THESIS

THE ROLE OF AFFECTIVE INTEREST IN VOCATIONAL INTEREST MEASUREMENT

Submitted by

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ABSTRACT

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Most vocational interest inventories used today operationalize interests in terms of enjoyment or liking. The potential role of affective interest in vocational preferences has not been examined empirically, despite indications that affective interest and enjoyment are distinct as emotions. The present study aimed to extend research distinguishing affective interest from enjoyment to the context of vocational preferences, and to determine whether incorporating affective interest items into an enjoyment-based vocational interest measure would improve its criterion-related validity for academic major choice and satisfaction. 423 university undergraduates completed online survey items rating vocational activities on various dimensions, including enjoyment and interest, and indicated their academic majors and major satisfaction. Results regarding the discriminant validity of enjoyment and interest in vocational activities were mixed. Affective interest did not have incremental criterion-related validity for academic major choice and satisfaction. These findings and the study's limitations suggest the need for further research on the potential role of affective interest in vocational interest measurement.

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INTRODUCTION

Vocational interests are a key construct in counseling psychology, with the first quantitative measure of vocational interests published by Edward Thorndike 100 years ago (Betsworth & Fouad, 1997; Dik & Rottinghaus, 2011). Since Thorndike's 1912 study of rank-ordered interests, the structure, lifespan trajectory, and applications of vocational interests have been studied extensively, and from the perspective of multiple theories of career development (Hansen, 2005). Despite the breadth and depth of research on vocational interests, however, it remains relatively isolated from fields outside of vocational psychology. There is a dearth of research in particular on the connection between affective or state interest and trait-like vocational interests (see Silvia, 2006 and Silvia, 2008 for reviews). Instead, vocational interest measures often operationalize interests as how much individuals *enjoy* or *like* various occupational activities – rather than how interested or curious they feel about them.

The current study has two main aims. The first is to expand prior research differentiating enjoyment and state/affective interest to the domain of vocational psychology. Second, the study aims to determine whether incorporating items on affective interest into a traditional, enjoyment-based vocational interest measure improves criterion-related validity for academic major choice and satisfaction. To provide context for these aims, related empirical research on vocational interests is briefly reviewed below.

VOCATIONAL INTERESTS: RESEARCH AND APPLICATIONS

Structure of Vocational Interests

The predominant model of vocational interests, both in research and practice, is Holland's model (1997). Holland classified interests as Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC), and arranged these interest types around a hexagon or circumplex based on their interrelationships (e.g., "Realistic" and "Investigative" are more consistent or compatible and thus are adjacent, while "Realistic" and "Social" are less related, even conflicting, and thus are on opposite sides of the circumplex; see Figure 1). Holland construed interests broadly as dispositions leading people to perceive, think and act in characteristic ways, with an individual's overall RIASEC profile representing their personality (Holland, 1997). Holland's Self-Directed Search (Holland, 1985) is one of the few interest inventories that measures interests beyond the enjoyment or liking factor alone. For instance, one section of the inventory asks respondents whether they find various occupations *appealing* or *interesting* versus those that they *dislike* or find *uninteresting*.

In addition to classifying individuals by their RIASEC profiles, Holland also proposed the classification of environments in RIASEC terms by looking at the personalities of people within those environments and features of the environments themselves (Holland, 1997). The basic premise of Holland's theory is that individuals gravitate towards environments congruent with their Holland profiles, and are more satisfied and higher performing in such environments, among other positive outcomes (Holland, 1997).

The basic circular order structure of Holland's hexagon has received robust empirical support across sex (Spokane & Cruza-Guet, 2005) and mixed support among ethnic minority groups, with some suggesting that the model may fit European American and Asian American populations better than individuals of Latino, African, or Native American ancestry (Armstrong, Hubert, & Rounds, 2003; Fouad & Walker, 2005). In addition, less research has investigated Holland's model outside of the U.S., Europe and Asia (Spokane & Cruza-Guet, 2005). Despite these issues, the basic structure of Holland's model appears to remain intact across culture and nationality.

Multiple attempts have been made to fine-tune Holland's model (see Gati, 1991, Hogan, 1983, and Prediger, 1982, for examples). For instance, Prediger translated Holland's circumplex and its six interest types into two bipolar, orthogonal dimensions of People/Things and Data/Ideas (1982). More recently, Tracey and Rounds (1996) advanced a spherical model of interests that adds prestige as a third dimension of Holland's original, hexagonal classification system. Variations on Holland's model in general tend to focus on the structural relationships among the RIASEC types rather than actual item content. That is, potential alternative operationalizations of vocational interests, that go beyond self-reported enjoyment of various occupational activities, have generally gone unexplored.

Development of Vocational Interests

Vocational interests have been referred to as the most stable individual differences construct in all of psychology (Hansen, 2005), with average inter-individual correlations estimated at $r = .7$ or higher over periods of 10 to 20 years for adults (Low et al., 2005; Swanson & Hansen, 1988; Strong, 1955). The mechanisms behind the formation and stabilization of vocational interests, however, are not well understood. Many theories of career development posit some role of subjective, individual experiences in the formation of interests (Holland, 1997; Lent, Brown, & Hackett, 1994). Holland, for instance, cited the role of learning experiences – perceived rewards and punishments – in the formation of vocational interests (1997). Lent and colleagues highlighted the converging and reciprocal effects of self-efficacy beliefs, outcome expectations, and personal goals (which are in turn influenced by prior success or failure with particular activities; Lent et al., 1994). Despite allusions to the role of emotions in vocational interest development, the specific roles of enjoyment and state interest have not received much, if any, empirical attention.

Using Vocational Interests to Predict Career Outcomes

As mentioned, Holland's theory states that individuals gravitate towards environments congruent with their Holland profiles, and those who are well-matched with their environments benefit from various positive career- and job-related outcomes as a result (Holland, 1997). This prediction is generally tested using hit rates, where a "hit" represents a match between the individual's strongest (i.e., highest score) Holland type and their environment's strongest Holland type, which is usually based on the Holland profiles of individuals in that environment. Criterion validity estimates of vocational interests for academic/occupational choice range from 40 to 80 percent depending on the study and the interest inventory used (Hansen, 2005; Hansen & Dik, 2004; Hansen & Neuman, 1999), indicating strong support for this aspect of Holland's theory. In addition, several studies indicate a positive relationship between person-environment congruence and persistence or tenure in the respective academic or occupational environment, and a tendency for individuals who change careers to move in a direction that is more congruent with their interests (see Spokane, Meir, & Catalano, 2000 for a review).

Support for the benefits of a good fit between person and occupation, however, is more mixed. In Spokane and colleagues' 2000 meta-analysis of career outcomes of congruence between individual and environmental Holland profiles, correlations typically did not exceed r = .25; the authors concluded that congruence may be sufficient but not necessary for job satisfaction (Spokane et al., 2000). Low correlations between person-environment congruence and outcomes such as tenure, achievement, and satisfaction have been explained in terms of various methodological limitations including restricted range, measurement issues, and potential moderators (Arnold, 2004; Spokane et al., 2000). The focus of many vocational interest inventory items on enjoyment or liking, as opposed to alternative response anchors such as interest or curiosity, has received little attention as a potential factor in their relatively low criterion-related validity for outcomes beyond career choice.

Vocational Interest Inventories. As stated previously, and despite Holland's broad construal of vocational interests as personality types, the great majority of interest inventories define interests by the degree to which individuals like or dislike various occupational activities. Popular interest inventories include the revised Strong Interest Inventory (SII; Donnay et al., 2005), the Campbell Interest and Skill Survey (Campbell, Hyne, & Nilsen, 1992), and the Self-Directed Search (SDS; Holland, 1985). Of these, only the SDS directs respondents to rate occupational activities based on degree of interest. Unfortunately, in the SDS liking and interest are conflated rather than treated separately. In one section, respondents are asked to indicate whether they find certain occupations *appealing* or *interesting* versus those that they *dislike* or find *uninteresting* (Holland, 1985). Items on most other interest measures do not mention interest at all, but rather form a Holland profile on the basis of self-rated enjoyment or liking alone. The assumption that enjoying an activity and being interested in it are one and the same may reflect a confounded operationalization of vocational interests, given research in other fields of psychology suggesting state/affective interest and enjoyment are distinct (e.g., Banse & Scherer, 1996; Berlyne, 1974; Reeve & Nix, 1997; Silvia, 2006; Turner & Silvia, 2006). The following sections review this research and its implications for the conceptualization and measurement of vocational interests.

RESEARCH ON INTEREST IN OTHER FIELDS OF PSYCHOLOGY

Affective Interest

Although the status of interest as an emotion is debated, advocates of affective interest have argued that interest satisfies criteria for several of the major taxonomies of emotion (Silvia, 2001), including distinct facial expressions and/or physiological changes (e.g., Tomkins, 1962), patterns of cognitive appraisal (Silvia, 2005), informational value (Batson, Shaw, & Oleson, 1992), and functional/motivational value (Izard & Ackerman, 2000; Ortony, Clore, & Collins, 1988; Silvia, 2008). These tentative findings contradict the equation of interest with liking or enjoyment in vocational interest measurement and are reviewed briefly below.

Expressed and perceived interest is associated with distinct physiological changes (Silvia, 2008). The interested facial expression is typified by increased eye contact, widened eyes, parted lips, expressions that are also associated with attention/concentration (e.g., Reeve, 1993; Reeve & Nix, 1997). These findings extend to infants (Izard, Huebner, Risser, & Dougherty, 1980; Langsdorf, Izard, Rayias, & Hembree, 1983; Oster, 1978), and research done within the framework of differential emotions theory has led to the identification of interest as one of seven discrete emotions expressed during infancy (Izard et al., 1980). In addition to the unique facial expressions associated with interest, the speech of interested individuals is characterized by certain vocal cues, such as faster and more variable tempo, compared to the speech of relatively uninterested individuals (Banse & Scherer, 1996). Banse and Scherer (1996) found that interest (as portrayed by actors) was the third most accurately perceived emotion out of 14 vocally expressed emotions, which suggests that indicators of interest may be socially meaningful. Finally, positive emotions including interest are associated with decreased heart rate (Langsdorf et al., 1983; Provost & Gouin-Décarie, 1979).

Interest also has unique cognitive correlates and proposed predictors (see Silvia, 2006 for a review). Izard (1977) described the phenomenological experience of interest as the feeling of being stimulated and engaged by something, and a concomitant desire to further explore or interact with the object of interest. Berlyne (1960) theorized that interest derives from conflict, defined as a combination of perceived novelty, complexity, uncertainty, and/or discord between simultaneous, incompatible possibilities. Berlyne's hypothesized inverted U function, with interest levels highest at moderate levels of conflict, converges with research showing that infants attend to moderately discrepant stimuli over high- and low-discrepancy stimuli (McCall & Kennedy, 1980), as well as Csikszentmihalyi's theory of optimal experience (1990), in which engagement results from tasks that challenge an individual's skill set without being too difficult or insuperable. More recently, Silvia (2006) proposed an appraisal theory of affective interest whereby interest is a function of perceived novelty-complexity, followed by an appraisal of one's ability to understand the target stimulus.

Interest also may have unique motivational value. Feelings of interest motivate individuals to develop knowledge and competence (Silvia, 2001). As mentioned, infants tend to direct their gaze at moderately discrepant/novel stimuli over nondiscrepant stimuli (McCall & Kennedy, 1980). Such "sensation seeking" is requisite for sensory and cognitive development, as some systems/functions require particular forms of stimulation to develop normally (Blakemore & Cooper, 1970; Bradley, Burchinal, & Casey, 2001; Cicerone et al., 2005; Hoyer & Verhaeghen, 2006; Leggio et al., 2005). Interest, or the "curious emotion" (Silvia, 2008), is well positioned to motivate individuals to seek out and engage with novel or complex stimuli. Indeed, some constructivist and motivational theories of learning posit interest as a motivating factor. Piaget, for instance, argued that interest was the primary emotion in early life because it motivated exploratory behaviors, in turn leading to knowledge acquisition (Piaget, 1981; Silvia, 2001). In addition to postulated developmental outcomes of interest, interest and related constructs such as engagement may have positive second-order effects on outcomes, including longevity and psychosocial adjustment among older adults (Swan & Carmelli, 1996; Mishra, 1992), and higher role satisfaction and performance among employees (Kahn, 1990). Finally, by leading individuals to broaden and build upon their life experiences (Fredrickson, 1998), interest may act as a counterweight to anxiety and avoidance of novelty (Silvia, 2008). In sum, research on affective interest, though limited, tentatively suggests that interest is expressed, perceived, and functions as a unique and motivating emotion.

Is interest happiness? The biggest criticism of affective interest to date is that it is not unique from happiness or enjoyment. However, affective interest and enjoyment have been shown to diverge across physiological, cognitive, and functional dimensions, as described earlier. Furthermore, aesthetics research has drawn several distinctions between interest and enjoyment, particularly in terms of predictors. First, whereas enjoyment is associated with that which is familiar, interest is associated with novelty (Silvia, 2001). For instance, Berlyne (1974) found that interest in art objects decreases as a function of multiple exposures, whereas enjoyment may increase or decrease initially depending on stimulus complexity. More specifically, enjoyment of a simple stimulus tends to decrease with subsequent exposures, but increases with multiple exposures to a more complex stimulus (Berlyne, 1974). Interest and enjoyment also appear to relate differently to complexity in and of itself. In a factor analysis of ratings of music, Crozier (1974) revealed interest and pleasantness as distinct factors that diverged across a piece's mathematically derived degree of uncertainty, with highly complex pieces rated as more interesting but less pleasant. The same pattern was found in a study of visual art: Enjoyment plateaued or decreased under conditions of moderately high novelty and complexity, ostensibly because the challenge was too great to be hedonic (i.e., pleasure-driven), while interest, a more eudaemonic/growth-driven emotion, thrived (Normore, 1974).

Finally, interest and pleasure have been shown to diverge in cases of disturbing versus calming stimuli. A recent study in which participants rated the appeal of 13 fine art paintings found that calming paintings were rated as pleasant but uninteresting, and disturbing paintings were rated as interesting but unpleasant (Turner & Silvia, 2006). To summarize, although interest and liking are related and may influence one another (e.g., see Iran-Nejad, 1987), research to date tentatively supports the idea that they are distinct constructs – a finding that may apply to vocational interest measurement as well.

Development of Trait Interests

Even if affective interest is indeed a unique emotion, its relationship with more durable traits – including vocational interests – is currently unknown. Within personality psychology, it has been suggested that affective interest maps onto openness to experience as defined by the five-factor model of personality (McCrae, 1994; Silvia, 2008), as well as trait curiosity (Kashdan, 2004). Research on potential causal links between experiences of affective interest and a curious or novelty-seeking personality is negligible, however. Instead, most of the research in personality psychology examines traits like openness to experience and sensation seeking as predictors rather than outcomes of interest. For instance, sensation seeking is defined by the search for varied and novel experiences, and predicts individual differences in what is perceived as interesting and/or enjoyable (Silvia, 2006).

In contrast to openness to experience and sensation seeking, trait curiosity has been researched from a developmental perspective. Classical conditioning (Kashdan, 2004), operant conditioning (Naylor & Gaudry, 1976), and the interaction of other personality traits (Beswick, 1971) all have been proposed as mechanisms behind the development of trait curiosity. Unfortunately, none of these perspectives has much research to support it, and alternative views of curious or interested behaviors as anxiety reduction mechanisms have been contradicted by empirical data (Kashdan, 2004).

Though theories on trait curiosity/interest development remain unsubstantiated, most posit some role of emotional experiences, including experiences of interest or curiosity, in the development of long-standing trait interest(s). As mentioned previously, the most recent formulation is Silvia's emotion-attribution theory of interest development (2006). The theory, which builds on previously developed "magnification" and "transformation" theories of trait interest development (e.g., Festinger, 1957; Tomkins, 1987), states that trait interests develop through a chain of positive emotional experiences, causal attributions, expectations, and means-end knowledge (i.e. knowledge of how to elicit positive affect, including interest, without also eliciting negative affect such as anxiety). Emotional attributions within this model function as a bridge between temporary interest-arousing experiences and general or domain-specific trait curiosity. Two experiments thus far have provided direct empirical support for Silvia's emotion-attribution theory. In both studies, the experimenters manipulated attributions of participants' emotional states to influence perceived interest in a particular topic in the predicted direction (Silvia, 2004; Gaze, 2000). As with other theorized predictors of trait interest, emotion-attribution theory requires further testing. Its propositions and provisional empirical support, however, suggest links between affective interest and trait interest(s), including vocational interests.

LINKING VOCATIONAL INTERESTS WITH AFFECTIVE INTEREST

The distinctions between affective interest and enjoyment, and potential developmental links between state and trait interest, have important implications for the conceptualization of vocational interests. The research reviewed above elicits two major research questions. The first is whether differences found between affective interest and enjoyment in aesthetics research will extend to the domain of vocational interests. Is interest in an occupational activity distinct from enjoyment of that activity? The second question is whether state/affective interest is part and parcel of vocational interests. As mentioned, most vocational interest assessments measure interest purely via enjoyment, but might this operationalization be improved by accounting for affective interest? Superior criterion-related validity for vocational interest scores that account for affective interest might suggest not only that affective interest is distinct from enjoyment in the context of the RIASEC model, but also that a more nuanced understanding of the RIASEC types themselves is needed. The predictions and rationale related to these aims are described below.

Hypotheses

The first aim of the proposed study is to extend the distinctions found between affective interest and enjoyment in other fields of psychology to vocational interest research. Hypothesis 1 states that enjoyment and affective interest are distinct within the context of vocational preferences. Briefly stated, discriminant validity will be assessed through measuring the absolute correlation between enjoyment and interest[1] scale scores, and through comparing the relationships of enjoyment versus interest scale scores with scores on four other scales (different patterns of relationships would suggest that enjoyment and interest are different constructs). In

[1] "Affective interest" is referred to as "interest" throughout this section as well as the Method and Results sections for the sake of simplicity.

addition, confirmatory factor analysis (CFA) will be used to determine relative goodness of fit of a one-factor enjoyment/interest model of vocational interests versus a two-factor model with enjoyment and interest as separate factors. Details and rationale for the associated sub-hypotheses are described below.

First, in light of previously reviewed research indicating that enjoyment and interest have distinct physiological correlates, patterns of cognitive appraisal, and functional value (see Silvia, 2001, 2008 for a review), it is expected that the correlation between the enjoyment and interest scales in the current study will not be high enough to suggest empirical redundancy. The cut-off *r*-value for empirical redundancy in this case will be set at $r = .80$ based on prior research (Brown, 2006). In addition, as imperfect internal consistency reliability could artificially attenuate the relationship between the scales (e.g., see Le, Schmidt, Harter, & Lauver, 2010 and Schmidt & Hunter, 1999), the correlation between enjoyment and interest will be compared with the lower of the two scales' internal consistency reliability estimates in order to better determine whether, after accounting for measurement error, the scales still seem to measure different constructs. These tests are probably conservative in that the enjoyment and interest scales have identical item content, response scaling, mode of administration, and resulting vulnerability to response bias and inflated correlation. Thus, failure to reject the following sub-hypotheses would constitute compelling evidence for the discriminant validity of enjoyment and interest in the context of vocational preferences:

H1a) Interest and enjoyment of various occupational activities, after adjusting for measurement artifacts, will correlate at less than .80.

H1b) The correlation coefficient between interest and enjoyment will be less than the scales' internal consistency reliability estimates.

Furthermore, based on prior research outside of vocational psychology (e.g., Berlyne, 1960; Campbell & Fiske, 1959), enjoyment and interest in vocational activities were expected to relate differently to subjective complexity, familiarity, and competence in those vocational activities. Such divergence would constitute additional evidence for the discriminant validity of enjoyment and interest.

First, affective interest and enjoyment were expected to relate differently to complexity. Berlyne's (1960) inverted U function of interest across amount of conflict, Csikszentmihalyi's theory of optimal experience (1990), and the finding that infants direct the most attention to moderately discrepant stimuli (McCall & Kennedy, 1980) all suggest that interest generally increases as a function of the perceived complexity of those activities, declining only at very high levels of complexity (Normore, 1974). Enjoyment or pleasure, on the other hand, tends to start declining at significantly lower levels of complexity and may even correlate negatively with complexity overall (Crozier, 1974; Normore, 1974; Silvia, 2006). Taken as a whole, this research leads to the following hypothesis:

H1c) Interest and complexity will correlate significantly more positively than enjoyment and complexity.

Similarly, interest and enjoyment have been suggested to relate differently to novelty/familiarity. Both Berlyne and Silvia's accounts of affective interest state that interest in part derives from novelty, while enjoyment is more often linked to familiarity (Berlyne, 1960; Silvia, 2001, 2006). Aesthetics research and research on interest among infants corroborates these propositions (Berlyne, 1974; McCall & Kennedy, 1980; Silvia, 2001; Turner & Silvia, 2006), leading to the hypothesis that:

H1d) Enjoyment and familiarity will correlate significantly more positively than interest and familiarity.

Finally, enjoyment and interest are predicted to have unique relationships with current and future competence. Silvia's postulated distinction between the functional values of interest ("wanting to know") and enjoyment ("liking what is known"; 2001) suggests that enjoyment will have a stronger relationship with current competence than will interest due to its association with past rewards. The unique value of affective interest for learning (Silvia, 2001), on the other hand, suggests that interest in an activity will correlate more strongly with self-estimates of future competence in that activity than will enjoyment. That is, the more interested an individual is in an activity, the more he/she will see "room for improvement" for that activity, whereas liked (but less interesting) activities will not elicit the same desire to improve one's skills. Thus I propose the following sub-hypotheses:

H1e) Enjoyment and current competence will correlate significantly more positively than interest and current competence.

H1f) Interest and future competence will correlate significantly more positively than enjoyment and future competence.

Finally, CFA will be used to determine the relative goodness of fit of grouping affective interest and enjoyment items as a single factor, versus separating them into two factors (see Figure 2 for a graphical representation of the two-factor model for Realistic activities). CFA is a well accepted statistical method for testing discriminant validity (e.g., Bollen & Long, 1993; Brown, 2006). Based on research indicating that affective interest and enjoyment are unique, I hypothesize that:

H1g) A two-factor model of enjoyment and interest will fit the sample data significantly better than a one-factor model that groups enjoyment and interest items together as indicators of the same construct.

Hypothesis 2 addresses the second study aim to clarify the nature of vocational interests: Should the operationalization of vocational interests include affective interest items in addition to traditional enjoyment- or liking-based items? More specifically, Hypothesis 2 examines whether measuring vocational interests in terms of enjoyment, affective interest, or both simultaneously, differentially supports key predictions of Holland's model regarding career/academic major choice and satisfaction.

Vocational interest research indicates a robust correlation between an individual's Holland type, which is generally assessed by enjoyment/liking, and academic and career choices (Hansen, 2005; Hansen & Dik, 2004; Hansen & Neuman, 1999; Hood & Johnson, 1997). Thus individuals' enjoyment-based Holland scores are expected to correlate with their chosen academic majors in the current study. In addition, given the hypothesized conceptual and empirical distinctions between enjoyment and affective interest (see H1a-H1e), as well as tentative developmental links between affective and trait interest(s) (Silvia, 2006), I hypothesize that:

H2a) Individuals' vocational interests, assessed through a combination of enjoyment and affective interest scores, will have greater concurrent validity (i.e., a higher hit rate) for academic major choice than vocational interests based on enjoyment scores alone.

Also discussed previously, research on the criterion-related validity of person-environment Holland profile congruence for occupational satisfaction has been mixed, with many studies finding only low or moderate correlations (Fritzche & Parrish, 2005; Hansen, 2005). A number of reasons have been proposed for this apparent contradiction of Holland's theory (Arnold, 2001; Spokane et al., 2000), but the possibility for improved measurement of vocational interests is rarely discussed as one of them. Along the same lines as H2a, the distinctions observed between enjoyment and affective interest in past research (e.g., Berlyne, 1974; Silvia, 2001, 2008), coupled with potential developmental links between state and trait interest(s) (Silvia, 2001, 2006), leads to the hypothesis that:

> *H2b) Adding affective interest scores to enjoyment-based interest scores will yield congruence values that have incremental validity for academic major satisfaction, beyond enjoyment-based congruence alone.*

METHOD

Sample

Data were drawn from archives collected from the Colorado State University psychology research pool from 2007 and 2008. The sample consisted of 423 students (*N* = 282 females, *N* = 141 males) with an average age of 18.98 years (*SD* = 2.78). The majority of participants were freshmen (*N* = 318) or sophomores (*N* = 60), with the remaining participants ranging from junior to second bachelor's status. 87.9 percent of the sample identified as Caucasian or European-American, with 3.8 percent identifying as Hispanic or Central/South American, 3.5 percent as Asian or Pacific Islander, 2.1 percent as African or African-American, .7 percent as American Indian or Alaskan native, and 1.4 percent as "other." The majority of participants (*N* = 313, or 74%) reported having declared a major.

Procedures

Surveys were completed online through SurveyMonkey.com as part of a larger study for course credit. Informed consent was obtained from participants prior to commencing the survey via a webpage that described the study and obtained electronic signatures from individuals who agreed to participate. Participants answered various survey items related to their interest, enjoyment, familiarity, current competence and future competence in various occupational activities as well as the perceived complexity of these activities. Participants also indicated their academic majors, if declared, and their academic major satisfaction. The order of the six scales on which participants rated vocational activities was counterbalanced such that approximately half the participants completed scales in one order and half completed scales in the reverse order. See Appendix B for a copy of the survey items.

Instruments

Enjoyment, Interest, Current Competence, Future Competence, Familiarity, and Complexity. These variables were assessed to test the first study hypothesis that enjoyment and interest are distinct and will diverge across multiple constructs. Enjoyment and current competence were assessed with the activity preference scales and activity competence belief scales from the Personal Globe Inventory (PGI; Tracey, 2002). The PGI is a vocational interest measure that examines activity preferences, activity competence beliefs, and occupational preferences. The PGI's six activity preference scales ask respondents to rate how much they like 48 occupational activities on a scale of 1 to 7 (1 = *Strongly dislike*, 7 = *Strongly like*), and the six competence scales instruct respondents to rate how competent they feel in each of the same activities (1 = *Unable to do*, 7 = *Very competent*).

Interest, future competence, familiarity, and complexity were assessed by manipulating the verb anchors for the PGI's 7-point scaled items such that participants also were instructed to rate (a) their interest in each activity (1 = *Not at all interesting*, 7 = *Very interesting*) (b) their predicted future competence in each activity (1 = *Unable to do*, 7 = *Very competent*), (c) their familiarity with each activity (1 = *Not at all familiar*, 7 = *Very familiar*), and (d) how complex they found each activity to be (1 = *Not at all complex*, 7 = *Very complex*). The modified scales were scored in a manner identical to the original PGI scales.

Evidence for the validity of PGI scores has been established across age, gender, and ethnicity, including European American, African American, Asian American, and Latino American populations (Tracey, 2002). The structural validity of the PGI's circumplex model has been supported using the randomization test of hypothesized order relations (Hubert & Arabie, 1987; Rounds, Tracey, & Hubert, 1992; see Tracey, 2002, for further explanation).

Though the PGI as a whole derives from a spherical model of vocational interests that includes prestige as a third dimension, the activity preference scales and competence scales used in the current study are based on Holland's original circumplex model of vocational types (Hogan, 1983; Rounds, Tracey, & Hubert, 1992). The activity preference scale scores have demonstrated internal consistency values above $\alpha = .80$ and two-week test-retest reliability coefficients of $r = .80$ or greater (Tracey, 2002). Construct validity of the PGI's activity preference scale scores is supported by high correlations with corresponding scores from the extensively used and empirically supported General Occupational Theme scales from the Strong Interest Inventory (SII; mean $r = .70$; Tracey, 2002). The PGI's competence scale scores also have demonstrated adequate internal consistency ($\alpha \geq .85$; two-week test-retest reliability of $r = .80$ and higher; Tracey, 2002). Construct validity of the PGI's competence scale scores is supported by correlations of $r = .75$ or greater with corresponding scores from the Skills Confidence Inventory (SCI; Betz, Borgen, & Harmon, 1996), a measure of self-efficacy often used in conjunction with the SII.

Academic Major Satisfaction. Satisfaction with academic major was assessed with the Academic Major Satisfaction Scale (AMSS; Nauta, 2007). The AMSS is currently the only multi-item measure of global academic major satisfaction that has psychometric support (Nauta, 2007). The AMSS consists of six items rated on a 6-point continuous scale which are summed for a total score (Nauta, 2007). Four of these items are reverse scored. Initial psychometric analysis of the AMSS has shown its scores to be highly internally consistent among college students with a wide range of academic majors, with Cronbach's alphas equal to or greater than .90 (Nauta, 2007). Students from Nauta's (2007) initial psychometric analysis constituted a similar demographic to the current study sample: the majority (79%) were female and European-

American (86%), with an average age of 20 years (Nauta, 2007). This suggested that scale scores also may be valid for the current study sample. Convergent validity for AMSS scores is indicated by significant positive correlations with GPA and career decision self-efficacy, and negative correlations with changing majors over a one-year period, career-choice anxiety, and generalized indecisiveness (Nauta, 2007).

Concurrent Hit Rate and Congruence Computations

Individual Holland Code. To test Hypothesis 2, individuals' 3-letter Holland codes were computed in three different ways: based on enjoyment, affective interest, or both enjoyment and affective interest. Enjoyment-based Holland codes were assigned using the original activity preference scales from the PGI, described previously. Tied scores (i.e., two or more scores tied for a particular position in the Holland profile) were resolved by ordering the tied Holland types in accordance with Holland's circumplex or by random assignment, methods used in the development of interest profiles for O*NET occupations (Rounds, Smith, Hubert, Lewis, & Rivkin, 1999). More specifically, when tied scores did not involve the highest type score (e.g., two scores tied for second place), the Holland type closest to the individual's primary Holland type was assigned. Tied scores that were equidistant to the primary Holland code were resolved randomly. Ties for first place also were resolved randomly.

Interest-based Holland profiles were computed with the modified PGI activity preference scales described previously (i.e., the scales that asked participants to rate their level of interest in various vocational activities). The modified scales were scored and converted into 3-letter Holland codes in the same way as the original PGI scales. Finally, Holland codes based on both enjoyment and interest were computed by averaging each participant's enjoyment and interest ratings. These averaged scores were converted into 3-letter Holland codes in the same way as the enjoyment- and interest-based Holland codes.

Academic Major Holland Code. Participants were instructed to indicate their academic major(s) in a free response item ("…what is your major?"). Participants who indicated more than one major were randomly assigned to one of their indicated majors ($N = 9$). Academic majors received 3-letter Holland codes based on the Educational Opportunities Finder (EOF; Rosen, Holmberg, & Holland, 1997). The EOF lists over 750 academic majors compiled by the National Center for Educational Statistics of the U.S. Department of Education's Classification of Instructional Programs (CIP; Morgan, 1990). The EOF assigns Holland codes to majors based on associated occupations and the NOICC Master Crosswalk, Version 4.0 (National Crosswalk Service Center, 1994). Current and prior versions of the EOF have been used in previous research (e.g., Ishitani, 2009; Srsic & Walsh, 2001; Trusty et al., 2000). For majors not included in the EOF, the primary investigator and an undergraduate research assistant consulted the university course catalogue and EOF to find the most similar major in the EOF and assign a Holland code accordingly.

Hit Rate for Academic Major Choice. Hit rates were used to determine concurrent validity of individual Holland codes for academic major choice (H2a). This approach, which reports the proportion of respondents whose highest-point Holland type matches the highest-point Holland type of their academic major or occupation, is endorsed by Holland, Powell and Fritzsche (1997) and is widely used in the literature (e.g., see Leung & Hou, 2001). This method also avoids the potential pitfall of inter-individual variability in Holland code differentiation, which can reduce the precision of congruence indices that account for type order. For example, an individual with a highly differentiated SAE profile might differ significantly from an individual with a relatively undifferentiated SAE profile. The latter's code order may owe to measurement error alone and is likely to be less reliable (Rayman, 1998).

Person-Environment Congruence. To test the incremental validity of interest-based congruence for academic major satisfaction (H2b), congruence between each individual's Holland code and his or her major's Holland code was calculated using Brown and Gore's standard C index (1994). The C index is frequently recommended for congruence computations due to its sensitivity to the order of interest types of Holland codes as well as to the distance between codes on the circumplex (Dik, Hu, & Hansen, 2007; Holland, 1997; Leung & Hou, 2001; Tinsley, 2000). The C index is computed with the following formula:

$$C = 3(X_1Y_1) + 2(X_2Y_2) + (X_3Y_3)$$

where X_iY_j are values of 3, 2, 1, or 0 that are assigned to each person-occupation comparison according to the distance between letters X_i and Y_j on Holland's hexagon (see Figure 1). Specifically, 3 = identical letters for the person and occupation (e.g., S and S); 2 = adjacent positions on the hexagon for person and occupation letters (e.g., S and E); 1 = alternate positions on the hexagon for person and occupation letters (e.g., S and C); and 0 = opposite hexagonal positions (e.g., S and R). The values of *C* index scores range from 0 to 18, with greater congruence reflected in higher scores.

Missing Data

Many participants had at least one missing item response in the current study (N = 233, or 55% of the sample). The overall amount of missing data was small, however (1.83%). While there is no definite consensus on the percentage of missing data that becomes problematic, five and ten percent have been recommended as cut-off points (Bennett, 2001; Plomer et al., 2010; Schafer, 1999). By these standards alone, the missing data were unlikely to have biased results.

Because of the large number of cases with missing data, however, and the fact that nonrandom missing data can bias results and limit generalizability, rational and statistical methods were used to estimate the likelihood that study data were missing at random.

First, the method of data collection was examined to determine the likelihood that it may have influenced the pattern of missing data. Items analyzed in the current study targeted perceptions of various occupational activities and major satisfaction; participants were also asked to identify relevant demographic characteristics such as their age, ethnicity, and year in school. Not only was the study itself voluntary, but participants also could opt out of answering individual items. Thus, the likelihood that items used in the main analyses would evoke non-response due to significant personal distress seems low. Fatigue effects were also expected to be minimal in that the average survey completion time was less than 30 minutes. This assumption was corroborated through the observation that scales administered towards the end of the survey did not have a significantly higher nonresponse rate than scales at the beginning of the survey. Thus it was concluded that no mechanism in the data collection itself seemed likely to have systematically influenced the pattern of missing data in the present study.

Second, the "missing at random" assumption (MAR) was tested using empirical methods. Data are considered to be MAR if there is no systematic difference between missing and nonmissing cases (Heitjan & Basu, 1996). First, the method recommended by Tinsley and Brown (2000) was used to examine differences between participants who completed all study items versus those with one or more missing responses. A dummy variable was created that divided the sample into those participants who provided complete data for all items (the "nonmissing" subgroup, $N = 190$) and those who had one or more missing responses (the "missing" subgroup, $N = 233$). The means of the missing and nonmissing subgroups on theoretically relevant variables (age, gender, ethnicity, year in school) were subsequently compared with four one-way analyses of variance (ANOVAs), with a Bonferroni correction to correct for inflated family-wise error rate due to multiple comparisons (resulting in $\alpha = .05/4$ or $.0125$). No significant differences were found for age ($F(1, 421) = .024$, $p = .877$), gender ($F(1, 421) = .119$, $p = .730$), ethnicity ($F(1, 419) = .112$, $p = .738$), or year in school ($F(1, 420) = 3.491$, $p = .062$). Second, Missing Value Analysis in SPSS (Release 20.0.0, 2011) was used to detect potential patterns in the missing data. It was observed that in no case did more than five percent of participants have the same pattern of missing data for any one scale. These analyses thus supported the interpretation that data were missing at random and thus were not likely to bias results.

Two main methods of handling missing data were employed in the current study. For tests of H1, which entailed testing multiple measurement models using confirmatory factor analyses (CFA) in MPlus (Version 6.11, Muthen & Muthen, 1998–2011), the standard method of full information maximum likelihood (FIML) was employed. FIML uses within-subjects and between-subjects data to generate parameter estimates, without imputing values for missing data itself. When missing data is negligible and/or missing at random, FIML has been shown to be more precise in terms of parameter estimates and more likely to yield optimal Type I error rates for overall model fit than alternative methods such as list- and pairwise deletion as well as certain forms of imputation or substitution (Enders & Bandalos, 2001). Computational details of FIML are provided by Arbuckle (1996).

For tests of H2, mean substitution was employed to impute scale scores when participants answered at least two-thirds of items for that scale. Tabachnick and Fidell (2007) suggest that when data are missing at random and are small in number, mean substitution will not result in substantive estimation bias. Furthermore, an imputation rather than deletion method was chosen for H2 analyses on the grounds that although the overall amount of missing data was small, and the patterns random, many participants did have one or more missing responses. Thus, list- or even pairwise deletion could significantly impact both effect sizes and statistical power. In general, data imputation methods are less subject to creating biased results and have the additional advantage of preserving statistical power (Schlomer, Bauman, & Card, 2010). A disadvantage of mean substitution is that it can truncate variance of study variables (Schlomer et al., 2010), which in the current study would inflate the Type II error rate for H2 analyses. The impact was expected to be negligible, however, given the small number of missing data per case. SPSS's default method of listwise deletion was used in analyses when entire scale scores were missing. In addition, 13 cases were removed from the main analyses due to response sets on the PGI-derived scale sets (e.g., answering "*4*" or "*Neutral*" for all 48 enjoyment items).

Statistical Analyses

Multiple Analysis of Variance (MANOVA). MANOVA was used to detect whether the order in which the six PGI-derived scales were administered may have impacted participants' patterns of scale scores, potentially leading to biased results. MANOVA was chosen as a suitable analytic method due to its ability to account for intercorrelations between multiple dependent variables without inflating the Type I error rate (Tabachnick & Fidell, 2007). As mentioned previously, scale order of the six PGI-derived scales was counterbalanced such that half of the participants were administered the scales in the reverse order from the remaining half. As such, scale order was treated as the independent variable in the MANOVA analysis, with enjoyment, current competence, future competence, complexity, familiarity, and interest scales as dependent variables.

Confirmatory Factor Analysis (CFA). CFA is a highly recommended and commonly used hypothesis-driven method of establishing construct validity and testing scale psychometrics (e.g., Bollen & Long, 1993; Brown, 2006), both key features of the current study. In addition, CFA has an advantage over alternative approaches in that it attenuates parameter estimates for measurement error, thus providing a more precise estimate of relationships between variables (Brown, 2006). CFA was used to test the first main study hypothesis that enjoyment and interest of vocational activities are distinct constructs. First, a six-factor measurement model was used to estimate PGI-based scale intercorrelations for subsequent comparison of relative correlations of enjoyment versus interest with current competence, future competence, complexity and enjoyment (with the expectation that enjoyment and interest would diverge in particular ways across those scales). CFA also was used to test whether a two-factor model (with separate enjoyment and interest factors) had improved fit over a one-factor model (with enjoyment and interest items combined as a single factor), providing further evidence for discriminant validity.

McNemar Test. The prediction of greater concurrent validity of vocational preference scores based on enjoyment and interest versus scores based on enjoyment alone (H2a) was tested with the McNemar test for matched-pair samples (McNemar, 1947). The McNemar test is traditionally used in within-subjects designs for dichotomously scored data, such as “hits” for academic major choice based on vocational preference scores in the current study. The McNemar test was first conducted on the sample as a whole, and then separately on freshmen and non-freshmen. This subsampling was based on the reasoning that freshmen participants might differ from non-freshmen in ways that would impact results related to Hypothesis 2. Specifically, freshmen as a group were expected to be less solidified in terms of their vocational preferences and major choices (e.g., see Hansen, 2005), and to have taken fewer classes in their major than more senior students. As these potential differences were not measured directly, freshman vs. nonfreshman class standing was used as a proxy group delimiter for both H2a and H2b.

Hierarchical Multiple Regression. Hierarchical multiple regression was used to test incremental validity of interest-based person-major congruence scores for academic major satisfaction, beyond enjoyment-based congruence scores alone (H2b). Hierarchical regression is often useful for testing theory-based hypotheses regarding incremental validity of certain variables (Cohen, 2001). In hierarchical regression, predictors are entered sequentially into the model based on theory, such that the relative influence of predictors entered later on (in this case, interest-based congruence) is considered in relation to that of previously entered predictors (enjoyment-based congruence). Similar to the McNemar test above, class standing was considered in the regression analyses as a potential moderating variable.

RESULTS

Order Effects (MANOVA)

Testing assumptions. The accuracy of MANOVA results is contingent on several assumptions about the data, including absence of outliers, multivariate normality, linearity of bivariate relationships, and homogeneity of variance-covariance matrices. Tests of these assumptions are described below.

First, outliers were identified through visual inspection and statistical methods. Univariate outliers were located through examining histograms for each of the 36 variables (enjoyment, interest, current competence, future competence, complexity, and familiarity scale scores for each of the six RIASEC types). No univariate outliers were observed. Multivariate outliers were detected through inspection of bivariate scatterplots for each MANOVA and the computation of Mahalanobis distances (D^2). Mahalanobis distance is recommended for detecting departures from the mean of a set of dependent variables (Burdenski, 2000; Tabachnick & Fidell, 2007). 15 outliers were detected with this method. Accordingly, the MANOVAs were run with and without these outliers included. The impact on results, however, was negligible. Thus the final analyses retained these outliers as they appeared to represent valid data from the population of interest.

Second, linearity was assessed for each MANOVA through visual inspection of bivariate scatterplots for all possible dependent variable pairings, a method recommended by Tabachnick and Fidell (2007). The assumption of linearity appeared to hold reasonably well for all pairs of variables.

Next, multivariate normality was considered. MANOVA is considered to be robust to departures from normality when degrees of freedom for the error term in the omnibus test is greater than 20 (Tabachnick & Fidell, 2007). In this case, degrees of freedom for the error term was 408 for each MANOVA, suggesting that any departures from multivariate normality were not likely to bias results. Examination of histograms did, however, indicate that several variables were positively skewed across RIASEC types, particularly familiarity and current competence. These departures from univariate normality make intuitive sense given the relatively young age of the sample. Visual inspection of bivariate scatterplots for dependent variable pairings also indicated potential departures from multivariate normality. However, as MANOVA with large samples and equal cell sizes is considered robust to the violation of these assumptions, transformations to obtain multivariate normality were not conducted for the purposes of examining order effects.

Finally, Box's M was used to test for homogeneity of variance-covariance matrices, or the assumption that the variance of each dependent variable is equal across levels of the independent variable. Box's M was significant for all MANOVAs ($ps < .003$). It is important to note that Box's M is considered to be overly stringent in analyses with large samples and approximately equal cell sizes (Tabachnick & Fidell, 2007) such as the current study. Nevertheless, the relatively conservative Pillai's trace statistic was used for the estimation of omnibus F statistics for each MANOVA as it is more robust to violation of the homogeneity of variance-covariance assumption (Tabachnick & Fidell, 2007).

Results of MANOVAs. A 2 (scale order) x 6 (scale score: enjoyment, current competence, future competence, complexity, familiarity, interest) MANOVA was conducted to test for order effects for each of the RIASEC scale sets. Results are presented in Table 1. Post hoc power analyses indicated adequate to very high statistical power (power values ranging from

.732 to 1.00, $\alpha = .05$) for each MANOVA, given a sample size of 415 and the effect size associated with each test.

Five of the six MANOVAs (for realistic, investigative, social, enterprising, and conventional or "RISEC" scale sets) indicated a significant overall main effect of scale order on scores (*p*s < .001). The main effect of scale order for artistic scales was not significant ($F(6, 408) = 2.01$, $p = .06$). Effect sizes for omnibus tests of the RISEC scales ranged from $\eta^2 = .04$ for the social scales to $\eta^2 = .09$ for the enjoyment scales; results suggested that, on average, six percent of the variance in scale scores was attributable to scale order.

Post hoc comparisons with univariate ANOVAs were conducted to compare individual scale score means by scale order. A Bonferroni correction was applied to correct for an inflated family-wise error rate due to six pairwise comparisons, resulting in a more stringent alpha level of .008. Significant differences were found across scale order for four of 36 total scales: future competence and complexity for social items, familiarity for enterprising items, and interest in conventional items (*p*s < .008, η^2s = .02), indicating that two percent of the variance in the four scales was accounted for by scale order. Each of the four scales had a slightly higher mean when administered earlier in the study.

Taken as a whole, these results suggest that while order appears to have had a statistically significant impact on four scale scores used in the main analyses, the practical significance of order effects was probably minimal in light of the small proportion of scales affected and the small associated effect sizes.

Discriminant Validity of Enjoyment and Interest

As mentioned, CFA was used to test Hypothesis 1. Analyses were conducted in MPlus. Each CFA model was tested on the sample as a whole, as prior research on Holland's theory suggests no reason to suspect that model fit would differ across participant characteristics such as sex, age, education level, or ethnicity (Hansen, 2005). The number of cases analyzed ($N = 418$ for each CFA) provided adequate statistical power for precise and reliable parameter estimates and model fit indices. More specifically, the sample size for each CFA met commonly used rules of thumb for statistical power based on Monte Carlo studies: The sample was relatively large ($N \geq 100$; Bentler & Chou, 1987), and there were at least 5 to 10 cases per freed parameter in each model (Tanaka, 1987). Although model-based power analyses are generally preferred for CFA, standard model-based approaches such as Satorra-Saris and Monte Carlo methods require precise estimates of population parameters based on prior research (Brown, 2006). As the current study employed novel scales measuring constructs whose interrelationships have received scant empirical attention up to this point, it was judged that Satorra-Saris and Monte Carlo approaches to power estimation would lead to misleading power estimates.

Testing assumptions. Assumptions of CFA are analogous to those required for regression (and by implication, assumptions of MANOVA in the current study; Flora, LaBrish, & Chalmers, 2012). The interested reader is referred to the section on order effects above for results of assumption-testing in the current study. Maximum likelihood estimation with robust standard errors (MLR) was used in all CFAs due to the violation of multivariate normality noted previously. MLR generates standard errors for parameter estimates that are robust to violation of normality (Brown, 2006). As described in the section on missing data, the full information maximum likelihood procedure was used to deal with missing values.

Results of CFAs. First, a six-factor CFA model was used to estimate PGI-derived scale intercorrelations for each of the six RIASEC types, attenuated for measurement error. Results for each RIASEC type are shown in Table 2. Table 3 provides the average scale correlations and internal consistency reliability estimates across RIASEC types. Interest and enjoyment correlated at less than $r = .80$ for each RIASEC type (rs from .51 to .78), supporting the prediction that interest and enjoyment would correlate at less than .80 after adjusting for measurement error (H1a). Correlations between enjoyment and interest for all six RIASEC types were smaller than the lower of the two scales' internal consistency reliability estimates (Cronbach's α's from .82 to .92), with a mean difference of $r = -.21$, supporting H1b. As additional evidence for the discriminant validity of enjoyment and interest, Dunn and Clark's z-test (Dunn & Clark, 1969) was used to compare the correlation of enjoyment and interest for each RIASEC type with the highest interscale correlation for that RIASEC type (for all types, the correlation between current and future competence was the highest of all scale intercorrelations). For all but the Social scales, enjoyment and interest correlated significantly less positively than did current and future competence (mean difference of $r = -.14$, ps $< .05$). There were no significant differences between these correlations for the Social scales. Thus, this additional test of H1 received partial support.

Next, interscale correlations of enjoyment and interest with the four other PGI-derived scales were compared to test H1c-f. Williams' t-test for dependent measures (Williams, 1959) was used to compare the correlation coefficients of enjoyment versus interest with complexity (H1c), familiarity (H1d), current competence (H1e), and future competence (H1f). Williams's t-test has been recommended for correlation coefficients of dependent measures when the sample size exceeds 20 (Chen & Popovich, 2002; Steiger, 1980).

Results were mixed and varied substantially based on RIASEC type (see Table 4). Overall, results did not support H1c. Enjoyment and interest did not differ significantly in their correlation with complexity for five out of six Holland types (RASEC). On the Investigative scales, interest related more positively to complexity than enjoyment ($t[420] = -2.69$, $p < .01$), supporting H1c for that Holland type. Mixed support was found for H1d: For RIAC scales, enjoyment correlated significantly more positively with familiarity than did interest (ts(420) from 2.46 to 13.67, ps < .01), as predicted. For the Enterprising scales, however, there were no significant differences and for the Social scales the relationship was opposite of that expected ($t[420] = -2.09$, $p < .05$). H1e, which predicted higher correlations of enjoyment than interest with current competence, was supported for RIAC scales (ts(420) from 3.51 to 5.68, ps < .05) with no significant differences for the Social and Enterprising scales. Findings related to H1f ran entirely contrary to expectation, with enjoyment correlating more strongly with future competence than interest for all RIASEC types (ts(420) from 2.12 to 6.45, ps < .05). In sum, results pertaining to H1 sub-hypotheses were mixed and varied substantially per RIASEC type. It is important to note, however, that although results were not in the direction predicted, in 17 of 24 cases there were significant differences between the correlations of enjoyment and interest with the remaining PGI-derived scales, suggesting at the very least that enjoyment and interest tend to relate differently to those scales depending on RIASEC type.

Finally, CFA was used to compare goodness of fit of a one-factor model combining enjoyment and interest versus a two-factor model of enjoyment and interest. Multiple goodness of fit indices were examined for a more comprehensive picture of model fit: Satorra-Bentler's scaled chi square statistic (SBS X^2; Satorra & Bentler, 1994), the comparative fit index (CFI; Bentler, 1990), and the root mean square error of approximation (RMSEA; Steiger & Lind, 1980). SBS X^2, CFI, and RMSEA gauge absolute fit, comparative fit, and fit corrected for model parsimony, respectively (see Brown, 2006 and Hu & Bentler, 1999 for details). CFI ≥ .90 and RMSEA ≤ .08 generally indicate acceptable model fit (e.g., Bentler, 1990; Brown, 2006; Browne

& Cudeck, 1993). X^2 tests of model fit reject the model when the associated p-value is less than the alpha level ($p < .05$, generally). These tests, however, tend to be overly stringent (Brown, 2006) and as a result are primarily used to statistically test differences in the fit of two or more models. CFI and RMSEA do not allow for statistical difference testing.

Fit statistics for the one- and two-factor models are presented in Table 5. Satorra-Bentler Scaled Chi-Square Difference tests (SBSΔX^2; Satorra & Bentler, 2011) indicated significantly improved model fit for the two-factor model across RIASEC types, supporting H1g. Furthermore, in all but one case (i.e., RMSEA for the Social models), there were observable improvements in the CFI and RMSEA statistics for the two-factor over the one-factor model. It should be noted, however, that despite significant improvement in model fit for the two-factor model, neither model met standard criteria for acceptable fit (CFI values from .43 to .81, RMSEA values from .12 to .21).

Taken as a whole, the results of the CFAs provided partial support for the study's first main hypothesis that enjoyment and interest are distinct constructs, with substantial variation per RIASEC type for tests of H1c-f in particular.

Concurrent Validity of Holland Code for Academic Major Choice

For the overall sample, the hit rate of enjoyment scores for academic major choice was 38.1%, with a hit rate of 35.9% for interest scores, and 36.7% for enjoyment-and-interest scores. Hit rates were higher for non-freshmen compared to freshmen (42.4% versus 36.3% for enjoyment scores, 40.2% versus 34.1% for interest scores, and 40.2% versus 35.2% for combined interest-and-enjoyment scores, respectively).

The McNemar test for the sample as a whole indicated no significant difference in the hit rates based on enjoyment scores versus both enjoyment and interest scores for the sample as a whole (p = .46). Likewise, McNemar test results were nonsignificant for freshmen (p = .65) and non-freshmen (p = .75). These results contradicted the prediction that inclusion of interest scores would lead to higher hit rates for academic major choice (H2a).

Incremental Validity of Interest-Based Congruence for Major Satisfaction (Hierarchical Regression)

Testing assumptions. The accuracy of multiple regression, including hierarchical regression, rests on several assumptions, including absence of outliers, adequate scale reliability, multivariate normality, linearity of bivariate relationships, homogeneity of variance-covariance matrices, and absence of multicollinearity. Tests of these assumptions are described below.

Outliers were identified through several methods. First, univariate outliers were detected by inspection of histograms for each continuous variable used in the regression analyses (i.e., enjoyment-based congruence, interest-based congruence, and academic major satisfaction) and through the computation of standardized scores on these variables for each participant. A z-score value greater than 3.29 ($p < .001$) was used as a cut-off for potential univariate outliers (see Tabachnick & Fidell, 2007). No univariate outliers were detected through either examination of univariate histograms or z-score computations (z-scores ranging from -3.09 to 1.87).

Multivariate outliers were detected by calculating Cook's and Mahalanobis distances for each case. As these statistics are sensitive to departures from normality (Tabachnick & Fidell, 2007), multivariate normality of regression variables was examined prior to computing these statistics, and the academic major satisfaction variable was transformed (see the paragraph on multivariate normality testing below for details). Next, cases with Cook's values higher than $4/n$ where n is the number of cases (.0316 for this dataset) were removed. This led to the removal of one case. As recommended by Tabachnick & Fidell (2007), a conservative probability estimate of $p < .001$ was used as a cut-off value for Mahalanobis distances. This led to the removal of three cases. Finally, outliers from the final regression solution (i.e., the transformed academic major satisfaction variable regressed on enjoyment-based congruence and interest-based congruence) were detected through computation of standardized residuals associated with the final regression model. A criterion of $p < .001$ ($z < -3.3$ or $z > 3.3$) was used as a cut-off (see Tabachnick & Fidell, 2007). No case exceeded the critical z-score (zs from -1.564 to 2.49), and thus all remaining cases were retained in the regression analyses.

Reliability for academic major satisfaction was adequate (Cronbach's $\alpha = .92$). Other variables included in the analyses (congruence values and class standing) were non-scalar, and as such there were no associated internal consistency reliability values.

Next, multivariate normality was examined. Inspection of histograms for enjoyment-based congruence, interest-based congruence, and academic major satisfaction indicated that academic major satisfaction was negatively skewed. Its distribution was reflected and a square root transformation was used to achieve approximate normality for the main HR analyses. Bivariate scatterplots between the two congruence variables and the transformed academic major satisfaction variable suggested approximate normality.

Linearity was examined through visual inspection of the bivariate scatterplots between each of the congruence variables and the transformed academic major satisfaction variable. The assumption of linearity appeared to hold reasonably well for both variable pairings.

Homoscedasticity was assessed by plotting standardized residuals on predicted values from the full regression model. Visual inspection of residuals plots indicated that the data were approximately homoscedastic.

Multicollinearity between enjoyment- and interest-based congruence scores was assessed through collinearity diagnostics in SPSS. Multicollinearity is indicated by one or more conditioning indices exceeding 30, coupled with variance proportions of greater than .50 for at least two different variables (Belsely, Kuh, & Welsch, 1980; Tabachnick & Fidell, 2007). This rule of thumb was not violated in the current study, suggesting a lack of multicollinearity. This conclusion was also supported by observed tolerance values of .678 for both enjoyment- and interest-based congruence (much greater than the typical .01 to .0001 range that would suggest multicollinearity), and a simple correlation between enjoyment- and interest-based congruence of .567 (Tabachnick & Fidell, 2007).

Results of Hierarchical Regression Analyses. Two HR analyses were conducted, first to examine potential interaction effects associated with class standing, and second to test incremental validity of interest-based congruence for academic major satisfaction beyond enjoyment-based congruence alone.

Moderating Effect of Class Standing. The first HR analysis examined the potential moderating effect of class standing (freshmen vs. non-freshmen) on the relationships between enjoyment- and interest-based congruence with academic major satisfaction (see Table 6). Class standing was dummy coded with freshmen as a reference group and non-freshmen as the comparison group. Two models were compared to test for interaction effects. The first model included enjoyment-based congruence (centered at the mean), interest-based congruence (centered at the mean), and the dummy-coded class standing variable as predictors. Results were nonsignificant (R = .122, R^2 = .015, F(3, 286) = 1.435, p = .233), indicating that the main effects of the three predictors did not account for significant variance in academic major satisfaction.

A second model added two interaction terms: One for class standing and enjoyment-based congruence, and another for class standing and interest-based congruence. This model was likewise nonsignificant (R = .145, R^2 = .021, F(5, 284) = 1.227, p = .296). The inclusion of the two interaction terms associated with class standing did not result in a significant improvement in model fit (ΔR^2 = .006, ΔF(2, 284) = .917, p = .401). Controlling for first order effects and the interaction between enjoyment-based congruence and class standing, the slope of the relationship between interest-based congruence and academic major satisfaction was .060 units higher for non-freshmen compared to freshmen (t(284) = 1.317, p = .189), a nonsignificant difference. Controlling for first order effects and the interaction between interest-based congruence and class standing, the relationship between enjoyment-based congruence and academic major satisfaction was .021 units lower for non-freshman compared to freshmen (t(284) = -.431, p = .667), also a nonsignificant difference. Due to the nonsignificant main effect and interaction effects associated with class standing, this variable and its associated interaction terms were removed from the final model testing incremental validity of interest-based congruence for academic major satisfaction. The removal of nonsignificant interaction terms has been recommended when strong theoretical justification for the inclusion of these terms is lacking (Frazier, Tix, & Barron, 2004). The class standing variable was likewise removed as its effect was nonsignificant after controlling for enjoyment- and interest-based congruence (t(286) = -1.522, p = .129).

Incremental Validity of Interest-Based Congruence for Major Satisfaction. Next, the main question of interest, namely, incremental validity of interest-based congruence for academic major satisfaction was tested, again using hierarchical regression (see Table 7). First, enjoyment-based congruence was entered as a predictor variable for satisfaction. Results were non-significant (R = .000, R^2 = .000, F(1, 288) = .000, p = .994). Then, interest-based congruence was entered as a second predictor in the model. Results for this model were likewise non-significant (R = .083, R^2 = .007, F(2, 287) = .989, p = .373). The main effect of enjoyment-based congruence, controlling for interest-based congruence, was non-significant (B = .018, t(287) = .791, p = .429), as was the main effect of interest-based congruence after controlling for enjoyment-based congruence (B = -.031, t(287) = -1.406, p = .161). Finally, interest-based congruence did not account for a significant amount of variance in satisfaction beyond enjoyment-based congruence alone (ΔR^2 = .007, ΔF(1, 287) = 1.978, p = .161).

Finally, post hoc power analyses indicated low power for detecting effects, likely due to small R^2 and ΔR^2 values for each HR analysis. The power of detecting interaction effects of class standing was .22, and the power to detect incremental validity of interest-based congruence for academic major satisfaction was .23. Again, this lack of statistical power was attributed to negligible effects rather than a sample size issue. It was observed, for instance, that a relatively small ΔR^2 value of .03 would have led to the rejection of the null hypothesis for H2b with a sample size of 256, whereas the current study's HR analyses used a sample of 290.

DISCUSSION

This study had two main aims. First, the study attempted to extend distinctions found between interest and enjoyment as distinct constructs to the context of vocational interests. Second, the study aimed to determine whether the inclusion of items designed to measure affective interest into a traditional, enjoyment-based vocational interest measure would improve criterion-related validity for academic major choice and satisfaction.

Hypotheses related to the study's first aim received mixed support. As predicted, enjoyment and interest correlated at less than $r = .80$ across the RIASEC types. In addition, the correlation between the enjoyment and interest scales for each RIASEC type was less than the lower of the two scales' internal consistency reliability estimates, suggesting that measurement error alone did not account for within-subjects differences in scale scores. Next, for all but the Social scales, enjoyment and interest correlated significantly less with each other than did current and future competence, again suggesting discriminant validity (while the nonsignificant difference in the two *r*-values on the Social scales does not support discriminant validity, it does not disconfirm it either in this case, since current competence and future competence are themselves distinct). Finally, significantly improved goodness of fit for the two-factor model of enjoyment and interest over the one-factor, combined enjoyment/interest model, also supported discriminant validity for enjoyment and interest in vocational activities. These results align with research in various fields outside of vocational psychology that suggests enjoyment and interest, though related, are distinct constructs.

Results related to H1c-f, however, were more variable. Though enjoyment and interest frequently related differently with current competence, future competence, complexity and familiarity (in 17 of 24 total comparisons, to be exact), their relative relationships with these four other variables were inconsistent across RIASEC types and oftentimes contradicted what would be expected based on prior research. For instance, the prediction that enjoyment would relate more positively with current competence than interest was supported for the RIAC scales, but not the Social or Enterprising scales, on which there were no differences. Similarly, the prediction that enjoyment would relate more positively with familiarity was supported for all but the Social scales (on which the predicted relationship was reversed) and the Enterprising scales (on which there was no difference). Furthermore, interest correlated more strongly with complexity than enjoyment only on the Investigative scales; for all other RIASEC types, the difference was not significant. The farthest departure from expectations related to future competence: Enjoyment was actually found to correlate significantly more than interest with future competence for all RIASEC scales.

These results are perplexing. Given that significant differences were often observed in the relative relationships of enjoyment versus interest with the four other PGI-derived variables, it is possible that RIASEC type moderated the relationships between enjoyment and interest with these four variables. The nature of these potential moderating relationships is unclear, however. For instance, consider the finding that interest only correlated more positively with complexity than enjoyment for the Investigative scales. While it might be tempting to assume that this is because of the stereotypically "complex" nature of investigative activities (leading to relatively high increases in interest compared to enjoyment; see Berlyne, 1960), the absolute correlations between enjoyment and complexity were actually lower for several other RIASEC scales, which would not be expected if investigative activities were perceived as more difficult overall. In addition, while it is notable that predictions related to current competence and familiarity were supported for all but the Social and Enterprising scales, it is not clear what might be unique about activities assessed on these scales. If anything, the highly intepersonal and relatively “affect-laden” nature of social and enterprising activities (e.g., sales), might lead one to expect that enjoyment would correlate particularly strongly with familiarity compared to interest for these activities. Thus, while moderating effects of RIASEC type are certainly possible, the logic of such interactions are difficult to discern from this study’s results alone.

Another explanation for the mixed patterns of scale intercorrelations across RIASEC types is differences in construct operationalization and related measurement issues. For instance, “complexity” in enterprising activities is likely to be quite different from “complexity” in the arts. Competence in social activities is likely to be seen much differently from competence in investigative activities, for example in terms of associated personality traits, abilities, desirability, and prestige. Potential lack of measurement invariance across RIASEC types for the six PGI-based scales might account for the differences in scale intercorrelation patterns across the RIASEC scales.

Finally, a third possible explanation for the mixed results related to H1c-f is that enjoyment and interest, at least in the context of vocational preferences, are not truly distinct. Though significant differences were indeed found between the relative correlations of enjoyment and interest with the four other PGI-derived scales, the seemingly random nature of these differences might represent inflated Type I error due to multiple comparisons across the six RIASEC types. That is, the significant differences observed might be the product of chance rather than true differences in enjoyment and interest. This interpretation converges with the poor overall fit of the two-factor model of enjoyment and interest (despite significantly improved fit over the one-factor model). That is, poor goodness of fit for the two-factor model might indicate that enjoyment items load as strongly or more strongly onto the interest factor as they do on the enjoyment factor, and vice-versa for the interest items. This possibility could be tested with exploratory factor analytic (EFA) methods. A lack of discriminant validity between enjoyment and interest in the context of vocational preferences contradicts what would be expected based on research in aesthetics and emotion. This contradiction might owe, among many other potential causes (such as this study's limitations), to more conservative hypothesis testing involved in CFA. Unlike traditional regression techniques used in prior research on interest and enjoyment, CFA attenuates parameter estimates for measurement error. If the results of prior studies were artifacts of measurement error, CFA would be less likely than other statistical techniques to replicate those findings. In sum, the reasons behind the mixed support for H1 suggest the need for future research to determine whether enjoyment and interest are truly distinct within the context of vocational preferences.

Results related to H2 were more nonequivocal. Though both enjoyment and interest did appear to predict academic major choice (with hit rates of 38.1 and 35.9%, respectively), combined enjoyment and interest scores, versus enjoyment scores alone, did not have a significantly higher hit rate for academic major choice. That is, interest did not seem to add anything unique to the prediction of academic major choice in the current study. Furthermore, person-environment congruence based on interest did not have incremental validity for academic major satisfaction in the current study beyond the use of enjoyment-based congruence alone. This was not altogether unexpected given the varied results related to Hypothesis 1. Support for H1 in the current study was a necessary but not sufficient condition for support of H2. As discriminant validity of the enjoyment and interest scales was not wholly supported, one might expect that interest scores would also lack incremental criterion-related validity for major choice and satisfaction. On the other hand, it is important to note that enjoyment-based congruence itself did not predict academic major satisfaction in this study. This finding contradicts prior research indicating relatively low but significant predictive validity of congruence for satisfaction (Spokane et al., 2000), and suggests that study design and/or measurement issues may have biased results for both H1 and H2, masking true effects if they existed. Limitations of the current study are discussed in further detail below.

Limitations

This study had several limitations. First, its results may have been influenced by common methods variance (CMV). Though the strength of its general impact has been debated, it has been estimated that as much as 28.9% of the variance in outcomes in social sciences research owe to CMV, with 36.2% of variance due to predictor variables and the remaining 34.9% due to error (Cote & Buckley, 1987; Malhotra et al., 2006). The current study's results are vulnerable to CMV on several levels. Study data were derived from a single source (i.e., participants' self-reports), items were administered in the same web-based format in one sitting, many items had similar content and response scales (particularly the 288 PGI-based items), and item content tended to be rather abstract and subjective (see Malhotra et al., 2006 for a review of potential sources of CMV). The repetitive nature of the PGI-based scales, which asked participants to rate the same 48 vocational activities on six dimensions, may have led to boredom and/or a tendency to rate activities in a generic way rather than to consider the distinctions between the verb anchors more carefully. As mentioned, data from 13 cases were removed from the analyses due to "perfect" response sets; these participants responded exactly the same way to all items on one or more of the PGI-derived scales. It is likely that more subtle, potentially unconscious forms of response bias also occurred, such as a tendency to rate an activity to be interesting largely on the basis of previously rating it as enjoyable. Thus, CMV in the current study may have led to inflated scale and item intercorrelations and increased Type II error rate for tests of H1 and H2 as a result. Future research on the questions posed in this study should use a design less susceptible to CMV (e.g., by including dissimilar "filler" tasks or items between repetitive scales, by including validity scales, and by reducing the overall number of items with repetitive content). In addition, an appropriate statistical technique may be used to estimate and account for CMV in future studies (see Malhotra et al., 2006 for examples).

Another limitation of this study is order effects. As mentioned, MANOVA indicated statistically significant main effects of scale administration order for the PGI-derived scale scores. These order effects were likely buffered to some extent by counterbalancing the six scales, and in any case were either statistically or substantively nonsignificant for each individual scale (e.g., very small effect sizes). However, these effects may have inflated the Type II error rate, particularly as most analyses were conducted within-subjects. In addition, as the counterbalancing procedure involved only 2 of 720 possible permutations of scale order, it may have insufficiently protected against order effects and led to the underestimation of such effects in MANOVA. Again, future researchers might consider including filler tasks or scales to disrupt order effects, or spreading out the administration of similar scales over time. Alternatively, order effects could be included as a control variable in the main study analyses.

Measurement error may also have biased study results. Four of the PGI-derived scales – scales designed to measure interest, familiarity, complexity, and future competence – were created for exploratory purposes and at this point still require more in-depth psychometric analysis. Although reliabilty and validity of scores on these new scales were expected to be adequate given related evidence for the PGI's scale scores (see Tracey, 2002), as well as their adequate internal consistency reliability estimates in this study (Cronbach's $\alpha \geq .78$), inadequate goodness-of-fit statistics from the CFAs suggested otherwise. First, the poor goodness-of-fit observed for the two-factor models of enjoyment and interest suggests that interest scale scores in this study lacked construct validity, which is obviously problematic given that interest in vocational activities was the main construct of interest in the current study. Goodness-of-fit was also poor for the 6-factor models used to compute interscale correlations, with CFI values as low as .473 (M = .59; recall that CFI = .90 is generally the cut-off for an acceptable model). This suggests that there may have been measurement problems with the future competence, familiarity and complexity scales, as well. Such measurement issues likely obscured the results of both H1 and H2. For instance, if the scales designed to measure interest had inadequate construct validity, the potential contribution of interest to the criterion-related validity of vocational preference scores would remain undetected. The clear solution to potential measurement issues is to carefully develop and validate any new scales that are to be included in future investigations.

Next, it is well known that many variables besides vocational interests, such as work-related values and outcome expectations, can have an impact on career-related choices and satisfaction (Judge & Bretz, 1992; Lent et al., 1994; Rounds & Armstrong, 2005). Though these variables were not themselves of interest in the current study, they should have been included as control variables in tests of H2 to more accurately gauge the relationships between enjoyment scores, interest scores, academic major, and major satisfaction.

A final limitation of this study is that academic major satisfaction may have been an inappropriate outcome measure. Freshmen students, who comprised the bulk of this study's sample, often take few if any classes in their majors. As a group their vocational interests are least crystallized, and they are more likely to change majors at some point in their college careers than more advanced students. Thus in the current study major satisfaction may have been much less experiential, and much more arbitrary, than the seemingly analogous construct of occupational satisfaction (see Spokane et al., 2000, for a review of congruence studies that use academic major versus occupation as the environment variable). This interpretation converges with the lack of incremental criterion-related validity of interest for satisfaction in this study, as well as the failure of either enjoyment- and interest-based congruence to predict significant variance in satisfaction. Future studies should consider sampling individuals with careers, or screening out students who haven't taken a certain number of classes in their major if a college student sample is used.

Future directions

The present study sought to establish discriminant validity of affective interest versus enjoyment of vocational activities, and to determine whether affective interest, compared to enjoyment alone, would explain additional variance in career-related choice and satisfaction. In light of equivocal and nonsupportive findings for H1 and H2, respectively, as well as a number of important limitations to the study design, further research is warranted for more definitive conclusions on the role of affective interest in vocational interest measurement. Future investigations should address this study's limitations, for example by accounting for potential confounding variables, statistically controlling for common methods variance and order effects, and using a different outcome measure or a more academically or occupationally experienced sample. In addition, as most of the research on affective interest is based on theory rather than empiricism, additional testing of the distinctions between interest versus enjoyment as emotions is recommended, as well as longitudinal research examining the role of these and other emotions in trait interest(s) development (e.g., the openness to experience trait, vocational interests).

Greater understanding of potential developmental links between state and trait interest is valuable in its own right and would aid in designing studies on the relationship and potential contributions of affective interest to vocational interest measurement in particular.

Implications for Practice

This study's mixed and/or nonsignificant findings, if considered valid, support the use of enjoyment-based interest inventories in career counseling as the best current approach to interest measurement. Though other modifications to current practices in vocational interest assessment might be valuable, the incorporation of affective interest items into existing interest inventories does not seem to enhance the ability of these measures to predict important outcomes like choice and satisfaction. The results of this study also suggest that certain inventories' equation of interest and liking (e.g., Holland's SDS) is justified, or at least not detrimental with regards to measurement. At the same time, partial support for H1 suggests that career counselors should consider using the terms "enjoy/like" and "interest" interchangeably when speaking to clients about their vocational preferences, as it might help to broaden clients' perspectives on potential areas for exploration (e.g., Hannah *likes* playing sports, but she is also *interested* in chemistry). This effort on the part of career counselors is also encouraged in that, despite lack of support for H2 (perhaps due to the study's limitations), there was also no evidence that accounting for affective interest negatively impacted the criterion-related validity of vocational preference scores. Thus, the mixed support for H1 at the very least suggests that counselors seeking to help clients explore their vocational preferences might consider probing them in terms of both enjoyment/liking and interest for additional insight into these preferences.

Conclusions

The current study aimed to show distinctions between affective interest and enjoyment in the context of vocational preferences, and to assess incremental validity of affective interest items for key career-related outcomes of choice and satisfaction. Findings were mixed with regards to the discriminant validity of affective interest, and did not support incremental validity of interest for choice and satisfaction. These findings, given the study's exploratory nature and limitations, suggest the need for further research to draw more definitive conclusions on the role of affective interest in vocational interest theory, measurement, and applications. To this author's knowledge, this study is unique in its attempt to deconstruct the nature of vocational interests into distinct affective components, and is also the first to empirically link affective interest research to vocational interest measurement. It is hoped that this study generates momentum for future investigators of vocational interests to draw on research outside of vocational psychology for a more in-depth understanding of vocational interests and how to best measure them. Such endeavors hold great value for science and practice alike.

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Appendix A

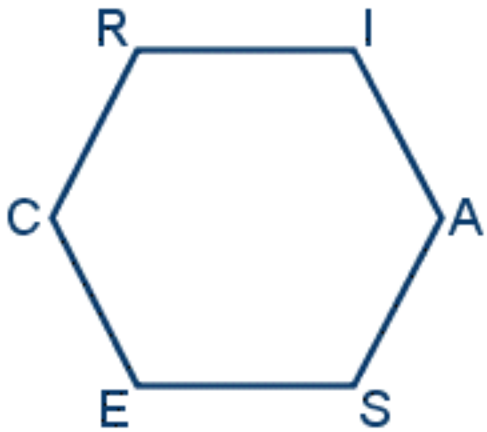

Figure 1. Graphical representation of Holland's RIASEC hexagon. R = Realistic. I = Investigative. A = Artistic. S = Social. E = Enterprising. C = Conventional.

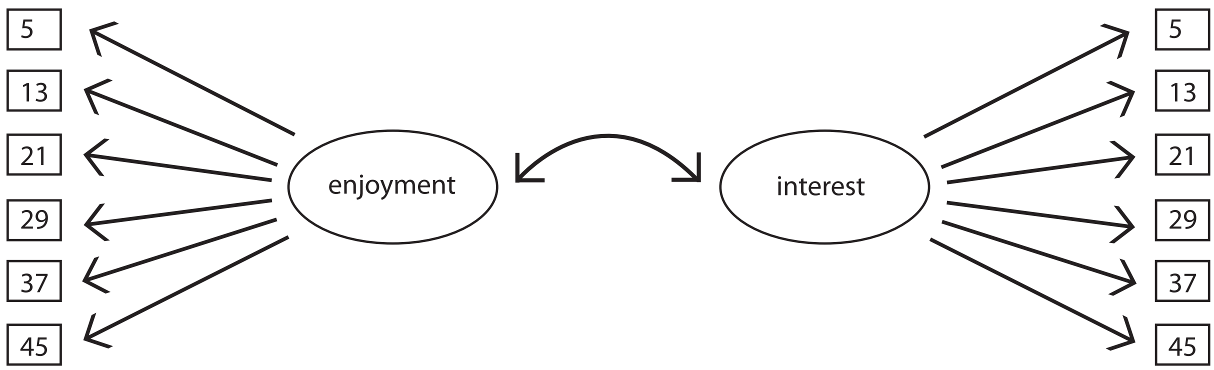

Figure 2. Confirmatory factor analysis two-factor model of enjoyment and interest for realistic activities. Indicator variables comprised items asking respondents to rate how much they liked each activity or how much they found each activity interesting. The items assessed enjoyment and interest for the following activities: 5. install electrical wiring, 13. oversee building construction, 21. design electronics systems, 29. repair airplanes, 37. inspect construction sites for safety, and 45. assemble precision optical instruments. The CFA two-factor models for investigative, artistic, social, enterprising and conventional activities are identical in structure to the above model, with different associated vocational activities.

Appendix B

Table 1

Results of MANOVA for Order of Scale Administration Effects

	Order 1		Order 2		Difference	*F*	Effect Size
	M	*SD*	*M*	*SD*			(η^2)
Realistic							
Omnibus Test						6.78	.09
Enjoyment	16.40	7.79	15.09	7.45	1.31	2.77	.01
Current Competence	11.99	6.66	12.04	6.74	-0.05	0.01	.00
Future Competence	14.98	8.20	15.37	8.97	-0.39	0.21	.00
Complexity	32.44	5.57	31.31	5.78	1.13	4.07	.01
Familiarity	10.89	7.27	12.43	8.47	-1.54	3.90	.01
Interest	13.22	7.45	14.89	7.52	-1.67	5.13	.01
Investigative							
Omnibus Test						3.94	.06
Enjoyment	20.96	7.61	19.04	8.36	1.92	5.90	.01
Current Competence	11.99	6.67	12.04	6.74	-0.05	0.01	.00
Future Competence	22.33	9.36	20.21	8.99	2.12	5.54	.01
Complexity	27.95	5.28	27.91	6.18	0.04	0.01	.00
Familiarity	15.47	6.99	16.19	8.09	-0.72	0.94	.00
Interest	19.19	9.29	19.07	8.38	0.12	0.02	.00
Artistic							
Omnibus Test						2.01	.03
Enjoyment	21.12	8.35	21.23	9.73	-0.11	0.02	.00
Current Competence	21.01	8.52	20.97	8.73	0.04	0.00	.00
Future Competence	21.76	9.51	21.00	9.92	0.76	0.63	.00
Complexity	24.90	6.75	24.25	6.84	0.65	0.93	.00
Familiarity	17.88	7.64	19.32	9.09	-1.44	3.01	.01
Interest	20.14	8.93	20.85	8.97	-0.71	0.66	.00

Table 1 (Continued)

Results of MANOVA for Order of Scale Administration Effects

	Order 1		Order 2		Difference	*F*	Effect Size
	M	*SD*	*M*	*SD*			(η^2)
Omnibus Test						2.91	.04
Enjoyment	26.93	5.38	25.84	6.41	1.09	3.52	.01
Current Competence	30.45	6.01	29.03	7.27	1.42	4.67	.01
Future Competence	31.75	6.69	29.78	7.33	1.97	8.11*	.02
Complexity	18.04	5.38	19.61	5.46	-1.57	8.75*	.02
Familiarity	24.29	6.68	23.03	6.68	1.26	3.73	.01
Interest	25.05	6.35	24.86	6.73	0.19	0.09	.00
Enterprising							
Omnibus Test						4.48	.06
Enjoyment	21.95	5.18	20.38	7.32	1.57	6.16	.02
Current Competence	28.29	6.74	27.40	7.62	0.89	1.57	.00
Future Competence	30.95	7.82	29.48	8.79	1.47	3.19	.01
Complexity	17.27	4.57	18.28	5.08	-1.01	4.44	.01
Familiarity	20.38	6.49	18.47	6.74	1.91	8.55*	.02
Interest	18.80	7.02	19.56	6.43	-0.76	1.34	.00
Conventional							
Omnibus Test						3.88	.05
Enjoyment	15.66	6.22	14.98	7.36	0.68	1.01	.00
Current Competence	13.84	6.40	14.05	6.73	-0.21	0.10	.00
Future Competence	19.08	7.92	19.08	8.37	0.00	0.00	.00
Complexity	30.63	5.03	29.70	5.56	0.93	3.11	.01
Familiarity	11.22	6.47	12.22	6.95	-1.00	2.25	.01
Interest	12.51	6.49	14.32	6.55	-1.81	7.89*	.02

Note: η^2 = eta-squared. α = .008. *p < .05.

Table 2

PGI- and PGI-Derived Scale Intercorrelations Per RIASEC Type

RIASEC Type	1	2	3	4	5	6
Realistic						
1. Enjoyment	(.89)					
2. Current Competence	.62	(.87)				
3. Future Competence	.62	.80	(.88)			
4. Complexity	-.19	-.40	-.37	(.78)		
5. Interest	.51	.40	.42	-.13	(.86)	
6. Familiarity	.64	.56	.47	-.15	.14	(.92)
Investigative						
1. Enjoyment	(.83)					
2. Current Competence	.67	(.81)				
3. Future Competence	.71	.86	(.86)			
4. Complexity	-.01	-.29	-.18	(.78)		
5. Interest	.78	.62	.66	.08	(.85)	
6. Familiarity	.62	.67	.57	-.07	.44	(.84)
Artistic						
1. Enjoyment	(.88)					
2. Current Competence	.74	(.87)				
3. Future Competence	.74	.88	(.91)			
4. Complexity	.05	-.26	-.21	(.84)		
5. Interest	.76	.63	.59	.01	(.87)	
6. Familiarity	.70	.78	.71	-.07	.58	(.86)
Social						
1. Enjoyment	(.82)					
2. Current Competence	.48	(.88)				
3. Future Competence	.49	.74	(.89)			
4. Complexity	.05	-.35	-.32	(.85)		
5. Interest	.73	.49	.43	.03	(.82)	
6. Familiarity	.55	.55	.48	-.10	.61	(.84)
Enterprising						
1. Enjoyment	(.84)					
2. Current Competence	.32	(.87)				
3. Future Competence	.44	.72	(.90)			
4. Complexity	.10	-.42	-.32	(.93)		
5. Interest	.59	.35	.37	.10	(.85)	
6. Familiarity	.47	.41	.37	-.03	.46	(.86)

Table 2 (Continued)

PGI- and PGI-Derived Scale Intercorrelations Per RIASEC Type

RIASEC Type	1	2	3	4	5	6
Conventional						
1. Enjoyment	(.93)					
2. Current Competence	.56	(.92)				
3. Future Competence	.57	.62	(.92)			
4. Complexity	-.18	-.28	-.17	(.89)		
5. Interest	.53	.42	.46	-.12	(.92)	
6. Familiarity	.51	.48	.37	-.10	.41	(.93)

Note: Auto-correlations along the diagonal represent Cronbach's alpha values.

Table 3

Mean PGI- and PGI-Derived Scale Intercorrelations Across RIASEC Types

Scales	1 *r (SD)*	2 *r (SD)*	3 *r (SD)*	4 *r (SD)*	5 *r (SD)*	6 *r (SD)*
1. Enjoyment	(0.87)					
2. Current Competence	.56 *(.15)*	(0.87)				
3. Future Competence	.60 *(0.12)*	.77 *(0.10)*	(0.90)			
4. Complexity	-.03 *(0.13)*	.33 *(0.07)*	-.26 *(0.09)*	(0.83)		
5. Interest	.65 *(0.12)*	.49 *(0.12)*	.49 *(0.11)*	-.01 *(0.10)*	(0.86)	
6. Familiarity	.58 *(0.09)*	.57 *(0.13)*	.49 *(0.13)*	-.09 *(0.04)*	.44 *(0.17)*	(0.87)

Note: Auto-correlations along the diagonal represent Cronbach's alpha values.

Table 4

Comparisons of Scale Intercorrelations

RIASEC Type	Comparison	*r*1	*r*2	Difference	Statistic[a]
Realistic	Enjoyment/Interest vs. Lowest Cronbach's Alpha	.51	0.86	-.35	---
	Enjoyment/Interest vs. Current/Future Competence	.51	.80	-.29	-8.35***
	Enjoyment vs. Interest, Current Competence	.62	.40	.22	5.68***
	Enjoyment vs. Interest, Future Competence	.62	.42	.20	5.19***
	Enjoyment vs. Interest, Complexity	-.19	-.13	-.06	-1.29
	Enjoyment vs. Interest, Familiarity	.64	.14	.50	13.67***
Investigative	Enjoyment/Interest vs. Lowest Cronbach's Alpha	.78	0.85	-.07	---
	Enjoyment/Interest vs. Current/Future Competence	.78	.86	-.08	-4.07***
	Enjoyment vs. Interest, Current Competence	.67	.62	.05	1.95*
	Enjoyment vs. Interest, Future Competence	.71	.66	.05	2.29*
	Enjoyment vs. Interest, Complexity	-.01	.08	-.09	-2.69**
	Enjoyment vs. Interest, Familiarity	.62	.44	.18	7.02***
Artistic	Enjoyment/Interest vs. Lowest Cronbach's Alpha	.76	0.87	-.11	---
	Enjoyment/Interest vs. Current/Future Competence	.76	.88	-.13	-6.71***
	Enjoyment vs. Interest, Current Competence	.74	.63	.11	4.72***
	Enjoyment vs. Interest, Future Competence	.74	.59	.15	6.45***
	Enjoyment vs. Interest, Complexity	.05	.01	.04	1.04
	Enjoyment vs. Interest, Familiarity	.70	.58	.12	5.02***

Table 4 (Continued)

Comparisons of Scale Intercorrelations

	Comparison	*r*1	*r*2	Difference	Statistic[a]
Social	Enjoyment/Interest vs. Lowest Cronbach's Alpha	.73	0.82	-.09	---
	Enjoyment/Interest vs. Current/Future Competence	.73	.74	-.01	-0.38
	Enjoyment vs. Interest, Current Competence	.48	.49	-.01	-0.26
	Enjoyment vs. Interest, Future Competence	.49	.43	.07	2.12*
	Enjoyment vs. Interest, Complexity	.05	.03	.02	0.50
	Enjoyment vs. Interest, Familiarity	.55	.61	-.06	-2.09*
Enterprising	Enjoyment/Interest vs. Lowest Cronbach's Alpha	.59	0.86	-.27	---
	Enjoyment/Interest vs. Current/Future Competence	.59	.72	-.13	-3.41***
	Enjoyment vs. Interest, Current Competence	.32	.35	-.03	-0.76
	Enjoyment vs. Interest, Future Competence	.44	.37	.07	1.67*
	Enjoyment vs. Interest, Complexity	.10	.10	.00	0.11
	Enjoyment vs. Interest, Familiarity	.47	.46	.01	0.24
Conventional	Enjoyment/Interest vs. Lowest Cronbach's Alpha	.53	0.92	-.39	---
	Enjoyment/Interest vs. Current/Future Competence	.53	.62	-.08	-1.98*
	Enjoyment vs. Interest, Current Competence	.56	.42	.14	3.51***
	Enjoyment vs. Interest, Future Competence	.57	.46	.11	2.89**
	Enjoyment vs. Interest, Complexity	-.18	-.12	-.06	-1.34
	Enjoyment vs. Interest, Familiarity	.51	.41	.10	2.46**

Note: [a]Dunn and Clark's Z was used to compare the correlations of enjoyment/interest with current/future competence. All other comparisons were made with Williams's dependent t-test. α = .05. **p* < .05. ***p* < .01. ****p* < .001. All *p*s one-tailed.

Table 5

Goodness of Fit for One- and Two-Factor Models of Enjoyment and Interest

RIASEC Type	Model	SBS X^2	*df*	SBS ΔX^2	CFI	RMSEA
Realistic	1-factor	765.74***	54	---	.61	.18
	2-factor	399.05***	53	108.66***	.81	.13
Investigative	1-factor	1060.52***	54	---	.57	.21
	2-factor	927.35***	53	65.35***	.62	.20
Artistic	1-factor	1075.06***	54	---	.61	.21
	2-factor	946.51***	53	41.15***	.66	.20
Social	1-factor	2377.77***	252	---	.43	.14
	2-factor	2230.51***	251	55.57***	.47	.14
Enterprising	1-factor	2256.15***	252	---	.49	.14
	2-factor	1785.56***	251	138.21***	.61	.12
Conventional	1-factor	3077.12***	252	---	.47	.16
	2-factor	2038.27***	251	277.78***	.67	.13

Note: SBS X^2 = Satorra-Bentler scaled chi-square statistic. CFI = comparative fit index. RMSEA = root mean square error of approximation. ***$p < .001$.

Table 6

Moderating Effects of Class Standing on Relationships Between Enjoyment- and Interest-Based Congruence with Academic Major Satisfaction

Step and Predictor Variable	*B*	*SE B*	95% CI	R^2	ΔR^2
Step 1					
Enjoyment-Based Congruence	0.02	0.02	[-0.02, 0.06]		
Interest-Based Congruence	-0.03	0.02	[-0.07, 0.01]		
Class Standing	-0.24	0.16	[-0.55, 0.07]	0.02	---
Step 2					
Enjoyment-Based Congruence	0.03	0.27	[-0.02, 0.08]		
Interest-Based Congruence	-0.05	0.28	[-0.11, 0.00]		
Class Standing	-0.24	0.16	[-0.55, 0.07]		
Class Standing x Enjoyment-Based Congruence	0.06	0.05	[-0.03, 0.15]		
Class Standing x Interest-Based Congruence	-0.02	0.05	[-0.12, 0.07]	0.02	0.01

Note: N = 290. CI = confidence interval. *p < .05.

Table 7

Incremental Validity of Interest-Based Congruence for Academic Major Satisfaction

Step and Predictor Variable	*B*	*SE B*	95% CI	R^2	ΔR^2
Step 1					
Enjoyment-Based Congruence	0.00	0.02	[-0.04, 0.04]	0.00	---
Step 2					
Enjoyment-Based Congruence	0.02	0.02	[-0.03, 0.06]		
Interest-Based Congruence	-0.03	0.02	[-0.07, 0.01]	0.01	0.01

Note: N = 290. CI = confidence interval. *p < .05.