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# Ability assessment and vocational outcomes: the impact of utilizing an ability measure in predicting choice, aspirations, and satisfaction

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**Ability assessment and vocational outcomes: The impact of utilizing an ability measure  
in predicting choice, aspirations, and satisfaction**

by

**Wyndolyn M. A. Ludwikowski**

A dissertation submitted to the graduate faculty  
in partial fulfillment of the requirements for the degree of

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Major: Psychology

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## ABSTRACT

The current study examined the extent to which ability provides incremental validity to the prediction of various vocational outcome variables, such as major and occupational choice, major satisfaction, and career aspiration level. The Ability Profiler (U.S. Department of Labor Employment and Training Administration, 2002) was utilized as the ability measure alongside a variety of self-report individual difference variables, such as personality, interest, and self-efficacy, in the prediction of these vocational outcome variables. Discriminant functions analyses were utilized to determine whether ability adds incremental validity to the prediction of major and occupation choice beyond what is predicted by the self-report measures, while hierarchical regression analyses were utilized to assess the incremental validity of ability in the prediction of major satisfaction and career aspiration level. It was determined that ability does not add incremental validity to the prediction of major and occupation choice nor does it add incremental validity to the prediction of major satisfaction and career aspiration level beyond what is predicted by the self-report measures. Implications for career counseling, limitations of the current study, and future directions are discussed.

## CHAPTER 1. INTRODUCTION

A range of individual differences constructs have been implicated in the process of making academic and career-related decisions. The models developed by vocational psychologists have identified interests, abilities, personality, and self-efficacy, as some of the important determinants of educational major and occupational choices, aspirations, and satisfaction. When these models are used in applied settings, such as career counseling, assessment of these key constructs is often an important component of clinical interventions (Brown & Lent, 2005). However, as noted by Lubinski (2010), the assessment of these constructs is often limited to self-report attitude measures, reminding the vocational psychology field of the long-standing history and evidence supporting the use of ability assessments to assist individuals along their career exploration processes.

Although models of the career choice process often acknowledge the role of abilities, the emphasis is often on self-report measures. For example, Social Cognitive Career Theory (SCCT; Lent, Brown, & Hackett, 1994) proposes a model where person inputs, such as gender, race/ethnicity, and disability status, and background contextual affordances, impact learning experiences, which in turn influences self-efficacy expectations and outcome expectations. These variables together influence interests, goals, and performance in particular domains with self-efficacy serving as the critical variable that influences subsequent career exploration processes (Lent, Brown, & Hackett, 1994). In other words, SCCT identifies self-efficacy as the key construct in a model that accounts for individual differences in how people choose their majors and careers, as well as their satisfaction and performance in these areas. In fact, some researchers would argue that self-efficacy has



greater utility in predicting major and occupational choice than actual ability in the career counseling process (Darcy & Tracey, 2003).

Although there is empirical support for the SCCT model (Sheu, Lent, Brown, Miller, Hennessy, & Duffy, 2010; Brown, Lent, Telander, & Tramayne, 2011), a number of issues have been raised with this model, including the central importance it places on self-efficacy and the relation between measures of self-efficacy and other constructs. Self-efficacy and interests are often measured according to Holland's Theory of Vocational Personalities (Holland, 1959; 1997), and it has been argued that interest measures and self-efficacy measures are both indicators of Holland type with a shared component related to Holland's typology (Armstrong & Vogel, 2009). It has also been suggested that objective ability measures are more effective than self-efficacy measures as indicators of individual differences in career-related behaviors (Judge, Jackson, Shaw, Scott, & Rich, 2007; Lubinski, 2010). Although an individuals' accuracy in estimating abilities may be contingent upon their actual ability level in a particular domain, some research suggests that individuals generally tend to be poor estimators of their own abilities. More specifically, individuals who perform poorly on tasks tend to over-estimate their abilities; whereas, above average performers tend to under-estimate their abilities (Kruger & Dunning, 1999; Ehrlinger, Johnson, Banner, Dunning, & Kruger, 2008).

The purpose of this research is to examine the potential incremental validity of an objective ability measure, where correct and incorrect answers to questions have been predetermined, in the battery of vocational assessments typically utilized in career counseling in the prediction of various outcome variables, including current academic program choice and satisfaction and future career choice and aspiration level. It is predicted that the

inclusion of an objectively-scored ability measure will improve the prediction of academic and vocational outcome variables when compared to results obtained from self-report measures. This research will contribute to current models of the career choice process by clarifying the relations between abilities and self-report measures of career-related attitudes and will be of potential utility to career counselors who are working with clients who are struggling with academic and career planning. To the extent that the inclusion of this ability measure improves prediction of these outcome variables, obtained results would support the increased utilization of objectively-scored ability measures in career counseling and the career exploration process.

## CHAPTER 2. LITERATURE REVIEW

### *Measures of Career Choice and Performance*

Career counselors often assist their clients by administering an array of individual differences measures to be best able to help their clients in their career decision-making processes. Cattell (1957) suggested that at least three sources of data should be utilized in the assessment process to best capture and understand individual differences related to educational and vocational outcome variables. Two of the sources of information, objectively-scored tests (*T-data*) and life records (*L-data*), are used not commonly in the career counseling process; however, self-report questionnaires (*Q-data*) are used quite frequently, which raises concerns regarding the impact of mono-method variance (Donaldson & Grant-Vallone, 2002; Williams & Brown, 1994).

During the assessment process, career counselors may also include less structured questions regarding client experiences and preferences, such as academic classes or work experiences these individuals have enjoyed, and they may ask their clients to describe the experiences in which they have excelled (Brown & McPartland, 2005; Whiston & Rahardja, 2008). Regarding the standardized assessment measures and more informal unstructured inquiry process, the clients are providing self-report data regarding how they would describe their own likes and dislikes, strengths and weaknesses, academic and work experiences, and other behavioral predispositions and preferences. In the career counseling process, objectively-scored measures, such as cognitive ability assessments, are used very infrequently and are often overlooked in various vocational psychology models.

### *Cognitive Abilities*

Cognitive ability has been recognized as a critical determinant of important life outcomes, such as academic achievement and job performance (Kuncel, Hezlett, & Ones, 2004). For example, Humphreys (1985) suggested that “[a general] intelligence test is the single most important test that can be administered for vocational guidance purposes” (pp.210-211). Despite this long-standing agreement over the potential utility of cognitive ability measures in the career exploration process, a great deal of debate has ensued regarding the definition and structure of cognitive abilities; however, in more recent years, a consensus has begun to emerge (Carroll, 1993). General cognitive ability, or general intelligence, is generally defined as a broad mental capacity that includes logical reasoning, problem solving, abstract thinking, the capacity to comprehend complex ideas, and the capacity to learn quickly (Gottfredson, 1997). In hierarchical models of cognitive ability, this general intelligence factor is sometimes conceptualized as *g*, the mental capacity for information processing that facilitates higher-order cognitive operations, such as reasoning, problem solving, and decision-making. In fact, Carroll (1993) proposed that *g* is the highest order factor of cognitive abilities with more specific abilities falling underneath *g*.

General cognitive ability has been found to be stable (Deary, Whalley, Lemmon, Crawford, & Starr, 2000) and strongly influenced by genetics (Bouchard, Lykken, McGue, Segal, & Tellegen, 1990). Deary et al. (2000) followed Scottish individuals from childhood to the age of seventy-seven, administering ability tests at two separate time points to determine how stable general ability remains over the course of a lifetime. The first and second administrations of the ability test were strongly and positively correlated with each other, suggesting that abilities tend to remain stable over time. Bouchard et al. (1990) examined the intellect of monozygotic and dizygotic twins that were reared apart and

determined that approximately seventy percent of the variance in intelligence could be attributed to genetic factors. These findings indicate that the general ability tends to remain stable over the course of a lifetime and is largely controlled by genetic influences.

*Cognitive Ability Constructs and Measures.* In considering the wide range of cognitive ability measures that are available for research and assessment purposes in applied settings, the establishment of a taxonomy for defining and organizing the underlying constructs is necessary. It has been stated that tests of cognitive ability measure not only general cognitive ability,  $g$ , but also specific components unique to that specific test (Spearman, 1937); however, a debate arose regarding the extent to which specific abilities exist. Through the course of history, various researchers have argued that any number of specific cognitive abilities exist, whether it is Thurstone's (1938) seven primary cognitive abilities or Guilford's (1959) one hundred distinct abilities.

Snow and Lohman (1989) proposed a model of cognitive abilities, consisting of the general factor,  $g$ , and three content ability domains: quantitative/numerical, spatial/mechanical, and verbal/linguistic. Studies have indicated that  $g$  accounts for approximately fifty percent of the common variance shared in a heterogeneous collection of intelligence tests with quantitative/numerical, spatial/mechanical, and verbal/linguistic abilities accounting for approximately eight to ten percent of the remaining common variance (Lubinski, 2004; Schmidt & Hunter, 2004). Although the general intelligence factor can account for the majority of variance in scores obtained on ability measures, specific abilities may provide additional information beyond  $g$ . In fact, some research has demonstrated that these specific abilities account for criterion variance above and beyond  $g$  in terms of predicting educational and occupational choice (Humphreys, Lubinski, & Yao, 1993). The

incremental validity of specific abilities demonstrates the potential utility of measuring individuals' relative strengths and weaknesses in specific abilities. Conversely, other research has demonstrated that there was no specific causal path from specific abilities to performance; however, general cognitive ability showed a causal link to performance, indicating the overall importance of measuring general cognitive ability when attempting to predict occupational performance (Hunter, 1983b).

Cognitive abilities were once utilized frequently in vocational psychology; however, in more recent years, the use of measures to assess cognitive abilities has decreased substantially. Brayfield (1961) theorized that the decrease in the utilization of cognitive ability measures could be attributed to a shift in what was perceived to be the most important outcome variable in vocational psychology. Initially, performance was regarded as more important than satisfaction; however, over the course of the twentieth century, satisfaction took the lead and became the prized vocational outcome variable. Vocational psychology researchers and career counselors strived to ensure that individuals seeking their assistance would be able to find educational and occupational environments in which they were satisfied rather than determining whether these individuals would succeed in these environments. Perhaps, each of these outcome variables is essential in vocational psychology. Therefore, to best assist clients in career counseling, it is important to measure abilities in order to determine what individuals can *actually* do rather than only measuring what they *believe* they can do. "Neither objective outcomes nor objective abilities are regularly consulted," and this is a major problem in the field of vocational psychology (Lubinski, 2010, p. 229).

*Abilities and Vocational Outcome Variables.* Campbell (1990) declared that “general mental ability is a substantively significant determinant of individual differences in job performance for any job that includes information-processing tasks” (p. 56). In fact, it has been argued that general cognitive ability is predictive of outcome variables in both educational and occupational settings (Kuncel et al., 2004). This concept, however, is not new. Since the early twentieth century, studies have been conducted investigating the extent to which general cognitive ability plays a role in educational and vocational outcome variables (Terman, 1925; Cox, 1926; Burks, Jensen, & Terman, 1930; Terman & Oden, 1947; Terman & Oden, 1959). Prior to a meta-analysis conducted by Schmidt and Hunter (1977), it was often assumed that ability requirements were job specific. That is, for any particular occupation, there would be a specific set of abilities that would best predict job performance. However, the results of meta-analyses have demonstrated that general cognitive ability acts as one of the strongest predictors of job performance to the extent that any contradictory findings are not interpreted as the result of statistical artifacts, such as sampling or measurement error and restriction of range effects (Schmidt & Hunter, 2004).

People who typically have higher general intelligence often attain higher levels of educational and vocational success. Gottfredson (1997) highlighted the importance of *g* in daily life and further discussed why *g* plays an important role in predicting work-related performance. It has been shown that *g* demonstrates good predictive validity when performance is measured by supervisors’ ratings of workers’ job performance with average predictive validity coefficients ranging between .3 to .5 (Hardigan & Wigdor, 1989). Gottfredson (1997) declared that these average predictive validities improve when performance is measured objectively, such as by utilizing actual work samples as a measure

of job performance. In fact, Jencks (1979) demonstrated that general intelligence measured at adolescence predicts occupational attainment, especially after controlling for differences in background and socioeconomic status. Other studies have continued to demonstrate that specific cognitive abilities predict occupational and educational attainment (Stanley, 1996). Furthermore, research demonstrates that people will either move to higher or lower levels of jobs to match their cognitive abilities (Wilk & Sackett, 1996). Even cognitive abilities measured at young ages can predict the occupational level achieved in adulthood, as shown by Judge, Higgins, Thoresen, and Barrick (1999).

It has been determined that cognitive abilities distinguish between performance outcome variables even in the top one percent of individuals in a particular ability domain. Researchers have conducted studies on children, assessing their abilities at a young age by administering an ability assessment that is typically utilized with an older population in order to assess longitudinal educational and occupational outcome variables. Even within the top one percent of performers on an ability test, researchers have observed higher levels of occupational achievement associated with the top quartile of the top one percent of performers with these individuals being more likely to attain doctoral degrees than the bottom quartile of the top one percent of performers (Park, Lubinski, & Benbow, 2007; 2008).

Webb, Lubinski, and Benbow (2002) examined the extent to which abilities and interests predict undergraduate mathematics or science majors attained when administering these assessments at age thirteen. It was noted that regardless of whether these individuals completed mathematics or science majors, these individuals often ended up in science or mathematics fields when these individuals were questioned twenty years later. These



participants reported both career and life satisfaction, and Webb et al. (2002) highlighted the importance of measuring individuals differences, such as cognitive ability, in order to best predict and account for vocational outcome variables, such as career satisfaction.

Research has demonstrated the importance of assessing abilities at a more specific level to best predict occupational and educational choice (Humphreys, Lubinski, & Yao, 1993). It has been said that while “ability level predicts the level of achievement, ability pattern predicts the nature of achievement” (Robertson, Smeets, Lubinski, & Benbow, 2010, p. 348). General cognitive ability level can inform career counselors to what level of education an individual might succeed; whereas, specific cognitive abilities may provide information into how individuals actually choose what educational degrees or occupations they want to pursue. Specific abilities tend to account for more criterion-related variance beyond *g*.

In a study conducted by Achter, Lubinski, Benbow, and Eftekhari-Sanjani (1999), a group of thirteen year olds scoring in the top one percent in general cognitive ability were followed over the course of a twenty year span to determine their educational and vocational choices. It was found that differences in mathematical, spatial, and verbal abilities reflected preferences and interests in classes and subsequent educational and vocational choices. Specifically, it was noted that individuals who scored the highest on the verbal abilities test relative to the mathematical or spatial abilities tests tended to be involved with the social sciences or humanities fields; whereas, individuals who received the highest scores on mathematical or spatial abilities measures tended to join science, technology, engineering, and mathematics fields (STEM). It appears that it is not only important to assess general cognitive ability but also specific abilities. If career counselors only utilize general

intelligence or ability scores (or fail to measure objective abilities), they are neglecting a whole set of valuable information that could potentially help guide these individuals into academic programs and occupations that would not only fit their interests and confidence but also their true ability levels.

*Potential Issues with Ability Measurement.* One potential issue with the use of ability measures in vocational psychology is the length of administration: Ability measures typically require much more time to complete than self-report measures. In fact, this may be one reason that their utilization has decreased in favor of asking individuals to self-estimate their abilities or report their confidence in performing a particular task. In addition, these measures are often quite costly to administer and score, which may deter the continued use of these measures, especially if the self-report substitution is deemed appropriate and satisfactory. Along these same lines, most of these measures require trained professionals to administer multiple subsets to the participants, which can cost a career center or vocational psychology research lab precious time, training, and resources that may be used for other tasks or activities. Despite these negative aspects that are accrued, it is suggested that cognitive ability measures be reintroduced to career counseling practice and research as past research has demonstrated their practical utility in the prediction of various vocational outcome variables.

### *Personality*

Personality has been defined as an individual's unique, relatively enduring pattern of emotions, attitudes, motives, thoughts, and behaviors (McCrae & Costa, 1999), a notion that can be traced back to Allport's establishment of the trait construct as habitual systems in 1921. Allport stated that personality traits were the main underlying determinant of human

behavior, and most research conducted over the course of the last century has focused on traits as the major components of personality (Winter & Barenbaum, 1999). Researchers must infer the characteristics of traits based on tangible, observable characteristics of individuals because personality structures are not directly observable (McCrae & Costa, 1999). Researchers might ask individuals to rate themselves according to their behaviors, attitudes, and preferences in order to assess their personality traits. Through this research, it has been repeatedly determined that personality traits are stable over individuals' life spans.

In one study of the stability of personality, researchers first assessed personality traits of elementary school children and administered a final assessment forty years later to examine the temporal stability of personality traits (Hampson & Goldberg, 2006). It was found that the test-retest reliabilities of personality traits were much lower through childhood than in adulthood, but these test-retest reliability coefficients stabilized in adulthood with reliability coefficients ranging from .70 to .79. Another study measured the extent to which personality traits changed over the course of ten year period from approximately age seventeen to age twenty seven (Donnellan, Conger, & Burzette, 2007), observing some minimal changes in personality over the course of this ten year period and concluding that personality is relatively stable. To summarize, research has demonstrated that personality traits are relatively stable over the course of time with only few systematic and expected changes (Robins, Fraley, Roberts, & Trzesniewski, 2001), and personality is most stable after age thirty (Terraciano, Costa, & McCrae, 2006; 2010).

*Five Factor Model.* Before the development of the Five Factor Model of personality, personality theories were largely developed with little empirical basis to ground them (Piedmont, 1998). However, based on the *lexical hypothesis*, the idea that cultures and

societies develop words for ideas that are related to the world as people see it, Allport and Odbert (1936) examined the English language to identify the words that encompass important dimensions of personality in United States' society and culture. They derived 17,953 different descriptors that illustrate individual differences with subsequent analyses conducted by other research teams to confirm a five factor structure of these individual difference terms (Ehrhart, Roesch, Ehrhart, & Kilian, 2008). In 1943, Cattell also reiterated the importance of utilizing a large set of English terms in factor analyses in order to avoid the inconsistencies in findings that other researchers were encountering. In 1990, Goldberg asked a number of participants to rate themselves on 1431 trait adjective terms and performed repeated factor analyses on subsets of these terms, and he consistently derived five factors from these analyses. In a second and third study, he cut the number of terms utilized and continued to find the same five factor structure, and these items were proposed to be the initial items that could serve as Big 5 markers in future research.

The Five Factor Model was formalized by McCrae and Costa (1996; 1999), describing the five factors as the basis of this theory and introducing a framework to conceptualize the development of personality according to the trait and lexical hypothesis tradition. According to the Five Factor Model of personality, there are five dimensions that describe individuals' personalities: Agreeableness, Conscientiousness, Extraversion, Neuroticism (Emotional Stability), and Openness to Experience (Intellect). These five factors are extremely broad in nature and have been said to be of the highest level of descriptors that can still portray behavior without being so broad as to be meaningless (Goldberg, 1993; John & Srivastava, 1999). Agreeableness has been described to be associated with altruism, generosity, compassion, trust, forgiveness, cooperation, warmth, and soft-heartedness;

Conscientiousness is related to dependability, persistence, motivation, attentiveness, carefulness, responsibility, organization, and efficiency; Extraversion relates to sociability, gregariousness, energy, activity, dominance, and forcefulness; Neuroticism is associated with anxiety, tenseness, cravings, urges, distress, insecurity, and indecisiveness with its inverse, Emotional Stability, being described with words, such as poise, self-reliance, and stability; and Openness to Experience is described as being imaginative, curious, unconventional, tolerant, creative, and original (Ehrhart et al., 2008; John & Srivastava, 1999; Piedmont, 1998).

The Five Factor Model personality traits tend to be relatively stable over time. Extraversion and Conscientiousness tend to be more stable than Neuroticism, which has demonstrated very poor stability over time (Hampson & Goldberg, 2006). Research has also been conducted examining the extent to which the Five Factor Model may be generalized and utilized in other cultures. In a review of the cross-cultural generalizability of this model, Rolland (2002) highlighted that while some of the factors demonstrate good generalizability across cultures, other traits do not appear in all cultures. Neuroticism, Openness to Experience, and Conscientiousness were found in sixteen cultures, while Extraversion and Agreeableness only appeared in some of the cultures examined. Triandis and Suh (2002) highlighted other issues associated with the Five Factor Model research conducted in other cultures, stating that it will be important for future research to include culture-specific descriptors and to include cultures that are very much different than Western cultures to fully analyze the generalizability of the Big Five factors.

*Personality and Vocational Outcome Variables.* While Mount, Barrick, Scullen, & Rounds (2005) consider interests to lead individuals to choose different academic and work

environments, they believe that personality influences individuals' actions within any chosen occupational environment. Other research has demonstrated the link between personality and performance by relating the Five Factor Model to high school and college grade point average and SAT scores (Noftle & Robins, 2007). Openness to Experience was found to be related to SAT verbal scores, and Conscientiousness was related to both high school and college grade point average. Upon further analysis, it was determined that the relation between Openness to Experience and SAT verbal scores is mediated by individuals' perceived verbal ability. Also, Conscientiousness can predict college grade point average even after accounting for high school grade point average and SAT scores. Finally, the relation between Conscientiousness and grade point average is mediated by perceived academic ability.

Ozer and Benet-Martinez (2006) have considered personality to be one of the variables that influences vocational outcome variables, such as performance, choice, and satisfaction. Conscientiousness and Agreeableness may come together to influence job performance. It has been demonstrated that individuals who are high in Conscientiousness but low in Agreeableness receive lower job performance ratings than those individuals who are high in Conscientiousness and also high in Agreeableness (Witt, Burke, Barrick, & Mount, 2002). It appears that it may be essential to consider multiple personality traits when attempting to predict educational or occupational performance. Judge, Heller, and Mount (2002) conducted a meta-analysis, examining the links between job satisfaction and the Five Factor Model. In examining 163 samples, their findings demonstrated that job satisfaction was positively correlated with Extraversion (.25), Agreeableness (.17), and Conscientiousness (.26). Openness to Experience appeared to be uncorrelated with job

satisfaction (.02), and Neuroticism was negatively correlated with job satisfaction (-.29). Individuals who tend to be energetic and personable, generous and warm, and dependable and organized tend to be more satisfied with their jobs than people who tend to experience lots of negative emotionality. Conversely, individuals that tend to be tense, anxious, or angry will likely experience these emotions on the job, making it less likely to report satisfaction in these jobs. Additionally, when considered as a whole set, the five factors were positively correlated with job satisfaction to a greater extent than considering any of them alone.

Bowling and Burns (2010) proposed that work-specific personality measures could add incremental validity to the prediction of job-related outcome variables, such as job satisfaction. Participants completed a general personality measure, assessing the Five Factor Model, and a work-specific personality measure, which was constructed by adding the words “at work” to the end of each personality item that was used in the general personality measure. The researchers did not include Openness to Experience items as past research demonstrated that this construct was less related to vocational outcome variables than the other four factors. It was found that Extraversion, Agreeableness, and Emotional Stability, the inverse of Neuroticism, were positively correlated with job satisfaction. In conducting hierarchical regression analyses, the researchers determined that job-specific Extraversion, Agreeableness, Emotional Stability, and Conscientiousness measures added incremental validity to the prediction of job satisfaction above and beyond the general personality factors. More research needs to be conducted to continue to determine what variables contribute to occupational outcome variables, such as job satisfaction.

### *Interests*

Multiple definitions of interests have been proposed in psychological research. Strong (1960) defined interests as liked and disliked activities, while Kuder (1977) stated that interests are preferences for various activities. In fact, Holland (1997), the creator of the premiere theory of vocational interests, stated that interests are basically expressions of personality that develop from genes and encounters with various activities that lead individuals to develop likes and dislikes, which then influences the development of competencies and dispositions.

*Holland's Model.* Holland (1959; 1997) described six interest-based categories that could be used to describe both people and occupational environments, naming the model the RIASEC model based off of the first letter of the names of the six different types: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. These types develop from a number of factors, such as values, self-concept, environment, biology, culture, and one's peers. Each category has a set of descriptors that can characterize and describe individuals and work environments of these types (Holland, 1997).

*Realistic.* An individual with Realistic interests likes working with one's hands, working outdoors, manipulating machinery, and performing physical activities. An individual with Realistic interests may enjoy working with plants and animals and may not like working in close relationships with other people; furthermore, an individual with Realistic interests may value the practical nature of things, as well as the material rewards for accomplishments. They see themselves as being conforming, practical, conservative, normal, and reserved.

*Investigative.* An individual with Investigative interests enjoys performing mathematical and scientific activities, and he/she may like solving complex problems mentally. This individual may also like to work with ideas and to search for information to



support these ideas. One with Investigative interests also enjoys exploring natural phenomena. Investigative individuals may value intellectual pursuits and the attainment of knowledge, and they may see themselves as being curious, intelligent, skeptical, analytical, and introspective.

*Artistic.* An individual with Artistic interests enjoys creative expression of forms, designs, and patterns. This individual may also take pleasure in environments without clear, established rules where he/she may be more able to express his/her ideas and emotions. Also, one with Artistic interests may enjoy literary and musical activities. Artistic individuals may also see the purpose of aesthetics while avoiding routine and conformity to established rules and regulations, and they may see themselves as being open to experience, innovative, unconventional, complicated, idealistic, and original.

*Social.* The individual with Social interests enjoys teaching, helping, and being around and working with other people. Social individuals may also enjoy volunteer work and have interest in religious and spiritual pursuits. Social individuals may see themselves as being agreeable, empathic, warm, patient, and extroverted.

*Enterprising.* An individual with Enterprising interests may enjoy leading, directing, manipulating, and persuading others. They enjoy making many decisions, taking risks, and starting new projects. An individual with Enterprising interests may enjoy working in business environments but dislike working in an area where he/she would not be able to influence others. Enterprising individuals may value obtaining material accomplishments and prestige and may see themselves as ambitious, energetic, gregarious, assertive, and self-confident.

*Conventional.* A person with Conventional interests may like routine and following set procedures. The individual with Conventional interests takes pleasure in establishing orderly routines and values financial accomplishments in business, social, or political areas. Conventional individuals may enjoy working with data and details and may dislike activities where no clear set of rules or regulations exist, and they may see themselves as being methodical, orderly, careful, conforming, and thorough.

Individuals seek out work environments where they can express their capabilities associated with their primary types (Holland 1959, 1997). Behaviors and vocational outcome variables usually result from interactions between individuals' type and the environments in which they perform their work duties. Holland indicated that congruence occurs when an individual pursues an academic or occupational environment that matches his/her type, which leads to greater satisfaction and performance in this occupation or academic program (Holland, 1996). Conversely, when an individual and environment are mismatched, incongruence results, leading an individual to be much less satisfied in this environment and to perform less well in this job or educational program.

As illustrated in Figure 1, Holland, Whitney, Cole, and Richards (1969) proposed a two-dimensional spatial model encompassing these six types with a hexagon (or circumplex) that represents the inter-relations among each of the types. The types were ordered clockwise around the hexagon, R-I-A-S-E-C. Types that are closer in proximity on the hexagon are described as more similar than are the types that are farther apart on the hexagon with the distance between types inversely proportional to the degree of similarity. The hexagon, or circumplex, interest structure, accounting for the inter-relations among the six RIASEC types, has been confirmed by numerous studies. Rounds and Tracey (1993) conducted a

meta-analysis that examined the structure of interests according to Holland's theory. Examining seventy-seven correlation matrices, the researchers confirmed Holland's hexagonal or circumplex structure of vocational interests.

Despite the utility of the Holland model, it has been called into question whether the RIASEC circumplex structure is able to be replicated with United States minority samples. Fouad (2002) compared the interests of individuals of five different groups in the United States: African Americans, Asian Americans, European Americans, Latino(a) Americans, and Native Americans. These participants completed the Strong Interest Inventory (SII; Donnay, Morris, Schaubhut, & Thompson, 2005), and only a small effect size was found when examining the differences in interests between United States ethnic minorities. Only one minority group, Native American women, did not fit the predicted Holland order and structure, indicating that generally the circumplex structure was replicated with diverse samples of individuals.

Armstrong, Hubert, and Rounds (2003) also examined the fit of the RIASEC circumplex structure with United States minority samples using circular unidimensional scaling. The researchers tested an unconstrained, quasi-circumplex model against a constrained, circular model for United States minorities. It was found that the circular model fit the data for European Americans and Asian Americans; however, the circular model fit the data of Latino(a) Americans and African Americans to a lesser degree. The quasi-circumplex model was found to be a good fit for all groups. The results from these studies indicate that the RIASEC model or close approximations of the RIASEC model can be utilized across different minority groups in the United States with confidence that it is generalizable to these groups.

*People-Things and Data-Ideas Dimensions.* As illustrated in Figure 1, Prediger (1982) proposed that there are two underlying dimensions for Holland's RIASEC model: People-Things and Data-Ideas. The People side of the People-Things dimension corresponds with the Social category, while the Things side of the People-Things dimension matches up with the Realistic category. The Data side of the Data-Ideas dimension runs between the Enterprising and Conventional types; whereas, the Ideas side of the Data-Ideas dimension runs between the Investigative and Artistic types. Prediger based these two dimensions off of the four work task categories that he developed in 1976. The Things task involves tasks that are non-personal in nature, such as working with tools or machines. The People task is associated with interpersonal activities, like caring for or leading other people. The Data task is impersonal in nature and deals with facts and systematic procedures. The Ideas task is intrapersonal in nature, dealing with theories and insights.

Research has generally supported the presence of these two bipolar dimensions that underlie Holland's RIASEC model (Prediger and Swaney, 2004). Examining general and detailed occupational information about the nature of work extracted from job analyses and individuals' interests, the researchers plotted this data in a two-dimensional space to determine how well this data fit the proposed People-Things and Data-Ideas dimensions. The researchers were able to repeatedly derive the People-Things and Data-Ideas dimensions, providing support of the presence of these dimensions underlying Holland's model.

Despite research confirming the presence of these two dimensions in Holland's interest-based structure, new research is being conducted that calls the proposed bipolarity of the People-Things and Data-Ideas dimensions into question. In particular, Tay, Su, and Rounds (2011) discussed that the bipolar nature of these dimensions insinuates that the types

associated with the poles of these dimensions are negatively correlated; however, based on their findings, only one of the correlations between opposite types (Investigative and Enterprising) reaches a threshold that would indicate bipolarity. Researchers suggest that career counselors do not assume bipolarity between opposite interest types in the RIASEC model as to not inhibit individuals' career choices.

*Interest Constructs and Measures.* Holland (1997) proposed that people seek out work environments that will allow them to exercise the skills, abilities, and values that are associated with their types, which makes it possible to assign types to work environments based on the types of individuals that compose the environment. Areas of the spatial model where an individual's interests are strongest can be identified using the results of an interest inventory, and the level of congruence for an occupational choice can be assessed by the distance between the location of strongest interests and an occupational choice (Rounds & Day, 1999). Furthermore, by matching an individual's interests to occupational characteristics by Holland category, it is possible to identify potential career choices for career counseling (Chartrand & Walsh, 1999; McDaniel & Snell, 1999).

McDaniel and Snell (1999) highlighted the benefits of accurate and thorough occupational information in that this information is utilized to help clients who are seeking career counseling. Many of the interest-based tools that career counselors use to help their clients are based on Holland's RIASEC model. Interest inventories, such as the Self-Directed Search (SDS; Holland, Fritsche, & Powell, 1997), Vocational Preference Inventory (Holland, 1977), and the Strong Interest Inventory (SII; Donnay, Morris, Schaubhut, & Thompson, 2005), report results according to Holland's model. Furthermore, occupational information databases, such as the O\*NET (Peterson, Mumford, Borman, Jeanneret, & Fleishman, 1999),

classify occupations according to the RIASEC model of vocational interests despite findings that the RIASEC model only captures approximately eighty-five percent of occupations (Deng, Armstrong, & Rounds, 2007). It appears that despite these issues, Holland's RIASEC model will remain the main mode of measuring vocational interests in career counseling and research.

*Interests and Vocational Outcome Variables.* Examining the relation of interests to vocational outcome variables has been a task that many researchers have undertaken in the last century. Holland (1997) theorized that the correspondence of interests and a particular environment leads to choice of that environment, satisfaction in that environment, and better performance in that environment. If there is a mismatch between an individual's interests and the atmosphere of a particular environment, it is likely that this individual will remove himself/herself from this environment due to dissatisfaction or he/she will be fired from this environment due to poor performance. SCCT also links interests to vocational outcome variables, such as choice.

*Potential Issues with Interests.* With the recent finding that the People-Things and Data-Ideas dimension may not be bipolar dimensions (Tay et al., 2011), it is necessary to reconsider views of the underlying structure encompassing vocational interests. Tay et al. (2011) proposed that vocational researchers should view the People-Things and Data-Ideas dimensions as bivariate dimensions rather than bipolar dimensions. Regarding these dimensions as bivariate will allow for the possibility of capturing individuals who possess both Social and Realistic interests, as well as individuals who have neither Social nor Realistic interests, which was not possible when these dimensions were considered to be bipolar.

Along the same lines, other research has demonstrated that strict cut-off scores when interpreting interest inventory and self-efficacy measure results may be problematic, especially if attempting to adhere to the SCCT model (Bonitz, Armstrong, & Larson, 2010). This model allows individuals to develop low confidence, resulting in low interests, and it also allows for individuals to develop high confidence, resulting in high interest. According to SCCT, individuals may develop high confidence in an area but not develop high interest in that area because it takes time to develop this interest; however, SCCT does not allow for individuals to have high interest and low confidence in an area, which is a common phenomenon. These researchers expressed concerns about this model, as well as the use of cut-off scores to place individuals in these high or low confidence/interest categories.

### *Self-Efficacy*

Based on Bandura's (1977; 1986) Social Cognitive Theory, self-efficacy has been defined as individuals' beliefs about their abilities to perform a *specific* activity successfully (Betz, 2000; Lent & Brown, 2006). Betz (2000) highlighted the continued importance of self-efficacy in the career development literature by describing not only the four sources of information that impact self-efficacy development but also the three behavioral consequences of the development of self-efficacy in any given domain. The three behavioral consequences of self-efficacy development are the following: approach versus avoidance behavior, quality of performance, and persistence in any given domain. The four sources of information that impact self-efficacy development are performance accomplishments, vicarious learning, emotional arousal, and social persuasion. Performance accomplishments' relation to self-efficacy resides in the idea that success will lead to the development of self-efficacy beliefs toward a given activity; whereas, failure will lead to the decreased likelihood of developing

self-efficacy or confidence to perform a particular activity. Vicarious learning applies the idea that if an individual observes someone who is perceived to be very similar to himself/herself succeed in an activity, this individual will likely believe that he/she is capable of undertaking the same task successfully. If failure is observed, self-efficacy beliefs will not develop for this activity. If individuals are persuaded to perform an activity, self-efficacy beliefs may be enhanced, but research indicates that this trend only holds true if the activity is a realistic challenge rather than an unattainable task. Finally, emotional arousal may influence self-efficacy beliefs with anxiety and stress hindering self-efficacy development to some extent and lower levels of anxiety boosting self-efficacy beliefs for a given behavior.

It is important to distinguish between self-efficacy and self-estimated abilities, as these are two distinct constructs that are often misidentified as the same construct. According to Hansen and Bubany (2008), the two constructs, self-efficacy and self-estimated abilities, were created in two different literatures for two different purposes. Self-efficacy revolves around the social learning theories proposed by Bandura (1977); whereas, self-estimated abilities were developed as replacements for objectively-measured abilities. These two constructs may appear quite similar, but differences exist in their proposed definitions and conceptualizations. While self-efficacy is regarded as a measure of confidence in a particular task that is to be completed, self-estimated abilities have been defined as “normative judgments about one’s current work-related abilities” (Brown, Lent, & Gore, 2000, p.224).

Tracey and Hopkins (2001) further clarified the definitions of these two constructs by making the distinction between self-efficacy and self-estimated of ability based on the extent to which individuals compare themselves in these judgments. Self-efficacy is confidence in performing an activity without any comparison to any outside or normative group, and self-



estimates of ability refer to individuals' confidence in performing an activity compared to some other group, which impacts the manner in which each of these constructs are measured. Typically, questions assessing individuals' self-efficacy in performing any given activity assess how confident individuals are in performing an activity; whereas, questions about individuals' self-estimates of ability assess individuals' self-rated ability to perform an activity compared to some reference group.

Despite these differences, it has been proposed that self-efficacy and self-estimates of abilities are distinct constructs that may reside underneath an overarching construct of ability judgments, and they only differ according to their directions and item response options (Hansen & Bubany, 2008). Other research has shown that measures of self-efficacy and self-estimates of ability may share similar structures. Research conducted by Prediger (1999) and Donnay and Borgen (1999) demonstrated that both self-efficacy estimates and ability self-estimates share underlying Holland-based structures (Holland, 1997), as well as the People-Things and Data-Ideas dimensional structure (Prediger, 1982). It appears that both self-efficacy and self-estimates of abilities can be described in terms of Holland's typology.

Marsh (1984) proposed an internal/external frame of reference model that distinguishes between individuals' self-comparisons of ability versus comparisons with other individuals' abilities. When individuals utilize an external frame of reference, they compare their abilities with others, much like self-estimates of ability. The internal frame of reference comparisons occur when an individual compares one domain with another only for himself/herself, which would be similar to self-efficacy estimates. Marsh (1984) expressed that there may be more problems associated with internal frame of reference comparisons and self-efficacy estimates than external frame of reference comparisons and self-estimates

of ability. Self-estimates of ability may be more accurate than self-efficacy estimates because in self-efficacy estimates, individuals must rank order their abilities, which may falsely place one ability lower or higher than it should be when compared to the normal population.

*Social Cognitive Career Theory (SCCT)*. Despite original concepts regarding self-efficacy introduced to the vocational psychology literature in 1981 (Betz & Hackett, 1981), Social Cognitive Career Theory (SCCT; Lent, Brown, & Hackett, 1994) was not developed until the mid-1990s. Based on Bandura's (1977) Social Cognitive Theory, SCCT attempts to explain the development of interests, vocational choices, and occupational performance by examining how self-efficacy, or one's confidence in abilities to perform an activity, mediates the relation between knowledge and subsequent behaviors, as illustrated in Figure 2 (Swanson & Fouad, 1999).

When considering the variables within the SCCT model, distinguishing between self-efficacy and outcome expectations is important (Bandura, 1986). Whereas self-efficacy is seen as confidence to be able to perform a particular task or behavior, outcome expectations are conceptualized as an individual's belief about what will occur after he or she performs the task or behavior. Individuals may believe that a certain positive outcome will result in completing specific tasks; however, individual may also have very low confidence in their capacity to actually successfully complete tasks, which will impede any effort or energy that individuals may apply towards task completion (Swanson & Fouad, 1999). It is also to be noted that both self-efficacy and outcome expectations are considered to be subjectively determined rather than objectively determined. SCCT focuses on these subjective values over objective values because "individuals' perceptions of reality are hypothesized to be greater determinants of their behavior than objective reality" (Swanson & Fouad, 1999, p. 126). That

is, SCCT places a greater value on self-report variables, such as self-efficacy, than on objectively-measured variables, such as cognitive abilities.

There are three segments to the SCCT model: the interest segment, the choice segment, and the performance segment. While there are three segments to the SCCT model, there are some components that are common to all three parts (Swanson & Fouad, 1999). Regardless of the segment of the model, self-efficacy is thought to be developed and impacted by the same variables. Additionally, learning experiences are central components in each segment: performance accomplishments, verbal persuasion, vicarious learning, and physiological states and arousal (Bandura, 1977). These learning experiences are influenced by various demographic variables and person inputs, such as gender, race/ethnicity, disability/health status, predispositions, and background contextual affordances. It is also noted that self-efficacy is related to outcome expectations in all of these parts of the SCCT model.

The interest segment of the SCCT model is characterized by the idea that both self-efficacy and outcome expectations jointly predict interest. Interests, self-efficacy, and outcome expectations impact and predict goals, which then determine behaviors individuals take and the degree to which goals are met. The choice segment of the SCCT model is a reciprocal model that contains many of the same features as the interest segment. Person inputs and background contextual affordances impact learning experiences, which impacts self-efficacy and outcome expectations. Self-efficacy and outcome expectations come together to influence interests, which leads to the development of choice goals, choice actions, and performance attainments. At this point, performance attainment in a particular

domain can be considered a new learning experience, which then impacts an individual's self-efficacy and learning experiences.

While the interest and choice models deal with vocational decision-making, the performance segment of SCCT has much more influence on individuals' behaviors after already becoming involved in a career with the influence being on the performance goals individuals set in these occupations. In fact, the variables that are considered in this model differ when compared to the interest and choice models. One's ability or past performance accomplishments impact self-efficacy and outcome expectations, which influence performance goals and subsequent performance levels attained.

Since the official introduction of self-efficacy to the vocational psychology literature with the development of SCCT, self-efficacy has become the predominant construct utilized in career counseling research (Betz, 2000). In fact, it has been found that over 10,000 investigations regarding self-efficacy have been conducted in the last thirty years (Judge, Jackson, Shaw, Scott, & Rich, 2007).

*Self-efficacy and Vocational Outcome Variables.* One of Betz' (2000) behavioral consequences of the development of self-efficacy is the subsequent quality of performance. Individuals who develop self-efficacy in a given area are much more likely to perform well in this domain than if they had never developed this confidence. Furthermore, these individuals are likely to persist in the face of adversity than those individuals without self-efficacy in this domain. One study examined the impact of self-efficacy beliefs on performance and persistence behaviors in fifteen science and technical academic majors (Lent, Brown, & Larkin, 1984; 1986). It was demonstrated that self-efficacy beliefs impact both performance and persistence behaviors with higher levels of self-efficacy leading to

greater performance, as measured by grades attained and persistence in these majors. It appears that self-efficacy greatly impacts academic and occupational performance. Meta-analyses examining the relation between self-efficacy and performance demonstrate that the correlation between these two variables is approximately .34 (Stajkovic & Luthans, 1998); however, arguments have been posed to further examine other variables that might be contributing to this relation between these two variables (Judge, Jackson, Shaw, Scott, & Rich, 2007).

Bandura (1997) highlights the extent to which self-efficacy impacts choice, indicating that “unless people believe they can produce desired effects by their actions, they have little incentive to act” (p. 2). Betz (2000) describes the three behavioral consequences or outcomes related to self-efficacy development in a given domain, one of which is approach versus avoidance behavior. According to self-efficacy theory, if an individual develops self-efficacy in a given domain, this individual is going to be more likely to choose to try this activity, major, or occupation than if he/she did not develop this level of self-efficacy in this area. On the other hand, if an individual never develops self-efficacy in a given domain, he/she is not very likely to choose to attempt this activity, major, or occupation.

*Potential Issues with Self-efficacy.* One problem with self-efficacy’s presence in vocational psychology is the level of specificity required to utilize the construct effectively. It has been noted that new measures must be in constant development to adequately assess any given domain, as global measures will not suffice (Lent & Brown, 2006). It seems that this method, while allowing great specificity, is incredibly inefficient. While there are benefits associated with self-efficacy and SCCT’s goal in examining “relatively dynamic and situation-specific aspects of people,” it appears that SCCT researchers may be examining

these dynamic variables without fully understanding the global measures and failing to take into account other variables, like cognitive abilities, that may better explain occupational outcome variables, such as choice, performance, and satisfaction, than self-efficacy is able to do.

In fact, some studies demonstrate that self-efficacy's impact on vocational outcome variables is relatively small (Judge, Jackson, Shaw, Scott, & Rich, 2007). Judge et al. (2007) proposed a conceptual path model where general mental ability, personality traits, and work experience come together to influence work-related performance through self-efficacy, as well as having direct influences on performance without being influenced by self-efficacy initially. Many past researchers have claimed that self-efficacy accounts for the most variance in predicting performance (Bandura, 1997;1999), but little research has been conducted examining the extent to which other individual difference variables predict performance alongside self-efficacy, which Judge et al.'s (2007) model allows. Judge et al. (2007) also sought to examine various moderators, such as job complexity and goal setting, of self-efficacy's effects on work-related performance, resulting in a very comprehensive meta-analytical examination of self-efficacy's impact on a single vocational outcome variable.

Judge et al. (2007) found that when they added self-efficacy to a regression model containing the other variables predicting work-related performance, self-efficacy did not significantly contribute to the prediction of performance, demonstrating poor incremental validity. Furthermore, when the researchers tested their conceptual path model, self-efficacy continued to not significantly impact or influence performance. These non-significant results may be due to the moderating effects of other variables on the relation between self-efficacy

and work-related performance. It was found that self-efficacy and performance are more strongly related and self-efficacy predicts job performance when the following occurred: Goals were developed, job complexity was low, and the subjects were undergraduate students rather than working adults. Judge et al. (2007) conclude that “once individual differences are taken into account, the predictive validity of self-efficacy shrinks dramatically,” highlighting the idea that perhaps self-efficacy has been over- and wrongly-utilized over the course of the last few decades due to its poor incremental validity and conditional predictive validity, especially after other individual difference variables have been demonstrated to perform better than self-efficacy in predicting work-related performance.

Another issue with the utilization of self-efficacy measures in vocational psychology research and career counseling is that people tend to be poor estimators of their true abilities. It has been demonstrated that individuals who are poor performers in a given task tend to over-estimate their abilities on that task (Ehrlinger, Johnson, Banner, Dunning, & Kruger, 2008), and these poor performing individuals also tend to be the ones who make the worst estimations regarding their performance on a task (Kruger & Dunning, 1999). Furthermore, the “incompetent” are also the individuals who are unable to “accurately recognize the magnitude of their deficits” (Ehrlinger et al., 2008, p. 99). If career counselors only administer an interest assessment and self-efficacy assessment, these individuals may be directed into careers in which they have interest and confidence but lack the skills necessary to succeed in these domains.

Other research has also demonstrated that a vast majority of people will rate themselves as above average on a given task, which is statistically impossible for everyone to

be above average at everything (Dunning, Meyerowitz, & Holzberg, 1989; Zenger, 1992), which would provide no interesting or useful information to career counselors or clients in determining which academic majors or occupations might be good fits for them. Even the top performers in a given task are unable to accurately estimate their true abilities on that task; however, top performers tend to under-estimate their abilities (Kruger & Dunning, 1999). Once again, if career counselors only administer an interest assessment and a self-efficacy assessment to a top performing individual, the career counselor may be directing this individual into an interest-congruent career that may not allow this individual to utilize their talents.

Some researchers have criticized these studies by arguing that these findings can be attributed to statistical issues (Krueger & Mueller, 2002), methodological issues, or task difficulty (Burson, Larrick, & Klayman, 2006) rather than any differences between high and low performers' abilities to self-estimate their abilities; however, more recent studies have shown that these arguments can be falsified (Ehrlinger et al., 2008). It was found that the great errors in estimating their own abilities that low performers demonstrate can be attributed to the minimal insight these individuals possess into their own abilities rather than making poor comparisons between other performers and themselves. Overall, it appears that self-efficacy measures are a poor stand-in for ability assessments, and it is suggested that vocational psychology move toward incorporating both types of assessments in career counseling practice and research in order to best help clients seeking these services.

#### *Relating Constructs and Vocational Outcome Variables*

*Abilities and Personality.* There is a long-standing history of examining the relations between personality and abilities with some of the first research in this area being conducted



by Cattell (1945a; 1945b). In these initial analyses, Cattell examined the extent to which there were correlations between intelligence, personality, and various abilities, such as drawing ability, mathematics ability, and verbal ability. Ackerman & Heggestad (1997) concluded that personality and ability come together to influence one's performance in a chosen work or academic environment, while interests lead individuals to pursue certain environments.

*Ability and Interest.* Holland (1997) describes various competencies that each type of individuals typically possesses. He noted that Realistic individuals may lack ability in human interactions and typically do not tend to perform well in academic tasks. Investigative individuals were theorized to possess scientific and mathematical abilities; however, it was also stated that Investigative individuals likely falter when asked to persuade another individual to perform a course of action. Artistic individuals tend to develop and possess competencies in the arts, such as dancing, drawing, and painting, while they may lack organizational ability and office skills. Social types may have an affinity for social relations and interactions with others, but they might not have skill in mechanical and technical types of activities. Enterprising individuals tend to have skills that allow them to lead and influence others but may lack skills in scientific, mathematical, or research-oriented pursuits. Individuals who possess Conventional interests tend to be able to perform clerical and business administrative tasks well while lacking artistic abilities. Each type possesses strengths and weaknesses.

*Personality and Interest.* For nearly a decade, researchers have been arguing about how interests and personality may relate (Larson, Rottinghaus, & Borgen, 2002). It was not until Holland developed his ground breaking theory that interests were seen as an

“expression of personality” (Larson et al., 2002, p.218). Other research has demonstrated that interests and personality are similar but distinct constructs (Barrick, Mount, & Gupta, 2003). In their meta-analysis of twelve different studies, these researchers found various links between interests and personality. Artistic interests and Openness to Experience correlated the most strongly of any of the personality and interest relations (.48), followed by Enterprising interests’ relation with Extraversion (.41). Social interests were related to Extraversion (.31), and Investigative interests were related to Openness to Experience (.28). Social interests were correlated with Agreeableness (.19). Individuals who tend to seek and appreciate new experiences and are creative are likely going to express Artistic or Investigative interests, such as acting, painting, or research activities. Also, individuals who tend to be talkative, social, active, and dominant are equally likely to have interest in helping or persuading other people. Along the same lines of reasoning, individuals that tend to be compassionate and soft-hearted will be drawn to teaching, helping, and caring for other people. These researchers also uncovered a few unexpected links: Enterprising interests were positively correlated with Conscientiousness and negatively correlated with Neuroticism. Also, Social interests were related to Openness to Experience.

Armstrong and Anthony (2008) examined the links between personality and interest, comparing two datasets that measured interests and personality using a variety of measures and populations. The researchers collected their own data and identified a preexisting data set from a Dutch-speaking sample (De Fruyt & Mervielde, 1997), and they examined how facets of the five factor model fit into Holland’s model. De Fruyt and Mervielde (1997) used Dutch translations of the Self-Directed Search (SDS; Holland, 1979) and the NEO-PI-R (Costa & McCrae, 1992), while Armstrong and Anthony (2008) measured interests with the Interest

Profiler (Lewis & Rivkin, 1999) and personality with the International Personality Item Pool (IPIP; Goldberg, Johnson, Eber, Hogan, Ashton, Cloninger, & Gough, 2006). It was found that many of the personality facets fit well into Holland's model of interests when subjected to property vector fitting analyses, though some discrepancies exist between the two samples in terms of how the personality facets fit with interest types. Generally, Openness to Experience facets linked with Artistic interests with some facets corresponding better with Investigative and Social interests. Extraversion facets corresponded well with Social and Enterprising interests, while Agreeableness facet scales matched up with Social interests to the greatest extent. When comparing both data sets, there was a lack of agreement for the placement of Conscientiousness and Neuroticism in the interest space. By linking interests and personality facets, career counselors will be better able to utilize these constructs to better help career counseling clients find academic majors and occupations that will be good fits for both their interests and personalities.

Other research has attempted to assess higher-order factors that account for the relations between the Five Factor model and RIASEC interests. Performing a meta-analysis, Mount, Barrick, Scullen, and Rounds (2005) found three dimensions that account for the relations between the personality and interest types. One of these dimensions merely accounted for the differences between the two types of measures, interest types versus personality types, highlighting the distinction between interest and personality. Two other factors were found: Striving for accomplishment versus striving for personal growth and interactions with people versus interactions with things. In terms of the striving for accomplishment versus striving for personal growth dimension, Conventional and Enterprising interests and Conscientiousness personality grouped together on one end of the

dimension, which was labeled striving for accomplishment; whereas, Artistic interests and Openness to Experience personality were situated on the other end of the dimension, which was called striving for personal growth. The interactions with people component of the third dimension encompassed Social and Enterprising interests and Extraversion, while the interactions with things component of the third dimension possessed Investigative and Realistic interests. Dimension three matches up with Prediger's (1982) People-Things dimension. While a great deal of other research that has been conducted examining the links between personality and interests, including studies examining the facet level relations between personality and interest, (Staggs, Larson, & Borgen, 2003; 2007; Sullivan & Hansen, 2004), these researchers encourage vocational psychologists to consider these fundamental motives that encompass both interests and personality in helping individuals determine academic majors and vocations that might be good fits for them.

Gasser, Larson, & Borgen (2004) examined the extent to which educational aspirations could be explained by personality and interests. As a means to measure educational aspirations, participants were asked to indicate the amount of postsecondary education they intended to obtain: Some college, a bachelor's degree, a master's degree, or a professional degree. Variables, such as sex, Investigative interest, and learning environment as measured by the Personal Style Scales of the Strong Interest Inventory (Harmon, Hansen, Borgen, & Hammer, 1994), were demonstrated to predict educational aspirations, accounting for seventeen percent of the variance in educational aspirations. In particular, Investigative interest and preference for academic learning environments predicted aspirations to attain higher levels of education.

*Personality and Self-efficacy.* In Bandura's (1977) initial writings about self-efficacy, he did not relate personality to this domain-specific construct. SCCT considers personality but only in that it develops prior to the development of interests and self-efficacy, demonstrating that the developers of SCCT only consider personality to play a small part in this model (Larson & Borgen, 2006). In fact, there appears to be very few studies that actually examine the relations between self-efficacy and personality. Larson & Borgen (2006) suggest that personality may moderate the relations between self-efficacy and choice, effort, and success in various vocationally-related activities in that "personality traits contribute to an increase (and decrease) in the number of opportunities and mastery experiences for vocational confidence to be strengthened or weakened across the RIASEC domains" (pp. 298-299).

In this study, the researchers determined that personality, as measured by the Multidimensional Personality Questionnaire (MPQ; Tellegen, 2000), was related to RIASEC-based confidence. In particular, positive emotionality, the tendency to experience positive emotions, was positively related to Realistic, Investigative, Artistic, Social, and Enterprising confidence. The researchers also found some relations between the subscales of the MPQ and self-efficacy. Social potency was positively correlated with Artistic, Social, and Enterprising confidence, and well-being was positively related to Social and Enterprising self-efficacy. Achievement was positively correlated with Investigative and Enterprising self-efficacy, while harm avoidance was negatively related to Realistic confidence. Finally, absorption was related to Artistic confidence. Additionally, Nofle and Robins (2007) found that self-efficacy may mediate the relation between personality and performance. Specifically, the relation between Openness to Experience and SAT verbal scores was

mediated by perceived verbal ability, while the relation between Conscientiousness and grade point average was mediated by perceived general academic ability.

*Interest and Self-efficacy.* Some researchers believe that interest and self-efficacy are independent constructs (Rottinghaus, Lindley, Green, & Borgen, 2002); whereas, other researchers argue that self-efficacy and interests are redundant. It is important to examine the links between interests and self-efficacy in order to determine whether unique information is obtained by administering both an interest inventory and a self-efficacy measure.

Rottinghaus, Larson, & Borgen (2003) conducted a meta-analysis to examine the correlational link between interests and self-efficacy across the six RIASEC types.

Rottinghaus et al. (2003) found a correlation of .59 between interests and self-efficacy across the Holland types with the strongest link found for the Investigative type ( $r = .68$ ), followed by the Realistic type ( $r = .67$ ), and the weakest link found for the Enterprising type ( $r = .50$ ). It was also determined that the correlation between interests and self-efficacy depended largely upon the measure that was being utilized.

Other research has examined SCCT postulations that self-efficacy influences the development of interests. One study determined that a reciprocal relation actually exists between self-efficacy and interests when these two constructs are examined over time (Nauta, Kahn, Angell, & Cantarelli, 2002). More recent research has continued to examine the links between interests and self-efficacy and their potential reciprocity. Armstrong and Vogel (2009) determined that interests and confidence can also be conceptualized as overlapping indicators of the RIASEC types. The researchers examined the degree to which the correlations between interest and self-efficacy beliefs can be attributed to Holland's RIASEC types rather than considering them as separate constructs. In this study, the

researchers examined the responses of 608 college students from a large Midwestern university who indicated their interests and their self-efficacy beliefs on forty-eight activities and occupations from the Alternate Forms Public Domain (AFPD) RIASEC marker scales (Armstrong, Allison, & Rounds, 2008). By performing statistical analyses on the results, including hierarchical clustering, multidimensional scaling, and structural equation modeling, the researchers tested the hypothesis that self-efficacy beliefs impact and influence the development of vocational interests.

The authors replicated the results from earlier studies, demonstrating that interests and self-efficacy beliefs are positively correlated, but no causal relationship between interests and self-efficacy was found in this study. Furthermore, this positive relationship between interests and self-efficacy has been shown to emerge in the Holland-based RIASEC framework in that interest scales were found to cluster with self-efficacy scales. In reply to these findings, Lent, Sheu, and Brown (2010) argued that whether researchers or career counselors choose to “highlight or minimize the differences between interest and self-efficacy may largely depend on whether one’s purpose is explanation or classification” (p. 219).

Despite these issues between interests and self-efficacy, recent research has demonstrated that utilizing both interest and self-efficacy scores can improve prediction and discrimination between college majors better than using interests or self-efficacy measures alone for samples of both men and women (Larson, Wu, Bailey, Borgen, & Gasser, 2010). Linking both interests and self-efficacy to the Holland model may help students making career decisions, by examining potential discrepancies in individuals’ interests and

confidence, which would prompt further exploration in these areas for individuals seeking career assistance.

*Ability, Personality, and Interest.* Rolfhus and Ackerman (1996) administered a variety of knowledge tests to over two hundred participants along with an ability assessment, interest inventory, and personality questionnaire in order to determine the commonalities between ability, interest, and personality. The researchers found that mathematical and physical science knowledge was related to Realistic and Investigative interests, while arts and humanities knowledge was related to Openness to Experience personality characteristics. Ackerman & Heggestad (1997) determined that there is a great deal of overlap between interests, abilities, and personality, and they proposed four trait complexes to account for this overlap: Social, clerical/conventional, science/math, and intellectual/cultural.

*Personality, Interest, and Self-efficacy.* A recent study examined the extent to which personality traits can help determine individuals' choice of major (Larson, Wu, Bailey, Gasser, Bonitz, & Borgen, 2010). Utilizing the Multidimensional Personality Questionnaire (MPQ; Tellegen, 2000; Tellegen & Waller, 2008) and sex as predictors, the researchers examined how well these predictors could distinguish between nine major families (engineering, sports and exercise physiology, physical and biological sciences, architecture/design, humanities, social sciences, elementary education, business, and computer science/accounting) in a discriminant functions analysis. Utilizing the jack knife hit rate, a conservative estimate of accuracy of group classification, it was found that sex and the MPQ were 18.5% accurate in classifying major membership in the nine major families, which is greater than chance. Two discriminant functions were derived from this analysis. Examining group centroids, it was determined that elementary education majors were



distinguished from engineering majors on the harm avoidance and social closeness scales of the MPQ with elementary education majors demonstrating higher harm avoidance and social closeness personality features than engineering majors. The second discriminant function separated business majors from architecture/design majors along the lines of aggression and absorption. Business majors demonstrated higher levels of aggression than architecture and design majors, while architecture and design majors showed higher levels of absorption than business majors.

Larson et al. (2010) also measured interests and self-efficacy with the Strong Interest Inventory (SII; Donnay, Morris, Schaubhut, & Thompson, 2005) and the Skills Confidence Inventory (SCI; Betz, Borgen, & Harmon, 1996; 2005) in order to determine if interest and self-efficacy would better predict major choice after considering personality. When examining the jack knife hit rate, personality, interest, and self-efficacy were 33.7% accurate in classifying group membership in the nine major families, which is greater than with personality alone and greater than chance as well. The MPQ can be linked to the five-factor model (Blake & Sackett, 1999; Church, 1994; Tellegen & Waller, 2008). The stress reaction scale is a marker of Neuroticism, the social closeness and social potencies scales are markers of Extraversion, the absorption scale is a marker of Openness to Experience, the aggression scale is an inverse marker of Agreeableness, and the control scale is a marker of Conscientiousness. According to the previously reported discriminant function analysis results, it may be deduced that elementary education majors demonstrate higher Extraversion than engineering majors, business majors possess low Agreeableness when compared to architecture/design majors, and architecture/design majors are more open to experience than business majors.

Five discriminant functions were obtained in Larson et al.'s (2010) analysis when they considered personality, interest, and self-efficacy together. The first function separated engineering majors from humanities majors with engineering majors reporting greater Investigative interest and confidence than humanities majors. The second discriminant function distinguished computer science/accounting and business majors from physical/biological science majors. It was found that computer science/accounting and business majors have higher Conventional and Enterprising interests than physical and biological science majors. The third discriminant function separated architecture/design majors from elementary education majors: Elementary education majors reported greater interest in Social activities than architecture/design majors, while architecture and design majors demonstrated greater confidence in Realistic activities than elementary education majors. The fourth discriminant function distinguished between computer science/accounting majors and business majors. Business majors reported greater Enterprising interests than computer science/accounting majors, and computer science/accounting majors demonstrated higher interest in Conventional activities. The fifth discriminant function differentiated between elementary education majors and social sciences majors. Social sciences majors reported greater interest in Artistic activities and greater confidence in Social activities than elementary education majors. It was concluded that self-efficacy and interests contribute unique information above and beyond personality in distinguishing between college major choices.

Rottinghaus, Lindley, Green, and Borgen (2002) considered the contributions of personality, self-efficacy, and interests to educational aspirations. Their findings indicate that personality predicted educational aspirations, but self-efficacy added incremental validity to

the prediction of aspirations; furthermore, interest added incremental validity beyond that accounted for by personality and self-efficacy in the prediction of educational aspirations. Specifically, it was found that certain variables differentiated individuals who wanted to pursue doctoral degrees from any of the other individuals pursuing less education. Individuals seeking to attain a doctoral degree were found to score higher on Openness to Experience and Conscientiousness, while reporting higher Investigative and Social confidence. Also, these individuals possessed higher Investigative and Artistic interests and low Enterprising interests. These individuals scored low on Neuroticism and reported that they prefer academic learning environments over hands-on learning environments.

#### *The Present Study*

Lubinski (2010) presented an argument in response to Armstrong and Vogel (2009), urging career counselors and vocational psychologists to reintegrate cognitive ability assessments in their “designing interventions, validating innovative scales, and testing the verisimilitude of theoretical frameworks about educational-vocational choice, performance after choice, and persistence” (p. 227). It was stated that cognitive abilities have long been neglected in vocational psychology and that they need to be reintroduced to create the best models predicting educational and occupational outcome variables. Lubinski (2010) discussed many reasons as to why cognitive abilities are absolutely essential to be included into vocational assessment batteries. Much research has demonstrated that cognitive abilities tend to account for the most variance in terms of these vocational outcome variables, which necessitates that these variables be included in career counseling and research rather than only having career clients estimate their abilities or report their self-efficacy in performing an activity or occupation.

The present study intends to examine the extent to which various psychological attributes can predict or explain a number of vocational outcome variables, such as major choice and satisfaction, as well as future career choice and aspiration level. There has been a long-standing history of utilizing self-report variables, such as personality, interests, and self-efficacy, to predict outcome variables; however, objectively-measured cognitive abilities are often overlooked in these analyses despite clear practical influence on vocational outcome variables. This study seeks to examine the incremental validity and contribution of objective abilities on the prediction of academic major choice, occupation choice, major satisfaction, and career aspiration level alongside other typical vocational variables, such as interests, self-efficacy, and personality.

### *Hypotheses*

*Ability Measures and the Prediction of Current and Future Choices.* Consistent with the arguments asserted by Lubinski (2010), it is hypothesized that the current practice of not utilizing ability measures in the career counseling process is an oversight. It is anticipated that adding ability measures to the battery of self-report measures typically used in the vocational assessment process will improve the prediction of criterion variables, such as current academic program choice and future career choices. Based on previous research, it is expected that personality, interests, and self-efficacy will be effective predictors both for participants' current academic choices and also for their future career choices as well. Therefore, to support the hypothesis that ability measures are under-utilized in career counseling, it is important to demonstrate the incremental validity of an ability measure in the prediction of outcome variables beyond what is possible with self-report measures. This

hypothesis will be evaluated by testing a series of predictions that will be evaluated using discriminant function analyses:

*(Hypothesis 1)* While it is hypothesized that the set of the self-report individual difference measures will be effective predictors of participants' current academic program choices, the most effective model for predicting current academic program choice will be a model that combines information from all sets of individual differences measures. In other words, it is hypothesized that including ability in a discriminant functions model of personality, interests, and self-efficacy will add incremental validity to this model. This model will be compared to the model that contains only the self-report individual difference measures as predictors in the prediction of major choice via McNemar's test.

*(Hypothesis 2)* In comparison to participants' current academic program choice, it is expected that the pattern of results obtained for participants' future career choices will be similar. While it is hypothesized that the set of the self-report individual difference measures will be effective predictors of participants' future occupational choices, the most effective model for predicting future occupation choice will be a model that combines information from all sets of individual differences measures. In other words, it is hypothesized that including ability in a discriminant functions model of personality, interests, and self-efficacy will add incremental validity to this model. This model will be compared to the model that contains only the self-report individual difference measures as predictors in the prediction of occupation choice via McNemar's test.

*(Hypothesis 3)* Although the overall pattern of results is expected to be similar for both criterion variables, it is likely that the individual differences measures will be more effective in predicting student's current academic choices than predicting future career

aspirations because choosing a major is the more proximal decision for students. The two models containing all of the individual difference variables will be compared via McNemar's test.

*Ability Measures and the Prediction of Major Satisfaction and Career Aspiration Level.* Similar to the hypothesized influence of the ability measure on major and occupational choice, it is believed that adding an ability measure to the set of self-report measures that are often utilized in career counseling will improve the prediction of current major satisfaction and future career aspirations. It is expected that personality, interests, and self-efficacy will predict satisfaction and career aspirations, but it is necessary to demonstrate the incremental validity of the ability measure above what can be accomplished with the self-report measures. This hypothesis will be examined by testing a series of predictions that will be evaluated using multiple regression analyses:

*(Hypothesis 4)* While it is predicted that the self-report measures together will be significant predictors of major satisfaction, the most effective model for predicting major satisfaction will be a model that combines information from all sets of individual differences measures. In other words, it is hypothesized that ability will add incremental validity to a model with personality, interests, and self-efficacy predicting major satisfaction.

*(Hypothesis 5)* In comparison the participants' current major satisfaction, it is expected that the pattern of results obtained for participants' future career aspiration level will be similar. While it is predicted that the self-report measures together will be significant predictors of career aspiration level, the most effective model for predicting aspirations will be a model that combines information from all sets of individual differences measures. In

other words, it is hypothesized that ability will add incremental validity to a model with personality, interests, and self-efficacy predicting career aspiration level.

*(Hypothesis 6)* Although the overall pattern of results is expected to be similar for both criterion variables, it is likely that the individual differences measures will be more effective in predicting students' current major satisfaction than predicting future career aspirations.

## CHAPTER 3. METHOD

### *Participants*

Participants were selected using the psychology department's SONA system through which undergraduate students enrolled in introductory psychology and communication studies courses voluntarily participate to earn extra credit for these courses. Eight hundred and forty three participants completed both portions of the study and had usable data. Four hundred and fifty two women and 390 men completed both portions of the study. The mean age of the participants was 19.64 with a range from 18 to 46 years of age. Six hundred and ninety four participants identified as White/European-American, 22 identified as African-American, 28 identified as Hispanic/Latino-American, 61 identified as Asian/Asian-American, and 14 identified as Biracial/Multiracial. Four hundred and twenty three participants were freshmen, 228 were sophomores, 107 were juniors, 75 were seniors, and 3 were graduate students. Twenty four students did not provide their races or ethnicities, 7 students did not provide their years in school, and one student did not report his or her sex.

### *Measures*

*General Aptitude Test Battery (GATB)/Ability Profiler.* The GATB, also known as the Ability Profiler, will be utilized to measure cognitive abilities. In the early 1940s, the United States Employment Services (USES) began developing the GATB to screen individuals for many occupations rather than developing thousands of ability tests to screen for individual occupations. The first two forms (Forms A and B) were released in 1947, while Forms C and D were developed in 1983. The final two versions, Form E and F, were released in the mid-1990s, and these forms are being utilized currently (Segall & Monzon, 1995; Mellon, Daggett, MacManus, & Moritsch, 1996). Though originally labeled Forms E and F of the



GATB, the tests encompassed by these forms have adopted a new name: the Ability Profiler. According to the Ability Profiler Administration Manual (U.S. Department of Labor Employment and Training Administration, 2002), the Ability Profiler was developed to achieve a few specific goals. Researchers involved in the creation of Forms E and F intended to decrease the number of items and subtests involved with the GATB, remove bias from the items, improve the instructions provided to test takers, reduce the “speededness” of the test, and attempt to report results in a manner that links individuals’ abilities to the ability requirements of various occupations on the O\*NET (Peterson, Mumford, Borman, Jeanerett, & Fleishman, 1999).

The Ability Profiler Administration Manual indicates that there are multiple ways one can administer the Ability Profiler to a group of individuals. It is possible to include all eleven subtests, which would require approximately 2.5 hours of administration time. However, if information is not needed about manual dexterity and psychomotor abilities, they may choose to include only the six non-psychomotor exercises, which can be administered in approximately 1.5 hours. Due to time constraints and logistical considerations, only the six pencil-and-paper non-psychomotor scales were utilized in this study.

The Arithmetic Reasoning subtest consists of eighteen math word problems and measures the ability to think logically to solve mathematical problems. The Vocabulary subtest requires participants to answer questions regarding similarities and analogies, measuring Verbal Ability. Individuals with strong verbal ability are able to grasp meanings of words and utilize vocabulary effectively in communication. The Vocabulary subtest has nineteen items. The Three Dimensional Space subtest measures Spatial Ability and has

twenty items. People with good spatial ability can rotate and picture two-dimensional representations of three-dimensional objects in their minds. The Computation subtest consists of forty computation questions. Individuals with strong Computation Ability can easily use addition, subtraction, multiplication, and division to solve problems mathematical problems quickly. The Name Comparison subtest measures Clerical Perception, and there are ninety items associated with this subtest. People who have Clerical Perception strengths can quickly and accurately identify errors in printed material. The Object Matching subtest measures Form Perception, consisting of forty two items. People with strong form perception abilities can identify differences and details in pictorial representations of objects.

Hartigan and Wigdor (1989) examined the psychometric properties of the GATB based the last fifty years' research. Reliability and validity of the GATB has been demonstrated to be good. In terms of test-retest reliability, Hartigan and Wigdor reported that the temporal stability of Verbal Ability ranged from .68 to .94, the temporal stability of Arithmetic Reasoning and Computation abilities ranged from .69 to .93, the temporal stability of Spatial Ability ranged from .69 to .89, the stability of the ability of Form Perception ranged from .62 to .88, and the stability of the ability of Clerical Perception ranged from .60 to .89.

Hartigan and Wigdor also examined the convergent validity of the GATB, comparing the abilities measured to other tests that measure similar abilities. Convergent validity coefficients for Verbal Ability ranged from .22 to .85 with a median of .72. Convergent validity coefficients for Arithmetic Reasoning and Computation ranged from .43 to .85 with a median of .68. Convergent validity coefficients for Spatial Ability ranged from .30 to .73 with a median of .62. The researchers indicated that the lower convergent validity range for

Spatial Ability may be due to different spatial constructs being measured by the different spatial ability tests. Convergent validity coefficients for the ability of Form Perception ranged from .38 to .65 with a median of .47. The lower convergent validity for Form Perception was hypothesized to be due to the speeded nature of the subtest that measures Form Perception ability. Convergent validity coefficients for the ability of Clerical Perception ranged from .24 to .76 with a median of .50.

In the current study, the reliability of the Ability Profiler scales was approximated using the Kuder-Richardson 21 (KR-21) formula. The Kuder-Richardson 20 (KR-20) formula was not utilized given that some of the scales are speeded tests, and we can assume equivalent levels of difficulty across all items. It is also acknowledged that the KR-20 estimation of reliability would be better suited for the power tests of the Ability Profiler; however, participants' data regarding their performance on individual items was not easily attainable. Thorndike (p. 119, 2005) suggested that KR-21 can serve as a "close, but conservative, approximation to KR-20" when it is more difficult or impossible to calculate KR-20. KR-21 was calculated using raw score data; however, the remainder of the analyses in the study were conducted using the proportion of items individuals answered correctly for each ability scale. Internal consistencies for the Ability Profiler scales ranged from .47 to .88 with a mean of .66 in the current study. Table 1 summarizes the internal consistencies, means, and standard deviations found for the current study for the Ability Profiler.

*Personality.* Participants completed the 50-item International Personality Item Pool (IPIP; Goldberg, 1999) Five Factor Model (FFM) measure to assess personality. Ten questions were asked to assess each of the following personality traits: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to Experience.

Participants were asked to consider how each of the items describe how they generally are along a 5-point Likert-type response format, ranging from 1 (Very Inaccurate) to 5 (Very Accurate). The 50-item IPIP FFM has demonstrated good fit for both men and women and for European American, Latino(a) American, and Asian American college student samples (Ehrhart et al., 2008). Internal consistencies for the five scales of the 50-item IPIP FFM measure have ranged from .74 (Conscientiousness) to .90 (Extraversion) with a mean of .82 (Lim & Ployhart, 2006). Comparing its underlying factor structure to the factor structure underlying the 60-item NEO-FFM demonstrates good convergent validity of the 50-item IPIP FFM. Coefficient alphas ranged from .77 to .90 with a mean of .83 for the current study. Table 2 contains the internal consistency reliability estimates, means, and standard deviations for the measures.

*RIASEC Interest and Confidence.* The activity-based scales from the Alternate Form Public Domain (AFPD) RIASEC markers (Armstrong et al., 2008) were used to measure interest and confidence in each of Holland's RIASEC types. Each RIASEC scale consists of eight items selected from the 30 item scales in the Interest Profiler (Lewis & Rivkin, 1999). Armstrong et al. (2008) reported that the internal consistency reliabilities for the AFPD activity scales had coefficient alphas ranging from .79 to .94 with a mean of .88. Convergent validity between the 8-item activity-based scales and the 1994 edition of the Strong Interest Inventory (Harmon, Hansen, Borgen, & Hammer, 1994) ranged from .56 to .72 with a mean of .64, and convergent validity between the activity scales and equivalent occupational-based measures ranged from .73 to .86 with a mean of .78. Structural analyses of the AFPD scales support the order predictions in Holland's (1997) model. Participants responded to the 48 AFPD Set A activity items using the original interest-based wording of the scales, rating how

much they would like to perform the work activity using a 5-point Likert-type response format, which ranged from 1 (Strongly Dislike) to 5 (Strongly Like).

Following procedures outlined in Armstrong and Vogel (2009), the 48 activity items in Set B were administered using an alternative self-efficacy rating format. Participants were asked to rate how much confidence they have in their abilities to perform each work-related activity on a 5-point Likert-type response format, ranging from 1 (Very Low Confidence) to 5 (Very High Confidence). Armstrong and Vogel reported that interest-confidence correlations for the RIASEC types measured by the AFPD activity scales ranged from .60 to .72 with a mean of .70. These interest-confidence correlations were consistent with those of established commercial RIASEC interest and confidence measures, providing validity evidence for the administration format used. The coefficient alphas for the interest scales ranged from .83 to .92 with a mean of .88, and the coefficient alphas for the self-efficacy scales ranged from .84 to .94 with a mean of .90 in the current study. Tables 3 and Table 4 contains the internal consistency reliability estimates, means, and standard deviations for the measures.

*Major and Occupational Choice.* Participants completed a demographic questionnaire where they provided their current majors. In addition, participants were asked to write down three occupations that they are currently thinking about pursuing as a career, indicating which of the occupations would be the most likely occupation that they will pursue in their futures.

*Major Satisfaction.* Participants completed the 6-item Academic Major Satisfaction Scale (AMSS; Nauta, 2007) to assess their general satisfaction with their current major of study. The scale consists of six items with four reverse coded items. Participants will rate the

extent to which they agree with each of the statements, rating their responses on a 5-point Likert-type response scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Higher scores on the AMSS indicate greater major satisfaction. Internal consistency has been found to be high, ranging from .90 to .94 (Nauta, 2007). Also, convergent validity evidence has been demonstrated with major satisfaction assessed by AMSS correlating with academic performance. Furthermore, the AMSS shows good predictive validity in that it is able to differentiate between students who stay in their majors and students who leave their majors. The coefficient alpha for this scale was .93 in the current study with a mean of 3.91 ( $SD = .93$ ). In addition, this scaled measure demonstrated good convergent validity based on its high positive correlation with participants' single-item description of how satisfied they are with their current majors ( $r = .77, p < .001$ ).

*Career Aspirations.* Participants completed the 10-item Career Aspiration Scale (CAS; O'Brien, 1996). The CAS measures the extent to which individuals aspire to leadership roles, supervise other employees, and attain additional education in their choice career fields. This scale consists of ten items with four reverse coded items. Participants rated the degree to which they agreed with each of the ten statements, rating their responses on a 5-point Likert-type response scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Higher scores on the CAS indicate greater career aspirations. Gray & O'Brien (2007) examined the psychometric properties of the CAS with various groups of high school and college aged women. They determined that the internal consistency of the CAS ranged between .51 and .77. They also examined the test-retest reliability of the CAS, determining that it is relatively stable ( $r = .84$ ). The coefficient alpha in the current study was .73 with a mean of 3.75 ( $SD = .53$ ).

*Procedures*

After signing up for a timeslot on the SONA system, participants arrived at a classroom to begin the first portion of the study. Ten to twenty participants completed the first part of the study concurrently, depending on the number of proctors that were available during a given timeslot. If one proctor was available, ten participants completed the first part of the study; however, if two proctors were available, twenty participants completed the first part simultaneously. Undergraduate research assistants handed out packets containing an informed consent document, pens, and a release of information form for ACT scores (composite and subtest scores) and GPA. Participants were given approximately fifteen minutes to complete these documents and a chance to ask questions.

The research assistants collected these documents and handed out the Ability Profiler, blank paper, pencils, and a scoring sheet. The research assistants provided instructions and led the participants through the six portions of the Ability Profiler being used in this study: Arithmetic Reasoning (twenty minutes), Vocabulary (eight minutes), Three Dimensional Space (eight minutes), Computation (six minutes), Name Comparison (six minutes), and Object Matching (five minutes). After completing these six portions of the Ability Profiler, participants turned in all materials and were free to go. This portion of the study lasted less than ninety minutes. The Ability Profiler and the answer sheet for the Ability Profiler is included in the Appendix .

Within the week after their participation in the first part of the study, participants were emailed a link to the second portion of the study. Participants followed this link to a SurveyMonkey survey where they completed a demographic questionnaire and answered questions about their personalities, their interests in activities, their confidence in performing

activities, their satisfaction in their majors, and their career aspiration levels. This portion of the study took less than thirty minutes. The demographic form and self-report measures can be found in the Appendix. After completing all portions of the study, participants were given a debriefing form and were granted three credits on the SONA system for their courses. If students only completed the first portion of the study, they were granted two credits on the SONA system.

#### *Data Preparation*

Based on procedures highlighted in Tabachnick and Fidell (2007), the data were evaluated for incomplete data and outliers. One thousand and twenty nine participants completed a portion of the study; however, sixty seven of these individuals only completed the first half of the study and were dropped from analyses. Seventy individuals skipped a large portion of the materials, resulting in incomplete data on one or more measures, and these individuals were removed from the analyses. Twenty six individuals were identified as univariate or multivariate outliers, and these participants were cut from the data set. Twenty three individuals did not list their major or occupations in which they are interested, so these individuals were removed from these analyses as well. The final data set contained 843 participants, which was 81.9% of the initial data set.

It was observed that many individuals skipped particular items on the self-report individual difference measures. For example, forty five individuals did not rate how accurately the following item described their personalities: “Shirk my duties.” Twenty six individuals did not describe how accurately the following statement described them: “Am exacting in my work.” It is hypothesized that these variables were left blank due to the participants’ unfamiliarity with some of the words used in these items, such as “shirk” or



“exacting.” To determine whether there were any significant mean differences of the dependent variables between the individuals who provided answers to these questions and the individuals who failed to answer these questions, these variables were dummy coded and t-tests were run. It was determined that there were no significant differences between the means on the dependent variables for the individuals who answered the items and the individuals who left these items missing for the variables.

Since there were no statistically significant mean differences between these two groups, scale scores were computed by averaging the individuals’ responses on the remainder of the scales’ items, which was the procedure used for the items without potentially problematic patterns of missing data. It is interesting to note that there were significant differences in the mean Verbal Ability scores (but none of the other ability scores) for the two groups on the items that contained the words “shirk” and “exacting” with the individuals who left these items missing receiving lower Verbal Ability scores when compared to the individuals who answered the items, which may support the hypothesis that the participants may have been unfamiliar with these vocabulary words, resulting in them leaving these items blank.

The data were also tested for univariate and multivariate normality through statistical and graphical methods. To assess for data normality, skewness and kurtosis of the data were analyzed. Skewness and kurtosis were examined by dividing the skewness and kurtosis of each scale by the standard errors of the skewness or kurtosis, respectively. This mathematical calculation derives z-scores, which can be compared to 1.96, the critical value to determine the significance of the potential skewness or kurtosis for each scale. Significant skew and kurtosis were observed for a number of scales. Additionally, given that univariate normality

was not attained, multivariate normality cannot be assumed. To assess for multivariate normality, skewness and kurtosis of a calculated Mahalanobis distance variable was evaluated via the methods outlined previously. It was determined that the data does not meet the criteria of multivariate normality with significant positive skew but fell within the normal range of kurtosis. However, given that the sample size exceeded 800 participants, the deviation from normality is not particularly impactful (Tabachnick & Fidell, 2007). Transformations were not conducted on this data given the large sample size and to preserve the interpretability of results.

An initial assessment of collinearity between the variables was assessed by examining bivariate correlations among all of the variables. According to Tabachnick and Fidell (2007), correlations between two variables above .90 indicate collinearity among the variables, which may indicate that these two variables may be measuring similar information. While none of the correlations between the measured variables reached a value of .90 or greater, it was observed that the correlations between RIASEC interest and confidence levels were highly and positively correlated. The correlation between Artistic interest and Artistic confidence was .81, the correlation between Realistic interest and Realistic confidence was .78, and the correlation between Investigative and Social interests and the respective confidence variables were .73. Given the relatively large size of the sample, the issue of collinearity is reduced; however, when the subsequent analyses were conducted, collinearity between the variables was considered in interpreting the results.

*Major Classification.* Majors were assigned numerical codes to allow for analyses to be conducted with them according to the National Center for Educational Statistics Classification of Instructional Programs (NCES CIP, 2000). Majors were generally grouped

according to the broad major categories specified by the CIP; however, similar groups of majors were combined to create larger sample sizes per group in order to run the analyses with the twenty three predictor variables. Tabachnick and Fidell (2007) indicate that the number of participants per group needs to be at least two greater than the number of dependent variables run in the analyses. The major groups that were included in the discriminant functions analyses were the following: Agriculture (n = 40), Architecture (n = 27), Biological/Physical Sciences (n = 59), Business (n = 150), Communications (n = 60), Education (n = 29), Engineering/Computers (n = 102), Human/Consumer Sciences (n = 30), Health/Fitness (n = 106), Protective Services (n = 34), Social Sciences (n = 115), and Visual/Performing Arts (n = 47). Participants who have not yet declared majors were not included in this analysis (n = 44), which left a total of 799 participants in the major choice discriminant functions analyses. Means and standard deviations of the predictor variables are provided in Tables 6 through 9 for the twelve groups included in the discriminant functions analyses.

*Occupation Classification.* Occupations were assigned numerical codes based on the O\*NET Standard Occupational Classification (SOC) system (2000). This system utilizes a four-level categorization system for occupations with the broadest level called “major group” and the narrowest level called “detailed occupation.” There are 23 major groups, 96 minor groups, 449 broad occupations, and 821 detailed occupations. The 449 broad occupation categorization level was utilized to assign initial codes, and this information was grouped into one of the 23 major groups for our analyses. Considering that Tabachnick and Fidell (2007) indicated that the number of participants were group needs to be at least two greater than the number of dependent variables run in the analyses, majors were categorized roughly

according to the SOC system with the following categories created: Architecture (n = 25), Business/Financial (n = 114), Communications (n = 53), Education (n = 81), Engineering/Computers (n = 93), Management/Law (n = 63), Medical (n = 153), Personal/Leisure Services (n = 43), Protective Services (n = 46), Sciences (n = 31), Social/Community Services (n = 82), and Visual/Performing Arts (n = 58). Means and standard deviations for the predictor variables are provided in Tables 10 through 13 for the twelve occupations groups included in the discriminant functions analyses.

### *Data Analyses*

*Discriminant Functions Analysis.* Discriminant functions analysis was utilized to examine the extent to which the individual difference variables predict major and occupation classification. Discriminant functions analysis is a technique that is used to predict a categorical dependent variable, such as academic major, with one or more continuous independent variables, such as abilities, personality, or interests. The end result is often an equation or model that will allow the prediction of group membership when only the continuous variables are known. Some of the assumptions required in discriminant functions analysis are that the data must demonstrate multivariate normality and be absent of multicollinearity. Additionally, the variance-covariance matrices should not differ between groups. Homogeneity of the variance-covariance matrices was established by conducting Box's M analyses and examining scatter plots for the groups utilized in the discriminant functions analyses.

Many different statistical values are reported within a discriminant functions analysis. After determining if the data meet the stated assumptions, it is important to ascertain if any significant group differences exist on the continuous predictor variables. If significant mean

differences exist on the variables for the different groups, the discriminant function analysis can proceed; however, if there are no significant differences in means between any of the groups on any of the variables, there is no need to continue because the discriminant functions analysis will be unable to differentiate between any of the groups in the analysis.

Examining the significance of the Wilks' Lambda and chi-square values, the number of significant discriminant functions that were produced in the analysis can be determined. In obtaining discriminant functions, the first discriminant function provides the most discrimination between groups, followed by the second function, and the third, and so on with all discriminant functions orthogonal to one another. According to Betz (1987), Wilks' Lambda tests the significance of the functions as a set and the proportion of variance of the set of functions that is not explained by group membership. One minus Wilks' Lambda describes the proportion of variance in the set of functions that is explained by group membership. The canonical correlation indicates the degree of relatedness between the groups and the derived functions with the squared canonical correlation of the first function indicating the proportion of variance in the unstandardized first discriminant function scores explained by group differences.

To interpret the results of the discriminant functions analysis, the standardized and unstandardized canonical correlation coefficients, discriminant structure matrices, and group centroids can be examined. The standardized canonical correlation coefficient demonstrates a variables' contribution to the discrimination between groups with larger values demonstrating greater contribution; however, this value does not indicate which groups are being discriminated. The unstandardized canonical correlation coefficients demonstrate the partial contribution of the variable on a discriminant function after controlling for the effects

of all of the other variables. The structure matrices provide the correlations between variables and the discriminant functions with higher values demonstrating greater relation between variable and a particular function. Only correlations above .33 were interpreted (Tabachnick & Fidell, 2007). It is noted that the attained structure coefficients can be used to name functions and help discriminate between groups. Group centroids provide key information in interpreting discriminant functions analysis findings. A group centroid is the mean of a discriminant score for a particular group. The group with the highest group centroid is the most different from the group with the lowest group centroid for a particular discriminant function. Particular attention was paid to the structure matrix and group centroids in interpreting the results.

The hit rate is provided, indicating the proportion of individuals who were correctly classified into a major or major category. In an attempt to minimize error, the more conservative jack-knife hit rate procedure was also be run, removing one participant's data at a time and estimating the discriminant function without that individual with this process ran until each case is removed one time to attain the jack knife hit rate. These values were compared to the chance classification to determine if the set of predictors better discriminates between major and occupation groups than by chance alone. The chance correct classification percentage is 12.5% (1/8) for the eight major groups. The chance correct classification percentage is 11.1% (1/9) for the nine occupation groups.

To determine whether there is a significant difference between the hit rates for different sets of predictors, the McNemar's test was utilized. This test examines whether the proportion of correct and incorrect classifications between two different discriminant function analysis models are significantly different from one another. Dummy coded

variables were created, where a value of zero indicated that the individual's major was correctly predicted and a value of one indicated that the major was incorrectly predicted by a set of predictors. McNemar's chi-square symmetry statistics were analyzed in SPSS for significance and confirmed by conducting hand calculations to attain the actual chi-square value since this value is not provided in the SPSS output. The following equation was utilized to attain the chi-square values:

$$\chi^2 = \frac{(B - C)^2}{(B + C)}$$

where

B = Correct classification for 1<sup>st</sup> analysis/Incorrect classification for 2<sup>nd</sup> analysis

C = Correct classification for 2<sup>nd</sup> analysis/Incorrect classification for 1<sup>st</sup> analysis

A resulting significant chi-square value indicates a significant difference in the two sets of analysis models' hit rates. Examining the proportion of correct classifications for each model indicates which model and set of individual difference predictors is significantly better at predicting group membership.

*Multiple Regression Analysis.* Multiple regression analyses were utilized to determine how the individual differences measures predict major satisfaction and career aspiration level. Multiple regression is an analysis that is utilized to determine the relation of a set of independent variables to a dependent variable, determining the level of importance of a particular independent variable or set of independent variables to the prediction of the dependent variable. Some of the assumptions that must be met to effectively run regression analyses are normality, linearity, homoscedasticity, and absence of multicollinearity.

Linearity and homoscedasticity of the data were evaluated by examining the residual plots obtained in the regression analysis, and collinearity is evaluated by considering the collinearity diagnostics attained in a multiple regression analysis.

According to Tabachnick and Fidell (2007), the best regression equation contains the smallest, reliable set of uncorrelated independent variables that predicts the most variance in the dependent variable. The parameter estimate in a multiple regression analysis is the unstandardized regression coefficient, which is known as a beta ( $\beta$ ) weight. The beta weight for each independent variable is interpreted as the change in the dependent variable associated with a single unit change in the independent variable after holding all of the other independent variables constant. To measure the amount of dependent variable's variance that is captured or predicted by a set of independent variables, r-squared ( $R^2$ ) is utilized. Often the adjusted  $R^2$  value is reported, which adjusts  $R^2$  overestimation in small samples. The  $F$  ratio is utilized to determine if the overall multiple regression equation is statistically significant. In addition,  $F$  test statistics are provided to demonstrate the statistical significance of individual independent variables. An  $F$  ratio is also provided for the change in  $R^2$  value in sequential (hierarchical) regression analyses.

In addition to examining the overall prediction of the dependent variables from the linear combination of the independent variables, it is essential to examine correlations between variables. In particular, the correlation between an independent variable and the dependent variable just be considered to understand their full relation; however, it is important to also examine the unique relation between an independent and dependent variable, which is accomplished by considering the partial correlation or semi-partial correlation between the variables. The partial correlation measures the correlation between an



independent and dependent variable after the contribution of all of the other independent variables is removed from both the independent and dependent variables. The semi-partial correlation measures the contribution of an independent variable to the total variance of a dependent variable. The squared semi-partial correlation is considered to be the most useful measure in determining the importance of an independent variable to a dependent variable (Tabachnick & Fidell, 2007); however, to interpret this attained value, one must consider the type of multiple regression that is being utilized. Finally, it is also important to account for the correlations between the independent variables. If there is a high correlation among some of the independent variables, interpretation of the multiple regression analyses may be more ambiguous. It may be difficult to partial out the unique contribution of each independent variable due to the multicollinearity between these variables.

There are many different types and variations of multiple regression analyses; however, only sequential (hierarchical) multiple regression analyses were conducted. Sequential (hierarchical) multiple regression allows researchers to decide the order in which the independent variables are entered into the multiple regression equation to predict a dependent variable. Researchers choose certain variables to be entered before other independent variables based on some theoretical basis. Each independent variable can be assessed for how much variance it uniquely accounts at its point of entry in the equation. In a sequential multiple regression analysis, the squared semi-partial correlation accounts for the amount of variance added by each independent variable to the prediction of the dependent variable at its own point of entry into the regression equation.

## CHAPTER 4. RESULTS

### *The Prediction of Major Choice*

*Preliminary Analyses.* Mean and mean differences between major groups were examined via analysis of variance (ANOVA) with Bonferroni adjustments to correct for the multiple comparisons ( $.05/23 = .002$ ). Correlations between all variables are presented in Table 5. The following analyses were conducted including the Undecided major group; however, there results are not provided since the discriminant functions analyses will not include this group of individuals.

There were no significant mean level differences on the ability measure; however, there were significant mean level differences on three personality measures: Agreeableness,  $F(12, 830) = 5.32, p < .001$ , Extraversion,  $F(12, 830) = 3.30, p < .001$ , and Openness to Experience,  $F(12, 830) = 4.20, p < .001$ . The Biological/Physical Science, Communications, Education, Health/Fitness, Social Science, and Visual/Performing Arts majors reported higher levels of Agreeableness than the Engineering/Computer majors. Also, the Communications and Health/Fitness majors reported higher levels of Agreeableness than the Business majors. The Communications majors reported higher levels of Extraversion than the Agriculture, Architecture, Biological/Physical Science, Business, Engineering/Computers, Health/Fitness, Protective Services, Social Science, and Visual/Performing Arts majors. The Biological/Physical Science, Social Science, and Visual/Performing Arts majors reported higher levels of Openness to Experience than the Business majors. Also, the Social Science and Visual/Performing Arts majors reported higher levels of Openness to Experience than the Health/Fitness majors.

Significant mean level differences were observed on all six interest measures: Realistic interest,  $F(12, 830) = 20.17, p < .001$ , Investigative interest,  $F(12, 830) = 17.02, p < .001$ , Artistic interest,  $F(12, 830) = 5.09, p < .001$ , Social interest,  $F(12, 830) = 10.83, p < .001$ , Enterprising interest,  $F(12, 830) = 9.93, p < .001$ , and Conventional interest,  $F(12, 830) = 12.19, p < .001$ .

Architecture, Business, and Protective Services majors reported higher levels of Realistic interest than Communications, Education, Health/Fitness, Human/Consumer Science, and Social Science majors. The Engineering/Computer majors reported higher levels of Realistic interest than the Agriculture, Biological/Physical Science, Business, Communications, Education, Health/Fitness, Human/Consumer Science, Social Science, and Visual/Performing Arts majors.

The Engineering/Computer and Social Science majors reported higher levels of Investigative interest than the Communications majors. The Agriculture majors reported higher levels of Investigative interest than the Business, Communications, Education, Engineering/Computer, Human/Consumer Science, Protective Services, Social Science, and Visual/Performing Arts majors. The Biological/Physical Science majors reported higher levels of Investigative interest than the Architecture, Business, Communications, Education, Engineering/Computers, Health/Fitness, Human/Consumer Science, Protective Service, Social Science, and Visual/Performing Arts majors. The Health/Fitness majors reported higher levels of Investigative interest than Business, Communications, Education, Human/Consumer Science, Protective Services, and Visual/Performing Arts majors.

Communications majors reported higher levels of Artistic interest than the Health/Fitness and Protective Service majors, while Social Science majors reported higher

levels of Artistic interest than the Health/Fitness majors. The Visual/Performing Arts majors reported higher levels of Artistic interest than the Agriculture, Biological/Physical Science, Business, Engineering/Computers, Health/Fitness, Human/Consumer Science, Protective Services, and Social Science majors.

The Agriculture, Biological/Physical Science, Business, and Communications majors reported higher levels of Social interest than the Engineering/Computer majors. The Human/Consumer Science majors reported higher levels of Social interest than the Architecture, Business, and Engineering/Computer majors. The Education, Health/Fitness, and Social Science majors reported higher levels of Social interest than the Architecture, Business, Engineering/Computer, and Protective Services majors.

The Business majors reported higher levels of Enterprising interest than the Agriculture, Biological/Physical Science, Education, Engineering/Computer, Health/Fitness, Protective Services, Social Science, and Visual/Performing Arts majors. The Communications majors reported higher levels of Enterprising interest than the Biological/Physical Science, Engineering/Computer, Health/Fitness, and Social Science majors.

The Architecture majors reported higher levels of Conventional interest than the Health/Fitness and Visual/Performing Arts majors. The Business majors reported higher levels of Conventional interest than the Agriculture, Biological/Physical Science, Communications, Education, Engineering/Computer, Health/Fitness, Human/Consumer Science, Protective Services, Social Science, and Visual/Performing Arts majors. The Engineering/Computer majors reported higher levels of Conventional interest than the

Health/Fitness, Human/Consumer Science, Social Science, and Visual/Performing Arts majors.

Significant mean level differences were observed on all six self-efficacy variables: Realistic self-efficacy,  $F(12, 830) = 19.35, p < .001$ , Investigative self-efficacy,  $F(12, 830) = 18.54, p < .001$ , Artistic self-efficacy,  $F(12, 830) = 5.17, p < .001$ , Social self-efficacy,  $F(12, 830) = 8.60, p < .001$ , Enterprising self-efficacy,  $F(12, 830) = 11.90, p < .001$ , and Conventional self-efficacy,  $F(12, 830) = 13.73, p < .001$ .

The Architecture and Business majors reported higher levels of Realistic confidence than the Communications, Education, Health/Fitness, Human/Consumer Science, and Social Science majors. The Protective Services majors reported higher levels of Realistic confidence than the Communications, Education, Health/Fitness, and Social Science majors. The Engineering/Computer majors reported higher levels of Realistic confidence than the Agriculture, Biological/Physical Science, Business, Communications, Education, Health/Fitness, Human/Consumer Science, Protective Services, Social Science, and Visual/Performing Arts majors.

The Agriculture and Architecture majors reported higher levels of Investigative confidence than the Communications, Education, Human/Consumer Science, and Visual/Performing Arts majors. The Engineering/Computer and Health/Fitness majors reported higher levels of Investigative confidence than the Business, Communications, Education, Human/Consumer Science, Protective Services, Social Science, and Visual/Performing Arts majors. The Biological/Physical Science majors reported higher levels of Investigative confidence than the Agriculture, Architecture, Business,

Communications, Education, Engineering/Computers, Health/Fitness, Human/Consumer Science, Protective Services, Social Science, and Visual/Performing Arts majors.

The Architecture and Communications majors reported higher levels of Artistic confidence than the Health/Fitness majors. The Visual/Performing Arts majors reported higher levels of Artistic confidence than the Agriculture, Business, Education, Engineering/Computer, Health/Fitness, Human/Consumer Science, Protective Services, and Social Science majors.

The Agriculture, Biological/Physical Science, Communications, and Health/Fitness majors reported higher levels of Social confidence than the Engineering/Computer majors. The Education, Human/Consumer Science, and Social Science majors reported higher levels of Social confidence than the Architecture, Business, Engineering/Computer, and Visual/Performing Arts majors.

The Business and Communications majors reported higher levels of Enterprising confidence than the Agriculture, Biological/Physical Science, Education, Engineering/Computer, Health/Fitness, Human/Consumer Science, Protective Services, Social Science, and Visual/Performing Arts majors.

The Architecture majors reported higher levels of Conventional confidence than the Education, Human/Consumer Science, and Visual/Performing Arts majors. The Biological/Physical Science majors reported higher levels of Conventional confidence than the Education and Human/Consumer Science majors. The Business and Engineering/Computer majors reported higher levels of Conventional confidence than the Agriculture, Communications, Education, Health/Fitness, Human/Consumer Science, Protective Services, Social Science, and Visual/Performing Arts majors.

Given that group level mean differences exist across predictor variables, it is appropriate to conduct and examine discriminant functions analysis results. Means and standard deviations for each major group for each predictor variable are provided in Tables 6 through 9.

*The Incremental Validity of Ability in the Prediction of Major Choice over All Sets of Self-Report Individual Difference Measures (Hypothesis 1).* In an attempt to determine whether ability adds incremental validity to the prediction of major choice, a discriminant functions analysis with the full set of self-report individual difference measures plus ability and a discriminant functions analysis with just the full set of self-report individual difference variables were run predicting major choice as predictors of choice were run. The classification ability of these models was compared with the McNemar test to determine which set of predictors more accurately classified individuals into major groups. The model that contains the three self-report individual difference variables is predicted to effectively predict major group membership. Additionally, it is predicted that the models that contains the full set of self-report measures and ability will demonstrate better predictive utility than the model that contain the full set of self-report measures, demonstrating incremental validity of the ability measure to the prediction of major choice.

First, the five personality, six interest, and six self-efficacy variables were entered together as predictors into a discriminant functions analysis in order to determine their utility in the prediction of major choice. The data demonstrated issues with multicollinearity. The following variables possessed variance inflation factors (VIF) over the value of four: Realistic interest (VIF = 4.18), Realistic self-efficacy (VIF = 4.76), Artistic interest (VIF = 4.00), and Artistic self-efficacy (VIF = 4.23). Variances-covariances appear to be unequal

across groups,  $F(1683, 123,315.01) = 1.31, p < .001$ . The resulting analysis may over-classify cases in groups with greater dispersion. Despite this issue, the jack knife hit rate statistic is unable to be attained in the recommended separate groups' classification procedure in the discriminant functions analysis, so the following results are based on the pooled variance-covariance matrix.

Eleven functions were produced in this analysis, and as a set these functions were significant, accounting for 38.5% of between-major variability,  $\chi^2(187) = 1188.85, p < .001$  ( $\lambda = .219$ ). It appears that 21.9% of the variance in group membership is left unexplained by this set of discriminant functions. Approximately 78.1% of the variance in the functions is explained by major choice. Examining the squared canonical correlation, there are six significant functions in this analysis that warrant further discussion. A summary of these results is provided in Table 14.

The first function demonstrated high positive correlations with Realistic interest and confidence, Conventional interest and confidence, and Enterprising confidence. The function showed high negative correlations with Social interest and confidence. The function maximally separated the Engineering/Computer major group from the Health/Fitness major group. The Engineering/Computer major group reported high highest levels of Realistic interest and confidence, the second highest level of Conventional confidence, the third highest level of Conventional interest, moderate levels of Enterprising confidence, and the lowest levels of Social interest and confidence. The Health/Fitness group reported moderate levels of Realistic interest and confidence, Conventional interest and confidence, and Enterprising confidence. They also reported moderate levels of Social interest and the third highest level of Social interest.



The second function demonstrated high positive correlations with Realistic interest and confidence and Investigative interest and confidence. There were no high negative correlations between the function and the independent variables. The second function maximally discriminated between the Biological/Physical Sciences majors from the Human/Consumer Science majors. The Biological/Physical Sciences majors reported the highest levels of Investigative interest and confidence and moderate levels of Realistic interest and confidence. The Human/Consumer Science majors reported the lowest levels of Realistic interest and confidence and the second lowest levels of Investigative interest and confidence.

The third function possessed high positive correlations with Enterprising interest and confidence and Conventional interest, and it demonstrated a high negative correlation with Openness to Experience. The function separated the Business majors from the Visual/Performing Arts majors. The Business majors reported the highest levels of Enterprising interest and confidence and Conventional interest, while reporting the second lowest levels of Openness to Experience. The Visual/Performing Arts majors demonstrated the lowest levels of Conventional interest and moderate levels of Enterprising interest and confidence. They also reported the highest levels of Openness to Experience when compared to the other major groups.

The fourth function demonstrated high positive correlations with Artistic interest and confidence and Openness to Experience. There were no high negative correlations between the fourth function and the independent variables. This function maximally separated the Visual/Performing Arts majors from the Protective Services majors. The Visual/Performing Arts reported the highest levels of Artistic interest, Artistic confidence, and Openness to

Experience, while the Protective Services majors reported the second lowest level of Artistic interest, the third lowest level of Artistic confidence, and the fourth lowest level of Openness to Experience.

The fifth function possessed high positive correlations with Conventional interest, Conventional confidence, and Openness to Experience with no high negative correlations with any of the independent variables. The function separated the Biological/Physical Science majors from the Health/Fitness majors. The Biological/Physical Science majors reported the third highest level of Openness to Experience, the fourth highest level of Conventional confidence, and moderate levels of Conventional interest; whereas, the Health/Fitness majors reported the second lowest levels of Openness to Experience, the fourth lowest levels of Conventional interest, and moderate levels of Conventional confidence.

The sixth function demonstrated high positive correlations with Conventional confidence and Emotional Stability. There were no high negative correlations between this function and the independent variables. The function maximally separated the Social Science majors and the Agriculture majors. The Social Science majors reported moderate levels of Conventional confidence and Emotional Stability, while the Agriculture majors demonstrated moderate levels of Conventional confidence and the lowest levels of Emotional Stability. The structure matrix and group centroids are summarized in Table 15.

Overall, the combination of the personality, interest, and self-efficacy measures correctly classified 40.4% of majors, and using the more conservative jack-knife procedure, 33.4% of the individuals were classified into their correct majors. The chance hit rate for is 8.3% (1/12), so the conservative method increased the hit rate for predicting major choice by

25.1%, which supports the hypothesis that the set of self-report measures would be effective predictors of major choice.

Then, the six abilities were added to the analysis containing the five personality, six interest, and six self-efficacy variables, and all of these variables were entered together as predictors into a discriminant functions analysis in order to determine their utility in the prediction of major choice. The data demonstrated issues with multicollinearity. The following variables possessed variance inflation factors (VIF) over the value of four: Realistic interest (VIF = 4.20), Realistic self-efficacy (VIF = 4.78), Artistic interest (VIF = 4.03), and Artistic self-efficacy (VIF = 4.26). Variances-covariances appear to be unequal across groups,  $F(3036, 122,811.38) = 1.20, p < .001$ . The resulting analysis may over-classify cases in groups with greater dispersion. Despite this issue, the jack knife hit rate statistic is unable to be attained in the recommended separate groups' classification procedure in the discriminant functions analysis, so the following results are based on the pooled variance-covariance matrix.

Eleven functions were produced in this analysis, and as a set these functions were significant, accounting for 37.5% of between-major variability,  $\chi^2(253) = 1250.52, p < .001$  ( $\lambda = .201$ ). It appears that 20.1% of the variance in group membership is left unexplained by this set of discriminant functions. Approximately 79.9% of the variance in the functions is explained by major choice. Examining the squared canonical correlation, there are five significant functions in this analysis that warrant further discussion. A summary of these results is provided in Table 14.

The first function demonstrated high positive correlations with Realistic interest and confidence and Conventional interest and confidence and high negative correlations with

Social interest and confidence. This function maximally separated the Engineering/Computer major group from the Health/Fitness major group. The Engineering/Computer major group reported the highest levels of Realistic interest and confidence, the second highest level of Conventional confidence, the third highest level of Conventional interest, and the lowest levels of Social interest and confidence. The Health/Fitness majors reported moderate levels of Realistic interest, Realistic confidence, Conventional interest, Conventional interest, and Social confidence. They also reported the third highest levels of Social interest.

The second function possessed high positive correlations with Realistic interest and confidence and Investigative interest and confidence, but there were no high negative correlations between the function and any of the independent variables. The second function maximally discriminated between the Biological/Physical Science majors and the Human/Consumer Science majors. The Biological/Physical Science majors reported moderate levels of Realistic interest and confidence and the highest levels of Investigative interest and confidence. The Human/Consumer Science majors reported the lowest levels of Realistic interest and confidence and the second lowest levels of Investigative interest and confidence.

The third function demonstrated high positive correlations with Enterprising interest and confidence and Conventional interest with no high negative correlations between the function and the independent variables. This function maximally separated the Business majors from the Visual/Performing Arts majors. The Business majors reported the highest levels of Enterprising interest and confidence, as well as the highest level of Conventional interest. The Visual/Performing Arts majors reported moderate levels of Enterprising interest

and confidence and the lowest level of Conventional interest when compared to the other major groups.

The fourth function possessed high positive correlations with Artistic interest and confidence, maximally discriminating between the Visual/Performing Arts majors and the Education majors. The Visual/Performing Arts majors reported the highest levels of Artistic interest and confidence, while the Education majors reported moderate levels of Artistic interest and the third lowest levels of Artistic confidence.

The fifth function possessed high positive correlations with Conventional confidence and Openness to Experience. This function separated the Biological/Physical Science majors from the Health/Fitness majors. The Biological/Physical Science majors reported moderate levels of Conventional confidence and the third highest levels of Openness to Experience, while the Health/Fitness majors reported moderate levels of Conventional confidence and the second lowest levels of Openness to Experience. The structure matrix and group centroids are summarized in Table 16.

Overall, the combination of the ability, personality, interest, and self-efficacy measures correctly classified 42.3% of majors, and using the more conservative jack-knife procedure, 33.2% of the individuals were classified into their correct majors. The chance hit rate for is 8.3% (1/12), so the conservative method increased the hit rate for predicting major choice by 24.9%.

To determine whether ability demonstrates incremental validity in the prediction of major choice beyond what was predicted by the combination of all of the self-report, individual difference measures, a McNemar's test was conducted by determining how many individuals in each analysis were correctly classified into their current majors by the

discriminant functions analyses. It was determined that there was not a significant difference between the two sets of measures prediction of major choice,  $\chi^2(1) = 2.23, p = .163$ . The set of ability, personality, interest, and self-efficacy measures attained a hit rate of 42.3%, while personality, interest, and self-efficacy attained a hit rate of 40.4%, indicating that the 1.9% increase in the proportion of individuals correctly classified in the model that contained the ability measures was not significantly different than the classification rate of the model with only the self-report individual difference variables. Hypothesis one did not received support: Ability adds no incremental validity to the prediction of major choice beyond what was predicted by personality, interest, and self-efficacy. A summary of these results is presented in Table 22.

#### *The Prediction of Occupation Choice*

*Preliminary Analyses.* Mean and mean differences between occupational groups were examined via analysis of variance (ANOVA) with Bonferroni adjustments to correct for the multiple comparisons ( $.05/23 = .002$ ). Correlations between all variables are presented in Table 5.

There were no significant mean group differences on any of the ability measures; however, there were significant differences between groups on two of the personality measures: Agreeableness,  $F(11, 831) = 6.10, p < .001$ , and Openness to Experience,  $F(11, 831) = 4.80, p < .001$ . The Health/Fitness and Social/Community Service occupational groups reported higher levels of Agreeableness than the Business, Engineering/Computers, and Protective Services occupation groups. Additionally, the Education occupation group indicated higher levels of Agreeableness than the Business and Engineering/Computers occupation groups. The Education, Engineering/Computers, and Visual/Performing Arts

occupation groups reported higher levels of Openness to Experience than the Business and Personal Care/Leisure occupation groups. Also, the Communications, Management/Law, Sciences, and Social/Community Services occupation groups reported higher levels of Openness to Experience than the Personal Care/Leisure occupation group.

Significant mean level group differences were observed on the following interest scales: Realistic interest,  $F(11, 831) = 18.46, p < .001$ , Investigative interest,  $F(11, 831) = 14.92, p < .001$ , Artistic interest,  $F(11, 831) = 8.54, p < .001$ , Social interest,  $F(11, 831) = 10.64, p < .001$ , Enterprising interest,  $F(11, 831) = 10.10, p < .001$ , and Conventional interest,  $F(11, 831) = 10.64, p < .001$ .

The Engineering/Computer occupation group reported higher levels of Realistic Interest than the Business/Financial, Communications, Education, Health/Fitness, Management/Law, Personal Care/Leisure, Protective Services, Sciences, Social/Community Services, and Visual/Performing Arts occupation groups. The Architecture, Business/Financial, Management/Law, and Protective Services occupation groups reported higher levels of Realistic interest than the Communications, Health/Fitness, and Social/Community Services occupation groups.

The Health/Fitness occupation group reported higher levels of Investigative interest than the Business/Financial, Communications, Education, Management/Law, Protective Services, Social/Community Services, and Visual/Performing Arts occupation groups. The Sciences occupation group reported higher levels of Investigative interest than the Business/Financial, Communications, Education, Management/Law, Protective Services, Social/Community Services, and Visual/Performing Arts occupation groups. The

Engineering/Computer and Personal Care/Leisure occupation groups reported higher levels of Investigative interest than the Business/Financial and Communications occupation groups.

The Visual/Performing Arts occupation group reported higher levels of Artistic interest than the Business/Financial, Education, Engineering/Computer, Health/Fitness, Management/Law, Personal Care/Leisure, Personal Services, and Social/Community Services occupation group. The Communications occupation group reported higher levels of Artistic interest than the Business/Financial, Engineering/Computer, Health/Fitness, Personal Care/Leisure, and Protective Services occupation groups. The Education occupation group reported higher levels of Artistic interest than the Health/Fitness occupation group.

The Social/Community Services occupation group reported higher levels of Social interest than the Architecture, Business/Financial, Communications, Engineering/Computer, Health/Fitness, Management/Law, Personal Care/Leisure, Protective Services, Sciences, and Visual/Performing Arts occupation groups. The Education and Health/Fitness occupation groups reported higher levels of Social interest than the Architecture, Business/Financial, Engineering/Computer, Protective Services, and Visual/Performing Arts occupation groups. The Business/Financial, Communications, and Management/Law occupation groups reported higher levels of Social interest than the Engineering/Computer occupation group.

The Business/Financial occupation group reported higher levels of Enterprising interest than the Education, Engineering/Computer, Health/Fitness, Personal Care/Leisure, Protective Services, Sciences, Social/Community Services, and Visual/Performing Arts occupation groups. The Management/Law occupation group reported higher levels of Enterprising interest than the Education, Engineering/Computer, Health/Fitness, Personal Care/Leisure, Protective Services, Sciences, and Social/Community Services occupation



groups. The Communications occupation group reported higher levels of Enterprising interest than the Engineering/Computers, Health/Fitness, Protective Services, and Sciences occupation groups.

The Business/Financial occupation group reported higher levels of Conventional interest than the Communications, Education, Engineering/Computer, Health/Fitness, Personal Care/Leisure, Sciences, Social/Community Services, and Visual/Performing Arts occupation groups. The Management/Law occupation group reported higher levels of Conventional interest than the Communications, Education, Health/Fitness, Personal Care/Leisure, Social/Community Services, and Visual/Performing Arts occupation groups. The Engineering/Computer occupation group reported higher levels of Conventional interest than the Visual/Performing Arts occupation group.

Significant mean level group differences were observed on the following self-efficacy scales: Realistic self-efficacy,  $F(11, 831) = 20.45, p < .001$ , Investigative self-efficacy,  $F(11, 831) = 13.74, p < .001$ , Artistic self-efficacy,  $F(11, 831) = 5.79, p < .001$ , Social self-efficacy,  $F(11, 831) = 11.04, p < .001$ , Enterprising self-efficacy,  $F(11, 831) = 10.67, p < .001$ , and Conventional self-efficacy,  $F(11, 831) = 11.34, p < .001$ .

The Engineering/Computers occupation group reported higher levels of Realistic confidence than the Business/Financial, Communications, Education, Health/Fitness, Management/Law, Personal Care/Leisure, Protective Services, Sciences, Social/Community Services, and Visual/Performing Arts occupation groups. The Protective Services occupation group reported higher levels of Realistic confidence than the Communications, Education, Health/Fitness, Personal Care/Leisure, and Social/Community Services occupation groups. The Architecture and Management/Law occupation groups reported higher levels of Realistic

confidence than the Communications, Education, Health/Fitness, and Social/Community Services occupation groups. The Business/Financial and Sciences occupation groups reported higher levels of Realistic confidence than the Social/Community Services occupations.

The Health/Fitness occupation group reported higher levels of Investigative confidence than the Business/Financial, Communications, Education, Management/Law, Personal Care/Leisure, Social/Community Services, and Visual/Performing Arts occupation groups. The Sciences occupation group reported higher levels of Investigative confidence than the Business/Financial, Communications, Education, Protective Services, Social/Community Services, and Visual/Performing Arts occupation groups. The Engineering/Computer occupation group reported higher levels of Investigative confidence than the Business/Financial, Communications, Education, Social/Community Services, and Visual/Performing Arts occupation groups. The Management/Law occupation group reported higher levels of Investigative confidence than the Communications occupation group.

The Visual/Performing Arts occupation groups reported higher levels of Artistic confidence than the Business/Financial, Education, Engineering/Computer, Health/Fitness, Personal Care/Leisure, Protective Services, Sciences, and Social/Community Services occupation groups. The Communications occupation group reported higher levels of Artistic confidence than the Health/Fitness occupation group.

The Social/Community Services occupation group reported higher levels of Social confidence than the Architecture, Business/Financial, Communications, Engineering/Computer, Health/Fitness, Management/Law, Personal Care/Leisure, Sciences, and Visual/Performing Arts occupation groups. The Education occupation group reported higher levels of Social confidence than the Architecture, Business/Financial,

Engineering/Computer, Sciences, and Visual/Performing Arts occupation groups. The Communications, Health/Fitness, Management/Law, and Protective Services occupation groups reported higher levels of Social confidence than the Engineering/Computer occupation group.

The Business/Financial occupation group reported higher levels of Enterprising confidence than the Education, Engineering/Computer, Health/Fitness, Personal Care/Leisure, Protective Services, Sciences, Social/Community Services, and Visual/Performing Arts occupation groups. The Management/Law occupation group reported higher levels of Enterprising confidence than the Education, Engineering/Computer, Health/Fitness, Personal Care/Leisure, Protective Services, Sciences, and Social/Community Services occupation groups. The Communications occupation group reported higher levels of Enterprising confidence than the Health/Fitness occupation group.

The Business/Financial and Engineering/Computer occupation groups reported higher levels of Conventional confidence than the Communications, Education, Health/Fitness, Personal Care/Leisure, Protective Services, Social/Community Services, and Visual/Performing Arts occupation groups. The Management/Law occupation group reported higher levels of Conventional confidence than the Communications, Education, Health/Fitness, Personal Care/Leisure, Social/Community Services, and Visual/Performing Arts occupation groups.

Given that group level mean differences exist across predictor variables, it is appropriate to conduct and examine discriminant functions analysis results. Means and standard deviations for each occupation group for each predictor variable are provided in Tables 10 through 13.

*The Incremental Validity of Ability in the Prediction of Occupation Choice over All Sets of Self-Report Individual Difference Measures (Hypothesis 2).* In an attempt to determine whether ability adds incremental validity to the prediction of occupation choice, a discriminant functions analysis with the full set of self-report individual difference measures plus ability and a discriminant functions analysis with just the full set of self-report individual difference variables were run predicting occupation choice. The classification ability of these models was compared with the McNemar test to determine which set of predictors more accurately classified individuals into occupation groups. The model that contains the three self-report individual difference variables is predicted to effectively predict occupation group membership. It is predicted that the models that contains the full set of self-report measures and ability will demonstrate better predictive utility than the model that contain the full set of self-report measures, demonstrating incremental validity of the ability measure to the prediction of occupation choice.

First, the five personality, six interest, and six self-efficacy variables were entered together as predictors into a discriminant functions analysis in order to determine their utility in the prediction of occupation choice. The data demonstrated issues with multicollinearity. The following variables possessed variance inflation factors (VIF) over the value of four: Realistic interest (VIF = 4.18), Realistic self-efficacy (VIF = 4.76), Artistic interest (VIF = 4.00), and Artistic self-efficacy (VIF = 4.23). Variances-covariances appear to be unequal across groups,  $F(1683, 155,620.37) = 1.28, p < .001$ . The resulting analysis may over-classify cases in groups with greater dispersion. Despite this issue, the jack knife hit rate statistic is unable to be attained in the recommended separate groups' classification

procedure in the discriminant functions analysis, so the following results are based on the pooled variance-covariance matrix.

Eleven functions were produced in this analysis, and as a set these functions were significant, accounting for 42.3% of between-occupation variability,  $\chi^2(187) = 1132.66, p < .001 (\lambda = .254)$ . It appears that 25.4% of the variance in group membership is left unexplained by this set of discriminant functions. Approximately 74.6% of the variance in the functions is explained by occupation choice. Examining the squared canonical correlation, there are six significant functions in this analysis that warrant further discussion. A summary of these results is provided in Table 17.

The first function possessed high positive correlations with Realistic interest and self-efficacy and Enterprising self-efficacy and high negative correlations with Social interest and Investigative interest. The function separated the Business/Financial occupation group from the Health/Fitness occupation group. The Business/Financial occupation group reported moderate levels of Realistic interest and self-efficacy and the highest level of Enterprising confidence. Additionally, they reported the lowest level of Investigative interest and moderate levels of Social interest. The Health/Fitness occupation group reported the lowest levels of Enterprising confidence, the third lowest level of Realistic interest, and moderate levels of Realistic confidence, while reporting the second highest level of Investigative interest and the third highest level of Social interest when compared to the other occupation groups.

The second function demonstrated high positive correlations with Realistic interest and self-efficacy and Investigative interest and self-efficacy and high negative correlations with Social interest and self-efficacy. The function maximally discriminated between the

Engineering/Computer occupation group and the Communications occupation group. The Engineering/Computer occupation group reported the highest levels of Realistic interest and confidence, the third highest level of Investigative confidence, moderate levels of Investigative interest, and the lowest levels of Social interest and confidence. The Communications occupation group reported the lowest levels of Realistic interest, Investigative interest, and Investigative confidence. They also reported the second lowest levels of Realistic interest and moderate levels of Social interest and confidence.

The third function demonstrated high positive correlations with Enterprising interest and confidence and Conventional interest, and it showed high negative correlations with Artistic interest and Openness to Experience. The third function separated the Business/Financial occupation group from the Visual/Performing Arts occupation group. The Business/Financial group reported the highest levels of Conventional interest, Enterprising interest, and Enterprising confidence when compared to the other occupation groups. They also indicated moderate levels of Artistic interest and the second lowest levels of Artistic interest. The Visual/Performing Arts occupation group reported the lowest levels of Conventional interest and moderate levels of Enterprising interest and confidence. They also possessed the highest levels of Artistic interest and Openness to Experience.

The fourth function possessed a high positive correlation with Artistic interest and a high negative correlation with Social confidence, maximally separating the Visual/Performing Arts occupation group from the Protective Services occupation group. The Visual/Performing Arts occupational group reported the highest level of Artistic interest and the third lowest level of Social confidence, while the Protective Services occupation group reported the lowest level of Artistic interest and moderate Social confidence.

The fifth function demonstrated high positive correlations with Artistic interest, Conventional confidence, and Openness to Experience with no high negative correlations with any of the independent variables. This function separated the Science occupation group from the Personal Care/Leisure occupation group. The Science occupation group reported the second highest levels of Openness to Experience and moderate levels of Artistic interest and Conventional confidence. The Personal Care/Leisure occupation group possessed the lowest level of Openness to Experience and the third lowest levels of Artistic interest and Conventional confidence.

The sixth function demonstrated a high positive correlation with Openness to Experience, but there were no high negative correlations between this function and the independent variables. The function maximally discriminated between the Protective Services occupation group and the Personal Care/Leisure occupation group. The Protective Services occupation group reported low to moderate levels of Openness to Experience, while the Personal Care/Leisure occupation group reported the lowest level of Openness to Experience when compared to the other occupation groups. The structure matrix and group centroids are summarized in Table 18.

Overall, the personality, interest, and self-efficacy measures correctly classified 37.4% of occupations, and using the more conservative jack-knife procedure, 30.5% of the individuals were classified into their correct occupations. The chance hit rate for is 8.3% (1/12), so the conservative method performed better than chance in classifying individuals correctly into their reported occupational decisions, which supports the hypothesis that the set of self-report measures would be effective predictors of occupation choice.

Then, the six abilities were added to the analysis containing the five personality, six interest, and six self-efficacy variables, and all of these variables were entered together as predictors into a discriminant functions analysis in order to determine their utility in the prediction of occupation choice.

The data demonstrated issues with multicollinearity. The following variables possessed variance inflation factors (VIF) over the value of four: Realistic interest (VIF = 4.20), Realistic self-efficacy (VIF = 4.78), Artistic interest (VIF = 4.13), and Artistic self-efficacy (VIF = 4.26). Variances-covariances appear to be unequal across groups,  $F(3036, 154,987.09) = 1.18, p < .001$ . The resulting analysis may over-classify cases in groups with greater dispersion. Despite this issue, the jack knife hit rate statistic is unable to be attained in the recommended separate groups' classification procedure in the discriminant functions analysis, so the following results are based on the pooled variance-covariance matrix.

Eleven functions were produced in this analysis, and as a set these functions were significant, accounting for 41.2% of between-occupation variability,  $\chi^2(253) = 1205.52, p < .001$  ( $\lambda = .232$ ). It appears that 23.2% of the variance in group membership is left unexplained by this set of discriminant functions. Approximately 76.8% of the variance in the functions is explained by occupation choice. Examining the squared canonical correlation, there are six significant functions in this analysis that warrant further discussion. A summary of these results is provided in Table 17.

The first function demonstrated high positive correlations with Social interest and self-efficacy and Investigative interest with high negative correlations with Realistic interest and self-efficacy and Enterprising self-efficacy. The function maximally separated the Health/Fitness occupation group from the Engineering/Computer occupation group. The



Health/Fitness occupation group reported the third highest levels of Social interest and confidence and the second highest level of Investigative interest. They also reported the third lowest levels of Realistic interest and confidence and the lowest level of Enterprising confidence. The Engineering/Computer occupation group reported the lowest levels of Social interest and confidence and moderate levels of Investigative interest and Enterprising confidence. They also reported the lowest levels of Realistic interest and confidence.

The second function demonstrated high positive correlations with Realistic interest and self-efficacy and Investigative interest and self-efficacy and high negative correlations with Social interest and self-efficacy and Enterprising interest. This function maximally separated the Engineering/Computer occupation group from the Communications occupation group. The Engineering/Computer occupation group reported the highest level of Realistic interest and confidence, moderate levels of Investigative interest, and the third highest level of Realistic confidence. They also reported the lowest levels of Social interest and confidence and moderate levels of Enterprising interest. The Communications occupation group reported the lowest level of Realistic interest and Investigative interest and confidence. They also possessed moderate levels of Social interest and confidence and the third lowest levels of Enterprising interest when compared to all of the other occupation groups.

The third function possessed high positive correlations with Enterprising interest and self-efficacy and Conventional interest and self-efficacy. This function also demonstrated high negative correlations with Artistic interest and Openness to Experience, maximally separating between the Business/Financial occupation group and the Visual/Performing Arts occupation group. The Business/Financial occupation group reported the highest levels of Conventional interest and confidence and Enterprising interest and confidence. They also

reported moderate levels of Artistic interest and the second lowest level of Openness to Experience. The Visual/Performing Arts occupation group reported the lowest levels of Conventional interest and confidence and moderate levels of Enterprising interest and confidence. They reported the highest level of Openness to Experience and Artistic interest.

The fourth function had a high positive correlation with Artistic interest and a high negative correlation with Social confidence. The function maximally separated the Visual/Performing Arts occupation group from the Protective Services occupation group. The Visual/Performing Arts occupation group reported the highest level of Artistic interest and the third lowest level of Social confidence, and the Protective Services occupation group reported the lowest Artistic interest and moderate levels of Social confidence.

The fifth function possessed high positive correlations with Conventional confidence and Openness to Experience, but there were no high negative correlations between the function and any of the independent variables. The function maximally separated the Education occupation group from the Personal Care/ Leisure occupation group. The Education group reported the third highest level of Openness to Experience and moderate levels of Conventional confidence, while the Personal Care/Leisure occupation group reported the third lowest level of Conventional confidence and the lowest levels of Openness to Experience when compared to the other occupation groups.

Even though six of the functions were found to be significant, when examining the structure matrix, it was determined that none of the independent variables correlated highly with the sixth function. This function was not interpreted in this analysis. The structure matrix and group centroids are summarized in Table 19.

Overall, the personality, ability, interest, and self-efficacy measures correctly classified 37.7% of occupations, and using the more conservative jack-knife procedure, 29.8% of the individuals were classified into their correct occupations. The chance hit rate for is 8.3% (1/12), so the conservative method performed better than chance, classifying 21.5% more individuals correctly into their reported occupational decisions.

To determine whether ability demonstrates incremental validity in the prediction of occupation choice beyond what was predicted by the combination of all of the self-report, individual difference measures, a McNemar's test was conducted by determining how many individuals in each analysis were correctly classified into their expressed occupational decisions by the discriminant functions analyses. It was determined that there was a significant difference between the two sets of measures prediction of occupation choice,  $\chi^2(1) = .44, p = .824$ . The set of ability, personality, interest, and self-efficacy measures attained a hit rate of 37.7%, while personality, interest, and self-efficacy attained a hit rate of 37.4%, indicating there was not a significant difference in the prediction of occupation choice between the two sets of individual difference measures. Hypothesis two did not received support: Ability appears to add no incremental validity to the prediction of occupation choice beyond what was predicted by personality, interest, and self-efficacy. The results are summarized in Table 22.

*The Prediction of Occupation Choice Compared to the Prediction of Occupation Choice with All Sets of Individual Difference Measures (Hypothesis 3).* Hypothesis three stipulated that the complete set of predictor variables would be better able to predict major choice than occupational choice. Choosing a major is the more proximal decision for college students than choosing an occupation. McNemar's test was conducted, comparing the

classification abilities of each set of predictors. It was determined that there is not a significant difference between the set of predictors' abilities to predict major choice versus occupation choice,  $\chi^2(1) = 1.50, p = .244$ . Hypothesis three did not received support: The set of predictors are approximately equal in their abilities to predict both major and occupational choices.

#### *The Prediction of Major Satisfaction*

The assumption of normality was evaluated by examining the skewness and kurtosis of the predictor variables and was discussed in the data preparation section. While some variables demonstrated significant skew and kurtosis, the sample size is large enough to be less affected by these deviations from normality. To preserve interpretability of results, non-transformed data was utilized in these analyses. The assumptions of linearity and homoscedasticity were evaluated by examining the derived residuals plots for each set of analyses. The data were determined to be linear when the residual plots attained from the regression analyses were roughly rectangular, and the data were deemed homoscedastic when the residual plot was observed to be the same width across all values, indicating that there were equal variances for all predicted scores. Multicollinearity was evaluated by examining variance inflation factors (VIF). It is noted that VIF over values of four indicate some issues with multicollinearity.

*The Incremental Validity of Ability in the Prediction of Major Satisfaction over All Sets of Self-Report Individual Difference Measures (Hypothesis 4).* To determine whether ability adds incremental validity to the prediction of major satisfaction beyond the self-report measures, a hierarchical regression analysis was conducted. At step one, the three self-report individual difference measures were entered to determine whether the three single self-report

measures were significant predictors of major satisfaction. At step two, abilities were entered to determine if they account for a significant portion of variance beyond what was predicted by the self-report measures together. It is predicted that the self-report individual difference measures will each be significant predictors of major satisfaction at step one; however, when abilities are entered at step two, it is also predicted that abilities will account for a significant portion of variance beyond what was predicted by the combination of self-report measures.

The data appear roughly linear with some heteroscedasticity: There appears to be more variability in the residuals for lower predicted values of major satisfaction than higher levels of major satisfaction. The VIFs associated with the following variables were over the value of four, which may suggest multicollinearity issues in the data: Realistic interest (Step 1 VIF = 4.18; Step 2 VIF = 4.20), Artistic interest (Step 1 VIF = 4.00; Step 2 VIF = 4.03), Realistic confidence (Step 1 VIF = 4.76; Step 2 VIF = 4.78), and Artistic confidence (Step 1 VIF = 4.23; Step 2 VIF = 4.26). Further examining the correlations among the independent variables, a number of variables were observed to be highly and positively correlated with one another. Artistic interest and Artistic confidence were very highly correlated,  $r(843) = .81, p < .001$ . In addition, Realistic interest and Realistic confidence were highly and positively correlated,  $r(843) = .78, p < .001$ .

At step one, the combination of personality, interests, and self-efficacy was a significant predictor of major satisfaction,  $R^2 = .143, F(17, 825) = 8.10, p < .001$ , adjusted  $R^2 = .125$ . Personality, interest, and self-efficacy together account for 12.5% of the variance in major satisfaction.

Four personality variables were significant, unique predictors of major satisfaction: Openness to Experience ( $B = .25, SE = .07$ ), Conscientiousness ( $B = .24, SE = .05$ ),

Emotional Stability ( $B = .16, SE = .04$ ), and Extraversion ( $B = .11, SE = .05$ ). Also, Realistic interest was a significant predictor of major satisfaction ( $B = .19, SE = .07$ ). Openness to Experience accounted for 1.4% of the variation in major satisfaction after the effects of the other variables had been removed, and Conscientiousness accounted for 2% of the variance in major satisfaction. Emotional Stability accounted for 1.3% of the variance in major satisfaction, while Extraversion accounted for 0.6% of the variance in major satisfaction after the effects of the other variables had been removed. Realistic interest accounted for 0.8% of the variance in major satisfaction. Higher levels of Openness to Experience, Conscientiousness, Emotional Stability, and Extraversion were predictive of higher levels of major satisfaction; however, higher levels of Realistic interest were predictive of lower levels of major satisfaction.

At step two, the model containing personality, interest, self-efficacy, and ability was significant,  $R^2 = .148, F(23, 819) = 6.16, p < .001$ , adjusted  $R^2 = .124$ ; however, the amount of variance in major satisfaction predicted by ability over personality, interest, and self-efficacy was not significant,  $\Delta R^2 = .005, F(6, 819) = 0.72, p = .63$ . Ability, personality, interest, and self-efficacy together predict 12.4% of the variance in major satisfaction. Ability, however, does not add incremental validity to the prediction of major satisfaction beyond what was predicted by personality, interest, and self-efficacy.

The same four personality variables that were significant predictors of major satisfaction at step one remained significant predictors of major satisfaction at step two: Conscientiousness ( $B = .25, SE = .06$ ), Openness to Experience ( $B = .25, SE = .07$ ), Extraversion ( $B = .11, SE = .05$ ), and Emotional Stability ( $B = .16, SE = .04$ ). Realistic interest remained a significant predictor of major satisfaction at step two as well ( $B = -.20, SE$

= .07). Conscientiousness accounted for 2.1% of the variance in major satisfaction and Openness to Experience accounted for 1.4% of the variance in major satisfaction. Emotional Stability accounted for 1.3% and Extraversion accounted for 0.7% of the variance in major satisfaction. Realistic interest accounted for 0.9% of the variance in major satisfaction after the effects of the other variables were removed. Higher levels of Conscientiousness, Openness to Experience, Emotional Stability, and Extraversion were predictive of higher levels of major satisfaction, while higher levels of Realistic interest were predictive of lower levels of major satisfaction.

Hypothesis four was unsupported. Ability did not add any incremental validity to the prediction of major satisfaction beyond what was predicted by the self-report individual difference variables. The results are summarized in Table 20.

#### *The Prediction of Career Aspirations*

*The Incremental Validity of Ability in the Prediction of Career Aspirations over All Sets of Self-Report Individual Difference Measures (Hypothesis 5).* To determine whether ability adds incremental validity to the prediction of career aspiration level beyond the self-report measures, a hierarchical regression analysis was conducted. At step one, the three self-report individual difference measures were entered to determine whether the three single self-report measures were significant predictors of aspiration level. At step two, abilities were entered to determine if they account for a significant portion of variance beyond what was predicted by the self-report measures together. It is predicted that the self-report individual difference measures will each be significant predictors of career aspiration level at step one; however, when abilities are entered at step two, it is also predicted that abilities will account

for a significant portion of variance beyond what was predicted by the combination of self-report measures.

The data appear linear and homoscedastic. VIFs associated with the following variables were over the value of four, which may suggest multicollinearity issues in the data: Realistic interest (Step 1 VIF = 4.18; Step 2 VIF = 4.20), Artistic interest (Step 1 VIF = 4.00; Step 2 VIF = 4.03), Realistic confidence (Step 1 VIF = 4.78; Step 2 VIF = 4.78), and Artistic confidence (Step 1 VIF = 4.23; Step 2 VIF = 4.26). Further examining the correlations among the independent variables, it appears that a number of variables are highly and positively correlated with one another.

At step one, the combination of personality, interests, and self-efficacy was a significant predictor of career aspiration level,  $R^2 = .310$ ,  $F(17, 825) = 21.81$ ,  $p < .001$ , adjusted  $R^2 = .296$ . Personality, interest, and self-efficacy together account for 29.6% of the variance in career aspiration level.

Nine of the variables were unique and significant predictors of career aspiration at step one. Seven of the variables were positively-related to aspiration level, while two of the variables were negatively-related to aspiration level. Conscientiousness ( $B = .19$ ,  $SE = .03$ ) accounted for 4.1% of the variance in aspiration level, and Openness to Experience ( $B = .21$ ,  $SE = .03$ ) accounted for 3.2% of the variance in aspirations. Extraversion ( $B = .08$ ,  $SE = .03$ ) accounted for 0.9% of the variance in career aspiration level, and Agreeableness ( $B = .10$ ,  $SE = .04$ ) accounted for 0.7% of the variance in career aspiration level. Higher levels of these personality variables predicted higher levels of aspirations. Enterprising self-efficacy ( $B = .09$ ,  $SE = .03$ ) accounted for 0.7% of the variation in aspiration level, and Conventional self-efficacy ( $B = .06$ ,  $SE = .03$ ) accounted for 0.4% of the variation in aspirations. Higher levels



of these self-efficacy variables were predictive of higher career aspirations. Realistic interest ( $B = -.14, SE = .03$ ) and Artistic confidence ( $B = -.13, SE = .04$ ) accounted for 1.4% and 1.1% of the variation in career aspiration level, respectively; however, higher levels of these variables were predictive of lower levels of career aspirations.

At step two, the model containing personality, interest, self-efficacy, and ability was significant,  $R^2 = .320, F(23, 819) = 16.73, p < .001$ , adjusted  $R^2 = .301$ ; however, the amount of variance in career aspiration level predicted by ability over personality, interest, and self-efficacy was not significant,  $\Delta R^2 = .010, F(6, 819) = .192, p = .076$ . Ability, personality, interest, and self-efficacy together predict 30.1% of the variance in career aspiration level. Ability, however, does not add incremental validity to the prediction of aspirations beyond what was predicted by personality, interest, and self-efficacy.

The same variables that were significant predictors of career aspiration level at step one remained significant predictors of career aspiration level at step two. Seven of the variables were positively-related to aspiration level, while two of the variables were negatively-related to aspiration level. Conscientiousness ( $B = .19, SE = .03$ ) accounted for 3.9% of the variance in aspiration level, and Openness to Experience ( $B = .22, SE = .03$ ) accounted for 3.3% of the variance in aspirations. Agreeableness ( $B = .10, SE = .04$ ) accounted for 0.6% of the variance in aspiration level, and Extraversion ( $B = .08, SE = .02$ ) accounted for 0.9% of the variance in aspirations. Higher levels of these personality variables predicted higher levels of aspirations. Enterprising self-efficacy ( $B = .09, SE = .03$ ) accounted for 0.7% of the variation in aspiration level, and Conventional self-efficacy ( $B = .06, SE = .03$ ) accounted for 0.3% of the variation in aspirations. Higher levels of these self-efficacy variables were predictive of higher career aspirations. Realistic interest ( $B = -.14, SE$

= .03) and Artistic confidence ( $B = -.13$ ,  $SE = .04$ ) accounted for 1.4% and 1.1% of the variation in career aspiration level, respectively; however, higher levels of these variables were predictive of lower levels of career aspirations. The results are summarized in Table 21.

Hypothesis five was unsupported. Ability did not add any incremental validity to the prediction of career aspiration level beyond what was predicted by the self-report individual difference variables.

*The Prediction of Major Satisfaction Compared to the Prediction of Career Aspirations with All Sets of Individual Difference Measures (Hypothesis 6).* Hypothesis six stipulated that the individual difference measures would be better predictors of major satisfaction, the more proximal vocational outcome variable for college students, than future career aspiration level. Contrary to what was hypothesized, the individual difference measures actually accounted for a higher proportion of variance in career aspiration level than major satisfaction. The set of all individual difference measures accounted for 14.8% of the variation in major satisfaction, while the set of individual difference measures accounted for 32.0% of the variation in career aspiration level, which is a 17.2% difference in the amount of variance these predictors predict in the outcome variables. Additionally, it is noted that a larger number of individual difference measures were significant predictors of career aspiration level than major satisfaction. Only personality variables and Realistic interest were unique predictors of major satisfaction; whereas, these variables along with Realistic self-efficacy, Enterprising self-efficacy, Conventional self-efficacy, and Artistic self-efficacy were significant and unique predictors of career aspiration level. In both models, higher levels of Conscientiousness, Openness to Experience, Extraversion, and Agreeableness were predictive of higher levels of satisfaction and aspiration level. In the career aspiration level

model, higher levels of Realistic, Enterprising, and Conventional self-efficacy were also predictive of higher levels of aspiration level, but Realistic interest and Artistic self-efficacy were predictive of lower levels of career aspirations. Abilities were not predictive of either vocational outcome variable.

## CHAPTER 5. DISCUSSION

Past research has examined the influence of a common set of individual difference variables in the prediction of vocational outcome variables, such as major and career satisfaction, major and occupational choice, and performance in these domains. Measures have been developed to assist career counselors in their pursuit to best assist career counseling clients in determining which majors or occupations might be the best fit for them; however, the vast majority of these measures rely on these clients to self-report their interests, confidence, learning experiences, or personality. It has been demonstrated that individuals are often poor estimators of their true standing on individual difference traits (Kruger & Dunning, 1999; Ehrlinger, Johnson, Banner, Dunning, & Kruger, 2008). It has also been suggested that objective ability measures are more effective than self-efficacy measures as indicators of individual differences in career-related behaviors (Judge, Jackson, Shaw, Scott, & Rich, 2007; Lubinski, 2010).

Lubinski (2010) reminded the vocational psychology field of the long-standing history and evidence supporting the use of ability assessments to assist individuals along their career exploration processes. The purpose of this research was to examine the potential incremental validity of using an objective ability measure in conjunction with self-report measures of self-efficacy, interests, and personality to predict a number of educational and vocational outcome variables, including current academic program choice and satisfaction and future career aspirations. A demonstration of the incremental validity of ability over the self-report measure in the prediction of vocational outcomes would suggest that ability measure should be adopted more frequently in future vocational psychology research and practice.

*The Prediction of Major Choice.* It was hypothesized that adding an ability measure to the set of individual difference measures that are often utilized in vocational psychology would add incremental validity to the prediction of major choice beyond what is predicted by the self-report measures alone. The results indicated that ability did not add incremental validity to the prediction of major choice when considering the self-report, individual difference variables together. In particular, the model that contained the ability measure with the self-report measures increased the hit rate for predicting major choice by 1.9%; however, this increase was not significant.

Additionally, it was determined that none of the ability measures assisted in the discrimination between major groups, which further indicates the lack of support found for the hypotheses that ability measures would provide incremental validity to the prediction of major choice beyond what was predicted by the set of self-report individual difference variables alone.

Various patterns, however, were observed in the results, and some of the patterns were similar to previous studies' findings, although Larson et al. (2010) utilized different personality, interest, and self-efficacy measures in their study than the measures that were used in the current study. When personality, interest, and self-efficacy were considered together, a jack knife hit rate of 33.7% was attained in the Larson et al. (2010) study, and a jack knife hit rate of 33.4% was obtained in the current study, once again highlighting the similarity of findings in these individual difference predictors' abilities to predict major choice.

The first function that was obtained across the two sets of analyses distinguished between the Engineering/Computer majors and the Health/Fitness majors. The variables that

were the most influential in this major group separation were Realistic interest and self-efficacy, Conventional interest and self-efficacy, and Social interest and self-efficacy. The Engineering/Computer majors reported higher levels of Realistic and Conventional interest and self-efficacy, while the Health/Fitness majors reported higher levels of Social interest and self-efficacy.

One way to conceptualize these results employs the use of Prediger's (1982) People-Things dimension. The People side of the People-Things dimension meets up the Holland's (1959; 1997) Social type; whereas, the Things side of the People-Things dimension matches up with the Realistic type in Holland's model, and these types fall on opposite sides of Holland's hexagon or circumplex, which can be used to represent both interest and self-efficacy information (Armstrong & Vogel, 2009). The People task is associated with interpersonal activities, like caring for or leading other people. The Things task involves tasks that are non-personal in nature, such as working with tools or machines. Individuals who enroll in Health or Fitness majors must interact with people in some regard. Additionally, the individuals who complete these majors often work in occupations where they must care for others in some capacity. The Engineering/Computer majors, on the other hand, must complete work activities that are associated with the Things side of the People-Things dimension: They will work with machines, such as computers, or other tools that are required in engineering majors and occupations.

The second function that was often obtained in the various analyses conducted pulled apart the Biological/Physical Science majors from the Human/Consumer Science majors. The predictor variables that were most influential in this separation were Investigative interest and self-efficacy and Realistic interest and self-efficacy. Once again, the pattern that

is observed makes sense when Holland's model is considered. Realistic and Investigative types are proximal to one another in Holland's hexagon or circumplex. Individuals who regard themselves as having interest in Realistic and Investigative interests are likely to enjoy working with their hands, working outdoors, working with science, and working with mathematics, which captures the Biological/Physical Science majors quite well. Additionally, individuals who score low on these measures will likely dislike these activities, instead preferring to work with people or artistic creations, which may better capture the Human/Consumer Science majors.

The third function that was obtained in the analyses often discriminated between the Business majors and the Visual/Performing Arts majors. The predictor variables that correlated highly with this function were Enterprising interest and self-efficacy and Conventional interest, which matches with the Data side of Prediger's (1982) Data-Ideas dimension. The Data task is impersonal in nature and deals with facts and systematic procedures, which may describe work activities that are associated with business majors and careers. Individuals who are enrolled in Visual/Performing Arts majors reported low interest and confidence in Enterprising and Conventional activities, and these individuals are not likely to enjoy or feel confident in their abilities to work strictly with facts and systematic procedures; whereas, individuals enrolled in Business majors are likely to enjoy persuading others, managing people, and organizing data.

The fourth function that was obtained in the two sets of analyses distinguished between the Visual/Performing Arts majors and the Protective Services or Education majors. The Visual/Performing Arts majors reported higher levels of Artistic interest and confidence and Openness to Experience than the Protective Services and Education majors.

Ackerman & Heggstad (1997) proposed that there is a great deal of overlap between interests, abilities, and personality, identifying four trait complexes to account for this overlap: social, clerical/conventional, science/math, and intellectual/cultural. Based on the results from the current study, it is possible that three of the four trait complexes were observed. The first function with its Social interest and self-efficacy influence may have tapped into the social trait complex. The second function with its Investigative interest and confidence impact may be connected to the science/math trait complex, and the third function may be similar to the clerical/conventional trait complex with its Enterprising and Conventional influence. Additionally, the intellectual/cultural complex was likely identified in the fourth attained function with its influence from Artistic interest and confidence, as well as Openness to Experience.

Overall, it appears that interest and self-efficacy are the largest contributors to the prediction of major choice with some influence of personality on making distinctions between individuals in various majors. All of the six Holland types influenced the separation between the major groups in these analyses, while Openness to Experience and Emotional Stability also contributed to the discrimination between groups in some cases. Contrary to the hypotheses, ability provided no incremental validity to the prediction of major choice beyond these self-report measures.

*The Prediction of Occupational Choice.* It was hypothesized that adding an ability measure to the set of individual difference measures that are often utilized in vocational psychology would add incremental validity to the prediction of occupation choice beyond what is predicted by the self-report measures alone. Ability demonstrated no incremental validity in the prediction of occupational choice beyond what was predicted by the self-report



individual difference variables. The model that contained ability along with all of the self-report individual difference variables only increased the hit rate in predicting occupation choice by 0.03%. This effect is neither statistically nor clinically significant: it appears that ability would not aid in the prediction of occupation choice beyond the self-report, individual difference variables. These results were similar to those attained in the major choice analysis. Utilizing the self-report measures alone may continue to be the best available alternative to helping individuals make career-related decisions.

It appeared that interest and self-efficacy variables were variables that possessed consistent influence on the prediction of occupational choice. Two patterns were observed in the first and second functions: These two functions often correlated highly with the same interest and self-efficacy variables. The first function separated the Health/Fitness occupation group from the Engineering/Computer occupation group with the students who hope to pursue engineering and computer careers reporting high levels of Realistic interest and confidence and Enterprising confidence. The students who want to attain careers in health or fitness areas reported high levels of Social interest and confidence and high Investigative interest. It seems that the individuals who are most interested in engineering or computer careers have interests that correspond with Prediger's (1982) Data and Things tasks, while the individuals who most want careers in the health field have the most interest in working with Ideas and People.

The second function demonstrated high correlations with Realistic, Investigative, Social, and Enterprising interest and self-efficacy variables. This function separated the Communications occupation group from the Engineering/Computer occupation group with the students who want to pursue occupations in communications reporting high levels of

interest in Social and Enterprising activities, while the students who want to enter careers in computers or engineering indicating that they had the most interest and confidence in Realistic and Investigative activities.

Examining the O\*NET (Peterson, Mumford, Borman, Jeanneret, & Fleishman, 1999) occupational database and the classification of occupations based on Holland's interest types, it is clear how the results of the discriminant functions analyses were derived. Many of the engineering occupations in the O\*NET are given the Holland code IR or RI, indicating that individuals who aspire to be engineers have high interest in Realistic and Investigative activities, which nearly mimics the findings from the current study that individuals who have interest in pursuing engineering careers have interest and confidence in Realistic and Investigative activities. Individuals who want to attain computer-based careers are assigned codes, like ICR, on the O\*NET system, which also fits the findings from the current study. Also, family practitioners of medicine are assigned a Holland code of IS, which is similar to the results from the current study: Students who want to pursue careers in medicine reported interest and confidence in Social activities and interest in Investigative activities. The attained results indicate that the interest and self-efficacy Holland variables are good predictors of occupation choice, and the attained results fall in line with past research on individuals' interests in various careers.

*The Prediction of Major Satisfaction.* Two analyses were run to test a set of hypotheses regarding which individual difference variables best predict major satisfaction with specific intentions to test whether adding ability adds incremental validity to the prediction of major satisfaction. When examined together, personality, interests, confidence, and learning experiences were all significant predictors of major satisfaction; however, the

six abilities did not significantly predict major satisfaction, which was contrary to what was hypothesized. Additionally, in all of the analyses undertaken, ability failed to demonstrate incremental validity to the prediction of major satisfaction beyond what was predicted by the self-report individual difference measures.

Overall, the most robust predictor of major satisfaction appears to be personality. Conscientiousness, Openness to Experience, Emotional Stability, and Extraversion were routinely unique and significant predictors of major satisfaction in all of the models predicting major satisfaction. Individuals who tend to be organized, efficient, goal-oriented, tolerant, happy, outgoing, and creative tended to report being more satisfied with their majors. Another variable that was a significant predictor of major satisfaction was Realistic interest; however, individuals who reported having interest in working with their hands, outdoors, and with animals tended to report lower satisfaction in their majors.

Considering these findings in relation to past research conducted on the Five Factor Model of personality (McCrae & Costa, 1996; 1999), it is noted that these five personality traits have been found to be temporally-stable (Robins, Fraley, Roberts, & Trzesniewski, 2001). In addition, both of the traits, Conscientiousness and Openness to Experience, have been found in sixteen cultures; whereas, the presence of some of the other personality traits of the Five Factor Model has not been supported in other cultures (Rolland, 2002). These two traits, in particular, seem to be robust in time and across cultures, which may indicate that they are more influential across time and people and are potentially more influential in the career exploration process. In fact, these two variables, along with Emotional Stability, accounted for a bit more variance in major satisfaction after removing the effects of the other variables than the other significant predictors of major satisfaction.

Individuals who consistently are more conscientious are potentially more motivated to find majors and occupations that are better fits for them, and these individuals may have the internal resources, such as organizational skills, persistence, and responsibility, to follow through on pursuing the majors and occupations. Individuals who report higher levels of Openness to Experience may also report higher levels of major satisfaction given these individuals' tolerant natures and curiosity. It may be that these individuals would report higher levels of major satisfaction in general rather than toward their specific major, given that they might enjoy many different areas of study. Additionally, the individuals who report low levels of neuroticism are likely to feel happier, less anxious, and less sad, which may impact the degree to which they would be willing to endorse feeling happy or satisfied in their current majors.

The finding that Openness to Experience is a significant predictor of major satisfaction was unexpected given the past research on job satisfaction and personality. Judge, Heller, and Mount (2002) conducted a meta-analysis on the relations between personality and job satisfaction, and they found that Conscientiousness was significantly correlated with job satisfaction; however, Openness to Experience was completely uncorrelated with job satisfaction. Given that Openness to Experience was a positive, significant predictor of major satisfaction, this variable should be included in future analyses conducted on the individual difference measures that influence vocational outcome variables.

*The Prediction of Career Aspirations.* Two analyses were run to test a set of hypotheses regarding which individual difference variables best predict career aspiration level with particular attention paid to determining whether adding abilities would produce incremental validity in the prediction of aspiration level after considering the self-report

individual difference variables. Ability failed to demonstrate incremental validity to the prediction of career aspiration level beyond what was predicted by the self-report individual difference measures. Ability level does not appear to be a salient variable in how individuals make decisions regarding the level of educational or career aspirations they hope to attain.

When all of the individual difference variables were considered together in the complete model, nine variables were significant predictors of career aspiration. Conscientiousness, Openness to Experience, Extraversion, Agreeableness, Realistic self-efficacy, Enterprising self-efficacy, and Conventional self-efficacy predicted higher levels of career aspiration; however, higher levels of Artistic self-efficacy and Realistic interest predicted lower levels of career aspiration.

It is important to consider multiple factors that may influence individuals' decision to pursue additional education or to strive for leadership positions in their lines of work. The most influential variables are intuitively-related to career aspiration level. The Career Aspiration Scale was developed to measure three themes: Aspiring to leadership and promotions, training and managing others, and pursuing further education. When one considers the personality of person who may be interested in pursuing higher levels of education or higher positions at work, it is not difficult to imagine this person as someone who is dependable, responsible, persistent, intelligent, and eager to learn. Additionally, this individual likely has had experiences learning about how to be a leader or has been persuaded to continue his/her academic learning to better himself/herself. In some of the analyses, it was determined that Agreeableness was a predictor of higher levels of career aspirations. The interpretation of the positive impact of Agreeableness on career aspiration level is less clear. It is possible that the combination of these significant personality variables

come together to influence vocational outcome variables. For example, Witt, Burke, Barrick, and Mount (2002) conducted a study examining personality effects on job ratings, and it was found that individuals who exhibited high levels of both Conscientiousness and Agreeableness received higher job ratings than individuals who were only high in Conscientiousness. Perhaps, individuals who are high in Conscientiousness and Agreeableness strive for higher levels of educational and occupational success than individuals who exhibit high levels of only one of these personality traits.

The variables that were negatively-related to career aspiration level in the complete model, Artistic learning experience and Realistic interest, are also important to consider and interpret. Individuals with high Realistic interests have been described as practical (Holland, 1997), and these individuals may not see a need for attaining additional education beyond what might be required of them to attain a job or learn a skill. In addition, it is possible that individuals who have acquired a great deal of learning experience in the Artistic realm do not have interest in climbing the occupational ladder if they have been taught to be more open-minded, unconventional, and non-conforming to societal pressures.

Gasser, Larson, and Borgen (2004) conducted a study to determine personality and interest's influence on educational aspiration level. They found that individuals with Investigative interests and individuals who reported enjoying learning in academic environments indicated that they intended to pursue higher levels of education. Even though Investigative interest did not significantly predict career aspiration level in the complete model, Investigative interest was a significant predictor of aspiration in the model that contained only the interest variables. Additionally, it was found that Investigative learning experience was a significant predictor of higher career aspirations in the complete model,

which may capture both individuals' interest in Investigative activities as well as preferences and experiences with academic learning environments, which hints at the similarity in findings in this study and Gasser et al.'s (2004) study.

It was also interesting to examine whether mean levels of reported career aspirations differed among the different major and occupational groups. Individuals who want to pursue careers in the fields of health and fitness reported generally higher mean levels of career aspirations than individuals who intend to enter the fields of architecture or the visual or performing arts. This finding is interesting given the variables that significantly predicted career aspirations in the complete model. Realistic interest predicted lower levels of career aspiration. Individuals who enjoy working with their hands and outdoors are likely to be the same individuals who would pursue art, architecture, or design in college. This additional analysis provides more insight into what contributes to major satisfaction and career aspiration level for college students.

*Current versus Future Vocational Outcome Variables.* When the various individual difference variables were utilized as predictors for major and occupational choice, it was predicted that the measures would be more effective predictors of major choice than occupation choice; however, the current study found that the predictors were approximately equally effective in predicting both major and occupation choice. It was thought that the predictors would be better predictors of major choice since the college students were currently in the process of making these vocational decisions; however, they might be still be a few years away from needing to make career decisions. It appears that utilizing the individual difference variables, especially the interest and self-efficacy variables, to help students find suitable majors and careers would be beneficial.

It is important to consider that the individual difference measures were better in predicting career aspiration level than major satisfaction, which is an unexpected finding. The individual difference measures predicted 14.8% of the variance in major satisfaction and 32.0% of the variance in career aspiration level. The full set of predictor variables predicted 17.2% more variance in career aspiration level than major satisfaction, which is contrary to what was hypothesized. The individual difference variables that were utilized in this study were more related to career aspiration level than major satisfaction.

In both models, the personality variables, Conscientiousness and Openness to Experience, tended to be the largest, unique predictors of each of the vocational outcome variables, indicating that these personality features are quite influential in the prediction of vocational outcome variables. In particular, individuals who reported being organized, efficient, and motivated indicated that they were both satisfied in their majors and possessed high career aspiration levels, hoping to strive for leadership and training positions in their future careers. In addition, individuals who saw themselves as original, creative, and tolerant also reported being satisfied with their majors and aspired to high career levels.

*Career Counseling Implications.* Despite Lubinski's (2010) urging to utilize ability measures in vocational psychology research and practice, the self-report measures may still be potentially more useful in these pursuits than other types of data based on the results from the current study. In particular, interest and self-efficacy were consistently influential predictors in the discrimination between major and occupation groups; whereas, personality was the most influential variable in the prediction of major satisfaction and career aspiration level. Ability failed to provide any incremental validity to the prediction of any of the career



counseling outcome variables beyond what was predicted by the self-report, individual difference variables.

If career counselors wish to assist their clients with major and career choices, Holland-based interest and self-efficacy measures may prove to be the most beneficial tools they can utilize. If career counselors hope to better understand their clients' potential satisfaction in their majors or general career aspiration level, it may be more helpful to assess their personalities. It was determined that individuals who reported higher levels of Conscientiousness and Openness to Experience also indicated that they were more satisfied in their majors and intended to pursue higher levels of education. Given that varying sets of individual difference measures were influential for different vocational outcome variables, it may be best for vocational researchers and career counselors to still employ a variety of individual measures to best propel forward the field and best help their clients.

*Limitations of the Current Study and Future Directions.* The current study contained a number of limitations upon which could be improved in future research. It was noted that some of the assumptions underlying regression and discriminant functions analyses were slightly violated. In particular, some of the variables demonstrated significant skew and kurtosis. Also, heterogeneity of variances and multicollinearity was observed. For the ability measure, skewness and kurtosis was expected given the particular population that was being tested: College students are likely to perform at the upper end of the distribution in terms of their intellectual abilities given their success in gaining college entry. It may be beneficial to collect data on a variety of populations, especially populations outside of the university setting, to better exemplify normality. Collinearity was observed between the two RIASEC-based measures measuring interest and self-efficacy. It may be beneficial to attempt to reduce

the collinearity between these measures by utilizing only one or the other in future research and practice, combine the information attained from both measures, and use statistical techniques to reduce the impact of collinearity on results.

It was also noted that the Ability Profiler did not demonstrate good internal consistency, which resulted in large standard errors. It may be beneficial to attempt a study with similar goals with a different ability measure with better internal consistency estimates to better determine ability's impact on vocational outcome variables. Also, given that the Ability Profiler was utilized with a college sample, it is likely that the results attained on the six Ability Profiler scales demonstrated a restriction of range effect: it is likely that the sample of college students was drawn from at least the upper half of a normal distribution in terms of ability level, and it may be important to conduct such studies on a more diverse sample to attain more variability in ability scores.

Also, it may be important to attempt to better understand the influence of ability, along with the other self-report individual difference variables, on the prediction of other vocational outcome variables. In particular, given the past research that has demonstrated that ability has a strong influence on actual performance (Schmidt & Hunter, 2004), a study that attempts to understand ability's incremental validity over the self-report, individual difference variables in the prediction of performance should be conducted. It is likely that ability will be much more influential in the prediction of performance than the self-report measures.

The current study encountered difficulties in attempting to predict occupational choice with the individual difference variables when considering the conservative jack knife hit rate procedure for classifying individuals into occupations. Issues exist with the Holland-

based system for classifying occupations in that only about 85% of the occupation in the United States can be conceptualized and fit into the Holland framework (Deng, Armstrong, & Rounds, 2007). In attempting to conceptualize the results from the study, the O\*NET classification system for occupations was considered, which uses the Holland-based framework to describe the interests of various individuals in these occupations. It is possible that some of the issues with the prediction of occupational decisions in the current study are due to the difficulties with attempting to categorize all occupations into this framework: Perhaps, the occupation groups were too broadly defined to fully capture the variability within groups. Creating a great number and more narrow categories may improve the prediction of occupational choice with the individual difference variables. Another issue that could have impacted the results was the unequal variance between the occupation groups.

Additional studies should be conducted to assess these vocational psychology issues. This study should be replicated with other populations and with an intent to reduce some of the limitations of the current study. Many vocational psychology research studies are conducted on college student populations, and it is essential that these results be compared to results that are attained from samples that include younger children, working adults, and other groups of individuals. Also, studies with similar variables and hypotheses should be conducted with samples of different races and ethnicities, especially since this sample contained such a large portion of individuals who self-identified as white or European American. It will also be important to whether sex plays a role in these variables' influence on these vocational outcome variables. Future research can further illuminate these issues.

*Summary and Conclusions.* The current study sought to better understand the use of individual difference measures in vocational psychology that did not utilize self-report data.

In particular, this study intended to assess whether an ability measure would add incremental validity to the prediction of various vocational outcome variables, such as major choice, occupational choice, major satisfaction, and career aspiration level, after considering the effects of a set of self-report individual differences measures that are often employed in vocational psychology research and practice, including personality, interest, and self-efficacy measures.

The findings from the current study indicate that ability does not contribute to individuals' major and occupational decision-making and plays an insignificant role in whether individuals report being satisfied in their current majors or to what level of education or occupational success individuals strive. It is possible that some of the issues with the current study impeded the ability measure to play a more influential role in the prediction of vocational outcome variables, and these issues should be further evaluated in future research. Also, it is hypothesized that ability likely plays a more direct role on individuals' actual performance in their majors and careers, which should be examined in future studies. Much more research needs to be conducted on the contribution of ability to vocational outcomes, such as career choice, satisfaction, and performance.

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## FIGURES AND TABLES

Figure 1

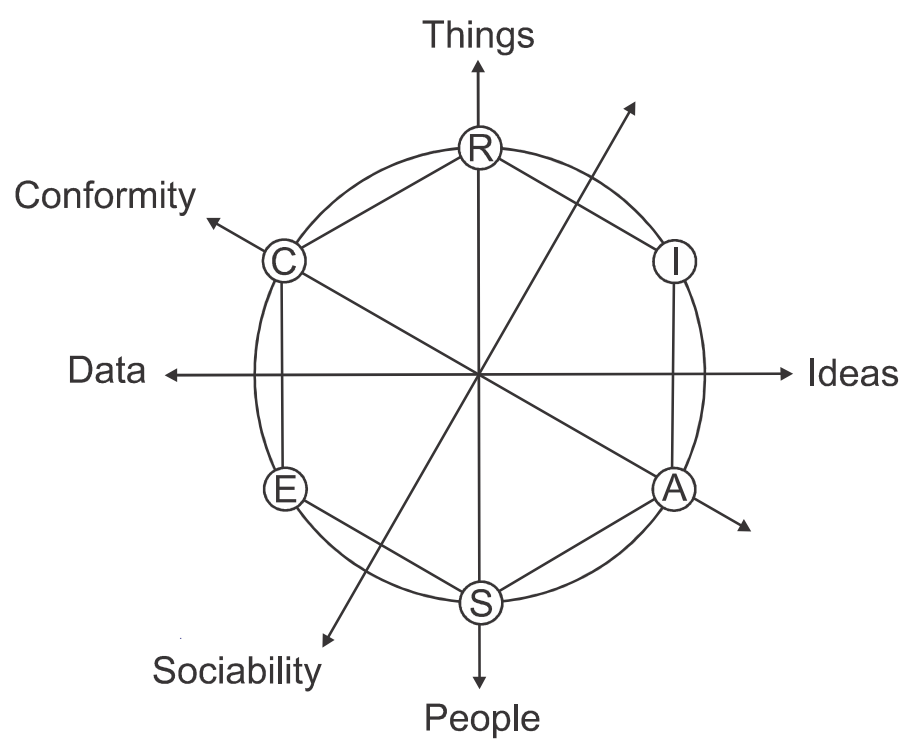
*Holland's Model*

Figure 2

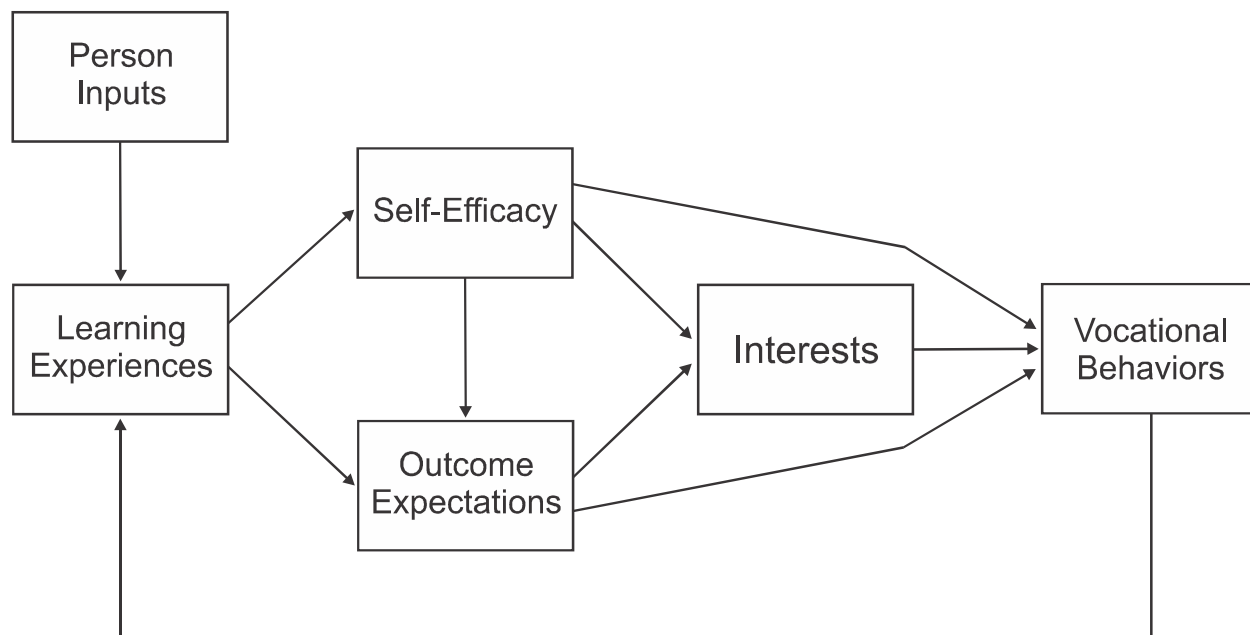
*Full SCCT Model*

Table 1

*Scale Reliabilities for the Ability Profiler*

Scale	# of Items	Mean	SD	KR-21
Arithmetic Reasoning	18	.731	.16	.64
Clerical Perception	90	.727	.13	.89
Computation	40	.482	.11	.47
Form Perception	42	.743	.11	.65
Spatial Ability	20	.830	.16	.75
Verbal Ability	19	.667	.16	.59

\**Note.* KR-21 = Kuder-Richardson 21; KR-21 calculated from raw scores. Means and standard deviations provided are based on proportion of items correct rather than raw scores.

Table 2

*Scale Reliabilities for the 50-Item International Personality Item Pool Five Factor Model*

Scale	# of Items	Mean	SD	Alpha
Agreeableness	10	36.03	5.14	.78
Conscientiousness	10	35.27	6.11	.81
Extraversion	10	34.25	7.81	.90
Openness to Experience	10	36.94	5.35	.77
Stability	10	32.06	7.25	.87

*Note.* Stability = Emotional Stability.

Table 3

*Scale Reliabilities for the Alternate Form Public Domain RIASEC Interest Markers*

Scale	# of Items	Mean	SD	Alpha
Realistic Interest	8	17.28	7.23	.92
Investigative Interest	8	23.59	7.37	.89
Artistic Interest	8	22.08	7.52	.86
Social Interest	8	26.95	6.32	.83
Enterprising Interest	8	22.57	6.64	.85
Conventional Interest	8	18.87	7.22	.92

Table 4

*Scale Reliabilities for the Alternate Form Public Domain RIASEC Confidence Markers*

Scale	# of Items	Mean	SD	Alpha
Realistic Confidence	8	20.67	8.48	.94
Investigative Confidence	8	20.14	7.76	.93
Artistic Confidence	8	21.38	7.06	.84
Social Confidence	8	25.57	7.00	.88
Enterprising Confidence	8	23.81	6.78	.87
Conventional Confidence	8	23.68	7.72	.92



Table 5

*Correlations between Variables*

Scale	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Arithmetic Reasoning	1.00														
2. Clerical Perception	.16	1.00													
3. Computation	.47	.19	1.00												
4. Form Perception	.13	.47	.18	1.00											
5. Spatial Ability	.31	.07	.16	.25	1.00										
6. Verbal Ability	.32	.19	.05	.10	.19	1.00									
7. Agreeableness	.01	.04	.05	-.03	-.03	.06	1.00								
8. Conscientiousness	.02	.04	.02	.03	-.03	.05	.30	1.00							
9. Extraversion	-.02	.01	.03	.04	.02	.04	.31	.03	1.00						
10. Openness	-.02	.04	.04	.02	-.01	-.04	.24	.11	.22	1.00					
11. Stability	.03	.09	.05	.09	.08	.05	.08	.07	.15	.12	1.00				
12. Realistic Interest	.02	-.01	.01	.01	.07	-.07	-.31	-.09	-.18	.01	.02	1.00			
13. Investigative Interest	-.01	-.01	.03	-.03	-.04	.02	.01	-.03	-.10	.17	-.09	.27	1.00		
14. Artistic Interest	.04	.03	.04	.02	.01	.02	.05	-.17	.08	.35	.05	.12	.25	1.00	
15. Social Interest	-.01	.03	.04	.01	-.03	.02	.45	.13	.25	.08	.01	-.14	.16	.26	1.00
16. Enterprising Interest	.09	.02	.08	.07	.05	.03	.00	-.08	.16	-.05	.00	.20	-.01	.29	.34
17. Conventional Interest	.05	.01	.03	-.01	.07	-.01	-.17	.04	-.14	-.10	-.02	.48	.13	.03	.05
18. Realistic Confidence	.00	-.01	.02	.04	.08	-.05	-.28	-.07	-.11	.17	.11	.78	.25	.15	-.22
19. Investigative Confidence	.03	.01	.00	.00	.03	.03	-.06	-.03	-.03	.16	-.02	.29	.73	.16	.06
20. Artistic Confidence	.04	.02	.03	.04	.02	-.01	.04	-.14	.17	.36	.10	.13	.20	.81	.18
21. Social Confidence	.00	-.01	.04	.01	.04	.03	.31	.05	.30	.10	.08	-.13	.13	.24	.73
22. Enterprising Confidence	.05	.01	.04	.05	.07	.02	.00	-.06	.30	.15	.10	.15	-.04	.27	.18
23. Conventional Confidence	.05	.03	.04	.04	.10	.02	-.14	.10	-.05	.12	.10	.38	.13	.06	-.03
24. Major Satisfaction	-.02	.03	-.01	-.01	.03	-.01	.16	.24	.14	.16	.16	-.08	-.08	-.08	.10
25. Career Aspiration	.03	.08	.00	.03	-.01	.10	.29	.32	.25	.31	.09	-.11	.08	-.02	.20

*Note.* Openness = Openness to Experience; Stability = Emotional Stability.

Table 5 (continued)

*Correlations between Variables*

Scale	16	17	18	19	20	21	22	23	30	31
16. Enterprising Confidence	1.00									
17. Conventional Confidence	.49	1.00								
18. Realistic Confidence	.07	.30	1.00							
19. Investigative Confidence	-.01	.18	.40	1.00						
20. Artistic Confidence	.26	.03	.26	.29	1.00					
21. Social Confidence	.26	-.03	-.05	.21	.33	1.00				
22. Enterprising Confidence	.65	.30	.30	.15	.40	.36	1.00			
23. Conventional Confidence	.27	.64	.51	.31	.13	.06	.46	1.00		
24. Major Satisfaction	-.09	-.04	-.06	-.07	-.08	.06	-.03	.04	1.00	
25. Career Aspiration	.07	-.01	.04	.11	.00	.19	.22	.18	.37	1.00

Table 6

*Means and Standard Deviations for the Ability Profiler by Major Group*

Scale	AG		ARC		BPS		BUS		COM		EDU		EC		HF		HCS		PS		SS		VPA	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Arithmetic	.77	.16	.76	.17	.75	.15	.72	.18	.75	.15	.75	.12	.73	.17	.72	.16	.73	.18	.72	.17	.71	.19	.74	.17
Clerical	.74	.14	.72	.14	.73	.11	.72	.12	.73	.14	.74	.14	.73	.14	.73	.13	.68	.13	.70	.14	.74	.14	.73	.13
Computation	.49	.11	.48	.12	.51	.10	.48	.11	.49	.10	.47	.11	.47	.12	.48	.11	.48	.11	.47	.11	.48	.11	.48	.09
Form	.76	.10	.73	.11	.75	.12	.74	.11	.75	.10	.76	.12	.74	.10	.74	.12	.71	.16	.73	.08	.75	.10	.76	.11
Spatial	.85	.17	.85	.18	.81	.19	.83	.15	.82	.15	.82	.16	.83	.14	.83	.16	.83	.18	.86	.16	.81	.16	.86	.16
Verbal	.70	.16	.60	.19	.71	.14	.68	.18	.67	.17	.67	.13	.66	.16	.68	.15	.64	.17	.67	.18	.65	.15	.62	.19

*Note.* Arithmetic = Arithmetic Reasoning, Clerical = Clerical Perception, Form = Form Perception, Spatial = Spatial Ability, Verbal = Verbal Ability; AG = Agriculture (n = 40), ARC = Architecture (n = 27), BPS = Biological/Physical Sciences (n = 59), BUS = Business (n = 150), COM = Communications (n = 60), EDU = Education (n = 29), EC = Engineering/Computers (n = 102), HF = Health/Fitness (n = 106), HCS = Human/Consumer Sciences (n = 30), PS = Protective Services (n = 34), SS = Social Sciences (n = 115), VPA = Visual/Performing Arts (n = 47).

Table 7

*Means and Standard Deviations for the 50-Item International Personality Item Pool Five Factor Model by Major Group*

Scale	AG		ARC		BPS		BUS		COM		EDU	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Agreeableness	4.08	.62	3.78	.49	4.08	.54	3.84	.51	4.13	.50	4.16	.49
Conscientiousness	3.59	.55	3.55	.45	3.66	.67	3.43	.58	3.48	.68	3.45	.63
Extraversion	3.38	.77	3.26	.61	3.37	.93	3.45	.66	3.92	.72	3.54	.89
Openness	3.54	.46	3.76	.53	3.84	.58	3.56	.55	3.76	.42	3.67	.42
Stability	2.87	.68	3.35	.67	2.98	.72	3.28	.68	3.20	.71	3.24	.64

*Note.* Openness = Openness to Experience, Stability = Emotional Stability; AG = Agriculture (n = 40), ARC = Architecture (n = 27), BPS = Biological/Physical Sciences (n = 59), BUS = Business (n = 150), COM = Communications (n = 60), EDU = Education (n = 29), EC = Engineering/Computers (n = 102), HF = Health/Fitness (n = 106), HCS = Human/Consumer Sciences (n = 30), PS = Protective Services (n = 34), SS = Social Sciences (n = 115), VPA = Visual/Performing Arts (n = 47).

Table 7 (continued)

*Means and Standard Deviations for the 50-Item International Personality Item Pool Five Factor Model by Major Group*

Scale	EC		HF		HCS		PS		SS		VPA	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Agreeableness	3.75	.56	4.12	.47	3.79	.50	3.79	.50	4.06	.62	4.08	.42
Conscientiousness	3.49	.56	3.69	.61	3.44	.83	3.55	.58	3.60	.63	3.50	.56
Extraversion	3.22	.75	3.49	.68	3.41	.80	3.31	.69	3.31	.87	3.40	.85
Openness	3.77	.52	3.56	.48	3.60	.58	3.58	.58	3.86	.50	3.92	.54
Stability	3.30	.72	3.22	.75	3.09	.76	3.22	.59	3.14	.75	3.29	.76

*Note.* Openness = Openness to Experience, Stability = Emotional Stability; AG = Agriculture (n = 40), ARC = Architecture (n = 27), BPS = Biological/Physical Sciences (n = 59), BUS = Business (n = 150), COM = Communications (n = 60), EDU = Education (n = 29), EC = Engineering/Computers (n = 102), HF = Health/Fitness (n = 106), HCS = Human/Consumer Sciences (n = 30), PS = Protective Services (n = 34), SS = Social Sciences (n = 115), VPA = Visual/Performing Arts (n = 47).

Table 8

*Means and Standard Deviations for the Alternate Form Public Domain RIASEC Interest Markers by Major Group*

Scale	AG		ARC		BPS		BUS		COM		EDU	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Realistic Interest	2.11	.72	2.55	.84	2.01	.81	2.42	.84	1.68	.68	1.68	.56
Investigative Interest	3.61	.77	3.15	.68	3.87	.76	2.64	.90	2.35	.81	2.46	.80
Artistic Interest	2.84	.96	3.18	.84	2.88	1.03	2.80	.93	3.24	.91	2.92	.92
Social Interest	3.53	.63	3.06	.72	3.30	.71	3.22	.80	3.53	.68	3.84	.56
Enterprising Interest	2.74	.87	2.94	.62	2.50	.88	3.36	.70	3.13	.66	2.68	.62
Conventional Interest	2.19	.85	2.72	.66	2.37	.92	2.99	.92	2.12	.86	2.01	.74

*Note.* AG = Agriculture (n = 40), ARC = Architecture (n = 27), BPS = Biological/Physical Sciences (n = 59), BUS = Business (n = 150), COM = Communications (n = 60), EDU = Education (n = 29), EC = Engineering/Computers (n = 102), HF = Health/Fitness (n = 106), HCS = Human/Consumer Sciences (n = 30), PS = Protective Services (n = 34), SS = Social Sciences (n = 115), VPA = Visual/Performing Arts (n = 47).

Table 8 (continued)

*Means and Standard Deviations for the Alternate Form Public Domain RIASEC Interest Markers by Major Group*

Scale	EC		HF		HCS		PS		SS		VPA	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Realistic Interest	3.03	.84	1.80	.78	1.51	.67	2.57	.96	1.87	.83	2.08	.66
Investigative Interest	3.01	.90	3.37	.88	2.40	1.01	2.50	.89	2.98	.95	2.59	.75
Artistic Interest	2.84	.89	2.53	.86	2.79	1.16	2.55	.90	2.95	.88	3.53	.72
Social Interest	2.87	.75	3.68	.73	3.80	.78	3.17	.76	3.67	.74	3.25	.75
Enterprising Interest	2.60	.77	2.64	.84	2.98	.88	2.71	.78	2.58	.80	2.80	.80
Conventional Interest	2.56	.76	2.09	.90	1.97	.90	2.39	.76	2.15	.80	1.97	.68

*Note.* AG = Agriculture (n = 40), ARC = Architecture (n = 27), BPS = Biological/Physical Sciences (n = 59), BUS = Business (n = 150), COM = Communications (n = 60), EDU = Education (n = 29), EC = Engineering/Computers (n = 102), HF = Health/Fitness (n = 106), HCS = Human/Consumer Sciences (n = 30), PS = Protective Services (n = 34), SS = Social Sciences (n = 115), VPA = Visual/Performing Arts (n = 47).

Table 9

*Means and Standard Deviations for the Alternate Form Public Domain RIASEC Confidence Markers by Major Group*

Scale	AG		ARC		BPS		BUS		COM		EDU	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Realistic Confidence	2.50	1.05	3.12	.83	2.48	.97	2.77	1.04	2.09	.87	1.92	.80
Investigative Confidence	2.82	.87	2.71	.73	3.61	.84	2.39	.93	1.99	.79	1.79	.61
Artistic Confidence	2.48	.85	3.06	.82	2.76	.92	2.69	.96	3.01	.85	2.55	.94
Social Confidence	3.35	.77	2.82	.77	3.28	.96	3.07	.83	3.37	.80	3.89	.76
Enterprising Confidence	2.78	.95	3.14	.61	2.68	.81	3.51	.71	3.48	.84	2.67	.78
Conventional Confidence	2.65	.89	3.27	.55	3.11	.95	3.49	.98	2.73	.90	2.36	.94

*Note.* AG = Agriculture (n = 40), ARC = Architecture (n = 27), BPS = Biological/Physical Sciences ( n = 59), BUS = Business (n = 150), COM = Communications (n = 60), EDU = Education (n = 29), EC = Engineering/Computers (n = 102), HF = Health/Fitness (n = 106), HCS = Human/Consumer Sciences (n = 30), PS = Protective Services (n = 34), SS = Social Sciences (n = 115), VPA = Visual/Performing Arts (n = 47).



Table 9 (continued)

*Means and Standard Deviations for the Alternate Form Public Domain RIASEC Confidence Markers by Major Group*

Scale	EC		HF		HCS		PS		SS		VPA	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Realistic Confidence	3.63	.83	2.23	.91	1.83	.81	2.97	.96	2.24	.96	2.56	.89
Investigative Confidence	2.85	.86	2.83	.90	1.82	.83	2.15	.83	2.34	.92	1.97	.79
Artistic Confidence	2.68	.77	2.33	.79	2.56	.95	2.55	.85	2.58	.86	3.29	.71
Social Confidence	2.71	.78	3.34	.82	3.74	.87	3.21	.81	3.44	.84	2.86	.93
Enterprising Confidence	2.85	.76	2.73	.80	2.87	.89	2.92	.79	2.65	.82	2.90	.82
Conventional Confidence	3.48	.73	2.67	.84	2.33	.99	2.77	.84	2.79	.92	2.53	.92

*Note.* AG = Agriculture (n = 40), ARC = Architecture (n = 27), BPS = Biological/Physical Sciences (n = 59), BUS = Business (n = 150), COM = Communications (n = 60), EDU = Education (n = 29), EC = Engineering/Computers (n = 102), HF = Health/Fitness (n = 106), HCS = Human/Consumer Sciences (n = 30), PS = Protective Services (n = 34), SS = Social Sciences (n = 115), VPA = Visual/Performing Arts (n = 47).

Table 10

*Means and Standard Deviations for the Ability Profiler by Occupation Group*

Scale	ARC		BF		COM		EDU		EC		HF		ML		PCL		PS		SCI		SCS		VPA	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>M</i>	<i>SD</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Arithmetic	.78	.16	.73	.17	.75	.18	.75	.15	.74	.16	.73	.17	.74	.18	.68	.16	.72	.18	.78	.16	.69	.18	.73	.14
Clerical	.73	.14	.73	.12	.72	.14	.74	.13	.73	.13	.75	.13	.73	.14	.70	.13	.71	.14	.74	.14	.71	.12	.73	.14
Computation	.49	.13	.48	.11	.47	.10	.50	.10	.48	.10	.49	.11	.45	.12	.48	.13	.47	.11	.50	.12	.48	.10	.49	.09
Form	.74	.10	.75	.11	.75	.09	.76	.11	.74	.10	.75	.10	.74	.12	.74	.13	.71	.10	.76	.09	.73	.10	.73	.14
Spatial	.88	.16	.74	.13	.83	.15	.85	.15	.83	.16	.82	.16	.83	.13	.81	.18	.80	.19	.83	.15	.81	.17	.83	.17
Verbal	.60	.20	.68	.16	.66	.16	.69	.16	.66	.18	.68	.14	.66	.18	.64	.17	.67	.16	.71	.14	.63	.15	.65	.16

*Note.* Arithmetic = Arithmetic Reasoning, Clerical = Clerical Perception, Form = Form Perception, Spatial = Spatial Ability, Verbal = Verbal Ability; ARC = Architecture (n = 25), BF = Business/Financial (n = 114), COM = Communications (n = 53), EDU = Education (n = 81), EC = Engineering/Computers (n = 93), HF = Health/Fitness (n = 153), ML = Management/Law (n = 64), PCL = Personal Care/Leisure (n = 43), PS = Protective Services (n = 46), SCI = Biological/Physical/Social Sciences (n = 31), SCS = Social/Community Services (n = 82), VPA = Visual/Performing Arts (n = 58).

Table 11

*Means and Standard Deviations for the 50-item International Personality Item Pool Five Factor Model by Occupation Group*

Scale	ARC		BF		COM		EDU		EC		HF	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>M</i>	<i>SD</i>
Agreeableness	3.76	.56	3.84	.49	4.04	.57	4.12	.51	3.74	.55	4.15	.51
Conscientiousness	3.50	.43	3.50	.55	3.40	.70	3.54	.63	3.53	.56	3.71	.62
Extraversion	3.32	.61	3.48	.66	3.55	.98	3.42	.83	3.22	.75	3.48	.74
Openness	3.78	.58	3.51	.54	3.76	.49	3.80	.45	3.79	.52	3.65	.50
Stability	3.37	.81	3.22	.66	3.09	.80	3.16	.72	3.29	.72	3.08	.75

*Note.* Openness = Openness to Experience, Stability = Emotional Stability; ARC = Architecture (n = 25), BF = Business/Financial (n = 114), COM = Communications (n = 53), EDU = Education (n = 81), EC = Engineering/Computers (n = 93), HF = Health/Fitness (n = 153), ML = Management/Law (n = 64), PCL = Personal Care/Leisure (n = 43), PS = Protective Services (n = 46), SCI = Biological/Physical/Social Sciences (n = 31), SCS = Social/Community Services (n = 82), VPA = Visual/Performing Arts (n = 58).

Table 11 (continued)

*Means and Standard Deviations for the 50-item International Personality Item Pool Five Factor Model by Occupation Group*

Scale	ML		PCL		PS		SCI		SCS		VPA	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>M</i>	<i>SD</i>
Agreeableness	3.96	.53	3.94	.67	3.78	.54	3.96	.50	4.16	.60	4.04	.45
Conscientiousness	3.38	.60	3.42	.68	3.52	.51	3.51	.54	3.63	.69	3.40	.58
Extraversion	3.58	.75	3.41	.72	3.21	.77	3.12	.91	3.44	.85	3.45	.76
Openness	3.74	.54	3.39	.51	3.52	.58	3.85	.60	3.74	.53	3.90	.51
Stability	3.35	.62	3.10	.79	3.23	.70	3.11	.83	3.13	.71	3.31	.71

*Note.* Openness = Openness to Experience, Stability = Emotional Stability; ARC = Architecture (n = 25), BF = Business/Financial (n = 114), COM = Communications (n = 53), EDU = Education (n = 81), EC = Engineering/Computers (n = 93), HF = Health/Fitness (n = 153), ML = Management/Law (n = 64), PCL = Personal Care/Leisure (n = 43), PS = Protective Services (n = 46), SCI = Biological/Physical/Social Sciences (n = 31), SCS = Social/Community Services (n = 82), VPA = Visual/Performing Arts (n = 58).

Table 12

*Means and Standard Deviations for the Alternate Form Public Domain RIASEC Interest Markers by Occupation Group*

Scale	ARC		BF		COM		EDU		EC		HF	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Realistic Interest	2.60	.88	2.28	.88	1.72	.73	1.98	.76	3.06	.82	1.85	.82
Investigative Interest	2.97	.68	2.48	.90	2.47	.80	2.78	1.01	3.05	.89	3.58	.85
Artistic Interest	2.95	.75	2.77	.91	3.37	.88	3.07	.86	2.79	.87	2.58	.87
Social Interest	3.04	.74	3.24	.75	3.35	.75	3.66	.68	2.83	.73	3.61	.70
Enterprising Interest	2.90	.63	3.31	.68	3.06	.72	2.81	.75	2.55	.76	2.63	.87
Conventional Interest	2.62	.80	2.97	.94	2.03	.79	2.16	.82	2.52	.79	2.20	.93

*Note.* ARC = Architecture (n = 25), BF = Business/Financial (n = 114), COM = Communications (n = 53), EDU = Education (n = 81), EC = Engineering/Computers (n = 93), HF = Health/Fitness (n = 153), ML = Management/Law (n = 64), PCL = Personal Care/Leisure (n = 43), PS = Protective Services (n = 46), SCI = Biological/Physical/Social Sciences (n = 31), SCS = Social/Community Services (n = 82), VPA = Visual/Performing Arts (n = 58).

Table 12 (continued)

*Means and Standard Deviations for the Alternate Form Public Domain RIASEC Interest Markers by Occupation Group*

Scale	ML		PCL		PS		SCI		SCS		VPA	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Realistic Interest	2.31	.86	1.96	.84	2.52	.88	2.12	.78	1.73	.73	2.06	.72
Investigative Interest	2.73	.91	3.13	.91	2.63	.87	3.65	.80	2.99	.93	2.75	.81
Artistic Interest	3.01	.97	2.64	1.01	2.53	.98	3.06	.91	2.90	.96	3.65	.75
Social Interest	3.28	.84	3.26	.85	3.15	.78	3.18	.62	3.99	.63	3.21	.75
Enterprising Interest	3.29	.84	2.47	.84	2.66	.77	2.40	.82	2.75	.85	2.85	.77
Conventional Interest	2.73	.90	2.03	.85	2.36	.76	2.26	.86	2.14	.77	2.03	.69

*Note.* ARC = Architecture (n = 25), BF = Business/Financial (n = 114), COM = Communications (n = 53), EDU = Education (n = 81), EC = Engineering/Computers (n = 93), HF = Health/Fitness (n = 153), ML = Management/Law (n = 64), PCL = Personal Care/Leisure (n = 43), PS = Protective Services (n = 46), SCI = Biological/Physical/Social Sciences (n = 31), SCS = Social/Community Services (n = 82), VPA = Visual/Performing Arts (n = 58).

Table 13

*Means and Standard Deviations for the Alternate Form Public Domain RIASEC Confidence Markers by Occupation Group*

Scale	ARC		BF		COM		EDU		EC		HF	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>M</i>	<i>SD</i>
Realistic Confidence	3.14	1.00	2.55	1.01	2.08	.91	2.25	.90	3.67	.82	2.25	.95
Investigative Confidence	2.60	.78	2.56	.93	1.90	.70	2.21	.96	2.82	.86	3.12	.94
Artistic Confidence	2.92	.77	2.63	.95	2.99	.82	2.65	.77	2.65	.74	2.41	.84
Social Confidence	2.84	.73	3.01	.80	3.16	.90	3.61	.76	2.67	.77	3.33	.85
Enterprising Confidence	3.18	.68	3.49	.71	3.19	.99	2.79	.76	2.84	.73	2.69	.82
Conventional Confidence	3.13	.64	3.47	.99	2.61	.91	2.79	.97	3.47	.70	2.71	.96

*Note.* ARC = Architecture (n = 25), BF = Business/Financial (n = 114), COM = Communications (n = 53), EDU = Education (n = 81), EC = Engineering/Computers (n = 93), HF = Health/Fitness (n = 153), ML = Management/Law (n = 64), PCL = Personal Care/Leisure (n = 43), PS = Protective Services (n = 46), SCI = Biological/Physical/Social Sciences (n = 31), SCS = Social/Community Services (n = 82), VPA = Visual/Performing Arts (n = 58).

Table 13 (continued)

*Means and Standard Deviations for the Alternate Form Public Domain RIASEC Confidence Markers by Occupation Group*

Scale	ML		PCL		PS		SCI		SCS		VPA	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>M</i>	<i>SD</i>
Realistic Confidence	2.85	1.12	2.34	.90	3.01	.91	2.80	.95	2.04	.92	2.57	.84
Investigative Confidence	2.49	1.00	2.39	.80	2.29	.85	3.06	.94	2.33	.96	2.17	.77
Artistic Confidence	2.94	1.04	2.47	.83	2.55	.96	2.59	.87	2.67	.88	3.32	.69
Social Confidence	3.26	.81	3.17	.76	3.18	.83	3.01	.90	3.77	.80	2.98	.91
Enterprising Confidence	3.46	.82	2.70	.75	2.87	.78	2.69	.87	2.78	.87	3.04	.82
Conventional Confidence	3.32	.89	2.62	.79	2.73	.86	3.04	1.02	2.72	.92	2.59	.90

*Note.* ARC = Architecture (n = 25), BF = Business/Financial (n = 114), COM = Communications (n = 53), EDU = Education (n = 81), EC = Engineering/Computers (n = 93), HF = Health/Fitness (n = 153), ML = Management/Law (n = 64), PCL = Personal Care/Leisure (n = 43), PS = Protective Services (n = 46), SCI = Biological/Physical/Social Sciences (n = 31), SCS = Social/Community Services (n = 82), VPA = Visual/Performing Arts (n = 58).



Table 14

*Discriminant Functions Results for the Prediction of Major Choice*

Predictors	Hit Rate (%)	Jack Knife (%)	CC <sup>2</sup>	Wilks' $\lambda$	# of Discriminants
P + I + C	40.4	33.4	.413	.219	6
A + P + I + C	42.3	33.2	.421	.201	5

*Note.* CC<sup>2</sup> = Squared canonical correlation. A = Ability, P = Personality, I = Interest, C = Confidence. Majors (k = 12) were Agriculture (n = 40), Architecture (n = 27), Biological/Physical Sciences (n = 59), Business (n = 150), Communications (n = 60), Education (n = 29), Engineering/Computers (n = 102), Health/Fitness (n = 106), Human/Consumer Sciences (n = 30), Protective Services (n = 34), Social Sciences (n = 115), Visual/Performing Arts (n = 47).

Table 15

*Discriminant Structure Matrix and Group Centroids for the Prediction of Major Choice with Personality, Interest, and Self-Efficacy (Hypothesis 1)*

Variable/Group	Discriminant Functions					
	1	2	3	4	5	6
Structure Matrix						
Agreeableness	-.301	-.105	.048	.232	-.010	-.023
Conscientiousness	-.132	.111	.004	.052	-.102	.137
Extraversion	-.045	-.180	.217	.186	-.065	-.104
Openness to Experience	-.025	.036	-.337	.365	.414	.199
Stability	.134	-.052	-.050	-.042	-.173	.349
Realistic Interest	.557	.351	-.218	-.267	-.135	-.181
Investigative Interest	-.262	.593	.156	.173	.019	-.112
Artistic Interest	.054	-.149	-.191	.556	.272	-.101
Social Interest	-.423	-.225	.098	-.118	-.021	.277
Enterprising Interest	.249	-.302	.472	-.025	.073	.016
Conventional Interest	.392	.092	.375	-.301	.337	.123
Realistic Confidence	.520	.385	-.257	-.123	-.178	-.131
Investigative Confidence	-.059	.693	.266	.136	.190	-.127
Artistic Confidence	.150	-.119	-.105	.570	.223	-.195
Social Confidence	-.651	-.207	.095	-.283	.221	-.200
Enterprising Confidence	.334	-.262	.494	.095	.078	-.034
Conventional Confidence	.426	.250	.237	-.168	.426	.341
Group Centroids						
AG	-.814	.451	.234	-.002	-.311	-.497
ARC	.760	.266	-.001	.409	-.096	.049
BPS	-.721	1.328	.360	.359	.562	-.231
BUS	.951	-.330	.634	-.191	.126	.066
COM	.069	-1.149	.313	.529	.018	-.091
EDU	-.928	-1.081	-.551	-.593	.227	-.269
EC	1.116	.927	-.606	-.117	-.065	.012
HF	-.946	.446	.393	-.040	-.463	.210
HCS	-.853	-1.183	-.152	-.366	.016	-.151
PS	.510	-.287	-.459	-.600	-.370	-.356
SS	-.749	-.154	-.467	-.132	.290	.248
VPA	.333	-.693	-.730	.948	-.217	.007

*Note.* Stability = Emotional Stability. AG = Agriculture (n = 40), ARC = Architecture (n = 27), BPS = Biological/Physical Sciences (n = 59), BUS = Business (n = 150), COM = Communications (n = 60), EDU = Education (n = 29), EC = Engineering/Computers (n = 102), HF = Health/Fitness (n = 106), HCS = Human/Consumer Sciences (n = 30), PS = Protective Services (n = 34), SS = Social Sciences (n = 115), VPA = Visual/Performing Arts (n = 47).

Table 16

*Discriminant Structure Matrix and Group Centroids for the Prediction of Major Choice with Ability, Personality, Interest, and Self-Efficacy (Hypothesis 1)*

Variable/Group	Discriminant Functions				
	1	2	3	4	5
	Structure Matrix				
Arithmetic Reasoning	-.005	.009	.032	.104	-.007
Clerical Perception	-.025	.042	-.028	.030	.059
Computation	-.063	.025	.082	.097	.133
Form Perception	-.026	-.009	-.019	.107	.090
Spatial Ability	.053	-.018	-.048	.052	-.189
Verbal Ability	-.044	.066	.190	-.084	.044
Agreeableness	-.298	-.109	.041	.212	.013
Conscientiousness	-.131	.107	-.007	.051	-.100
Extraversion	-.045	-.175	.215	.181	-.026
Openness to Experience	-.025	.030	-.325	.316	.437
Stability	.135	-.051	-.048	-.040	-.149
Realistic Interest	.548	.354	-.213	-.237	-.124
Investigative Interest	-.268	.586	.111	.191	-.036
Artistic Interest	.052	-.152	-.190	.522	.298
Social Interest	-.414	-.227	.096	-.128	-.032
Enterprising Interest	.246	-.288	.471	.009	.024
Conventional Interest	.384	.107	.378	-.255	.243
Realistic Confidence	.511	.385	.257	-.101	-.152
Investigative Confidence	-.070	.692	.232	.156	.132
Artistic Confidence	.145	-.120	-.106	.546	.241
Social Confidence	-.344	-.206	.111	-.290	.184
Enterprising Confidence	.328	-.246	.492	.124	.057
Conventional Confidence	.416	.262	.242	-.144	.368

*Note.* Stability = Emotional Stability. AG = Agriculture (n = 40), ARC = Architecture (n = 27), BPS = Biological/Physical Sciences (n = 59), BUS = Business (n = 150), COM = Communications (n = 60), EDU = Education (n = 29), EC = Engineering/Computers (n = 102), HF = Health/Fitness (n = 106), HCS = Human/Consumer Sciences (n = 30), PS = Protective Services (n = 34), SS = Social Sciences (n = 115), VPA = Visual/Performing Arts (n = 47).

Table 16 (continued)

*Discriminant Structure Matrix and Group Centroids for the Prediction of Major Choice with Ability, Personality, Interest, and Self-Efficacy (Hypothesis 1)*

Variable/Group	Discriminant Functions				
	1	2	3	4	5
	Group Centroids				
AG	-.860	.439	.168	.060	-.364
ARC	.777	.223	-.146	.501	-.233
BPS	-.791	1.353	.399	.356	.584
BUS	.959	-.289	.684	-.174	.104
COM	.057	-1.140	.342	.523	.101
EDU	-.925	-1.097	-.506	-.637	.269
EC	1.135	.928	-.623	-.139	-.025
HF	-.950	.440	.351	-.021	-.498
HCS	-.810	-1.217	-.115	-.384	-.067
PS	.545	-.298	-.416	-.611	-.408
SS	-.744	-.167	-.461	-.176	.317
VPA	.336	-.751	-.805	.961	-.177

*Note.* AG = Agriculture (n = 40), ARC = Architecture (n = 27), BPS = Biological/Physical Sciences (n = 59), BUS = Business (n = 150), COM = Communications (n = 60), EDU = Education (n = 29), EC = Engineering/Computers (n = 102), HF = Health/Fitness (n = 106), HCS = Human/Consumer Sciences (n = 30), PS = Protective Services (n = 34), SS = Social Sciences (n = 115), VPA = Visual/Performing Arts (n = 47).

Table 17

*Discriminant Functions Results for the Prediction of Occupation Choice*

Predictors	Hit Rate (%)	Jack Knife (%)	CC <sup>2</sup>	Wilks' $\lambda$	# of Discriminants
P + I + C	37.4	30.5	.408	.254	6
A + P + I + C	37.7	29.8	.417	.232	6

*Note.* CC<sup>2</sup> = Squared canonical correlation. A = Ability, P = Personality, I = Interest, C = Confidence. Occupations (k = 12) were Architecture (n = 25), Business/Financial (n = 114), Communications (n = 53), Education (n = 81), Engineering/Computers (n = 93), Health/Fitness (n = 153), Management/Law (n = 64), Personal Care/Leisure (n = 43), Protective Services (n = 46), Sciences (n = 31), Social/Community Services (n = 82), Visual/Performing Arts (n = 58).

Table 18

*Discriminant Structure Matrix and Group Centroids for the Prediction of Major Choice with Personality, Interest, and Self-Efficacy (Hypothesis 2)*

Variable/Group	Discriminant Functions					
	1	2	3	4	5	6
Structure Matrix						
Agreeableness	-.277	-.216	-.036	.109	.248	.140
Conscientiousness	-.158	.096	.080	-.109	.076	.121
Extraversion	-.025	-.165	.151	.086	.073	.089
Openness to Experience	.017	-.003	-.378	.137	.508	.422
Stability	.125	.037	-.031	-.012	.038	.215
Realistic Interest	.411	.544	-.119	-.259	.063	.063
Investigative Interest	-.412	.406	-.011	.292	.153	-.034
Artistic Interest	.138	-.301	-.361	.419	.347	.069
Social Interest	-.398	-.381	.067	-.315	.226	.214
Enterprising Interest	.247	-.327	.412	-.023	.266	.327
Conventional Interest	.286	.119	.515	-.252	.247	.119
Realistic Confidence	.396	.616	-.208	-.100	.073	.187
Investigative Confidence	-.261	.539	.181	.208	.295	.217
Artistic Confidence	.184	-.204	-.246	.323	.074	.292
Social Confidence	-.313	-.352	-.030	-.418	.149	.239
Enterprising Confidence	.342	-.217	.395	.072	.137	.234
Conventional Confidence	.315	.250	.328	-.239	.520	-.203
Group Centroids						
ARC	.746	.420	.019	.190	-.273	.338
BF	.922	-.278	.869	-.116	.014	-.120
COM	.421	-1.014	-.241	.477	-.013	-.096
EDU	-.290	-.550	-.497	-.426	.319	-.086
EC	.858	1.232	-.426	-.140	.161	-.134
HF	-1.246	.412	.367	.216	.018	.106
ML	.696	-.170	.327	.006	.233	.258
PCL	-.450	.021	-.043	.083	-.669	-.582
PS	.391	.293	-.339	-.544	-.630	.384
SCI	-.581	.579	-.297	.515	.340	-.207
SCS	-.871	-.598	-.213	-.491	.006	.021
VPA	.596	-.525	-.687	.743	-.101	.157

*Note.* Stability = Emotional Stability. ARC = Architecture (n = 25), BF = Business/Financial (n = 114), COM = Communications (n = 53), EDU = Education (n = 81), EC = Engineering/Computers (n = 93), HF = Health/Fitness (n = 153), ML = Management/Law (n = 64), PCL = Personal Care/Leisure (n = 43), PS = Protective Services (n = 46), SCI = Sciences (n = 31), SCS = Social/Community Services (n = 82), VPA = Visual/Performing Arts (n = 58).

Table 19

*Discriminant Structure Matrix and Group Centroids for the Prediction of Occupation Choice with Ability, Personality, Interest, and Self-Efficacy (Hypothesis 2)*

Variable/Group	Discriminant Functions					
	1	2	3	4	5	6
Structure Matrix						
Arithmetic Reasoning	-.060	.040	-.031	.171	.299	.054
Clerical Perception	.039	.043	.043	.111	.233	.052
Computation	.061	.010	-.057	.000	.048	-.246
Form Perception	.047	-.017	.085	.119	.211	-.194
Spatial Ability	-.041	-.013	.034	.031	.160	-.042
Verbal Ability	.037	.018	.085	.038	.292	-.132
Agreeableness	.272	-.208	-.047	.125	.207	.126
Conscientiousness	.156	.097	.077	-.103	.060	.054
Extraversion	.026	-.166	.144	.093	.047	.122
Openness to Experience	-.022	.005	-.374	.174	.441	-.215
Stability	-.124	.035	-.028	-.006	.032	.189
Realistic Interest	-.408	.535	-.092	-.251	.073	.008
Investigative Interest	.400	.410	-.012	.293	.071	-.008
Artistic Interest	-.136	-.294	-.361	.427	.238	-.020
Social Interest	.393	-.373	.046	-.285	.221	.214
Enterprising Interest	-.238	-.332	.403	.010	.261	.284
Conventional Interest	-.277	.106	.519	-.221	.247	.072
Realistic Confidence	-.397	.608	-.181	-.093	.071	.142
Investigative Confidence	.252	.538	.184	.226	.224	.181
Artistic Confidence	-.182	-.201	-.247	.316	-.004	.211
Social Confidence	.307	-.343	-.045	-.381	.224	.288
Enterprising Confidence	-.332	-.225	.390	.090	.122	.214
Conventional Confidence	-.307	.238	.341	-.197	.447	-.215

*Note.* Stability = Emotional Stability. ARC = Architecture (n = 25), BF = Business/Financial (n = 114), COM = Communications (n = 53), EDU = Education (n = 81), EC = Engineering/Computers (n = 93), HF = Health/Fitness (n = 153), ML = Management/Law (n = 64), PCL = Personal Care/Leisure (n = 43), PS = Protective Services (n = 46), SCI = Sciences (n = 31), SCS = Social/Community Services (n = 82), VPA = Visual/Performing Arts (n = 58).

Table 19 (continued)

*Discriminant Structure Matrix and Group Centroids for the Prediction of Occupation Choice with Ability, Personality, Interest, and Self-Efficacy (Hypothesis 2)*

Variable/Group	Discriminant Functions					
	1	2	3	4	5	6
	Group Centroids					
ARC	-.779	.398	-.021	.260	-.299	.401
BF	-.885	-.313	.892	-.137	-.006	-.191
COM	-.435	-1.015	-.259	.505	-.013	-.076
EDU	.319	-.526	-.498	-.368	.448	-.144
EC	-.897	1.237	-.394	-.144	.118	-.165
HF	1.269	.424	.366	.227	.010	.106
ML	-.766	-.174	.326	.083	.310	.422
PCL	.487	-.010	-.039	-.027	-.747	-.484
PS	-.441	.314	-.348	-.638	-.478	.432
SCI	.584	.619	-.298	.575	.385	-.285
SCS	.883	-.609	-.238	-.520	-.057	.053
VPA	-.608	-.516	-.705	.703	-.223	.084

*Note.* ARC = Architecture (n = 25), BF = Business/Financial (n = 114), COM = Communications (n = 53), EDU = Education (n = 81), EC = Engineering/Computers (n = 93), HF = Health/Fitness (n = 153), ML = Management/Law (n = 64), PCL = Personal Care/Leisure (n = 43), PS = Protective Services (n = 46), SCI = Sciences (n = 31), SCS = Social/Community Services (n = 82), VPA = Visual/Performing Arts (n = 58).



Table 20

*The Incremental Validity of Ability in the Prediction of Major Satisfaction over All Sets of Self-Report Individual Difference Measures (Hypothesis 4)*

Predictor	$R^2$	$\Delta R^2$	$B$	$B$ 95% CI	$SE$	$\beta$	$t$
Step 1	.143**	.143**					
Agreeableness			-.02	[-0.15, 0.12]	.07	-.01	-.21
Conscientiousness			.24	[ 0.13, 0.35]	.05	.16	4.40**
Extraversion			.11	[ 0.02, 0.20]	.05	.09	2.46*
Openness to Experience			.25	[ 0.12, 0.39]	.07	.14	3.71**
Stability			.16	[ 0.07, 0.24]	.04	.12	3.59**
Realistic Interest			-.19	[-0.33, -0.09]	.07	-.19	-2.81*
Investigative Interest			-.04	[-0.15, 0.06]	.05	-.04	-.79
Artistic Interest			.01	[-.012, 0.14]	.07	.01	.15
Social Interest			.13	[-0.01, 0.27]	.07	.11	1.91
Enterprising Interest			-.09	[-0.22, 0.03]	.06	-.08	-1.47
Conventional Interest			.08	[-0.04, 0.19]	.06	.07	1.28
Realistic Confidence			.11	[-0.01, 0.23]	.06	.12	1.76
Investigative Confidence			-.04	[-0.15, 0.07]	.06	-.04	-.66
Artistic Confidence			-.13	[-0.27, 0.01]	.07	-.12	-1.81
Social Confidence			-.01	[-0.12, 0.11]	.06	-.01	-.08
Enterprising Confidence			-.06	[-0.18, 0.07]	.06	-.01	-.88
Conventional Confidence			.05	[-0.06, 0.15]	.05	.05	.82
Step 2	.148**	.005					
Agreeableness			-.02	[-0.15, 0.12]	.07	-.01	-.22
Conscientiousness			.25	[ 0.14, 0.36]	.06	.16	4.51**
Extraversion			.11	[ 0.03, 0.20]	.05	.10	2.50*
Openness to Experience			.25	[ 0.11, 0.38]	.07	.14	3.65**
Stability			.16	[ 0.07, 0.24]	.04	.12	3.59**
Realistic Interest			-.20	[-0.34, -0.07]	.07	-.19	-2.91*
Investigative Interest			-.04	[-0.14, 0.07]	.05	-.04	-.66
Artistic Interest			.01	[-0.12, 0.14]	.07	.01	.13
Social Interest			.13	[-0.01, 0.27]	.07	.11	1.88
Enterprising Interest			-.08	[-0.21, 0.05]	.07	-.07	-1.26
Conventional Interest			.07	[-0.05, 0.18]	.06	.07	1.15
Realistic Confidence			.11	[-0.01, 0.24]	.06	.13	1.81
Investigative Confidence			-.04	[-0.15, 0.07]	.06	-.04	-.71
Artistic Confidence			-.13	[-0.27, 0.01]	.07	-.12	-1.79
Social Confidence			-.01	[-0.13, 0.11]	.06	-.01	-.10
Enterprising Confidence			-.06	[-.019, 0.06]	.06	-.06	-.97
Conventional Confidence			.05	[-0.06, 0.15]	.06	.05	.86
Arithmetic Reasoning			.04	[-0.41, 0.49]	.23	.01	.17
Clerical Perception			.24	[-0.29, 0.77]	.27	.03	.90
Computation			-.32	[-0.97, 0.33]	.33	-.04	-.97
Form Perception			-.37	[-1.02, 0.27]	.33	-.04	-1.11
Spatial Ability			.29	[-0.13, 0.71]	.21	.05	1.36
Verbal Ability			-.22	[-0.63, 0.18]	.21	-.04	-1.08

Note.  $n = 843$ . Stability = Emotional Stability. Step 1 Adjusted  $R^2 = .124$ ; Step 2 Adjusted  $R^2 = .124$ . \*  $p < .05$ , \*\*  $p < .01$ .

Table 21

*The Incremental Validity of Ability in the Prediction of Career Aspiration Level over All Sets of Self-Report Individual Difference Measures (Hypothesis 5)*

Predictor	$R^2$	$\Delta R^2$	$B$	$B$ 95% CI	$SE$	$\beta$	$t$
Step 1	.310**	.310**					
Agreeableness			.10	[ 0.03, 0.17]	.04	.10	2.81*
Conscientiousness			.19	[ 0.14, 0.25]	.03	.22	7.04**
Extraversion			.08	[ 0.03, 0.12]	.02	.11	3.26*
Openness to Experience			.21	[ 0.14, 0.28]	.03	.21	6.16**
Stability			.01	[-0.04, 0.05]	.02	.01	.37
Realistic Interest			-.14	[-0.21, -0.07]	.03	-.24	-4.07**
Investigative Interest			.08	[-0.01, 0.10]	.03	.09	1.73
Artistic Interest			.00	[-0.06, 0.06]	.03	.00	.00
Social Interest			.06	[-0.01, 0.12]	.04	.08	1.56
Enterprising Interest			.04	[-0.03, 0.10]	.03	.06	1.17
Conventional Interest			-.04	[-0.10, 0.02]	.03	-.07	-1.28
Realistic Confidence			.10	[ 0.04, 0.17]	.03	.21	3.30*
Investigative Confidence			.02	[-0.04, 0.07]	.03	.03	.63
Artistic Confidence			-.13	[-0.20, -0.06]	.04	-.22	-3.64**
Social Confidence			-.01	[-0.07, 0.05]	.03	-.02	-.35
Enterprising Confidence			.09	[ 0.03, 0.16]	.03	.15	2.88*
Conventional Confidence			.06	[ 0.01, 0.11]	.03	.11	2.11*
Step 2	.320**	.010					
Agreeableness			.10	[ 0.03, 0.17]	.04	.10	2.74*
Conscientiousness			.19	[ 0.13, 0.24]	.03	.22	6.88**
Extraversion			.08	[ 0.03, 0.12]	.02	.11	3.31*
Openness to Experience			.22	[ 0.15, 0.28]	.03	.22	6.33**
Stability			.01	[-0.04, 0.05]	.02	.01	.28
Realistic Interest			-.14	[-0.21, -0.07]	.03	-.24	-4.08**
Investigative Interest			.05	[-0.01, 0.10]	.03	.09	1.85
Artistic Interest			-.01	[-0.07, 0.06]	.03	-.01	-.15
Social Interest			.05	[-0.02, 0.12]	.04	.08	1.49
Enterprising Interest			.04	[-0.02, 0.10]	.03	.06	1.22
Conventional Interest			-.04	[-0.09, 0.02]	.03	-.06	-.21
Realistic Confidence			.11	[ 0.05, 0.17]	.03	.22	3.47*
Investigative Confidence			.01	[-0.04, 0.07]	.03	.02	.38
Artistic Confidence			-.13	[-0.20, -0.06]	.04	-.21	-3.58**
Social Confidence			-.01	[-0.06, 0.06]	.03	-.01	-.15
Enterprising Confidence			.09	[ 0.03, 0.15]	.03	.15	2.80*
Conventional Confidence			.06	[ 0.01, 0.11]	.03	.10	2.06*
Arithmetic Reasoning			.15	[-0.07, 0.37]	.11	.05	1.32
Clerical Perception			.20	[-0.07, 0.46]	.13	.05	1.47
Computation			-.31	[-0.63, 0.02]	.17	-.06	-1.86
Form Perception			-.06	[-0.38, 0.27]	.17	-.01	-.34
Spatial Ability			-.10	[-0.31, 0.11]	.11	-.03	-.91
Verbal Ability			.17	[-0.04, 0.37]	.10	.05	1.61

Note.  $n = 843$ . Stability = Emotional Stability. Step 1 Adjusted  $R^2 = .296$ ; Step 2 Adjusted  $R^2 = .301$ . \*  $p < .05$ , \*\*  $p < .01$ .

Table 22

*Incremental Validity Results for Ability in the Prediction of Vocational Outcomes*

	McNemar $\chi^2/\Delta R^2$	Significance
Hypothesis 1: Major Choice	2.230	.163
Hypothesis 2: Occupation Choice	0.444	.824
Hypothesis 3: Major Satisfaction	0.005	.630
Hypothesis 4: Career Aspiration Level	0.010	.076

*Note.* \*  $p < .05$ . A = Ability; P = Personality; I = Interest; C = Confidence.

APPENDIX

*Ability Profiler Instrument*



ability profiler™



Form 1

*a tool for career  
exploration*



U.S. Department of Labor  
Employment and Training Administration



## GENERAL INSTRUCTIONS

This booklet contains several separate parts. **Each part has its own instructions, separate section on the answer sheet, and time limit.** Read and listen carefully to all of the instructions to make sure that you're working on the correct part and filling out the correct section of your answer sheet. The instructions will also help you decide how fast you should work and when it is best to guess.

Before you begin each part, you'll have a chance to work a few practice questions. Please ask questions if you do not understand the instructions or are having trouble with the practice questions.

When it is time to do the actual timed questions, you'll be told when to start and when to stop. Be sure to begin immediately when you're told to begin and stop immediately when you're told to stop.

Mark only one answer for each question. If you want to change an answer, erase the first answer completely and fill in your new choice. You won't be allowed to clean up your answer sheet after you've been told to stop.

When you finish a page, the instructions at the bottom will tell you whether to go to the next page or stop and wait for further instructions.

If you finish before time is called, you may turn back to previous pages of the same part and check the work you've just completed. But do not turn back to a previous part at any time.

Do not turn to the next page until told to do so.

**GENERAL INSTRUCTIONS****Parts 1, 2, and 3**

On the next three parts work **CAREFULLY**. You should have enough time to answer each question. It is to your advantage to **ANSWER EVERY QUESTION**. Even if you're not sure of an answer, make your **BEST GUESS**, fill in your answer, then go to the next question. Your score for each part will be the number of questions you answer correctly. There is no penalty for answering incorrectly.

**Part 1 - ARITHMETIC REASONING**  
**Instructions**

On this page are some arithmetic questions.

Read Practice Question 1:

1. It takes  $\frac{1}{2}$  hour to fill 1 tank. How many tanks can be filled in 6 hours?
  - A. 3
  - B. 9
  - C. 12
  - D. 15
  - E. none of these

In Practice Question 1, the correct answer is 12. In the answer column, the letter next to 12 is C. On your answer sheet find the shaded box labeled **PART 1 PRACTICE**. Notice that for Practice Question 1, the oval under letter C has been filled in.

Now read Practice Question 2:

2. Harry spends  $\frac{1}{3}$  of his monthly income on rent. He earns \$1,560 per month. How much does he pay for rent?
  - A. \$460
  - B. \$490
  - C. \$530
  - D. \$560
  - E. none of these

In Practice Question 2, the correct answer is \$520. However, \$520 does not appear in the answer column. Therefore, E or "none of these" is the correct answer. For Practice Question 2, the oval under letter E has been filled in because none of the other answers given was correct.

Now do Practice Questions 3 and 4 on the next page in the same way. Follow the directions and then in the practice box fill in the ovals under the letters of your answers.

Do not write in this booklet. Do your work on the scratch paper provided.

**Practice Questions**

3. Candy bars cost \$0.65 each. How much will 6 candy bars cost?
- A. \$2.50
  - B. \$2.80
  - C. \$3.60
  - D. \$3.90
  - E. none of these
4. Jim has used  $2\frac{1}{2}$  feet of fencing from a piece that was  $9\frac{1}{2}$  feet long. How many feet are left?
- A. 6
  - B.  $6\frac{1}{2}$
  - C. 7
  - D.  $7\frac{1}{2}$
  - E. none of these

On the next pages are more questions like the ones you've just answered. For each question, fill in the oval under the letter of your answer.

Work **CAREFULLY**. You should have enough time to answer each question. It is to your advantage to **ANSWER EVERY QUESTION**. Even if you're not sure of an answer, make your **BEST GUESS**, then mark your choice on the answer sheet. You'll receive one point for each correct answer. Points will not be subtracted for questions you answer incorrectly.

Do not write in this booklet. Do your work on the scratch paper provided.

When answering the questions in this part, be sure to work down the page and not across.

If you finish before time is called, go back and check your work in **THIS PART** only. If you want to change an answer, erase the first answer completely, then fill in your new choice.

**You will have 20 minutes to complete this part.**

**Do not turn this page until told to do so.**



Do all of your work on the scratch paper provided. Do not write in this book.

- |   |   |
|---|---|
| <p>1. Charles works regularly 45 hours a week. Last week he worked 17 hours overtime. How many hours did he work?</p> <p>A. 28 hours<br/>B. 38 hours<br/>C. 52 hours<br/>D. 61 hours<br/>E. none of these</p>                             | <p>4. A hair stylist can do 16 haircuts in 1 day. How many haircuts can he do in 13 days?</p> <p>A. 29<br/>B. 64<br/>C. 91<br/>D. 208<br/>E. none of these</p>  |
| <p>2. It usually takes 45 minutes to get to work. This morning it took 1 hour and 5 minutes. How much longer did it take this morning?</p> <p>A. 5 minutes<br/>B. 10 minutes<br/>C. 20 minutes<br/>D. 30 minutes<br/>E. none of these</p> | <p>5. A boy earned \$12.50 doing errands. He owes his mother \$5.75. How much will he have left after he pays his mother?</p> <p>A. \$6.85<br/>B. \$7.75<br/>C. \$7.85<br/>D. \$8.75<br/>E. none of these</p>                 |
| <p>3. Howi usually runs 75 miles each month. Last month he ran an extra 16 miles. How many miles did he run last month?</p> <p>A. 59<br/>B. 81<br/>C. 134<br/>D. 166<br/>E. none of these</p>   | <p>6. A group of 12 friends bought a boat costing \$5,424. Each of the friends paid an equal share of the cost. How much did each person pay?</p> <p>A. \$442<br/>B. \$462<br/>C. \$542<br/>D. \$562<br/>E. none of these</p> |

GO TO THE NEXT PAGE 

Do all of your work on the scratch paper provided. Do not write in this book.

- |  |  |
|--|--|
| <p>7. A doctor sees each of her patients for 15 minutes. How many patients can she see in <math>4\frac{1}{2}</math> hours?</p> <p>A. 18<br/>B. 19<br/>C. 20<br/>D. 30<br/>E. none of these</p>   | <p>10. A table measures 3.5 feet long and 2.745 feet wide. How many feet longer is it than wide?</p> <p>A. 0.745<br/>B. 0.755<br/>C. 1.275<br/>D. 6.245<br/>E. none of these</p>   |
| <p>8. A motorcycle was bought for \$4,375.00. Later it was sold for \$452.25 less than the buying price. What was the selling price?</p> <p>A. \$3,822.75<br/>B. \$3,823.75<br/>C. \$3,922.75<br/>D. \$3,923.75<br/>E. none of these</p> | <p>11. An ice cream store sold 1,545 ice cream cones in June. Of these, 60% were vanilla. How many vanilla ice cream cones were sold?</p> <p>A. 600<br/>B. 618<br/>C. 927<br/>D. 945<br/>E. none of these</p>  |
| <p>9. A baker can decorate 5 cakes in 3 hours. How many cakes can he decorate in 4 days if he works 9 hours each day?</p> <p>A. 20<br/>B. 60<br/>C. 180<br/>D. 540<br/>E. none of these</p>  | <p>12. A carpenter is building a gate that will be <math>3\frac{1}{4}</math> feet wide. The gate will be made of boards 3 inches wide. How many pieces of board will it take to fit across the front of the gate?</p> <p>A. <math>9\frac{3}{4}</math><br/>B. 11<br/>C. 12<br/>D. 13<br/>E. none of these</p> |

GO TO THE NEXT PAGE 

Do all of your work on the scratch paper provided. Do not write in this book.

13. A classroom will seat 80 people. If 56 seats are filled, what percentage of the seats are filled?
- A. 24
  - B. 30
  - C. 36
  - D. 70
  - E. none of these
14. Michi put \$7.50 worth of gas in her car. Two co-workers who were riding to work with her offered to share the cost of the gas. One paid  $\frac{1}{2}$  of the total amount and the other paid  $\frac{1}{3}$  of the total amount. How much of the total amount was left for Michi to pay?
- A. \$1.25
  - B. \$2.25
  - C. \$5.25
  - D. \$6.25
  - E. none of these
15. A bookshelf is  $4\frac{3}{4}$  feet wide. How many 3-inch-wide books will fit on the shelf?
- A.  $14\frac{1}{4}$
  - B. 17
  - C. 18
  - D. 19
  - E. none of these
16. It takes a woman 12 minutes to drive one way to work. She goes home for lunch 3 days each week. How much time does she spend driving to and from work each 5-day work week?
- A. 2 hours, 36 minutes
  - B. 3 hours
  - C. 3 hours, 12 minutes
  - D. 3 hours, 20 minutes
  - E. none of these

GO TO THE NEXT PAGE 

Do all of your work on the scratch paper provided. Do not write in this book.

17. A business buys invoice forms at a cost of \$4.45 a box for the first 20 boxes, \$4.00 a box for the next 25 boxes, and \$3.75 a box for any additional boxes. How many boxes of invoice forms can be bought for \$234.00?
- A. 47  
B. 57  
C. 67  
D. 81  
E. none of these
18. A student returned 4 overdue books to the library. The fine for each overdue book is \$0.35 for the first day, \$0.40 for each of the next 3 days, and \$0.45 for each day after that. The total fine was \$13.40. How many days overdue were the books?
- A. 6  
B. 8  
C. 18  
D. 20  
E. none of these

**STOP** DO NOT TURN THE PAGE UNTIL TOLD TO DO SO. **STOP**

**Part 2 - VOCABULARY**  
**Instructions**

On this page are some questions in which you are asked to pick the two words that are either *most nearly the same* in meaning or *most nearly the opposite* in meaning.

Read Practice Question 1:

1.   A. big  
      B. large  
      C. dry  
      D. slow

BIG and LARGE have the *same* meaning. The letter for BIG is A and the letter for LARGE is B.

On your answer sheet find the shaded box labeled **PART 2 PRACTICE**.

Notice that for Practice Question 1, the oval under letters A-B has been filled in.

Now read Practice Question 2:

2.   A. witty  
      B. sad  
      C. tired  
      D. happy

SAD and HAPPY have *opposite* meanings. The letter for SAD is B and the letter for HAPPY is D. Therefore, on your answer sheet for Practice Question 2, the oval under letters B-D has been filled in.

Now do the next three practice questions on the next page in the same way. For each question, choose the two words that are either *most nearly the same* in meaning or *most nearly the opposite* in meaning.

Consider all of the choices before selecting an answer to be sure you haven't overlooked a choice that is better. Then, in the practice box, fill in the oval under the *letter combination* of your answer.

When you finish these practice questions, stop and wait for further instructions.

**Practice Questions**

3.   A. smart  
      B. false  
      C. true  
      D. good
  
4.   A. help  
      B. strike  
      C. begin  
      D. end
  
5.   A. frighten  
      B. accept  
      C. bother  
      D. scare

On the next pages are more questions like the ones you've just answered. For each question, fill in the oval under the *letter combination* of your answer.

Work **CAREFULLY**. You should have enough time to answer each question. It is to your advantage to **ANSWER EVERY QUESTION**. Even if you're not sure of an answer, make your **BEST GUESS**, then mark your choice on the answer sheet. You'll receive one point for each correct answer. Points will not be subtracted for questions you answer incorrectly.

Do not write in this booklet.


When answering the questions in this part, be sure to work down the page and not across.

If you finish before time is called, go back and check your work in **THIS PART** only. If you want to change an answer, erase the first answer completely, then fill in your new choice.

**You will have 8 minutes to complete this part.**

**Do not turn this page until told to do so.**

1. A. push B. dine C. nap D. eat	6. A. decompose B. adjust C. decay D. replenish
2. A. easy B. fast C. difficult D. free	7. A. digestive B. conclusive C. decisive D. heroic
3. A. prompt B. plush C. happy D. tardy	8. A. thirst B. turmoil C. petroleum D. chaos
4. A. junction B. induction C. intersection D. attention	9. A. scrub B. scorch C. scald D. sprung
5. A. ripe B. humble C. arrogant D. autumnal	10. A. wallow B. darken C. produce D. illuminate

GO TO THE NEXT PAGE 

11. A. reasonable B. irrational C. shifty D. humorous	16. A. commodious B. unwavering C. cowardly D. oscillatory
12. A. animosity B. restitution C. resentment D. intuition	17. A. regret B. respect C. deference D. poverty
13. A. recognition B. descendant C. opponent D. antagonist	18. A. sequestrate B. segregate C. delegate D. dehydrate
14. A. prudent B. mirthful C. helpless D. sullen	19. A. impenitent B. compendious C. capable D. sorry
15. A. oviparous B. eulogistic C. carnivorous D. laudatory	

**STOP** DO NOT TURN THE PAGE UNTIL TOLD TO DO SO. **STOP**

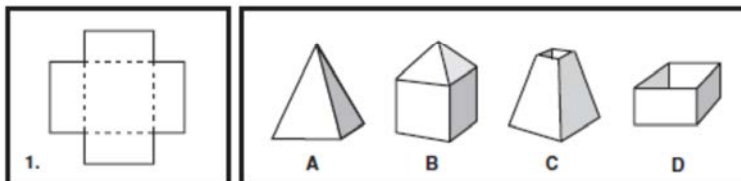


### Part 3 - THREE-DIMENSIONAL SPACE

#### Instructions

On this page are some problems in which flat shapes have been folded or rolled or both to make three-dimensional objects.

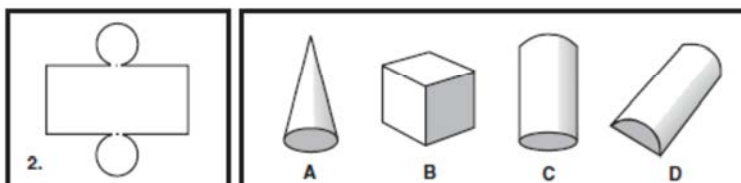
Look at Practice Problem 1:



At the left is a drawing of a flat shape. The dotted lines show where the shape must be folded. At the right are four different drawings of three-dimensional objects. Notice that only *Object D* can be made by folding the flat shape shown in *Figure 1*.

On your answer sheet find the shaded box labeled **PART 3 PRACTICE**. Notice that for Practice Problem 1, the oval under letter **D** has been filled in.

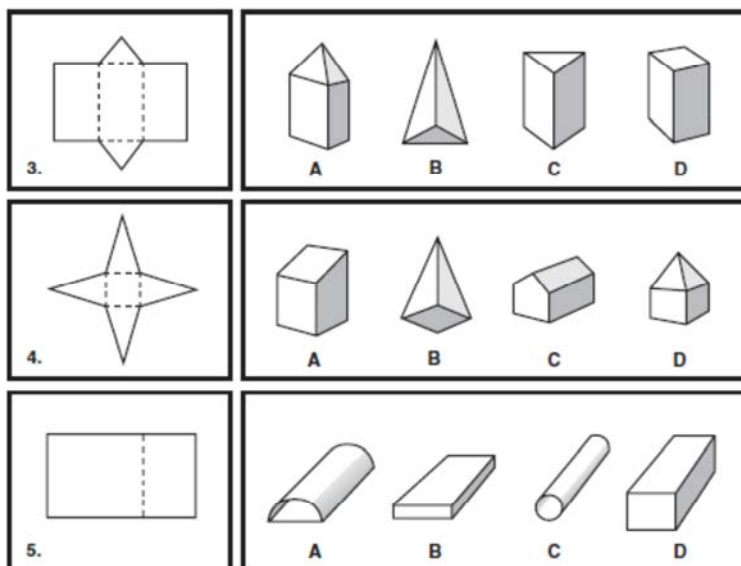
Now look at Practice Problem 2:



At the left is another drawing of a flat shape. There are no indications on the flat shape to show where it's to be rolled. There are dotted lines where the circles meet the rectangle to show where it's to be folded. Notice that of the four different drawings on the right, only *Object C* can be made by both rolling and folding the flat shape. Therefore, on your answer sheet for Practice Problem 2, the oval under letter **C** has been filled in.

Now do the next three practice problems on the next page in the same way. In the practice box, fill in the ovals under the letters of your answers. When you finish these practice problems, stop and wait for further instructions.

## Practice Problems



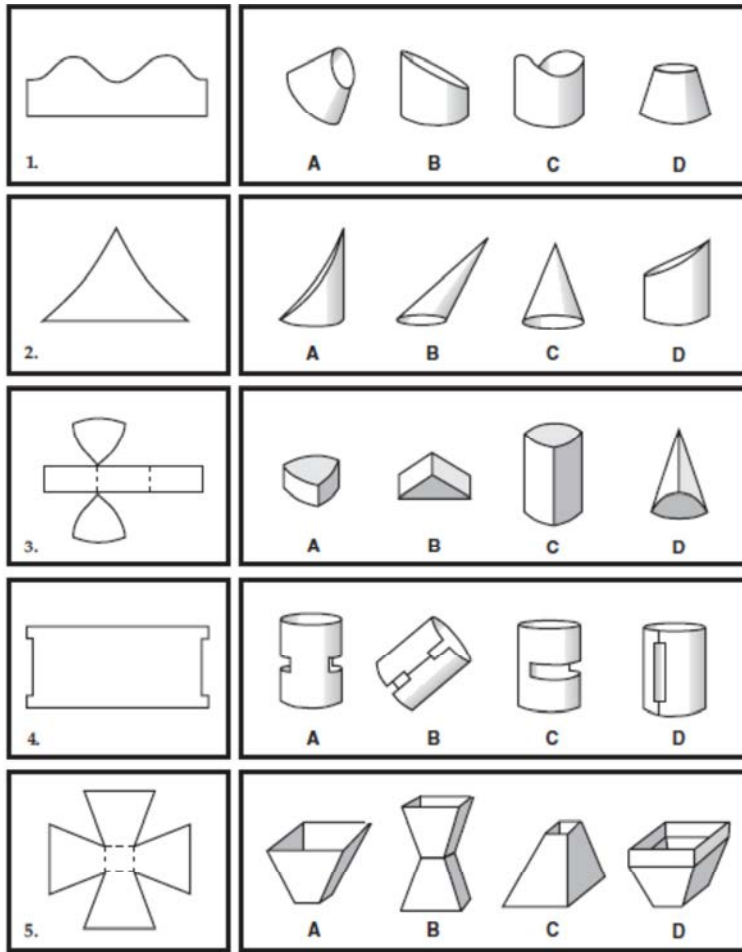
On the next pages are more problems like the ones you've just answered. Only *one* object can be made from the flat shape by folding *or* rolling *or* both. For each problem, fill in the oval under the letter of your answer.


Work **CAREFULLY**. You should have enough time to answer each problem. It is to your advantage to **ANSWER EVERY PROBLEM**. Even if you're not sure of an answer, make your **BEST GUESS**, then mark your choice on the answer sheet. You'll receive one point for each correct answer. Points will not be subtracted for problems you answer incorrectly.

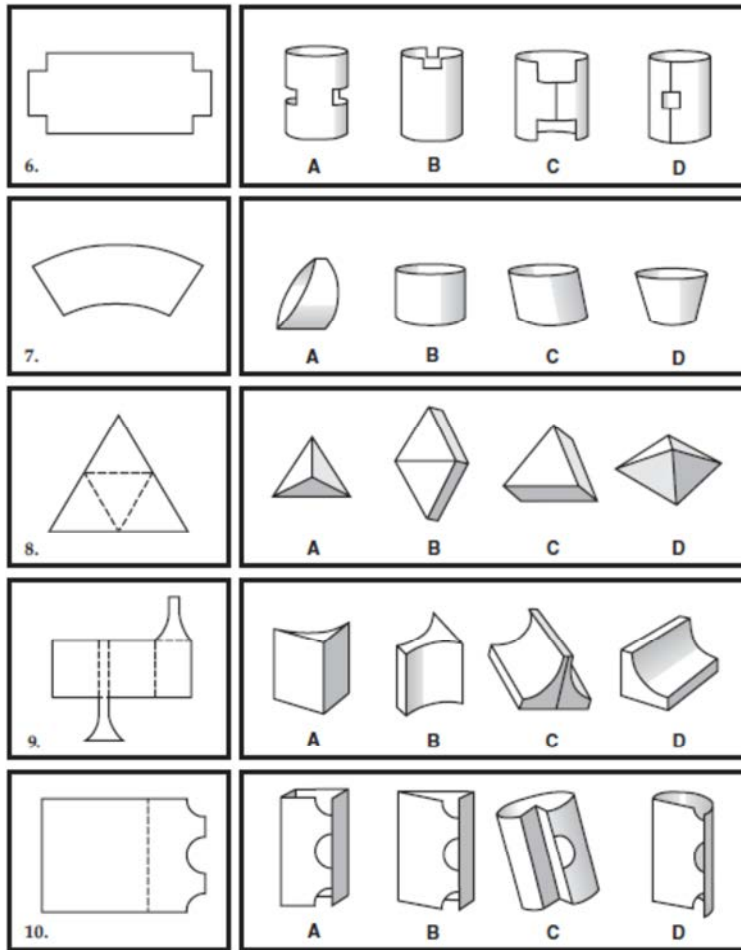
Do not write in this booklet. If you finish before time is called, go back and check your work in **THIS PART** only. If you want to change an answer, erase the first answer completely, then fill in your new choice.


You will have 8 minutes to complete this part.

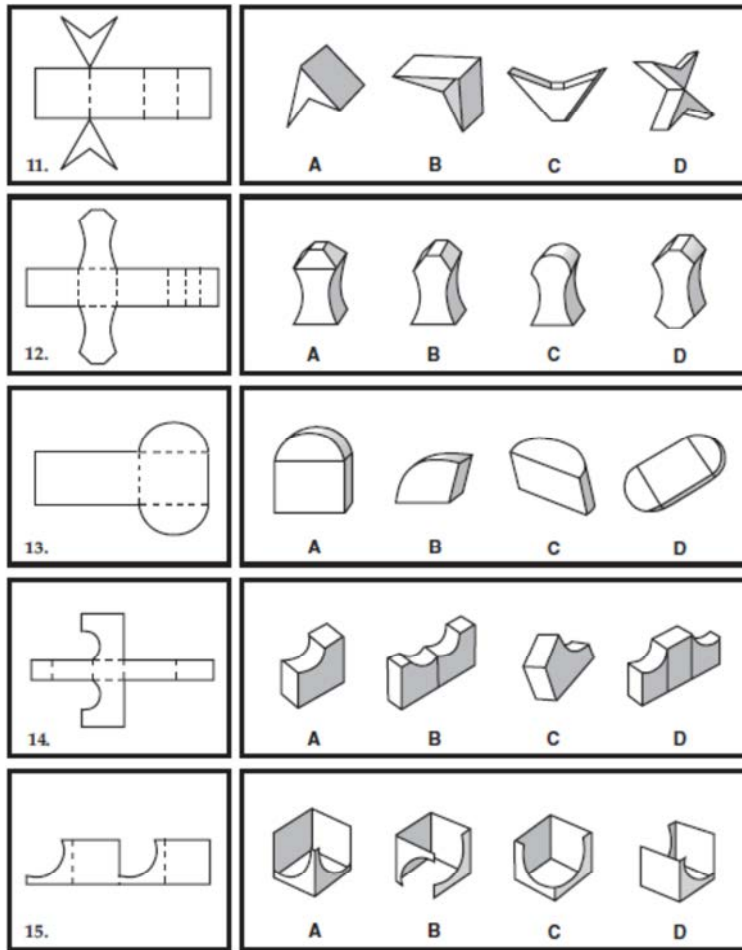
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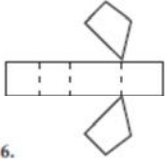

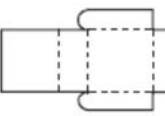
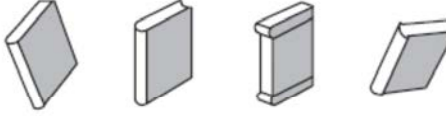

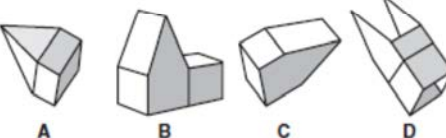
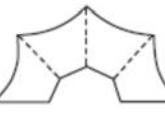
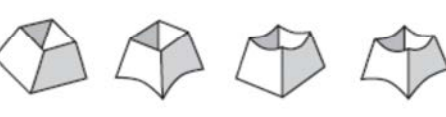
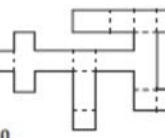
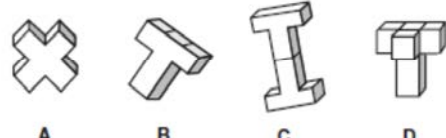
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<p>16.</p> 	 <p>A B C D</p>
<p>17.</p> 	 <p>A B C D</p>
<p>18.</p> 	 <p>A B C D</p>
<p>19.</p> 	 <p>A B C D</p>
<p>20.</p> 	 <p>A B C D</p>

STOP DO NOT TURN THE PAGE UNTIL TOLD TO DO SO. STOP

**GENERAL INSTRUCTIONS****Parts 4, 5, and 6**

The next three parts are different from the parts you've already taken. On these parts, **SPEED** is **VERY IMPORTANT**. You won't have time to answer every question. You must work as **FAST** as you can but don't be careless.

If you have even the slightest idea of the answer, it is to your advantage to make your **BEST GUESS**. If you can eliminate one or more wrong choices to the question, then make your **BEST GUESS** from the remaining choices. However, if you have no idea of the correct answer, don't spend time guessing; go to the next question.

You'll receive one point for each correct answer. You'll be penalized for wrong answers. Points will not be subtracted for questions you don't answer.

**Part 4 - COMPUTATION**  
**Instructions**

On this page are some computation questions. Read Practice Question 1:

- |             |                  |
|-------------|------------------|
| 1. SUBTRACT | A. 4             |
|             | B. 5             |
| 8           | C. 6             |
| <u>- 2</u>  | D. 7             |
|             | E. none of these |

In Practice Question 1, the correct answer is 6. In the answer column, the letter next to 6 is C. On your answer sheet find the shaded box labeled **PART 4 PRACTICE**. Notice that for Practice Question 1, the oval under letter **C** has been filled in.

Now, read Practice Question 2:

- |            |                  |
|------------|------------------|
| 2. ADD     | A. 6             |
|            | B. 7             |
| 8          | C. 10            |
| <u>+ 1</u> | D. 11            |
|            | E. none of these |

In Practice Question 2, the correct answer is 9. However, 9 does not appear in the answer column. Therefore, E or "none of these" is the correct answer. For Practice Question 2, the oval under letter **E** has been filled in because none of the other answers given was correct.

Now do Practice Questions 3 and 4 on the next page in the same way. Follow the directions and then in the practice box fill in the ovals under the letters of your answers.

Do not write in this booklet. Do your work on the scratch paper provided.

When you finish these practice questions, stop and wait for further instructions.



## Practice Questions

3. MULTIPLY
- $$\begin{array}{r} 3 \\ \times 4 \\ \hline \end{array}$$
- A. 8  
B. 9  
C. 12  
D. 14  
E. none of these

4. DIVIDE
- $$2 \overline{)6}$$
- A. 3  
B. 4  
C. 5  
D. 6  
E. none of these

On the next pages are more questions like the ones you've just answered. For each question, fill in the oval under the letter of your answer.

Remember, on this part **SPEED** is very important. Work as **FAST** as you can, but don't be careless. If you have even the slightest idea of the answer, it is to your advantage to make your **BEST GUESS**. If you can eliminate one or more wrong choices to a problem, make your **BEST GUESS** from the remaining choices. However, if you have no idea of the correct answer, don't spend time guessing; go to the next problem.

You'll receive one point for each correct answer. You'll lose one quarter (1/4) of a point for each wrong answer. Points will not be subtracted for problems you don't answer.

Do not write in this booklet. Do your work on the scratch paper provided.

When answering the questions in this part, be sure to work down the page and not across.

If you finish before time is called, go back and check your work in **THIS PART** only. If you want to change an answer, erase the first answer completely, then fill in your new choice.

**You will have 6 minutes to complete this part.**

**Do not turn this page until told to do so.**

Do all of your work on the scratch paper provided. Do not write in this book.

1. ADD

$$\begin{array}{r} 4 \\ + 3 \\ \hline \end{array}$$

A. 1  
B. 6  
C. 7  
D. 12  
E. none of these

2. SUBTRACT

$$\begin{array}{r} 19 \\ - 5 \\ \hline \end{array}$$

A. 14  
B. 24  
C. 34  
D. 95  
E. none of these

3. MULTIPLY

$$\begin{array}{r} 13 \\ \times 3 \\ \hline \end{array}$$

A. 16  
B. 36  
C. 37  
D. 39  
E. none of these

4. DIVIDE

$$9 \overline{)63}$$

A. 5  
B. 6  
C. 7  
D. 8  
E. none of these

5. ADD

$$\begin{array}{r} 25 \\ 18 \\ + 13 \\ \hline \end{array}$$

A. 46  
B. 56  
C. 63  
D. 66  
E. none of these

6. SUBTRACT

$$\begin{array}{r} 33 \\ - 14 \\ \hline \end{array}$$

A. 17  
B. 19  
C. 21  
D. 27  
E. none of these

7. MULTIPLY


$$\begin{array}{r} 4 \\ \times 4 \\ \hline \end{array}$$

A. 0  
B. 8  
C. 14  
D. 15  
E. none of these

8. DIVIDE

$$7 \overline{)182}$$

A. 24  
B. 25  
C. 26  
D. 28  
E. none of these

GO TO THE NEXT PAGE 

Do all of your work on the scratch paper provided. Do not write in this book.

9. ADD

$$\begin{array}{r} 3 \\ 8 \\ + 4 \\ \hline \end{array}$$

A. 12  
B. 15  
C. 16  
D. 17  
E. none of these

10. SUBTRACT

$$\begin{array}{r} 377 \\ - 42 \\ \hline \end{array}$$

A. 335  
B. 336  
C. 345  
D. 419  
E. none of these

11. MULTIPLY

$$\begin{array}{r} 17 \\ \times 3 \\ \hline \end{array}$$

A. 20  
B. 54  
C. 55  
D. 61  
E. none of these

12. DIVIDE

$$15 \overline{)495}$$

A. 27  
B. 29  
C. 30  
D. 31  
E. none of these

13. ADD

$$\begin{array}{r} 963 \\ + 12 \\ \hline \end{array}$$

A. 951  
B. 965  
C. 975  
D. 985  
E. none of these

14. SUBTRACT

$$\begin{array}{r} 7,384 \\ - 285 \\ \hline \end{array}$$

A. 7,099  
B. 7,107  
C. 7,109  
D. 7,669  
E. none of these

15. MULTIPLY


$$\begin{array}{r} 123 \\ \times 4 \\ \hline \end{array}$$

A. 127  
B. 492  
C. 582  
D. 592  
E. none of these

16. DIVIDE

$$8 \overline{)64}$$

A. 4  
B. 6  
C. 7  
D. 9  
E. none of these

GO TO THE NEXT PAGE 

Do all of your work on the scratch paper provided. Do not write in this book.

17. ADD

$$\begin{array}{r} 1,049 \\ 83 \\ + 435 \\ \hline \end{array}$$

A. 1,567  
B. 1,568  
C. 1,577  
D. 1,578  
E. none of these

18. SUBTRACT

$$\begin{array}{r} 150 \\ - 67 \\ \hline \end{array}$$

A. 83  
B. 84  
C. 93  
D. 217  
E. none of these

19. MULTIPLY

$$\begin{array}{r} 66 \\ \times 7 \\ \hline \end{array}$$

A. 442  
B. 452  
C. 462  
D. 667  
E. none of these

20. DIVIDE

$$7 \overline{)378}$$

A. 44  
B. 45  
C. 49  
D. 54  
E. none of these

21. ADD

$$\begin{array}{r} 465 \\ 96 \\ + 954 \\ \hline \end{array}$$

A. 1,305  
B. 1,315  
C. 1,515  
D. 1,615  
E. none of these

22. SUBTRACT

$$\begin{array}{r} 147 \\ - 59 \\ \hline \end{array}$$

A. 98  
B. 108  
C. 112  
D. 206  
E. none of these

23. MULTIPLY


$$\begin{array}{r} 8,733 \\ \times 4 \\ \hline \end{array}$$

A. 32,822  
B. 32,932  
C. 34,932  
D. 35,932  
E. none of these

24. DIVIDE

$$14 \overline{)29,554}$$

A. 2,116  
B. 2,121  
C. 2,131  
D. 2,146  
E. none of these

GO TO THE NEXT PAGE 

Do all of your work on the scratch paper provided. Do not write in this book.

25. ADD

$$\begin{array}{r} 6,234 \\ 549 \\ + 473 \\ \hline \end{array}$$

A. 6,256  
B. 7,256  
C. 7,356  
D. 7,526  
E. none of these

26. SUBTRACT

$$\begin{array}{r} 42,726 \\ - 6,175 \\ \hline \end{array}$$

A. 36,551  
B. 36,651  
C. 37,241  
D. 48,901  
E. none of these

27. MULTIPLY

$$\begin{array}{r} 246 \\ \times 6 \\ \hline \end{array}$$

A. 1,446  
B. 1,476  
C. 1,486  
D. 1,576  
E. none of these

28. DIVIDE

$$6 \overline{)43,764}$$

A. 7,094  
B. 7,189  
C. 7,199  
D. 7,294  
E. none of these

29. ADD

$$\begin{array}{r} 36,905 \\ 9,672 \\ 10,193 \\ 230 \\ + 325 \\ \hline \end{array}$$

A. 55,115  
B. 57,325  
C. 58,315  
D. 59,425  
E. none of these

30. SUBTRACT

$$\begin{array}{r} 239 \\ - 75 \\ \hline \end{array}$$

A. 154  
B. 264  
C. 304  
D. 314  
E. none of these

31. MULTIPLY


$$\begin{array}{r} 97,132 \\ \times 9 \\ \hline \end{array}$$

A. 97,123  
B. 97,141  
C. 874,128  
D. 874,188  
E. none of these

32. DIVIDE

$$7 \overline{)597,065}$$

A. 85,205  
B. 85,285  
C. 85,295  
D. 85,305  
E. none of these

GO TO THE NEXT PAGE 

Do all of your work on the scratch paper provided. Do not write in this book.

33. ADD

12,125	A. 80,819
8,971	B. 80,919
56,660	C. 81,819
513	D. 90,819
<u>+ 2,550</u>	E. none of these

36. DIVIDE

$9 \overline{) 114,363}$	A. 1,277
	B. 12,707
	C. 12,807
	D. 12,907
	E. none of these

34. SUBTRACT

154,321	A. 148,829
<u>- 5,492</u>	B. 148,929
	C. 149,939
	D. 159,813
	E. none of these

37. ADD

242	A. 2,029
853	B. 2,479
36	C. 2,529
42	D. 2,629
396	E. none of these
9	
10	
81	
4	
78	
765	
4	
<u>+ 9</u>	

35. MULTIPLY

273	A. 13,642
<u>x 54</u>	B. 14,642
	C. 14,728
	D. 14,742
	E. none of these

38. SUBTRACT

3,871,532	A. 2,373,999
<u>- 597,633</u>	B. 2,383,899
	C. 3,272,999
	D. 3,273,899
	E. none of these

GO TO THE NEXT PAGE 

Do all of your work on the scratch paper provided. Do not write in this book.

39. MULTIPLY

$$\begin{array}{r} 47,094 \\ \times 413 \\ \hline \end{array}$$

- A. 47,507
- B. 376,742
- C. 18,649,812
- D. 19,449,822
- E. none of these

40. DIVIDE

$$34 \overline{) 476,034}$$

- A. 1,401
- B. 14,001
- C. 14,071
- D. 14,072
- E. none of these

**STOP** DO NOT TURN THE PAGE UNTIL TOLD TO DO SO. **STOP**

**Part 5 - NAME COMPARISON**  
Instructions

On this page are some questions in comparing names.

Read Practice Question 1:

1.                    C. K. Duncan     —     C. K. Duncan

The two names are *exactly the same*.

On your answer sheet find the shaded box labeled **PART 5 PRACTICE**.

Notice that for Practice Question 1, the oval under **S**, for *same*, has been filled in.

Now read Practice Question 2:

2.                    Debbie Bailey     —     Debbie Baily

These two names are *different*. So for Practice Question 2, the oval under **D**, for *different*, has been filled in.

Now do the next six practice questions in the same way. If the names are *exactly the same*, fill in the oval under **S**. If they are *different in any way*, fill in the oval under **D**. When you finish these practice questions, stop and wait for further instructions.

3.                    Brimms Co.        —     Brimms Company  
4.                    Wesson & Wyle    —     Wesson & Wyle  
5.                    Remington, D. E. —     Remington, D. F.  
  
6.                    Linda Small        —     Lynda Small  
7.                    Strong Ltd.        —     Strong Inc.  
8.                    James Reagon     —     James Reagon



On the next pages are more questions like the ones you've just answered. For each question, fill in the oval under the letter of your answer.

Remember, on this part **SPEED** is very important. Work as **FAST** as you can, but don't be careless. If you have even the slightest idea of the answer but are not sure, then it is to your advantage to make your **BEST GUESS**. However, if you have no idea of the correct answer, don't spend time guessing; go to the next question. You'll receive one point for each correct answer. You'll lose one point for each wrong answer. Points will not be subtracted for questions you don't answer.

Do not write in this booklet.

If you finish before time is called, go back and check your work in **THIS PART** only. If you want to change an answer, erase the first answer completely, then fill in your new choice.


**You will have 6 minutes to complete this part.**

**Do not turn this page until told to do so.**

1.	Paramore & Co.	—	Paramore & Co.
2.	Bimler	—	Binler
3.	E-Z Neon	—	E-Z Neon
4.	Blackstone	—	Blackstone
5.	Chris Brasch	—	Chris Grascch
6.	A & V Mech.	—	A & V Mech.
7.	Bustamante & Co.	—	Bustamante & Co.
8.	Endospace	—	Endospace
9.	Fran Barber	—	Fran Barber
10.	T.S. Mankus	—	T.S. Mankos
11.	Broadway Dance Co.	—	Broadway Dance Co.
12.	Marine Salvage	—	Marine Salvage
13.	R.V. Knoll	—	R.V. Knoell
14.	Cue Comic	—	Cue Comic
15.	T.A. Bowles	—	T.A. Bowls
16.	Abbey Dwayne	—	Abbey Dwaayne
17.	Sunbeam Lamps	—	Sunbeam Lamps
18.	Waylan R. Massell	—	Waybin R. Massell
19.	Rolon Rodes	—	Rolon Rodes
20.	Genro Dawson Ed.	—	Jenro Dawson Ed.
21.	Anawuye Inc.	—	Anawuuye Inc.
22.	Sungold Stencils	—	Sungold Stencils
23.	Western Steel Wagon	—	Western Steel Wagon
24.	Culp Div.	—	Culp Dir.
25.	Carlos' Catering	—	Carlos' Catering
26.	J & H Denims	—	J & H Denim
27.	Rashid P.T.	—	Rashed P.T.
28.	J.B. Midori	—	J.B. Midori
29.	Commerce Dr.	—	Commerce Dr.
30.	Ida Muni	—	Ida Muni

GO TO THE NEXT PAGE 

31.	Joe T. Bara	—	Jo T. Bara
32.	Allen Div.	—	Allens Div.
33.	Champlain Ave.	—	Champlain Ave.
34.	Berlin-Soonam-Fiske	—	Berlin-Soonam-Fiske
35.	I.M. Bonregime	—	I.M. Bonregime
36.	Fairway Golf Course	—	Fareway Golf Course
37.	C.F. Tool & Die	—	C.F. Tool & Die
38.	Donna Brendan	—	Donna Brendon
39.	Village Pizza Place	—	Village Pizza Place
40.	Ardis Deckert	—	Ardis Deckert
41.	W. Ulfilas	—	W. Ulfilas
42.	Arcway Machine	—	Arcway Machine
43.	Gindel's Gages	—	Gundel's Gages
44.	Conte Verde Academy	—	Conte Verde Academy
45.	Jina M. Holland Esq.	—	Jina M. Holland Esq.
46.	Neper & Brown Co., Inc.	—	Neper & Brown Co., Inc.
47.	Eve Moemu	—	Eve Moemu
48.	Bo Sema's Supply	—	Bo Sima's Supply
49.	Arimoto & Cook, Inc.	—	Arinoto & Cook, Inc.
50.	B.K. Baiamonte Sr.	—	B.K. Bajamonte Sr.
51.	Bryn Mawr Food Mart	—	Bryn Mawyr Food Mart
52.	Lake Shore Day Care	—	Lake Shore Bay Care
53.	Sunland Cement Co.	—	Sunlund Cement Co.
54.	Builders Exchange	—	Builders Exchange
55.	T.R. Humphrey Stores	—	T.R. Humphry Stores
56.	College Cycle Center	—	College Cycle Centre
57.	Kin Flagg	—	Kin Flagg
58.	Phoenix Foundry	—	Phoenix Foundry
59.	Mika Langings	—	Miki Langings
60.	Breeze V.N. & Co.	—	Breeze V.N. & Co.

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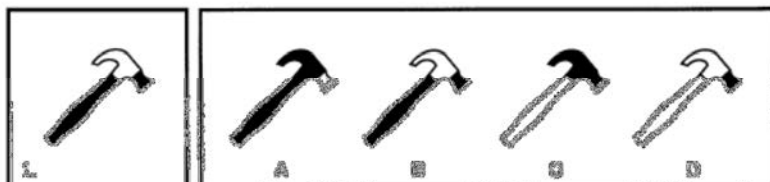
61.	Mei Jean Wholesaler	—	Mei Jeen Wholesaler
62.	Teeterboard	—	Teeterboard
63.	Atlas Flagg, Inc.	—	Atlas Flag, Inc.
64.	C.G. Munguia	—	C.G. Munguia
65.	Q & Q Quaint Bazaar	—	Q & Q Quaint Bazar
66.	Bradley Gillberston	—	Bradley Gillbertsen
67.	Hanglas Bakery	—	Hanglas Bakery
68.	Franklin Rd.	—	Franklin Rd.
69.	D.O. Etumu & Sons	—	D.O. Etumu & Sons
70.	Ben Spark	—	Ben Sprak
71.	I.K. Season Corp.	—	I.K. Season Corp.
72.	Cole's Heat Systems	—	Cole's Heat Systems
73.	Ridgewood Writers	—	Ridgwood Writers
74.	Progressive Svc.	—	Progressive Svc.
75.	Cai Cheung Wax Co.	—	Cai Cheung Wax Co.
76.	Wrner Olukayode	—	Warner Olukayode
77.	Capital Press Center	—	Capitol Press Center
78.	Chesmu Cross C.	—	Chesmu Cross C.
79.	Edwin J. Rotzoll	—	Edwin J. Rotzoll
80.	Harkenville, Jerome	—	Harkenville, Jerome
81.	Dresser Ctge.	—	Dresser Ctge.
82.	Juana N. Parks	—	Juana N. Park
83.	Pogbee Dr.	—	Pogbee Dr.
84.	Anastasia Cowan	—	Anastasia Cowan
85.	Jonina Jannini	—	Jonina Jannini
86.	Velocity Rwys.	—	Velocity Rwys.
87.	Corona Stefan	—	Corona Stefan
88.	Co-op Plumbers Ass'n	—	Co-op Plumber Ass'n
89.	Big Sky Balloons Co.	—	Big Sky Baloons Co.
90.	Henderson St. Ctr.	—	Hendersen St. Ctr.

**STOP** DO NOT TURN THE PAGE UNTIL TOLD TO DO SO. **STOP**

### Part 6 - OBJECT MATCHING

#### Instructions

On this page are some problems in which you compare objects. Look at Object 1 and the four objects that follow.

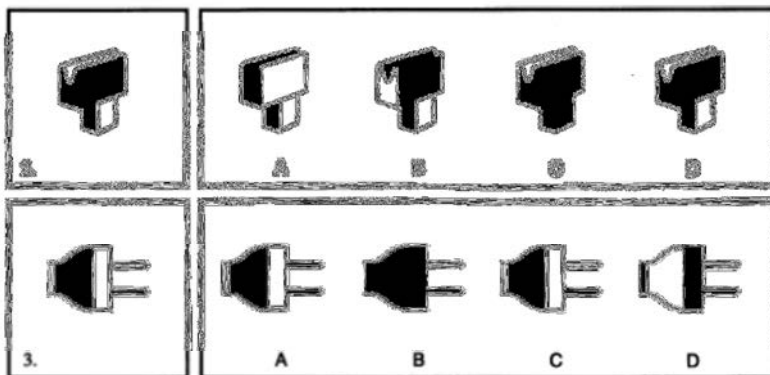


Notice that only Object B is *exactly the same* as Object 1.

On your answer sheet find the shaded box labeled **PART 6 PRACTICE**. Notice that for Practice Problem 1, the oval under letter **B** has been filled in.

Now do the next two practice problems in the same way. In each one, find the *lettered* object that is *exactly the same* as the *numbered* object. Then, in the practice box, fill in the oval under the letter of your answer.

When you finish these practice problems, stop and wait for further instructions.



On the next pages are more problems like the ones you've just answered. For each problem, fill in the oval under the letter of your answer.

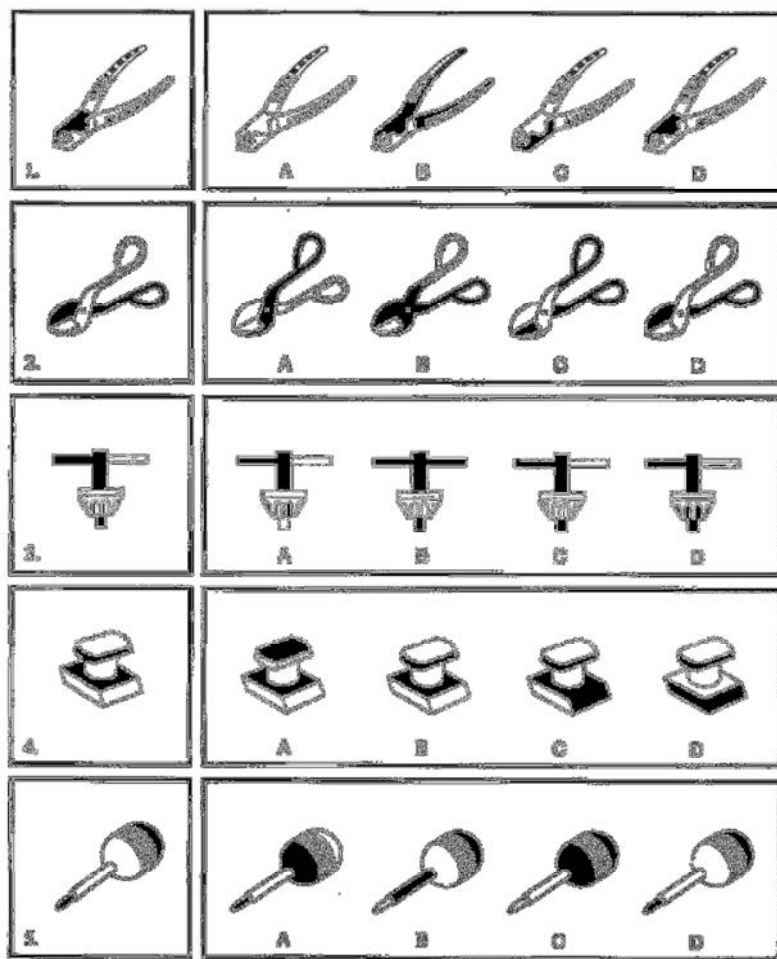
Remember, on this part **SPEED** is very important. Work as **FAST** as you can, but don't be careless. If you have even the slightest idea of the answer, it is to your advantage to make your **BEST GUESS**. If you can eliminate one or more wrong choices to a problem, then make your **BEST GUESS** from the remaining choices. However, if you have no idea of the correct answer, don't spend time guessing; go to the next problem. You'll receive one point for each correct answer. You'll lose one third ( $1/3$ ) of a point for each wrong answer. Points will not be subtracted for problems you don't answer.

Do not write in this booklet.

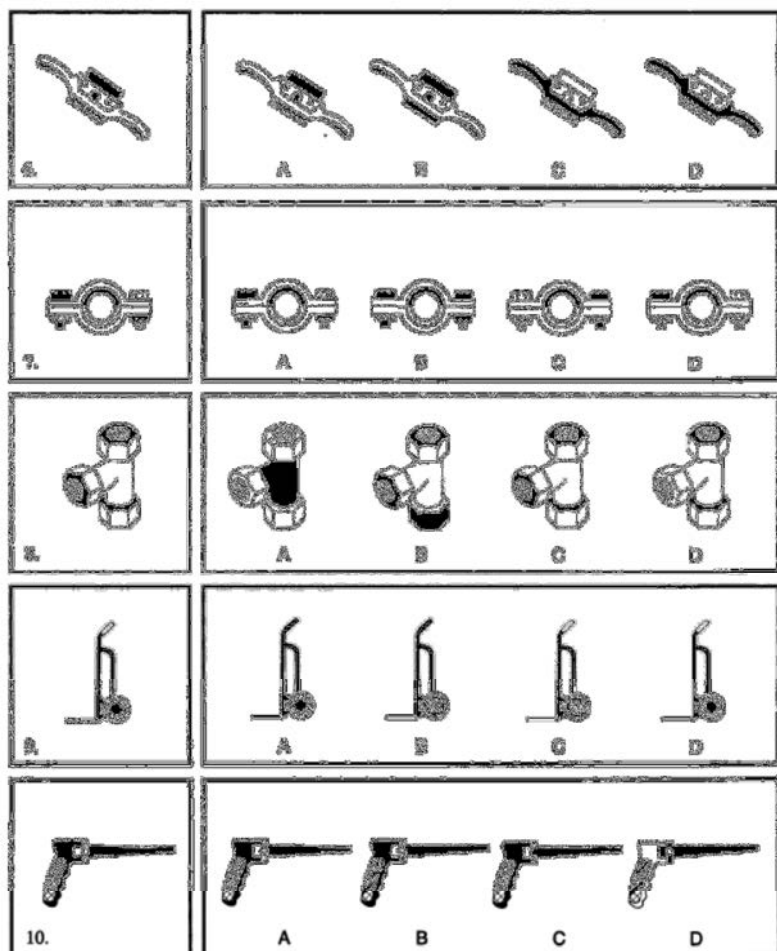
If you finish before time is called, go back and check your work in **THIS PART** only. If you want to change an answer, erase the first answer completely, then fill in your new choice.


**You will have 5 minutes to complete this part.**

**Do not turn this page until told to do so.**

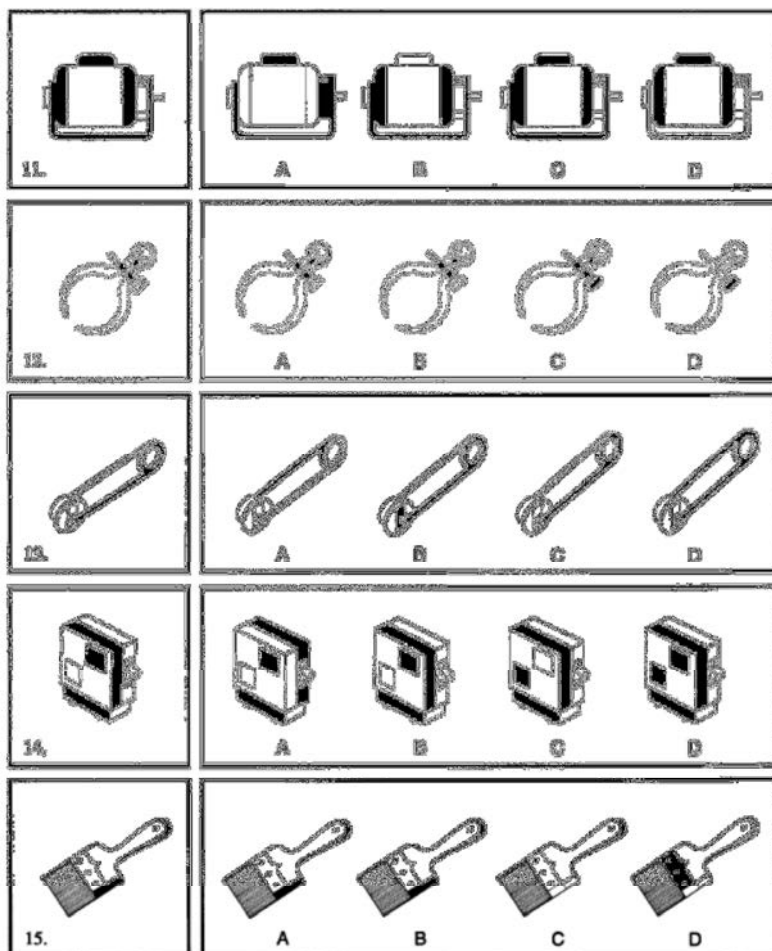


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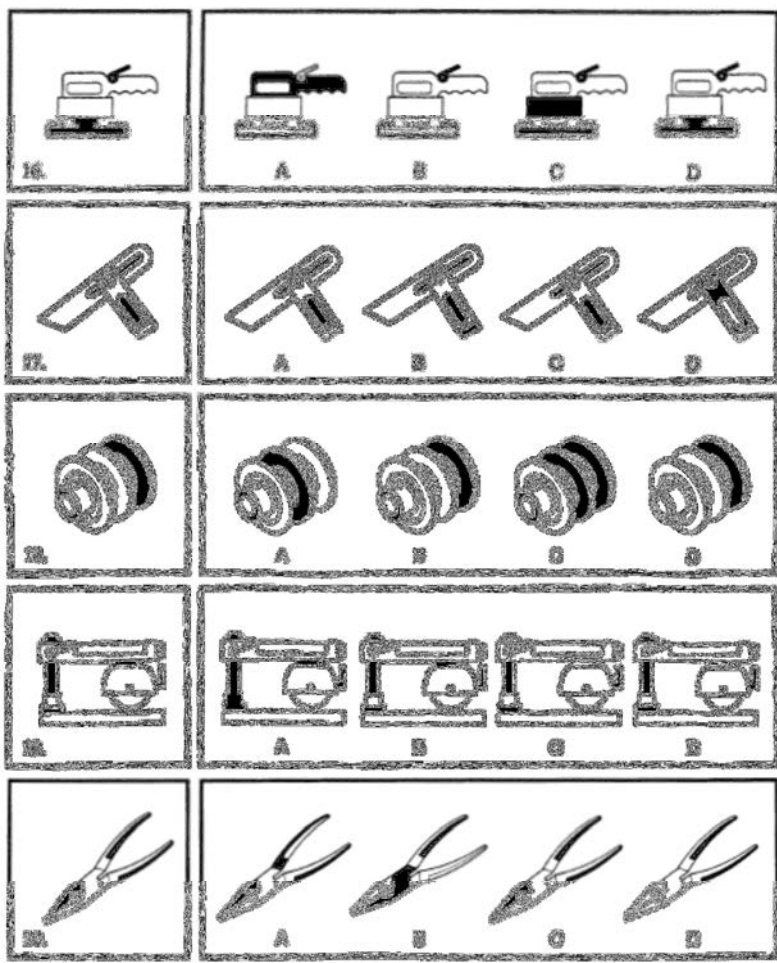



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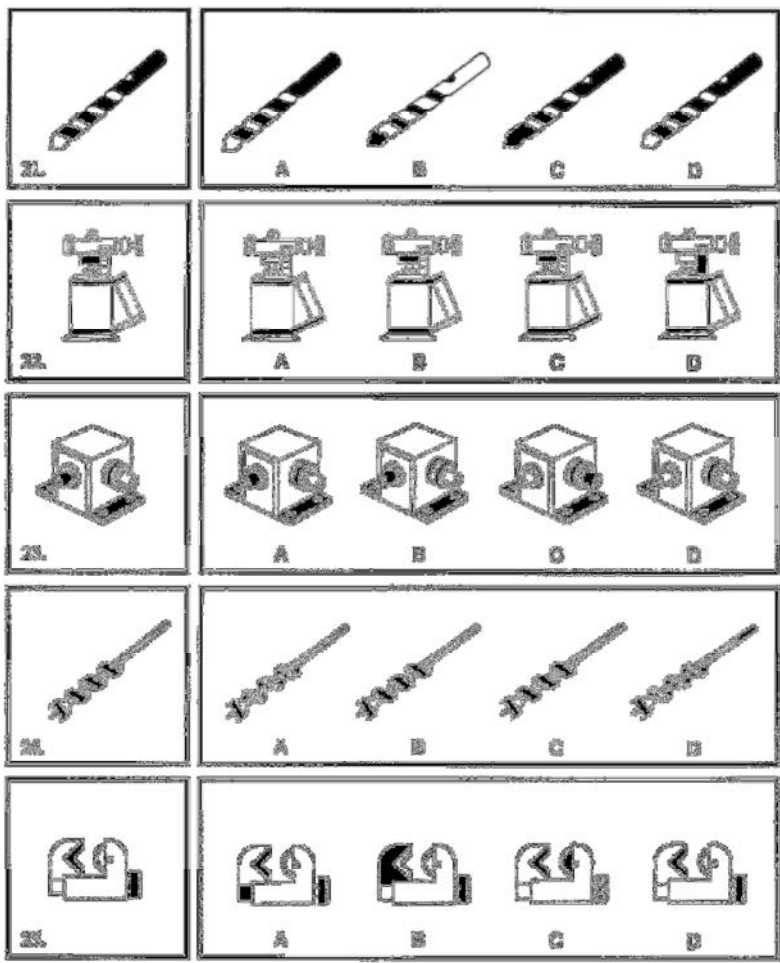




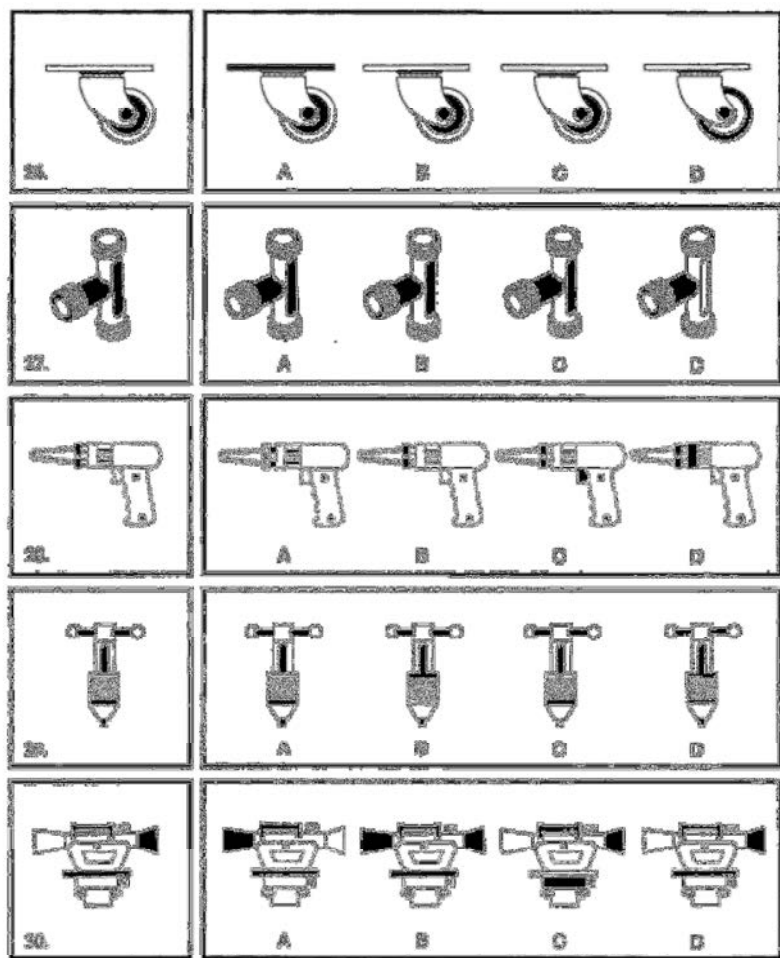
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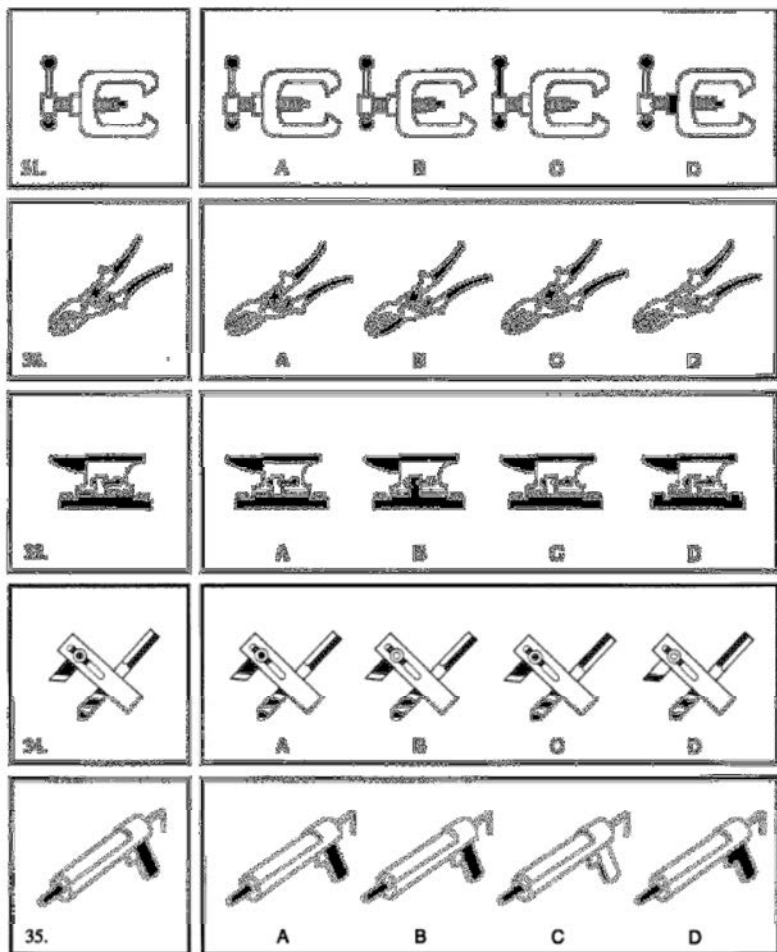
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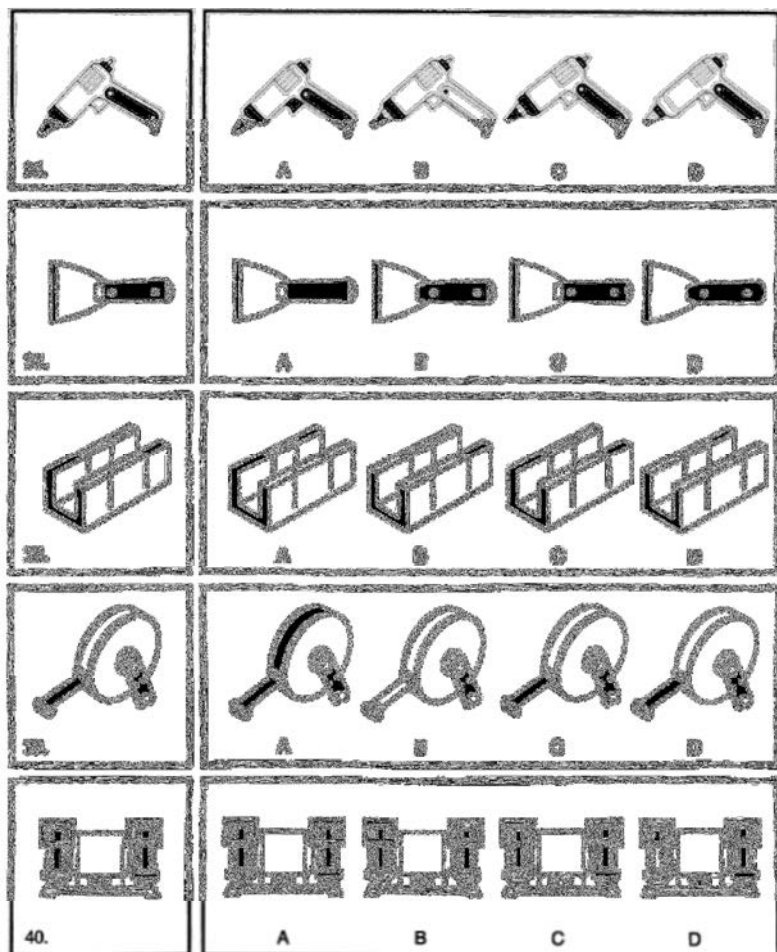
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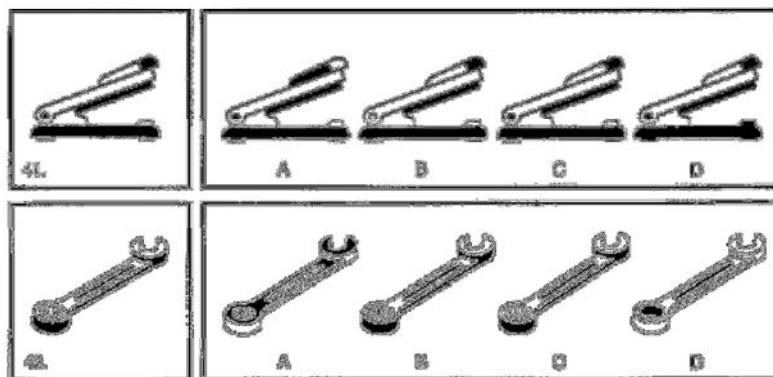
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**STOP** STOP HERE! WAIT FOR FURTHER INSTRUCTIONS. **STOP**

Ability Profiler Answer Sheet

PAGE 1



Answer Sheet for  
Manual Data Entry

Name (Last, First)  
\_\_\_\_\_

Student ID Number  
\_\_\_\_\_

NetID (ISU e-mail)  
\_\_\_\_\_

Age  Gender  Female  Male

Racial or Ethnic Identity  
\_\_\_\_\_

Academic Status (Year in School)  
\_\_\_\_\_

Current Major  
\_\_\_\_\_

O\*NET Ability Profiler™  
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Form 1, A, 2

1 inch Tool results may be inaccurate unless this answer sheet is printed at full scale on legal-size paper.



**PART 1**  
**ARITHMETIC REASONING**

PAGE 2

**PART 1**  
**PRACTICE**

A B C D E  
1 ○ ○ ● ○ ○

A B C D E  
2 ○ ○ ○ ○ ●

A B C D E  
3 ○ ○ ○ ○ ○

A B C D E  
4 ○ ○ ○ ○ ○

A B C D E  
1 ○ ○ ○ ○ ○

A B C D E  
2 ○ ○ ○ ○ ○

A B C D E  
3 ○ ○ ○ ○ ○

A B C D E  
4 ○ ○ ○ ○ ○

A B C D E  
5 ○ ○ ○ ○ ○

A B C D E  
6 ○ ○ ○ ○ ○

A B C D E  
7 ○ ○ ○ ○ ○

A B C D E  
8 ○ ○ ○ ○ ○

A B C D E  
9 ○ ○ ○ ○ ○

A B C D E  
10 ○ ○ ○ ○ ○

A B C D E  
11 ○ ○ ○ ○ ○

A B C D E  
12 ○ ○ ○ ○ ○

A B C D E  
13 ○ ○ ○ ○ ○

A B C D E  
14 ○ ○ ○ ○ ○

A B C D E  
15 ○ ○ ○ ○ ○

A B C D E  
16 ○ ○ ○ ○ ○

A B C D E  
17 ○ ○ ○ ○ ○

A B C D E  
18 ○ ○ ○ ○ ○

**PLEASE**  
**DO**  
**NOT**  
**WRITE**  
**IN**  
**THIS**  
**AREA**

1 inch      \*Test results may be inaccurate unless this answer sheet is printed at full scale on legal-size paper.

PART 2 VOCABULARY	PART 3 3-D SPACE	PART 4 COMPUTATION
<p><b>PART 2 PRACTICE</b></p> <p>1 AB AC AD BC BD CD  <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/></p> <p>2 AB AC AD BC BD CD  <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/></p> <p>3 AB AC AD BC BD CD  <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/></p> <p>4 AB AC AD BC BD CD  <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/></p> <p>5 AB AC AD BC BD CD  <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/></p>	<p><b>PART 3 PRACTICE</b></p> <p>1 ABCD  <input type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/></p> <p>2 ABCD  <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/></p> <p>3 ABCD  <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/></p> <p>4 ABCD  <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/></p> <p>5 ABCD  <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/></p>	<p><b>PART 4 PRACTICE</b></p> <p>1 ABCDE  <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/></p> <p>2 ABCDE  <input type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/></p> <p>3 ABCDE  <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/></p> <p>4 ABCDE  <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/></p>
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1 inch Tool results may be inaccurate unless this answer sheet is printed at full scale on legal-size paper.

**PART 5  
NAME COMPARISON**

PART 5 PRACTICE			
S D	S D	S D	S D
1 ● ○	2 ○ ○	31 ○ ○	61 ○ ○
S D	S D	S D	S D
2 ○ ●	3 ○ ○	32 ○ ○	62 ○ ○
S D	S D	S D	S D
3 ○ ○	4 ○ ○	33 ○ ○	63 ○ ○
S D	S D	S D	S D
4 ○ ○	5 ○ ○	34 ○ ○	64 ○ ○
S D	S D	S D	S D
5 ○ ○	6 ○ ○	35 ○ ○	65 ○ ○
S D	S D	S D	S D
6 ○ ○	7 ○ ○	36 ○ ○	66 ○ ○
S D	S D	S D	S D
7 ○ ○	8 ○ ○	37 ○ ○	67 ○ ○
S D	S D	S D	S D
8 ○ ○	9 ○ ○	38 ○ ○	68 ○ ○
S D	S D	S D	S D
9 ○ ○	10 ○ ○	39 ○ ○	69 ○ ○
S D	S D	S D	S D
10 ○ ○	11 ○ ○	40 ○ ○	70 ○ ○
S D	S D	S D	S D
11 ○ ○	12 ○ ○	41 ○ ○	71 ○ ○
S D	S D	S D	S D
12 ○ ○	13 ○ ○	42 ○ ○	72 ○ ○
S D	S D	S D	S D
13 ○ ○	14 ○ ○	43 ○ ○	73 ○ ○
S D	S D	S D	S D
14 ○ ○	15 ○ ○	44 ○ ○	74 ○ ○
S D	S D	S D	S D
15 ○ ○	16 ○ ○	45 ○ ○	75 ○ ○
S D	S D	S D	S D
16 ○ ○	17 ○ ○	46 ○ ○	76 ○ ○
S D	S D	S D	S D
17 ○ ○	18 ○ ○	47 ○ ○	77 ○ ○
S D	S D	S D	S D
18 ○ ○	19 ○ ○	48 ○ ○	78 ○ ○
S D	S D	S D	S D
19 ○ ○	20 ○ ○	49 ○ ○	79 ○ ○
S D	S D	S D	S D
20 ○ ○	21 ○ ○	50 ○ ○	80 ○ ○
S D	S D	S D	S D
21 ○ ○	22 ○ ○	51 ○ ○	81 ○ ○
S D	S D	S D	S D
22 ○ ○	23 ○ ○	52 ○ ○	82 ○ ○
S D	S D	S D	S D
23 ○ ○	24 ○ ○	53 ○ ○	83 ○ ○
S D	S D	S D	S D
24 ○ ○	25 ○ ○	54 ○ ○	84 ○ ○
S D	S D	S D	S D
25 ○ ○	26 ○ ○	55 ○ ○	85 ○ ○
S D	S D	S D	S D
26 ○ ○	27 ○ ○	56 ○ ○	86 ○ ○
S D	S D	S D	S D
27 ○ ○	28 ○ ○	57 ○ ○	87 ○ ○
S D	S D	S D	S D
28 ○ ○	29 ○ ○	58 ○ ○	88 ○ ○
S D	S D	S D	S D
29 ○ ○	30 ○ ○	59 ○ ○	89 ○ ○
S D	S D	S D	S D
30 ○ ○	31 ○ ○	60 ○ ○	90 ○ ○

**PART 6  
OBJECT MATCHING**

PART 6 PRACTICE			
A B C D	A B C D	A B C D	A B C D
1 ○ ● ○ ○	22 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
2 ○ ○ ○ ○	23 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
3 ○ ○ ○ ○	24 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
4 ○ ○ ○ ○	25 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
5 ○ ○ ○ ○	26 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
6 ○ ○ ○ ○	27 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
7 ○ ○ ○ ○	28 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
8 ○ ○ ○ ○	29 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
9 ○ ○ ○ ○	30 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
10 ○ ○ ○ ○	31 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
11 ○ ○ ○ ○	32 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
12 ○ ○ ○ ○	33 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
13 ○ ○ ○ ○	34 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
14 ○ ○ ○ ○	35 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
15 ○ ○ ○ ○	36 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
16 ○ ○ ○ ○	37 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
17 ○ ○ ○ ○	38 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
18 ○ ○ ○ ○	39 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
19 ○ ○ ○ ○	40 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
20 ○ ○ ○ ○	41 ○ ○ ○ ○	A B C D	A B C D
A B C D	A B C D	A B C D	A B C D
21 ○ ○ ○ ○	42 ○ ○ ○ ○	A B C D	A B C D

1 inch \*Test results may be inaccurate unless this answer sheet is printed at full scale on legal-size paper.

*Online Survey of Self-Report Scales*

## 1. Demographics

**INTRODUCTION**

This online survey is Part 2 of the Abilities and Career Choice Project. You should have received a link to this survey by e-mail after completing an in-person assessment of your abilities. Your continued participation in this study is completely voluntary and confidential, and you may refuse to participate or leave the study at any time.

**QUESTIONS OR PROBLEMS**

You are encouraged to ask questions at any time during this study. For further information about the study contact Patrick Armstrong, Ph.D., at 515-294-8788, pia@iastate.edu.

If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office for Responsible Research, Iowa State University, Ames, Iowa 50011.

**INSTRUCTIONS**

The survey questions for this research project appear on the next 8 pages. A progress bar at the bottom of each page will indicate how much of the survey you have completed.

If you would like to continue participating in this study, please complete the information requested below then click the 'next' button at the bottom of this page. If you decide at any point that you would not like to continue in the study, you can use the 'exit survey' button at the top of each page of the survey to end your participation.

**1. Name**

  
**2. Student ID Number**  
**3. NetID**  
**4. Age**  
**5. Gender**

Female

Male

**6. Racial or Ethnic Identity**

- White (European American)  
 African American  
 Hispanic/Latino  
 Asian or Asian American  
 Native American  
 Biracial/Multiracial  
 Other (please specify)

\_\_\_\_\_

**7. Year in School**

- Freshman  
 Sophomore  
 Junior  
 Senior  
 Graduate Student  
 Other (please specify)

\_\_\_\_\_

**8. Current GPA**

\_\_\_\_\_

**9. Age**

\_\_\_\_\_

**10. How satisfied are you with your current major?**

- Very Satisfied  
 Satisfied  
 Somewhat Satisfied  
 Neither Satisfied or Dissatisfied  
 Somewhat Dissatisfied  
 Dissatisfied  
 Very Dissatisfied

**11. Please list any previous majors**

\_\_\_\_\_

**12. What are some careers you have considered?**

First Choice:

Second Choice:

Third Choice:

**13. Of the careers you have considered, which one you most like to have?**























## 8. Debriefing Form

### Debriefing Form – Abilities and Career Choice Project

Thank you for participating in Abilities and Career Choice Project. This study is an investigation of assessments that are used in vocational and counseling psychology research and in career counseling conducted by Patrick Armstrong, Ph.D. from the counseling psychology program, Department of Psychology, Iowa State University.

The primary objective of this project is to learn more about how students' perceptions of themselves and the educational environment impact career and college major choices. The psychological attributes under investigation in this study are abilities, interests, self-efficacy, personality, career attitudes, and perceptions of the educational environment. It is hoped that the information gained in this study will benefit society by contributing to the understanding of vocational and personality assessments, and to the understanding of career choices.

We asked for your participation in this study because you are currently enrolled in a psychology class at Iowa State University. Your participation in this study has made an important contribution towards the completion of the project. If you are interested in receiving a copy of the study results, please complete the form at the bottom of this page. Please remember that your participation in this study is voluntary and you are free to withdraw from this study at any time without penalty. Your decision to participate or not participate in this study will not have an effect on your grade in any course you take as a student at Iowa State University. As mentioned before, all responses will be kept confidential. Your responses will be kept in a locked cabinet, in a locked office, and on password protected computers.

If you have any concerns about this study, please direct your questions to Patrick Armstrong at 294-8788 (e-mail: pia@iastate.edu). If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office for Responsible Research, Iowa State University, Ames, Iowa 50011.

If participation in this study raised personal concerns that you would like to discuss with a counselor, there are community resources listed below. If you are interested in learning more about how the personal psychological attributes involved in this study relate to career exploration and development, please contact the ISU Career Exploration Service.

#### Community Resources

Student Counseling Services: 3rd Floor Student Services Building, 294-5056.

Career Exploration Service: 2nd Floor Student Services Building, 294-0742.

Career Services website:

<http://www.public.iastate.edu/~stdtcouns/Careerservices2.htm>

Richmond Center: 1619 South High Street, Ames, IA. 232-5811.



## ACKNOWLEDGEMENTS

I would sincerely like to thank everyone who has contributed to this project and supported me throughout this endeavor. First, I would like to thank my major professor, Dr. Patrick Armstrong, for his advice, feedback, and encouragement over the duration of my time studying at Iowa State University: Thank you for introducing me to the field of vocational psychology! Additionally, I appreciate all of the assistance my committee members provided to me on this project. I would also like to extend a thank you to all of the undergraduate research assistants working in the Identity Development Laboratory who have administered the Ability Profiler to hundreds and hundreds of college students. Also, I truly have been thankful for all of the loving support provided to me by my parents (Jim and Nancy Allison) younger brother (Austin Allison), my grandmother (Jean Allison), and the rest of my amazing family. Last but definitely not least, I would like to express huge gratitude to my husband, Jake, who has been the largest source of encouragement, support, care, humor, and love for me during my journey through this project. Thanks all of y'all!