consulting Psychologists Press.
- Costa PT, Fozard JL, McCrae RR. (1977). Personological interpretation of factors from the strong vocational interest blanks. *Journal of Vocational Behavior*, 10, 231–243.

- Costa PT Jr, McCrae RR. (1992). *Revised NEO personality inventory (NEO PI-R) and NEO five-factor inventory (NEO FFI) professional manual*. Odessa, FL: Psychological Assessment Resources.
- Costa PT, McCrae RR, Holland JL. (1984). Personality and vocational interests in an adult sample. *Journal of Applied Psychology*, 69, 390-400.
- Dauber SL, Benbow CP. (1990). Stability of vocational interests among the intellectual gifted from adolescence to adulthood. *Journal of Applied Psychology*, 80, 196-200.
- Dawis RV. (1991). Vocational interests, values, and preferences. In Dunnette MD, Hough LM (Eds.), *Handbook of industrial and organizational psychology*, (pp. 833-871). Palo Alto, CA: Consulting Psychologists Press.
- Day SX, Rounds J. (1998). Universality of vocational interest structure among racial and ethnic minorities. *American Psychologist*, 53, 728-736.
- De Fruyt F, Mervielde I. (1997). The five-factor model of personality and Holland's RIASEC interest types. *Personality and Individual Differences*, 23, 87-103.
- De Fruyt F, Mervielde I. (1999). RIASEC types and Big Five traits as predictors of employment status and nature of employment. *PERSONNEL PSYCHOLOGY*, 52, 701-727.
- Digman JM. (1990). Personality structure: Emergence of the five-factor model. *Annual Review of Psychology*, 41, 417-440.
- Digman JM. (1997). Higher order factors of the Big Five. *Journal of Personality and Social Psychology*, 73, 1246-1256.
- Ebenhardt BJ, Muchinsky PM. (1982). Biodata determinants of vocational typology: An integration of two paradigms. *Journal of Applied Psychology*, 67, 714-727.
- Gati I. (1991). The structure of vocational interests. *Psychological Bulletin*, 109, 309-324.
- Gellatly IR. (1996). Conscientiousness and task performance: Test of a cognitive process model. *Journal of Applied Psychology*, 81, 474-482.
- Goff M, Ackerman PL. (1992). Personality-intelligence relations: Assessment of typical intellectual engagement. *Journal of Educational Psychology*, 84, 537-552.
- Goh DS, Leong FTL. (1993). The relationship between Holland's theory of vocational interest and Eysenck's model of personality. *Personality and Individual Differences*, 15, 555-562.
- Goldberg LR. (1992). The development of markers of the Big Five factor structure. *Psychological Assessment*, 4, 26-42.
- Gottfredson GD, Jones EM, Holland JL. (1993). Personality and vocational interests: The relation of Holland's six interest dimensions to five robust dimensions of personality. *Journal of Counseling Psychology*, 40, 518-524.
- Gray JA. (1987). *The psychology of fear and stress*. New York: Cambridge University Press.
- Hansen JC, Campbell DP. (1985). *Manual for the SVIB-SCII* (4th ed.). Palo Alto, CA: Consulting Psychologists Press.
- Hansen JC, Collins RC, Swanson JL, Fouad NA. (1993). Gender differences in the structure of interests. *Journal of Vocational Behavior*, 40, 200-211.
- Hogan R. (1983). Socioanalytic theory of personality. In Page MM (Ed.), *1982 Nebraska symposium on motivation: Personality—Current theory and research* (pp. 55-89). Lincoln: University of Nebraska Press.
- Hogan R, Blake R. (1999). John Holland's vocational typology and personality theory. *Journal of Vocational Behavior*, 55, 41-56.
- Hogan R, Hogan J, Roberts BW. (1996). Personality measurement and employment decisions: Questions and answers. *American Psychologist*, 51, 469-477.
- Holland JL. (1978). *Manual for the vocational preferences inventory*. Palo Alto CA: Consulting Psychologist Press.
- Holland JL. (1985). *Manual for the self-directed search*. Odessa, FL: Psychological Assessment Resources.

- Holland JL. (1996). Exploring careers with a typology: What we have learned and some new directions. *American Psychologist*, 51, 397-406.
- Hunter JE, Schmidt FL. (1990). *Methods of meta-analysis: Correcting error and bias in research findings*. Newbury Park, CA: Sage.
- Hurtz GM, Donovan JJ. (2000). Personality and job performance: The Big Five revisited. *Journal of Applied Psychology*, 85, 869-879.
- Jin S. (1991). A study of relations between vocational interests and personality. *Bulletin of Educational Psychology*, 24, 91-115.
- Judge TA, Ilies R. (2002). Relationship of personality to performance motivation: A meta-analytic review. *Journal of Applied Psychology*, 87, 797-807.
- Judge TA, Thoreson CJ, Bono JE, Patton GK. (2001). The job satisfaction-job performance relationship: A qualitative and quantitative review. *Psychological Bulletin*, 127, 376-407.
- Kanfer R, Ackerman PL, Heggstad ED. (1996). Motivational skills and self-regulation for learning: A trait perspective. *Learning and Individual Differences*, 8, 185-209.
- Kenrick DT, Funder DC. (1991). The person-situation debate: Do personality traits really exist? In Derlaga VJ, Winstead BA, Jones WH (Eds.), *Personality: Contemporary theory and research*. Chicago: Nelson-Hall.
- Loughead TA, Reardon RC. (1989). The relationship between Holland's SDS differentiation scale and psychological adjustments. *Counseling Psychology Quarterly*, 2, 431-440.
- Lubinski D, Benbow CP. (1992). Gender differences in abilities and preferences among the gifted: Implications for the math/science pipeline. *Current Directions in Psychological Science*, 1, 61-66.
- Martin DC, Bartol KM. (1986). Holland's vocational preference inventory and the Myers-Briggs type indicator as predictors of vocational choice among master's of business administration. *Journal of Vocational Behavior*, 29, 51-65.
- McCloy RA, Campbell JP, Cudeck R. (1994). A confirmatory test of a model of performance determinants. *Journal of Applied Psychology*, 79, 493-505.
- Montag I, Schwimmer M. (1990). Vocational interests and personality traits. *Man and Work*, 2, 77-95.
- Neiner AG, Owens WA. (1985). Using biodata to predict job choice among college graduates. *Journal of Applied Psychology*, 70, 127-136.
- Ones DS. (1993). *The construct validity of integrity tests*. Unpublished doctoral dissertation, University of Iowa.
- Prediger DT. (1982). Dimensions of underlying Holland's hexagon: Missing link between interests and occupations. *Journal of Vocational Behavior*, 21, 259-287.
- Prediger DT, Vansickle TR. (1992). Locating occupations on Holland's hexagon: Beyond RIASEC. *Journal of Vocational Behavior*, 40, 111-128.
- Rounds J, Tracey TJ. (1993). Prediger's dimensional representation of Holland's RIASEC circumplex. *Journal of Applied Psychology*, 78, 875-890.
- Salgado JF. (1997). The five-factor model of personality and job performance in the European community. *Journal of Applied Psychology*, 82, 30-43.
- Schneider B. (1987). The people make the place. *PERSONNEL PSYCHOLOGY*, 40, 437-453.
- Spokane AR. (1985). A review of research on person-environment congruence in Holland's theory of careers. *Journal of Vocational Behavior*, 26, 306-343.
- Stewart GL, Barrick MR. (in press). Lessons learned from the person-situation debate: A review and research agenda. In Smith B, Schneider B (Eds.), *Personality and organizations*. Mahwah, NJ: Erlbaum.
- Tokar DM, Swanson JL. (1995). Evaluation of the correspondence between Holland's vocational personality typology and the five-factor model of personality. *Journal of Vocational Behavior*, 46, 89-108.

- Tracey TJ, Rounds J. (1993). Evaluating Holland's and Gati's vocational-interest models: A structural meta-analysis. *Psychological Bulletin*, 113, 229-243.
- Walsh B. (1974). Consistent occupational preferences and personality. *Journal of Vocational Behavior*, 4, 145-153.
- Watson D, Clark AC, Harkness AR. (1994). Structures of personality and their relevance to psychopathology. *Journal of Abnormal Psychology*, 103, 18-31.

Copyright of Personnel Psychology is the property of Blackwell Publishing Limited and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.