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Covariates of sex differences in RIASEC interests and confidence scores

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Covariates of sex differences in RIASEC interests and confidence scores

by

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ABSTRACT

The current study examined the extent to which perceptions of occupations, gender identity, and learning experiences impact the magnitude of observed sex differences on interest and confidence in the People-Things and Data-Ideas dimensions that underlie Holland's model of vocational interests. Measures of the perceptions of the prestige and sex ratio of occupations, Bem's (1974) masculinity and femininity constructs, and learning experiences will be used as covariates in a series of multivariate analyses of covariance (MANCOVA) examining sex differences in interests and confidence. Large sex differences were found in interest and confidence along the People-Things dimension, and small sex differences were found in interests and confidence along the Data-Ideas dimension. Sex differences retained a significant impact on interest and confidence in all analyses despite finding many significant covariates. Implications for career counseling and limitations are also discussed.

CHAPTER 1. INTRODUCTION

Career decision-making is often thought of as an ongoing process. For high school and college students, interest inventories are often used to assist with this sometimes arduous endeavor of choosing academic majors and career aspirations, and it has been shown that these interest measures are effective predictors of these outcomes (Gasser, Larson, & Borgen, 2004, 2007; Campbell, 1971). Many of these career-related interest inventories are self-report measures based on Holland's (1959, 1997) theory of vocational personality types and work environments. The importance of the Holland model of vocational interests and work environments over the past few decades has been discussed by a number of researchers, suggesting that Holland's theory is the main model for conceptualizing vocational interests (Borgen, 1986; Rounds, 1995; Rounds & Day, 1999). However, sex differences are frequently observed for self-report measures, especially along the People-Things interest dimension that underlies Holland's model (Lippa, 1998, 2005; Su, Rounds, & Armstrong, 2009). In particular, sex differences in interests may contribute to the poor representation of women in fields, such as Science, Technology, Engineering, and Mathematics, known as STEM occupations (Lubinski & Benbow, 2006).

The under-representation of women in these STEM occupations needs to be examined, considering that these occupations tend to be some of the better paying occupations, which perpetuates the problem of women being paid less than men in the world of work. This effect has been labeled as the "glass ceiling" that hinders women from advancing into higher positions or more lucrative careers due to culturally-embedded assumptions that women's skills and competencies are fewer than men's competencies (Eriksson-Zetterquist & Styhre, 2008). In fact, the Census 2000 Special Report documented that the average earnings of men equaled $50,000, while the average earnings for women equaled $33,000. This $17,000 deficit in the amount of

money women earn on average may be attributed to this under-representation of women in these STEM occupations. Therefore, it is necessary to examine what may be contributing to these sex differences in interest assessments in order to deliver accurate messages to students about their interests so that they are able to make informed occupational choices.

The present study will examine factors that may contribute to these observed sex differences in interests and confidence, including perceptions of the world of work, gender identity, and learning experiences. In this study, perceptions of the world of work are referring to perceptions of the amount of money earning in specific occupations, as a measure of prestige of occupations, and the ratio of the number of men and women in specific occupations, as a measure of sex-type of occupations. Gender identity refers to Bem's (1974) construct of masculinity and femininity as relatively independent traits. Masculine gender identity is the degree to which an individual adheres to society's standards of how a man should behave, while feminine gender identity is the degree to which an individual adheres to society's standards of how a woman should behave. Learning experiences in this study is a measure of the extent to which individuals have had experiences with Bandura's four sources of self-efficacy information: performance accomplishments, vicarious learning, verbal persuasion, and physiological or emotional arousal. Multivariate Analyses of Covariance (MANCOVA) will be utilized to assess the extent to which occupational perceptions, gender identity, and learning experiences are related to Holland's vocational interest space. Implications for career counseling, as well as limitations and future directions, will also be discussed.

CHAPTER 2. LITERATURE REVIEW

Holland's RIASEC Model

Holland (1959, 1997) proposed using six interest-based categories for classifying individuals and work environments: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional, also referred to as the RIASEC model. As outlined in Holland (1997), each type represents a synthesis of preferences for work and other individual differences attributes:

Realistic. An individual with Realistic interests likes working with one's hands, working outdoors, manipulating machinery, and typically involves 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. Realistic individuals may lack ability in human interactions and 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, may lack ability in persuasion and interpersonal skills, and 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, may lack organizational ability and office skills, and 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; however, they might not enjoy nor have skill in mechanical and technical types of activities. 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, making many decisions and 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 or where lots of scientific ability is required. 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.

Interest Structure

Holland (1959, 1997) proposed that an individual's type is derived from a large set of factors, such as biology, values, self-concept, physical environment, perceptions of environment, culture, and peers. Also, Holland (1996) indicated that in order for an individual to succeed in an environment, it is necessary that he/she seek out an environment that is congruent with his/her own type. Holland stated that the congruence between an individual's interests and work environment leads to greater satisfaction and stability in a career path. On the other hand, when an individual's interests and work environment are mismatched, this leads to what Holland terms *incongruence*. Incongruence between an individual's interests and work environment leads to dissatisfaction and instability in a career path.

A two-dimensional spatial model of the types was proposed by Holland, Whitney, Cole, and Richards (1969), using a hexagon to represent the inter-relations between the types, ordered clockwise R-I-A-S-E-C. As indicated by Figure 1, the degree of similarity between any two types is inversely proportional to the distances between them in the hexagon. Types that are closer in proximity to one another are more similar than ones on the opposite side of the hexagon. For example, the Realistic type is on one side of the hexagon, and the Social type is positioned on the opposite side of the hexagon, which indicates that these two types are dissimilar; whereas, the Investigative type is situated next to the Realistic type, which demonstrates that these two types possess more similar characteristics.

Meta-analyses of studies reporting correlations among RIASEC interest types have generally supported the circular order structure of Holland's model (Rounds & Tracey, 1993). 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 environment based on the types of individuals that compose the environment. Areas of the spatial model where the 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).

Despite the utility of the Holland model, it has been called into question whether the RIASEC structure as a circumplex is able to be replicated with United States minority samples. A recent study completed by Fouad (2002) examined this issue with a large sample of professional adults and college students, comparing 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, and utilizing the randomization test of hypothesized order, 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.

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 minority sample data from the Strong Interest Inventory (SII; Donnay, Morris, Schaubhut, & Thompson, 2005) and the UNIACT (ACT, 1995). 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 we can utilize the RIASEC model or close approximations of the RIASEC model across different minority groups in the United States with much more confidence that it is generalizable to these groups, although much more research needs to be completed in this area.

People-Things and Data-Ideas Dimensions

As illustrated in Figure 1, Prediger (1982) proposed two underlying dimensions associated with Holland's RIASEC model: People-Things and Data-Ideas. The Ideas side of the Data-Ideas dimension lies between the Investigative and Artistic Holland types, while the Data side of the Data-Ideas dimension lies between the Enterprising and Conventional Holland types. For the People-Things dimension, the Things side corresponds with the Realistic Holland category, and the People side corresponds with the Social Holland category. These dimensions are based off of four work task categories that were developed by Prediger (1976). The Things task involves tasks that are non-personal in nature and may involve working with tools or machines, while the People task involves tasks that are interpersonal in nature, like caring for or leading others. The Data task involves tasks that are impersonal in nature and involves facts and systematic procedures, and the Ideas task involves tasks that are intrapersonal in nature, such as dealing with theories and insights. In his initial study, Prediger (1982) found support for these dimensions by analyzing the factor structure of interest scores of 11,275 individuals and the mean interest scores of 53,429 individuals from multiple samples. Tracey (1997) also found support for the People-Things and Data-Ideas dimension for abilities, demonstrating support for these dimensions beyond interests.

A recent study by Prediger and Swaney (2004) examined the fit of the People-Things dimension and Data-Ideas dimension as related to individual's interest, as well as the world of work. Assessing the general nature of work, the detailed nature of work, and the interests of workers in three different databases, the researchers obtained intercorrelation matrices and examined the dimensional structure by performing the Targeted-Factor Extraction Procedure (T-FEP). This analysis allowed the researchers to look at how well this data corresponds to the theoretical People-Things and Data-Ideas dimension locations by plotting this data in a two-dimensional space. The researchers derived the People-Things dimension and the Data-Ideas dimension in all three databases, providingfurther support of the presence of the People-Things dimension and the Data-Ideas dimension underlying Holland's RIASEC model.

Sex Differences in Interests

Sex differences in RIASEC interests have been found to be largest along the People-Things dimension with women expressing more interest in People-oriented activities and occupations than do men, and men expressing more interest in Things-oriented activities and occupations (Su et al., 2009). Estimates of the magnitude of sex differences in the People-Things dimension are of at least 1.20 standard deviations units with effect sizes ranging from .08 to .79 (Lippa, 1998, 2005; Su et al., 2009).

In his 2005 study, Lippa conducted four separate studies where he examined 4479 participants' interests in occupations in order to determine if sex differences are present in occupational interests. In these four studies, Lippa labeled sex-linked occupations as those that correlated with sex at a level of .15 or greater. After identifying these sex-linked occupations, Lippa completed principal component analyses and discovered that there are distinct masculine subdomains and feminine subdomains in occupational interests. Lippa labeled the masculine

subdomains that appeared consistently across the four studies as "blue-collar realistic," "educated realistic," and "flashy, risk-taking," while the feminine subdomains were labeled as "fashion-related," "artistic," "helping," and "children-related." Furthermore, Lippa (2005) concluded that these sex differences form a cohesive, bipolar individual difference dimension that lies on the People-Things dimension.

Lippa's (2005) study suggests that women tend to be more interested in working in occupations where they are able to help, teach, or care for others, and men tend to have more interest in working in occupations where they are able to work with their hands, work outdoors, or perform athletic activities. Other research has also demonstrated that men tend to be more interested in Realistic and Investigative activities, which also supports Lippa's postulation (Weinrach, 1996). These findings may be artifacts of the idea that men may have fewer acceptable gender-related work environments than women (Hayes, 1986). For many men, it may appear that Realistic and Investigative occupations and activities are the most masculine, and therefore, the most appealing; on the other hand, Social occupations and activities are viewed as more feminine and are not within males' acceptable options. In fact, another study concluded that men who have traditionally feminine occupations or interests tend to be more feminine themselves, while males who enter more traditionally masculine occupations tend to be more masculine (Chusmir, 1990; Gianakos & Subich, 1988).

Past research has demonstrated that men and women tend to be more similar than different in multiple areas (Hyde, 2005); however, interest measurement is one area where men and women tend to differ substantially. Lippa argues that the presence of these sex differences along the People-Things dimensions demonstrates a concrete method of measuring gender, labeled Gender Diagnosticity (GD; Lippa, 1998). One who endorses "male-like" interests, such

as Realistic interests, would be labeled as more masculine; whereas, one who endorses "female-like" interests, such as Social interests, would be labeled as more feminine. More research needs to be done on issues around sex and interests in order to better understand what is contributing to these differences in interests between and within the sexes.

The Impact of Self-efficacy

Other theories of interest development center on the influence of self-efficacy, developed from Bandura's social cognitive theory (1977, 1986). Self-efficacy is defined as an individual's beliefs about his/her ability to perform an activity successfully (Bandura, 1977). Betz (2000) and Lent and Brown (2006) discuss that self-efficacy is not an attribute that an individual possesses in general: self-efficacy refers to an individual's belief that he/she can successfully perform a specific activity. Furthermore, Betz summarizes a few components that impact an individual's perceived self-efficacy regarding an activity, some of which include performance accomplishments, vicarious learning, emotional arousal, social persuasion, approach versus avoidance, performance, and persistence.

The initial application of self-efficacy theory to vocational decision-making examined men and women's self-efficacy in ten traditionally masculine occupations and ten traditionally feminine occupations (Betz & Hackett, 1981). In this pioneer study, the researchers discovered that sex differences were present in occupational self-efficacy: men tended to have similar levels of self-efficacy for both traditionally masculine occupations and traditionally feminine occupations. On the other hand, women tended to have higher levels of self-efficacy for traditionally feminine occupations, while they had much lower levels of self-efficacy for traditionally masculine occupations. These findings are particularly important in considering the

low numbers of women in traditionally masculine occupations, as well as demonstrating the importance in considering the impact of self-efficacy in occupational choices.

Social Cognitive Career Theory (SCCT) proposes that interest development is influenced by self-efficacy beliefs (Lent, Brown, & Hackett, 1994). With the development of self-efficacy beliefs and interests in an occupational area, one is more likely to pursue this occupation. SCCT differs from the widely utilized Holland model in that the researchers that proposed SCCT believe that self-efficacy beliefs develop before interests and then subsequently impact an individuals' interests; on the other hand, Holland proposed a model of person-environment fit where both interests and self-efficacy come together to impact occupational decision-making.

In a recent study, Rottinghaus, Larson, and Borgen (2003) performed a meta-analysis of the current vocational psychology literature in order to examine the link between self-efficacy and interests across Holland's RIASEC types. Scouring published articles, unpublished articles, books, and dissertations, the researchers statistically analyzed 37,829 individuals' interests and self-efficacy ratings. It was found that measures of self-efficacy are positively correlated with interest measures with an overall correlation of .59. Also, the researchers determined that these results were impacted by which measure was utilized in the studies: all six RIASEC types had stronger associations between self-efficacy and interests on the Campbell Interest Inventory Skills Survey (CISS; Campbell, Hyne, & Nilsen, 1992) than the Skills Confidence Inventory (SCI; Betz, Borgen, & Hackett, 1996) and Strong Interest Inventory (SII; Donnay, Morris, Schaubhut, & Thompson, 2005). Furthermore, the researchers discovered that there is a stronger association between interests and self-efficacy for men on the Realistic, Social, and Conventional types than for women.

Additionally, interests and confidence can also be conceptualized as overlapping indicators of the RIASEC types (Armstrong & Vogel, 2009). 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 48 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. Linking both interests and self-efficacy beliefs to the Holland model will assist career counselors in helping students make career decisions by being able to examine potential discrepancies in individuals' interests and confidence, which would prompt further exploration in these areas for individuals seeking career assistance.

Occupational Images: Sex-type and Prestige

Perceptions of the world of work may be a factor contributing to sex differences in interest and confidence. Gottfredson (1981) introduced a theory that postulated that individuals

possess both images of themselves and occupations: self-concepts and occupational images. Self-concept is defined as who an individual is, who an individual is not, and who an individual wants to be, while occupational images are comprised of an individual's view of the sex-type, prestige, and the field of work, which encompass Gottfredson's cognitive map of occupations. According to Gottfredson's theory, career aspirations are developed according to the compatibility of an individual's self-concept and his/her cognitive map of occupations. If there is a high level of compatibility, the individual will have a high preference for that occupation. If there is a low level of compatibility between the person's views of himself/herself and an occupation, the individual will not likely prefer this occupation.

The sex-type of occupations is the view an individual holds regarding how masculine or feminine an occupation is, while the prestige of an occupation is typically described as the earning power one would obtain in this occupation, how much education the occupation requires to attain, or the desirability of the occupation. In a recent study, Tracey & Rounds (1996) proposed adding prestige as a third dimension in the RIASEC model alongside the People-Things and Data-Ideas dimensions. The researchers examined the presence of a prestige dimension in interest space by looking at 266 college students' responses on the Vocational Preference Inventory (VPI; Holland, 1958), as well as their responses to 111 occupations that the researchers also included in the study in order to encompass a wider range of prestige in occupations. They found support for all three dimensions, represented as a spherical structure, suggesting that prestige and sex-type of occupations are two different constructs when it comes to individuals' interests.

More recent research has found similar results: Sodano & Tracey (2008) found that prestige is considered a separate factor than sex-type in students' interests in activities. The

participants in this study were 391 college students who were asked to complete the Personal Globe Inventory (PGI; Tracey, 2002), as well as a content rating section where the students were asked to rate the degree to which activities involved prestige, effort, skill, and competition. By performing exploratory component analysis and a vector fitting approach, the researchers discovered that prestige is a separate dimension than sex-type that lies alongside interests.

Research has demonstrated that sex differences exist in both the sex-type and prestige of preferred career choices. Gifted adolescent boys were shown to pursue more prestigious occupations than gifted adolescent girls. In comparison, gifted adolescent girls identified wider ranges of acceptable occupations, as measured by sex-type, than did adolescent boys (Mendez & Crawford, 2002). Day and Rounds (1997) also postulated that the interest space may be different for men and women. It was shown that two different dimensions exist for each sex on the Basic Interest Scales of the Strong Interest Inventory. For men, the Basic Interests tended to be grouped by sex with People-oriented interests together on one end of the dimension and Things-oriented interests on the other end of the dimension. For women, the Basic Interests were grouped by a prestige or status dimension. High status jobs were grouped on one end, while lower status jobs were grouped on the other end of the dimension.

While perceptions of sex-type and prestige of an occupation are two distinct constructs, they are often interrelated. Einarsdottir and Rounds (2000) found that masculine occupations vary from low to high prestige, but feminine occupations tend to cluster around low to medium levels of prestige. Also, prestige ratings seem to vary by Holland type. Deng, Armstrong, & Rounds (2007) examined United States occupations to assess their fit to the Holland model. The researchers also compared a two-dimensional model and three-dimensional model to determine which would be able to best capture the People-Things and the Data-Ideas dimensions as

proposed by Prediger (1982). The researchers also assessed the presence of sex-type and prestige dimensions. The responses of 838 college students from a large Midwestern university were examined, and it was determined that only in the three-dimensional structure do all of these dimensions emerge. Furthermore, it was found that prestige is orthogonal to sex-type and the People-Things dimension. Realistic and Conventional occupations were associated with having the lowest amount of prestige, while Artistic and Investigative occupations were associated with having the highest amount of prestige. Research also suggests that men may be more willing to choose a traditionally male job of lower prestige than a more traditionally feminine occupation of higher prestige (Leung & Plake, 1990).

Gender Identity

While past research has indicated that men and women tend to possess interests in different types of activities and occupations, it may be beneficial to examine the variation of interests within each sex; furthermore, it may be interesting to consider a different way of conceptualizing sex in relation to interests that goes beyond Lippa's idea of Gender Diagnosticity. For example, gender identity, the extent to which individuals view themselves as either masculine or feminine, may influence interests and confidence on the People-Things dimension (Lippa, 2005). The Bem Sex Role Inventory (BSRI; Bem, 1974) was developed by utilizing men and women's ratings of the relative desirability of traits for men and women. By proceeding with the scale development in this fashion, Bem was able to construct a sex role inventory where the masculinity and femininity scales were not based on the differences in how men and women endorsed the items. In the BSRI, masculinity and femininity are defined as relatively independent traits, creating the possibility that individuals can identify with traits associated with either (or both) genders. Considering this possibility, it may be beneficial to

analyze how individuals' levels of masculinity, femininity, and androgyny relate to interest measurement rather than just labeling someone "masculine" as one who has "male-like" interests or labeling someone "feminine" as one who has "female-like" interests.

In recent years, research on the BSRI has led to questions regarding its factor structure (Choi & Fuqua, 2003). For example, seven first-order factors were found to underlie the higher-order masculine and feminine factors in the BSRI in a study of 665 college students (Choi, Fuqua, & Newman, 2007). The seven first-order factors have been labeled as compassionate, interpersonal affect, shy, decisive, dominant, athletic, and self-sufficient, while the two higher-order factors are still labeled as masculine and feminine. The factors called compassionate, interpersonal affect, and shy correlate positively with the feminine factor, and the factors labeled decisive, dominant, athletic, and self-sufficient correlate positively with the masculine factor.

With research demonstrating that there may be actually seven first-order factors that underlie masculinity and femininity, it has been argued that it may be beneficial to regard the BSRI as multidimensional and hierarchical in future analyses (Blanchard-Fields, Suhrer-Roussel, & Hertzog, 1994; Choi et al., 2008). With the potential multidimensional nature of the BSRI, much richer analyses of what constitutes masculinity and femininity may be completed around the area of interest assessment and career choice rather than merely looking at masculinity and femininity as narrower constructs. Despite these concerns, the BSRI was found to effectively predict the sex of 92% of respondents in the Choi et al. (2007) study.

In her 1974 article, Bem argued that an individual who scores highly on the masculinity scale has internalized society's view on how men should behave, while an individual who scores highly on the femininity scale has internalized society's view on how women should act. Bem also states that individuals have high motivation to maintain behaviors consistent with their

internalized gender identities. For example, a man with a high masculinity gender identity will be motivated to behave in a masculine way and will likely develop interest and confidence in areas that are considered masculine. Also, a woman with a high feminine gender identity will be motivated to behave in a feminine way and will likely develop interest and confidence in areas that are considered feminine.

However, a 1994 meta-analysis of the changes in masculinity and femininity scores on the BSRI (Twenge, 1997) indicated that both men and women's masculinity sex role scores have increased significantly over the course of the last few decades. The knowledge that perception of gender identity is a malleable construct makes the usage of the BSRI ever more important rather than only examining biological sex. Individual differences in the perception of masculinity and femininity, combined with biological sex and other influences, may be an important factor contributing to sex differences in interests, confidence, and occupational choices.

Learning Experiences

Learning experiences influence the development of self-efficacy and interests in the SCCT model (Lent et al., 1994); therefore, sex differences in learning experiences may influence sex differences in interest and confidence on the People-Things dimension. In order to measure the effect of learning experiences, Schaub (2004) developed the Learning Experiences Questionnaire, which measures four learning experiences based off of Bandura's four sources of self-efficacy information (Bandura, 1986).

The four sources of self-efficacy information are labeled as performance accomplishments, vicarious learning, verbal persuasion, and physiological or emotional arousal. Bandura recognized that successfully accomplishing a task builds self-efficacy, while not being able to successfully complete a task hinders the development of self-efficacy for that task. Also,

if an individual has the opportunity to witness another person succeed at a given task, it is likely that person would believe that it is possible for him/her to complete the task as well. Bandura also states that if an individual receives lots of positive feedback about his/her abilities to complete a task successfully, this individual may build his/her self-efficacy regarding this task. Furthermore, the emotional state that an individual is experiencing while attempting a task may impact the level of self-efficacy he/she develops for this task.

The Learning Experiences Questionnaire (LEQ) takes these sources of self-efficacy as different learning experiences an individual may encounter and measures them along each Holland RIASEC type, which makes up the twenty four subscales of the LEQ. Past research has utilized this measure in order to examine the SCCT model. In particular, researchers have analyzed whether learning experiences mediate the pathway between person inputs, such as personality and gender, and self-efficacy and interests. One such study by Schaub and Tokar (2005) found that learning experiences are a partial mediator of the relation between personality and interests, indicating that learning experiences account for at least some impact on the development of interests. They also discovered that learning experiences contribute positively to corresponding self-efficacy perceptions for each of the Holland types.

Williams and Subich (2006) examined whether sex differences exist in learning experiences. The researchers found that there were sex differences in Realistic, Investigative, and Social learning experiences with women reporting fewer learning experiences in Realistic and Investigative areas and men reporting fewer learning experiences in the Social area. These learning experiences were found to significantly predict self-efficacy scores for both men and women.

A study by Tokar, Thompson, Plaufcan, and Williams (2007) examined the roles of personality, sex, and conformity to gender role norms in learning experiences. All of these factors were found to contribute to RIASEC-based learning experiences. Women tend to report more positive learning experiences for the Artistic and Social areas; whereas, men reported more positive learning experiences in Realistic, Investigative, and Enterprising areas. In particular, the researchers discovered that there was a direct effect of sex on Realistic, Investigative, and Social learning experiences. Furthermore, for both the Realistic and Social models tested, sex contributed directly to Realistic and Social learning experiences, as well as indirectly through gender role norms. The effects of conformity to gender role norms on learning experiences are seen with adherence to masculine role norms relating positively to Realistic and Enterprising learning experiences and negatively related to Social learning experiences. Adherence to feminine role norms was found to relate positively to Social and Artistic learning experiences.

Overview of the Present Study

The primary objective of the present study is to examine the relative influence of factors that may contribute to sex differences in interests and confidence on the People-Things dimension. Measures of the perceptions of the prestige and sex ratio of occupations, Bem's (1974) masculinity and femininity constructs, and learning experiences will be used as covariates in a series of multivariate analyses of covariance (MANCOVA) examining sex differences in interests and confidence. Analyses of sex differences in interests and confidence along the Data-Ideas dimension and covariates will also be examined. It is predicted that covariates will be significant and will reduce the magnitude of sex differences in interests and confidence along the People-Things dimension. Small effects are hypothesized to be found along the Data-Ideas dimension. It also is predicted that the impact of covariates will be cumulative, where each

covariate will retain a significant contribution when all of the variables are entered at the same time and that the reduction in magnitude of sex differences will be largest when considering all of the covariates together. However, in considering Lippa's (1998) postulation that sex differences along the People-Things dimension is a unique construct and a concrete method of measuring gender, it is possible that despite controlling for gender identity and other covariates that there may still be a significant sex difference in interests and confidence along the People-Things dimension in the final MANCOVA model.

CHAPTER 3. METHOD

Participants

Participants were recruited from the subject pool of a psychology department at a large Midwestern university. Students were enrolled in introductory-level psychology courses and agreed to participate in the current study in exchange for course credit. A total of 418 college students (248 female, 170 male) completed survey packets and the other research instruments included in the study. The mean age of the participants was 19.47 years with a range from 17 to 37 years of age. Thirty two of the participants were seniors, 68 were juniors, 137 were sophomores, and 181 were freshman. Seven participants self-identified as African-American, 9 self-identified as Asian-American, 374 self-identified as Caucasian, 6 self-identified as Latino(a) American, and 22 indicated other.

Measures

RIASEC Interests and Confidence. The activity-based scales from the 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. reported that the internal consistency reliabilities for the AFPD activity scales had coefficient alphas ranging from .79 to .94 with a mean of .88 (Table 1). 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 (Table 2). 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; participants were asked to rate how much they would like to perform the work activity using a 5-point Likert-type response format, ranging 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 scale. A list of Set A and Set B activities is provided in the Appendix. Participants were asked to rate how much confidence they had 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 in the current study. Coefficient alpha estimates of internal consistency with the two sets of AFPD activity scales ranged from .80 to .93 with a mean of .88 in the current study.

Occupational Ratings. The occupation-based scales from the AFPD markers (Armstrong et al., 2008) were used to measure participants' ratings of the prestige and sex-type of occupations for each of Holland's RIASEC types. Each RIASEC scale consists of eight items selected from the O*NET database (Peterson, Mumford, Borman, Janneret, & Fleishman, 1999). Armstrong et al. (2008) reported that the internal consistency reliabilities for the AFPD occupational scales had coefficient alphas ranging from .78 to .88 (Table 3). Convergent validity between the 8-item occupation-based scales and the brief activity-based scales ranged from .73 to .86 with a mean of .78 (Table 4).

Participants responded to the 48 AFPD Set A occupation items in the Perceptions of Occupational Income scale, rating how much income a person would make in each job, in comparison to all other jobs, using a 5-point Likert-type response format, ranging from 1 (Lower income than most other jobs) to 5 (Higher income than most other jobs). Participants also responded to the 48 AFPD Set B occupation items in the Perceptions of Sex Ratio at Work scale, rating the relative number of men and women employed in the occupation, using a 5-point Likert-type response format, ranging from 1 (Mostly men employed in this job) to 5 (Mostly women employed in this job). A list of Set A and Set B occupations is included in the Appendix.

Coefficient alpha estimates of internal consistency with the two sets of AFPD occupation scales ranged from .46 to .89 with a mean of .68 in the current study. Kendall's coefficient of concordance was utilized to assess for participant agreement on the number of men and women and amount of money perceived to be associated with these occupations. A score of 0 indicates no agreement among participants on the amount of money or number of men and women associated with the occupations, while a score of 1 indicates complete agreement among participants. We obtained a Kendall's coefficient of concordance score of .581 when we analyzed the perceptions of the amount of money total scale scores by RIASEC type, while we obtained a Kendall's coefficient of concordance score of .879 when we transformed these scores into the People-Things and Data-Ideas dimensions. We obtained a Kendall's coefficient of concordance score of .715 when we analyzed the RIASEC total scale scores of perceptions of the number of men and women in occupations. When we transformed the scores into the People-Things and Data-Ideas dimensions, we obtained a Kendall's coefficient of concordance of .818, suggesting agreement among participants on the number of men and women in these occupations.

Gender Identity. The Bem Sex-Role Inventory (BSRI; Bem, 1974) was utilized in this study in order to examine the masculinity and femininity of the participants. Sixty personality characteristics comprise the BSRI: Twenty items judged to be desirable traits for men, twenty items judged to be desirable for women, and twenty items judged to be neither masculine nor feminine. Participants receive three scores on the BSRI. The Masculinity score is calculated from the mean ratings of all endorsed masculine items with scores ranging from 1 (lower Masculinity score) to 7 (higher Masculinity score). The Femininity score is calculated in the same manner by examining the mean ratings on all endorsed feminine items with scores ranging from 1 (lower Femininity score) to 7 (higher Femininity score). The Masculinity score and the Femininity score are independent of one another. The Androgyny score is calculated by "difference between an individual's masculinity and femininity normalized with respect to the standard deviations of his or her masculinity and femininity scores" (Bem, 1974). As the Androgyny score approaches zero, the participant is more androgynous.

Internal consistency reliabilities for the BSRI scales have been found to be high with coefficient alphas of .83 for the Femininity scale and .86 for the Masculinity scale, indicating high internal consistency of the items representing each scale (Choi, Fuqua, & Newman, 2007). Also, test-retest reliability was found to range from .56 to .68 by Yanico (1985) for the three scales in a second administration of the BSRI four years after the initial administration in a sample of college-age women. Bem (1974) examined convergent validity of the BSRI by comparing subjects' scores on the California Psychological Inventory (CPI) and the Guilford-Zimmerman Temperament Survey, which have been utilized in past research to assess sex-roles of individuals. It was found that the BSRI correlated with the CPI but not with the Guilford-Zimmerman Temperament Survey. It was also found that male participants scored higher on the

Masculinity scale than the Femininity scale, and female participants scored higher on the Femininity scale than the Masculinity scale as expected.

In the Bem Sex-Role Inventory, participants typically respond to the sixty personality adjectives on the following scale: 1 ("Never or almost never true") to 7 ("Always or almost always true"); however, in the current study, participants were asked to respond to the degree to which the personality adjectives accurately represent themselves on a 5-point Likert-type response format, ranging from 1 (Very inaccurate) to 5 (Very accurate). The internal consistency for the Masculinity scale for the current study was calculated as .84, and the internal consistency for the Femininity scale was calculated as .81.

Learning Experiences. Participants also completed the Learning Experiences Questionnaire (LEQ; Schaub, 2004). In considering the SCCT (Lent, Brown, & Hackett, 1994) model's emphasis on the impact that learning experiences have on the development on self-efficacy and interests, Schaub developed the LEQ to assess the impact of learning experiences within the RIASEC model framework. The LEQ consists of 120 questions to assess four learning experiences that are associated with each RIASEC type. Participants taking the LEQ are usually asked to rate their learning experiences along a 6-point Likert-type response format, ranging from 1 (Strongly Disagree) to 6 (Strongly agree); however, in the current study, participants were asked to rate their personal experiences and attitudes toward learning along a 5-point Likert scale to remain consistent with the 5-point Likert scales used throughout the study. The LEQ has demonstrated good internal consistency in past studies with alphas ranging from .73 to .89 (Schaub, 2004). Internal consistency scores for the current study ranged from .73 to .87 with a mean of .81. Research conducted with the LEQ suggests that this measure is an effective

predictor of self-efficacy beliefs (Schaub & Tokar, 2005; Williams & Subich, 2006). All survey material are included in the appendix.

Procedures

Undergraduates enrolled in an introductory psychology course chose to voluntarily participate in the current study from a list of studies on an online database. Individuals signed up for a time and came to the research laboratory where they were asked to carefully read an informed consent form that detailed the procedures, risks, benefits, costs, compensation, participant rights, and confidentiality of the study. If individuals wanted to participate in the study after reading the informed consent form, they signed and dated the informed consent form; however, participants were also informed that they could end their participation at any point without penalty.

Those that decided to participate were then asked to fill out a demographic sheet, which asked for the participants' ages, major programs of study, current grade point averages, sex, year in school, ethnic/cultural identities, and top occupational choices. After completing the demographic sheet, individuals filled out the BSRI.

After completing these tasks, students were given a packet to complete during the next week and were instructed to return the packet during lab hours by the end of one week's time. The packet included two surveys and two bubble sheets where students were asked to complete the interest measure, the self-efficacy measure, the Perceptions of Occupational Income scale, and the Perceptions of Sex Ratio at Work scale. Upon returning the packet, students received two credits that would be applied to their overall grade in their psychology courses. Students were also given a debriefing form that gave more information about the study, and they were also

given the opportunity to leave their email addresses to receive a results summary email when the study is completed.

Data Analyses

      To evaluate the contributions of occupational perceptions, gender identity, and learning experiences on sex differences in interest and confidence, a series of multivariate analyses of covariance (MANCOVA) were performed. Sex, as measured by the demographic questionnaire, was considered the independent variable, gender identity, as measured by the BSRI, acted as a covariate, and each Holland type, as measured by the activity-based interest and confidence scales, were dependent variables. The Perceptions of Sex Ratio at Work scale, Perceptions of Occupational Income scale, and the Learning Experiences Questionnaire were utilized as covariates to determine if learning experiences or occupation perceptions account for any of the effect between sex and the variables of interest and self-efficacy for the six RIASEC types. Before conducting these analyses, the variables were first scored to reflect the People-Things dimension and Data-Ideas dimension as proposed to underlie the RIASEC by following the formulas supplied by Prediger (1982). To perform the calculations to score the data to reflect the People-Things dimension, the following formula was used: $2(R - S) + I + C - A - E$. To perform the calculations to score the data to reflect the Data-Ideas dimension, the following formula was used: $1.7(E + C - I - A)$.

      It was hypothesized that the largest effect and largest sex differences would be found along the People-Things dimension, as proposed and found by Lippa (2005). However, Lippa discussed that he believes sex differences found in interest measures are not completely related to other measures of masculinity and femininity, such as the BSRI. This appears to be a complicated concept, stating that sex differences in interests are not related to other measures of

sex and could be interpreted in another way. The current study proposed that these measures will be related, and by controlling for the effects of different levels of self-identified masculinity and femininity in these analyses, one can focus on the true sex differences in the measurement of interests and confidence; furthermore, it is proposed that these differences will be smaller than the those found without controlling for gender identity because some of these sex differences in interests and confidence will be controlled for when gender identity differentiation is held constant. It is also purported that the effect of sex on interests and self-efficacy beliefs will be reduced with the addition of the covariates of the perceptions of number of men and women in occupations, amount of money earned in occupations, and participants' learning experiences.

In order to interpret the effects of the covariates on interests and confidence, Wilks' Lambda and an overall F test were utilized to examine the multivariate effect of sex, controlling for perceptions of occupations, gender identity, and learning experiences, on interests by measuring the total amount of variance in interests that can be attributed to sex. Furthermore, since past research has demonstrated that self-efficacy and interests are linked in Holland's RIASEC structure, the extent to which sex differences impact self-efficacy beliefs after controlling for the effect of learning experiences, gender identity, and perceptions of occupations was examined. It is anticipated that similar findings as in the interest measure will be uncovered.

CHAPTER 4. RESULTS

Means and standard deviations for all variables are presented in Table 5. The means and standard deviations for the interest and confidence variables were calculated along the People-Things and Data-Ideas dimensions for both men and women. The overall mean for the interest variable along the People-Things dimension is -2.9642 with a standard deviation of 3.231. The mean of the interest variable for women on the People-Things dimension is -4.3550 with a standard deviation of 2.655, while the mean of the interest variable for men on the People-Things dimension is -.935 with a standard deviation of 2.912. The overall mean for the interest variable along the Data-Ideas dimension was found to be -1.143 with a standard deviation of 3.329. The mean of the interest variable along the Data-Ideas dimension for women was found to be -1.1428 with a standard deviation 3.290, while the mean of the interest variable along the Data-Ideas dimension for men was found to be -.1337 with a standard deviation of 3.305.

The overall mean for the confidence variable along the People-Things dimension was found to be -.9602 with a standard deviation of 3.277. The mean of the confidence variable for women along the People-Things dimension was found to be -2.386 with a standard deviation of 2.774, while the mean of the confidence variable for men along the People-Things dimension was found to be 1.119 with a standard deviation of 2.814. The overall mean for the confidence variable along the Data-Ideas dimension was found to be 2.070 with a standard deviation of 2.898. The mean of the confidence variable for women along the Data-Ideas dimension was found to be 1.752 with a standard deviation of 2.832, while the mean of the confidence variable for men along the Data-Ideas dimension was found to be 2.533 with a standard deviation of 2.940.

Correlations between variables for men and women are presented in Table 6. A significant positive correlation was found between interest along the People-Things dimension and confidence along the People-Things dimension (r = .688, n = 418, p < .001, two tailed). A significant positive correlation was also found between interest along the Data-Ideas dimension and confidence along the Data-Ideas dimension (r = .598, n = 418, p < .001, two tailed). There was also a significant positive correlation between confidence along the People-Things dimension and confidence along the Data-Ideas dimension (r = .134, n = 418, p < .01, two tailed).

MANCOVA Analyses

To evaluate sex differences in interest and confidence, a multivariate analysis of variance (MANOVA) was run with sex as the independent variable, interest and confidence on the People-Things and Data-Ideas dimensions as the dependent variables, and no covariates. After the initial MANOVA, a series of Multivariate Analyses of Covariance (MANCOVA) were conducted. To test the hypothesis that controlling for participants' perceptions of the number of men and women in occupations and the income level of occupations could reduce the sex differences in interest and confidence, a MANCOVA was conducted, where sex was the independent variable, interests and confidence on the People-Things and Data-Ideas dimensions were the dependent variables, and occupational perceptions, as measured by the Perceptions of Sex Ratio at Work scale and the Perceptions of Occupational Income scale, were covariates. To test the hypothesis that controlling for gender identity would reduce the sex differences in interests and confidence, another MANCOVA was run, where sex was the independent variable, interests and confidence on the People-Things and Data-Ideas dimensions were the dependent variables, and gender identity, as measured by the BSRI, was the only covariate. To test the

hypothesis that controlling for participants' learning experiences could reduce the sex differences found in interest and confidence scores, a third MANCOVA was run, where sex was the independent variable, interests and confidence on the People-Things and Data-Ideas dimensions were the dependent variables, and learning experiences, as measured by the LEQ, was the only covariate. A final MANCOVA was conducted where all of the covariates were placed in the model to evaluate the cumulative effect of the covariates on sex differences in interest and confidence. F-test results and partial Eta-squared effect sizes for MANCOVAs are presented in Tables 7 and 8, respectively.

*Sex Differences in Interests and Confidenc*e. A multivariate analysis of variance (MANOVA) was completed with sex as the independent variable, interest and confidence as the dependent variables, and no covariates. The results of the initial MANOVA evaluating sex differences in interest and confidence reveal statistically significant sex differences with the multivariate $F (4, 413) = 52.143$, $p < .001$. Overall, sex accounted for 33.6% of the variance in interests and confidence along the People-Things and Data-Ideas dimensions. Post-hoc examination of univariate F-tests suggests that this multivariate effect is primarily due to differences on the People-Things dimension with sex accounting for 27.1% of the variance in interest scores ($F (1, 416) = 154.56$, $p < .001$) and 27.7% of the variance in confidence scores ($F (1, 416) = 159.131$, $p < .001$). In comparison, sex differences account for 2.2% of the variance in interest scores ($F (1, 416) = 9.452$, $p < .01$) and 1.8% of the variance in confidence scores on the Data-Ideas dimension ($F (1, 416) = 7.422$, $p < .01$).

Occupational Perceptions Covariates. In the MANCOVA with occupational perceptions as the covariates, there were two statistically significant covariates: Perceptions of the number of men and women in occupations along the People-Things dimension ($F (4,409) = 6.250$, $p < .001$)

and perceptions of the amount of money earned in occupations along the Data-Ideas dimension ($F_{(4,409)} = 6.115$, $p < .001$). Perceptions of the number of men and women in occupations along the People-Things dimension accounted for 5.8% of the variance in interests and confidence, and perceptions of the amount of money earned in occupations along the Data-Ideas dimension accounted for 5.6% of the variance in interests and confidence scores.

In particular, perceptions of the number of men and women in occupations along the People-Things dimension was a significant covariate of interests along the People-Things dimension, accounting for 2.4% of the variance in interests ($F_{(1, 412)} = 10.234$, $p < .01$). These sex-based occupational perceptions also accounted for 1.8% of the variance in interests ($F_{(1, 412)} = 7.377$, $p < .01$) and 2.9% of the variance in confidence ($F_{(1, 412)} = 12.455$, $p < .001$) along the Data-Ideas dimension. Perceptions of the amount of money earned in occupations along the Data-Ideas dimension accounted for 4.4% of the variance in interests ($F_{(1, 412)} = 194.523$, $p < .001$) and 2.3% of the variance in confidence ($F_{(1, 412)} = 9.616$, $p < .01$) on the Data-Ideas dimension. Perceptions of the number of men and women in occupations along the Data-Ideas dimension and perceptions of the amount of money earned along the People-Things dimension were not significant covariates in this analysis ($F_{(4, 409)} = 1.972$, $p = .098$; $F_{(4, 409)} = 1.903$, $p = .109$).

However, after controlling for individual differences in occupational perceptions, there were still significant sex differences in interests and confidence ($F_{(4, 409)} = 42.443$, $p < .001$), accounting for 29.3% of the variance in interest and confidence scores. Sex retained the largest effect on interest ($F_{(1, 412)} = 120.395$, $p < .001$) and confidence ($F_{(1, 412)} = 136.701$, $p < .001$) along the People-Things dimension, accounting for 22.6% of the variance in interests and 24.9% of the variance in confidence after controlling for occupational perceptions. Sex

maintained a smaller yet significant effect on interest (F (1,412) = 6.872, p < .01) and confidence (F (1,412) = 6.174, p < .05) along the Data-Ideas dimension accounting for 1.6% of the variance in interest scores and 1.5% of the variance in confidence scores after controlling for occupational perceptions.

Gender Identity Covariates. In the MANCOVA analysis with BSRI gender identity measures as covariates, feminine gender identity was a significant covariate in the relationship between sex and interests and confidence (F (4, 411) = 11.675, p < .001), accounting for 10.2% of the variance in interest and confidence scores. In particular, Femininity has a significant effect on interest (F (1, 414) = 39.118, p < .001) and confidence (F (1, 414) = 24.358, p < .001) along the People-Things dimension, accounting for 8.6% of the variance in interest scores and 5.6% of the variance in confidence scores. Masculine gender identity was not a significant covariate for sex differences in interests and confidence (F (4, 411) = 1.241, p = .293).

However, after controlling for individual differences in Masculinity and Femininity, there were still significant sex differences (F (4, 411) = 26.142, p < .001) that accounted for 20.3% of the variation in interest and confidence scores. In particular, sex retained the largest effect on interest scores (F (1, 414) = 70.717, p < .001) and confidence scores (F (1, 414) = 81.419, p < .001) along the People-Things dimension, accounting for 14.6% of the variance in interest and 16.4% of the variance in confidence. Sex also retained a significant effect on interest (F (1, 414) = 4.567, p < .05) along the Data-Ideas dimension, accounting for 1.1% of the variance in interest scores; however, after controlling for gender identity, sex lost its small but significant effect on confidence scores along the Data-Ideas dimension.

Learning Experiences Covariates. In the MANCOVA with learning experiences as a covariate, the LEQ scores on both the People-Things dimension (F (4, 411) = 74.161, p < .001)

and Data-Ideas dimension (F (4, 411) = 65.973, p < .001) were statistically significant covariates. LEQ scores on the People-Things dimension accounted for 41.9% of the variance in interest and confidence scores, while LEQ scores along the Data-Ideas dimension accounted for 39.1% of the variance in interest and confidence scores.

Learning experiences along the People-Things dimension had a significant effect on interest (F (1, 414) = 211.194, p < .001) and confidence (F (1, 414) = 182.534, p < .001) along the People-Things dimension, accounting for 33.8% of the variance in interest and 30.6% of the variance in confidence. Additionally, learning experiences along the People-Things dimension had significant effect on interest (F (1, 414) = 5.95, p < .05) and confidence (F (1, 414) = 9.36, p < .01) along the Data-Ideas dimension, accounting for 1.4% of the variance in interest scores and 2.2% of the variance in confidence scores along the Data-Ideas this dimension. Learning experiences along the Data-Ideas dimension was a significant covariates of interest (F (1, 414) = 149.128, p < .001) and confidence (F (1, 414) = 171.511, p < .001) on the Data-Ideas dimension, accounting for 26.5% of the variance in interest and 29.3% of the variance in confidence on this dimension. Additionally, learning experiences on the Data-Ideas dimension was a significant covariate of interests (F (1, 414) = 35.783, p < .001) and confidence (F (1, 414) = 9.467, p < .01) on the People-Things dimension, accounting for 8% of the variance in interests and 2.2% of the variance in confidence on this dimension.

However, after controlling for individual differences in learning experiences, there were still significant sex differences in interests and confidence (F (4, 411) = 18.593, p < .001), accounting for 15.3% of the variance in interests and confidence scores. In particular, sex only retained a significant effect on interest (F (1, 414) = 52.308, p < .001) and confidence (F (1, 414)

= 48.595, p < .001) along the People-Things dimension, accounting for 11.2% of the variance in interests and 10.5% of the variance in confidence.

Cumulative Effects of Sex Differences Covariates. To evaluate both the cumulative effects of the covariates on sex differences in interests and confidence and potential overlap among covariates, a final MANCOVA was conducted with the complete set of occupational perceptions, gender identity, and learning experiences covariates.

Perceptions of the number of men and women in occupations along the People-Things dimension was a significant covariate for sex differences in interests and confidence (F (4, 405) = 4.218, p < .01), accounting for 4% of the variance in this relationship. In particular, perceptions of the number of men and women in occupations along the People-Things dimension had was a significant covariate for sex differences in interests along the People-Things dimension (F (1, 408) = 9.1046, p < .01) and confidence along the Data-Ideas dimension (F (1,408) = 6.428, p < .05), accounting for 2.2% of the variance in interests on the People-Things dimension and 1.6% of the variance in confidence on the Data-Ideas dimension. Perceptions of the number of men and women along the Data-Ideas dimension was not a significant covariate for sex differences in interest and confidence (F (4, 405) = 2.378, p = .051).

Perceptions of the amount of money earned in occupations along the Data-Ideas dimension was a significant covariate for sex differences in interest and confidence (F (4, 405) = 5.622, p < .001), accounting for 5.3% of the variance in interests and confidence scores. In particular, perceptions of the amount of money earned in occupations along the Data-Ideas dimension was a significant covariate for sex differences in interest (F (1, 408) = 16.55, p < .001) and confidence (F (1, 408) = 8.113, p < .01) along the Data-Ideas dimension, accounting for 3.9% of the variance in interests and 1.9% of the variance in confidence for this dimension.

Perceptions of the amount of money earned in occupations along the People-Things dimension was not a significant covariate in the relationship for sex differences in interest and confidence $(F (4, 405) = 1.089, p = .362)$.

Feminine gender identity was a significant covariate of the relationship between sex and interest and confidence $(F (4, 405) = 5.851, p < .001)$, accounting for 5.5% of the variance in this relationship. In particular, feminine gender identity had a significant effect on interest $(F (1, 408) = 19.886, p < .001)$ and confidence $(F (1, 408) = 9.792, p < .01)$ along the People-Things dimension, accounting for 4.6% of the variance in interests and 2.3% of the variance in confidence on this dimension. Masculine gender identity did not have a significant covariate effect on the relationship between sex and interest confidence $(F (4, 405) = 1.960, p = .10)$.

Learning experiences along the People-Things dimension was found to be a significant covariate for sex differences in interest and confidence $(F (4, 405) = 66.832, p < .001)$, accounting for 39.8% of the variance in interests and confidence. In particular, learning experiences along the People-Things dimension was a significant covariate for sex differences in interest $(F (1, 408) = 187.932, p < .001)$ and confidence $(F (1, 408) = 159.796, p < .001)$ along the People-Things dimension, accounting for 31.5% of the variance in interests and 28.1% of the variance in confidence for this dimension. Learning experiences along the People-Things dimension was also a significant covariate for sex differences in interests $(F (1, 408) = 6.371, p < .05)$ and confidence $(F (1,408) = 8.404, p < .01)$ along the Data-Ideas dimension, accounting for 1.5% of the variance in interest and 2% of the variance in confidence for this dimension.

Learning experiences along the Data-Ideas dimension was found to be a significant covariate for sex differences in interests and confidence $(F (4, 405) = 61.805, p < .001)$, accounting for 37.9% of the variance in interest and confidence scores. In particular, learning

experiences along the Data-Ideas dimension was a significant covariate for sex differences in interest ($F (1, 408) = 152.881$, $p < .001$) and confidence ($F (1, 408) = 152.437$, $p < .001$) along the Data-Ideas dimension, accounting for 27.3% of the variance in interest scores and 27.2% of the variance in confidence scores for this dimension. Learning experiences along the Data-Ideas dimension was a significant covariate for sex differences in interest ($F (1, 408) = 31.602$, $p < .001$) and confidence ($F (1, 408) = 9.731$, $p < .01$) along the People-Things dimension, accounting for 7.2% of the variance in interests and 2.3% of the variance in confidence for this dimension.

However, after controlling for the effects of all of the covariates, sex retained a significant effect on interest and confidence ($F (4, 405) = 10.18$, $p < .001$), accounting for 9.1% of the variance in interest and confidence scores. Specifically, sex had a significant effect on interest ($F (1, 408) = 21.553$, $p < .001$) and confidence ($F (1, 408) = 31.361$, $p < .001$) along the People-Things dimension, accounting for 5.0% of the variance in interests and 7.1% of the variance in confidence for this dimension. In comparison, sex differences in interests and confidence along the Data-Ideas dimension were not statistically significant.

CHAPTER 5. DISCUSSION

The current study examined the degree to which perceptions of occupations, gender identity, and learning experiences impact the observed effect of sex on interest and confidence in the People-Things and Data-Ideas dimensions that underlie the RIASEC types.

It was hypothesized that the largest sex differences in interest and confidence would be found along the People-Things dimension, as seen in prior research done by Lippa (2005); however, also it was also hypothesized that some of this effect would be reduced with the addition of covariates. Large sex differences in interest and confidence were found along the People-Things dimension, and comparatively small sex differences were found in interests and confidence along the Data-Ideas dimension. For each MANCOVA model, there was at least one significant covariate that reduced the effect of sex on interests and confidence; however, sex retained a significant impact on interest and confidence in all analyses, even in the cumulative MANCOVA model.

Sex Differences in Interest and Confidence

In examining the effects of sex on interest and confidence, we found that sex accounted for 33.6% of the overall variance in interest and confidence of RIASEC-based activities. Looking at the results more closely, we discovered that sex had a large effect on interest and confidence along the People-Things dimension as predicted, accounting for 27.1% and 27.7% of the variance in these relationships, respectively; however, sex still had an effect, although a small one, on interest and confidence along the Data-Ideas dimension, accounting for 2.2% and 1.8% of the variance in these relationships, respectively. Women reported having more interest and confidence than men in People activities, while men reported more interest and confidence than women in Things activities. Women also reported more interest in Ideas activities than men, and

men reported more confidence in Data activities than women. These results replicate previous research (e.g. Lippa, 2005) demonstrating that sex differences are tied more to the People-Things dimension than the Data-Ideas dimension. The findings also replicated what Betz and Hackett (1981) found in that men demonstrated more confidence in activities on the Things side of the People-Things dimension and women demonstrated more confidence with activities associated with the People side of the People-Things dimension.

In comparison to Lippa's (2005) idea of Gender Diagnosticity, wherein an individual with more "male-like" interests is more masculine and one with "female-like" interests is more feminine, the current findings suggest that other factors, such as learning experiences, may contribute to sex differences in interests and confidence on the People-Things dimension. Also, it is important to consider the fact that Lippa utilized occupational titles in his study, where activities were utilized in the current study to examine interests and confidence. In fact, Kuder (1977) expressed that utilizing occupational titles in interest inventories can be problematic due to potential biases. More specifically, individuals make judgments about occupations based on their knowledge (or lack of knowledge) of the world of work, and when knowledge is limited, individuals may base their judgments on stereotypical beliefs (Harmon & Conroe, 1976). In using activity-based RIASEC scales, we have attempted to remove the effects of the biases inherently found in occupational titles. However, sex differences in interests and confidence were substantial along the People-Things dimension, despite the use of activity-based items.

 Covariates of Sex Differences in Interest and Confidence

Occupational Perceptions as a Covariate of Sex Differences. Perceptions of the number of men and women in occupations along the People-Things dimension and perceptions of the amount of money earned in occupations along the Data-Ideas dimension were found to be

significant covariates in the relation between sex and interest and confidence, accounting for 5.8% and 5.6% of the total effect, respectively. The perceptions of the sex ratio of occupations along the People-Things dimension has an impact on interest along both the People-Things dimension and the Data-Ideas dimension, while sex-ratio of occupations along the People-Things dimension only has an impact on confidence along the Data-Ideas dimension. The perceptions of occupational income covariate had a significant effect on interest and confidence along the Data-Ideas dimension. The perceptions of occupational income covariate may be a covariate of interest and confidence scores along the Data-Ideas dimension because this covariate is thought to be associated with prestige, and prestige is not tied to the People-Things dimension but may be associated with the Data-Ideas dimension.

Finding that perceptions of the number of men and women in occupations had effects on interest and confidence along the Data-Ideas dimension but only for interest along the People-Things dimension is unexpected. This covariate is thought to be a measure of sex-type, which is more often considered to be associated with the People-Things dimension, making it more likely for this covariate to have an effect on both interest and confidence along the People-Things dimension and less likely for it to have an effect on interest and confidence along the Data-Ideas dimension. Perhaps, confidence in activities along the People-Things dimension is impacted by other factors, such as learning experiences, and is less influenced by perceptions of the number of men and women in these occupations. Another interpretation of these findings is that sex differences in interest and confidence are partially mediated through perceptions of the sex ratio of occupations along the People-Things dimension and perceptions of the income of occupations along the Data-Ideas dimension.

Gender Identity as a Covariate of Sex Differences. MANCOVA analyses were conducted to determine if the observed sex differences in interest and confidence could be impacted by accounting for the differences in feminine and masculine gender identity. The gender identity covariates reduce the magnitude of sex differences from 33.6% to 20.3% of the variance in interest and confidence scores, which is a 13.3% decrease in these scores. However, sex differences in interest and confidence remained statistically significant, which suggests that factors other than gender identity are also contributing to sex differences on the People-Things dimension. Examining the covariates in this analysis, we found that having a feminine gender identity was a significant covariate; furthermore, feminine gender identity was a significant covariate in the relationship between sex and interest and confidence along the People-Things dimension, accounting for 8.6% and 5.6% of the variance in these relationships, respectively.

One interpretation of these findings is that feminine gender identity partially mediates the relation between sex differences and interest and confidence, while masculine gender identity is not a mediator in this relation. The finding that masculine gender identity is not a significant factor contributing to sex differences in interests and confidence is somewhat consistent with results obtained in factor analyses of the Bem Sex Role Inventory and has potential links to the RIASEC model. In particular, Choi et al. (2007) found there to be three first order factors that were associated with the feminine gender identity and four first order factors that were associated with the masculine gender identity. The three feminine factors were labeled as compassionate, interpersonal affect, and shy. Of these factors, compassionate and interpersonal affect can be linked to the Social type at the People end of the People-Things dimension, and shyness also has implications for interactions with people. In comparison, the four masculine factors were labeled as decisive, dominant, athletic, and self-sufficient. Of the four masculine factors, it seems likely

that one of the four, athletic, would be associated with the Realistic type, which falls at the Things end of the People-Things dimension. However, two other factors, decisive and dominant, may be associated with the Enterprising type, which is tied more to the People end of this dimension. These differences in RIASEC-based associations may undermine the effectiveness of the BSRI Masculinity scale as a covariate of sex differences in interest and confidence.

Learning Experiences as a Covariate. Learning experiences appear to be an important factor contributing to sex differences in interest and confidence with a decrease in overall effect of sex of 18.3%. In this study, it appears that learning experiences along the People-Things and Data-Ideas dimension act as a partial mediator in the relation between sex and interest and confidence. When interpreting these results, it is important to consider that learning experiences is the construct most related to interest and confidence for both theoretical and methodological reasons. In SCCT, learning experiences are an important predictor of both confidence and interests, tying this measure directly to the confidence and interest measures utilized in this study. Perceptions of occupations and gender identity may have emerged at a relatively early age (Gottfredson, 1981), which may decrease their covariance with an individual's current interest and confidence scores. Furthermore, the influences of factors, such as gender identity, are mediated through learning experiences in the SCCT model. The learning experiences measure used in the current study, the LEQ, was designed to measure learning experiences in each of the six Holland RIASEC types. As such, shared method variance between the LEQ and the activity-based interest and confidence measures may also contribute to the magnitude of the LEQ's covariance in the present analyses. Furthermore, since the LEQ was developed based off of Bandura's four sources of self-efficacy information, it may be that the LEQ is tapping into some

shared variance with our confidence measures as well, which could be in part causing the strong covariate relation between learning experience and sex differences in interest and confidence.

Past research has demonstrated that women tend to have fewer learning experiences in the Realistic and Investigative areas and more learning experiences in the Artistic and Social areas, while men tend to have fewer learning experiences in the Social area and more learning experiences in the Realistic, Investigative, and Enterprising areas (Williams & Subich, 2006). Research has also indicated that learning experiences can be linked to confidence in activities, which is associated with interest, indicating that learning experiences may be an important covariate to consider when trying to account for the effect of sex on interest and confidence (Schaub, 2004; Schaub & Tokar, 2005).

Cumulative Effects of Covariates on Sex Differences in Interest and Confidence. In examining the cumulative effect of sex in addition to all of the covariates on interest and confidence, the effect of sex on interest and confidence has been reduced by 25%, now accounting for only 9.1% of this relationship. Furthermore, sex only has retained its effect on interest and confidence along the People-Things dimension. There were a few significant covariates in this analysis: feminine gender identity, perceptions of the number of men and women in occupations along the People-Things dimension, perceptions of the amount of money earned in occupations along the Data-Ideas dimension, and learning experiences along the People-Things and Data-Ideas dimensions. Of all of these covariates, learning experiences had the largest effect on interest and confidence, accounting for 39.8% and 37.9% of the variance in these relationships, respectively. Perceptions of the number of men and women in occupations along the People-Things dimension, perceptions of the amount of money earned in occupations along the Data-Ideas dimension, feminine gender identity, and learning experiences along the

People-Things and Data-Ideas dimension could be seen as partial mediators in the relation between sex and interest and confidence.

Results from all of the MANCOVA analyses have been summarized in Figure 2. The pattern of results illustrated in Figure 2 demonstrate two key points: First, there are a number of factors that contribute to sex differences in interests, and statistically controlling for these factors drastically reduces the magnitude of this effect. Second, it appears that there may be a component of sex differences in interests and confidence that is related to factors other than the covariates used in the present study. After controlling for occupational perceptions, gender identity, and learning experiences, men still tend to have more interest and confidence in Realistic activities, and women still tend to have more interest and confidence in Social activities, even when considering differing levels of feminine gender identity, perceptions of occupations, and differences in learning experiences. Therefore, other factors may be contributing to sex differences in interest and confidence. These numbers also demonstrate that while we are unable to completely account for the effect between sex and interest and confidence, we can potentially drastically reduce this effect by considering these factors.

Implications for Career Counseling

Career counselors frequently use RIASEC-based measures to help clients identify career choices that are good fits. The current findings indicate that sex differences in how individuals respond to these inventories are influenced by a number of factors, including perceptions of the world of work, gender identity, and learning experiences. These factors may also be contributing to sex differences in career choices. For example, the current debate over the poor representation of women in the STEM fields may be tied, in part, to the cumulative effects of occupational perceptions, gender identity, and learning experiences on interest and confidence scores along

the People-Things dimension. The STEM fields are strongly associated with the Things end of this dimension, and the largest sex differences in interest and confidence are found on this dimension. As such, it is not surprising that there are low numbers of women pursuing STEM careers. However, this issue extends beyond the measures used in career counseling because the STEM fields encompass a number of high prestige, high income occupations, and women, on average, make $17,000 less per year than men.

It was found that individuals' perceptions of the number of men and women in occupations impact their interest and confidence in RIASEC-based activities. Individuals' perceptions of the amount of money earned in occupations also had a significant impact on interests and confidence in activities, especially along the Data-Ideas dimension. In working with a client, career counselors can utilize this information by taking the steps to try to understand if the individual has any perceptions about the sex ratio or the income associated with occupations that he/she may be considering as potential future career. As the career counselor, it may be necessary to provide accurate information about the number of men and women actually working in different occupations or to discuss potential amount of money earned, so an individual can explore an area thoroughly before making a career decision. Also, the career counselor may want to discuss with the client why these variables are particularly important for him/her to consider in the career decision-making process.

Feminine gender identity impacts interest and confidence, especially along the People-Things dimension. One with a stronger feminine gender identity has more interest and confidence in Social activities, which is associated with the People side of the People-Things dimension. Some students may be reluctant to consider academic programs or careers that are incompatible with their gender identities, but for other students, this may not be a salient issue.

Therefore, when working with a client who is reluctant to consider a gender non-traditional career, it may be helpful to provide positive examples of individuals who have worked in non-traditional careers.

Another important area that career counselors may want to explore with a client is the client's past learning experiences. The large effect learning experiences has on interest and confidence makes it important for the career counselor to provide the space for the client to fully explore their performance accomplishments, any vicarious learning, and any verbal persuasion he/she has received in activities in order to determine if and how these experiences have impacted the individual's interest and confidence. It may even be beneficial for the career counselor to present the option of using the LEQ with the client if the client is having a difficult time recalling their learning experiences during the session. The career counselor may even find it beneficial to verbally persuade the client to try out new activities in order to attain performance accomplishments if the client is curious about a particular occupation.

Limitations and Future Directions

Our participant sample was drawn from a population that largely consists of European American, female, freshman students studying psychology, which is a limitation of our study. Approximately 44.4% of our sample consisted of freshman students at a large Midwestern university. Approximately 59.4% of our sample identified as female, and approximately 89% of our sample identified as European American. The results found may not generalize to other populations, so it will be necessary to perform more research on samples that include individuals of different ages, males, and individuals that identify as a part of different racial or ethnic groups. Furthermore, the individuals that comprised our sample for our study may have similar worldviews and experiences, which may impact gender identity formation, perceptions of

occupations, and learning experiences. As seen from the results, these variables play unique factors in interest and confidence development, so it will be very important to gain information from other groups by completing more research regarding these topics.

Summary and Conclusions

The results of the current study demonstrate that there are other important factors impacting levels of interest and confidence than just sex differences. In particular, career counselors and future researchers may want to pay attention to the effect of feminine gender identity, perceptions of the number of men and women in occupations associated with the People-Things dimension, perceptions of the amount of money earned in occupations associated with the Data-Ideas dimension, and learning experiences on interests and confidence. Also, it is important to note that in the current study that we were unable to neutralize the effect of sex despite the addition of multiple covariates into the model, indicating that sex still retains a strong effect on interest and confidence.

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Tables and Figures

Table 1

Reliability Coefficients for AFPD Activity-Based RIASEC Scales

	Female			Male		
Scale	30-Item Scale	Set A	Set B	30-Item Scale	Set A	Set B
Activities						
Realistic	.95	.88	.82	.97	.90	.89
Investigative	.96	.90	.90	.96	.91	.91
Artistic	.97	.89	.87	.97	.89	.87
Social	.96	.84	.88	.97	.89	.91
Enterprising	.95	.88	.87	.93	.84	.79
Conventional	.97	.93	.94	.97	.91	.92

Note. Results obtained from 534 college students (328 female, 206 male).

Table 2

Convergent Validity for 8-Item AFPD RIASEC Scales

Scale	Full Interest Profiler	30-Item Occupations	SII
Set A Activities			
Realistic	.96	.87	.63
Investigative	.93	.82	.61
Artistic	.96	.86	.67
Social	.94	.72	.67
Enterprising	.92	.73	.56
Conventional	.96	.78	.67
Set B Activities			
Realistic	.95	.87	.62
Investigative	.95	.82	.59
Artistic	.96	.86	.70
Social	.95	.75	.72
Enterprising	.93	.73	.56
Conventional	.96	.73	.68

Note. Results for Interest Profiler and O*NET occupation-based scales obtained

from 534 college students (328 female, 206 male). Results for SII obtained from

a separate sample of 313 college students (202 female, 111 male).

Table 3

Reliability Coefficients for Occupation-Based AFPD RIASEC Scales

	Females			Males		
Scale	30-Item Scale	Set A	Set B	30-Item Scale	Set A	Set B
Occupations						
Realistic	.94	.81	.84	.94	.84	.82
Investigative	.93	.88	.86	.94	.86	.86
Artistic	.95	.86	.84	.94	.87	.81
Social	.92	.78	.74	.95	.84	.84
Enterprising	.93	.82	.81	.82	.82	.79
Conventional	.95	.87	.88	.94	.84	.85

Note. Results obtained from 534 college students (328 female, 206 male).

Table 4

Convergent Validity for 8-Item Occupation-Based AFPD RIASEC Scales

| | Interest Profiler | |
Scale	Set A	Set B
Set A Occupations		
Realistic	.75	.75
Investigative	.80	.83
Artistic	.86	.85
Social	.79	.82
Enterprising	.77	.75
Conventional	.79	.77
Set B Occupations		
Realistic	.77	.78
Investigative	.85	.86
Artistic	.86	.86
Social	.77	.78
Enterprising	.74	.75
Conventional	.77	.73

Note. Results obtained from 534 college students (328 female, 206 male).

Table 5

Means and Standard Deviations of Dependent Variables and Covariates

Measure	Male		Female	
	M	SD	M	SD
Interest – People/Things	-0.94	2.66	-4.35	2.91
Interest – Data/Ideas	-0.13	3.29	-1.14	3.31
Confidence – People/Things	1.12	2.77	-2.39	2.81
Confidence – Data/Ideas	2.53	2.83	1.75	2.94
Feminine	3.33	0.39	3.73	0.40
Masculine	3.79	0.44	3.46	0.44
Sex ratio – People/Things	-4.68	1.97	-5.37	2.33
Sex ratio – Data/Ideas	-1.71	1.30	-1.63	1.65
Income – People/Things	2.68	1.59	2.23	1.61
Income – Data/Ideas	-2.63	1.58	-3.22	1.65
Learning experiences – People/Things	0.92	1.60	-0.96	1.69
Learning experiences – Data/Ideas	1.40	1.60	0.74	1.75

Table 6

Correlations for Dependent Variables and Covariates

Scale	1	2	3	4	5	6	7	8	9	10	11	12
1. Interest – P/T	--	-0.05	0.59	-0.04	-0.30	-0.11	0.28	0.08	-0.03	0.18	0.50	-0.24
2. Interest – D/I	0.09	--	-0.06	0.62	-0.08	0.00	-0.11	0.16	0.01	0.14	0.18	0.49
3. Confidence –P/T	0.54	0.04	--	0.03	-0.27	-0.17	0.15	-0.02	0.01	0.02	0.48	-0.12
4. Confidence – D/I	-0.03	0.55	0.14	--	-0.12	0.05	-0.17	0.16	0.13	0.03	0.15	0.55
5. Feminine	-0.33	-0.09	-0.26	0.00	--	0.29	-0.10	-0.09	-0.02	-0.23	-0.18	0.09
6. Masculine	0.09	-0.05	0.13	0.08	0.07	--	-0.03	-0.02	-0.08	-0.15	0.05	0.14
7. Sex ratio – P/T	0.05	-0.06	-0.21	-0.14	0.10	0.05	--	0.17	-0.25	0.18	0.14	-0.14
8. Sex ratio – D/I	0.04	-0.06	-0.08	-0.09	-0.03	0.14	0.47	--	0.06	-0.03	0.02	0.10
9. Income – P/T	0.07	0.13	0.15	0.15	-0.06	0.09	-0.37	-0.28	--	-0.14	-0.01	0.11
10. Income – D/I	0.04	0.23	-0.02	0.20	0.03	-0.07	0.22	0.09	-0.11	--	0.02	-0.09
11. Learning exp. – P/T	0.61	0.14	0.64	0.25	-0.32	0.11	-0.18	-0.11	0.17	0.01	--	0.07
12. Learning exp. – D/I	-0.06	0.53	0.07	0.56	-0.04	0.17	-0.27	-0.21	0.32	0.06	0.25	--

Note. Correlations above the diagonal are for men; correlations below the diagonal are for women. P/T = People/Things; D/I = Data/Ideas; exp. = experiences.

Table 7

MANCOVA results

MANCOVA Model and Covariates	Multivariate F	Interests Univariate F		Confidence Univariate F	
		P/T	D/I	P/T	D/I
1. No Covariates	52.14***	154.56***	9.45**	59.13***	7.42**
2. Gender identity	26.14***	70.72***	4.57*	81.42***	1.48
Femininity	11.68***	39.12***	2.79	24.36***	3.03
Masculinity	1.24	--	--	--	--
3. Occupational perceptions	42.44***	120.40***	6.87**	136.70***	6.17*
Sex ratio – P/T	6.25***	10.23**	7.38**	0.18	12.46***
Sex ratio – D/I	1.97	--	--	--	--
Income – P/T	1.90	--	--	--	--
Income – D/I	6.12***	3.72	18.88***	0.04	9.62**
4. Learning experiences	74.16***	52.31***	0.02	48.60***	0.78
Learning experiences – P/T	65.97***	211.19***	5.95*	182.53***	9.36**
Learning experiences – D/I	18.59***	35.78***	149.13***	9.47**	171.51***
5. All Covariates	10.18***	21.55***	0.00	31.36***	0.99
Femininity	5.85***	19.89***	0.44	9.79**	0.67
Masculinity	1.96	--	--	--	--
Sex ratio – P/T	4.22**	9.10	2.43	0.03	6.43
Sex ratio – D/I	2.38	--	--	--	--
Income – P/T	1.09	--	--	--	--
Income – D/I	5.62**	3.31	16.55***	0.16	8.11**
Learning experiences – P/T	66.83***	187.93***	6.37*	159.79***	8.40**
Learning experiences – D/I	61.81***	31.60***	152.88***	9.73**	152.44***

Note. P/T = People/Things; D/I = Data/Ideas. Univariate F-values are not reported when the

multivariate effect was not statistically significant.

* *p*<.05; ** *p*<.01; *** *p*<.001

Table 8

Partial Eta-Squared Effect Sizes

MANCOVA Model and Covariates	Multivariate Effect Size	Interests Univariate Effect Size		Confidence Univariate Effect Size	
		P/T	D/I	P/T	D/I
1. No Covariates	.336	.271	.022	.277	.018
2. Gender identity	.203	.146	.011	.164	.004
Femininity	.102	.086	.007	.056	.007
Masculinity	.012	--	--	--	--
3. Occupational perceptions	.293	.226	.016	.249	.015
Sex ratio – P/T	.058	.024	.018	.000	.029
Sex ratio – D/I	.019	--	--	--	--
Income – P/T	.018	--	--	--	--
Income – D/I	.056	.009	.044	.000	.023
4. Learning Experiences	.153	.112	.000	.105	.002
Learning experiences – P/T	.419	.338	.014	.306	.022
Learning experiences – D/I	.391	.080	.265	.022	.293
5. All Covariates	.091	.050	.000	.071	.002
Femininity	.055	.046	.001	.023	.002
Masculinity	.019	--	--	--	--
Sex ratio – P/T	.040	.022	.006	.000	.016
Sex ratio – D/I	.023	--	--	--	--
Income – P/T	.011	--	--	--	--
Income – D/I	.053	.008	.039	.000	.019
Learning experiences – P/T	.398	.315	.015	.281	.020
Learning experiences – D/I	.379	.072	.273	.023	.272

Note. P/T = People/Things; D/I = Data/Ideas. Univariate effect sizes are not reported when the multivariate effect was not statistically significant.
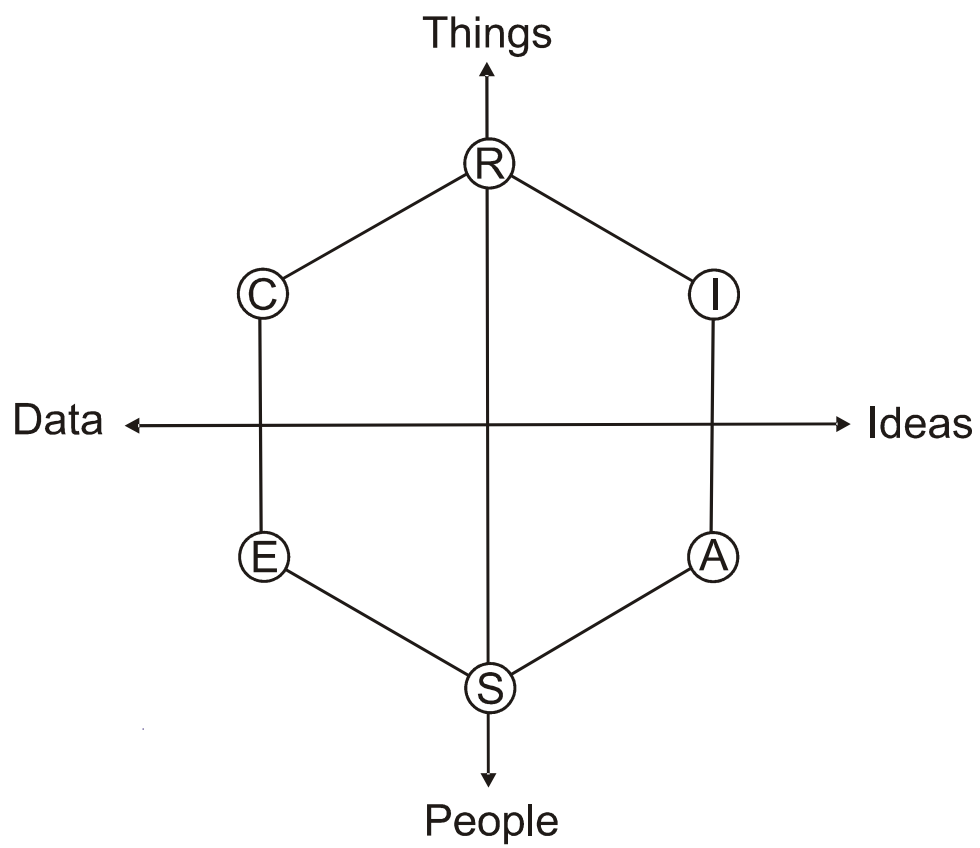
Figure 1

Figure 2

Appendix

Identity Development Laboratory

Occupational Perceptions Survey – Orange Form

Please use a #2 Pencil to fill in your answers
on the Orange scantron form
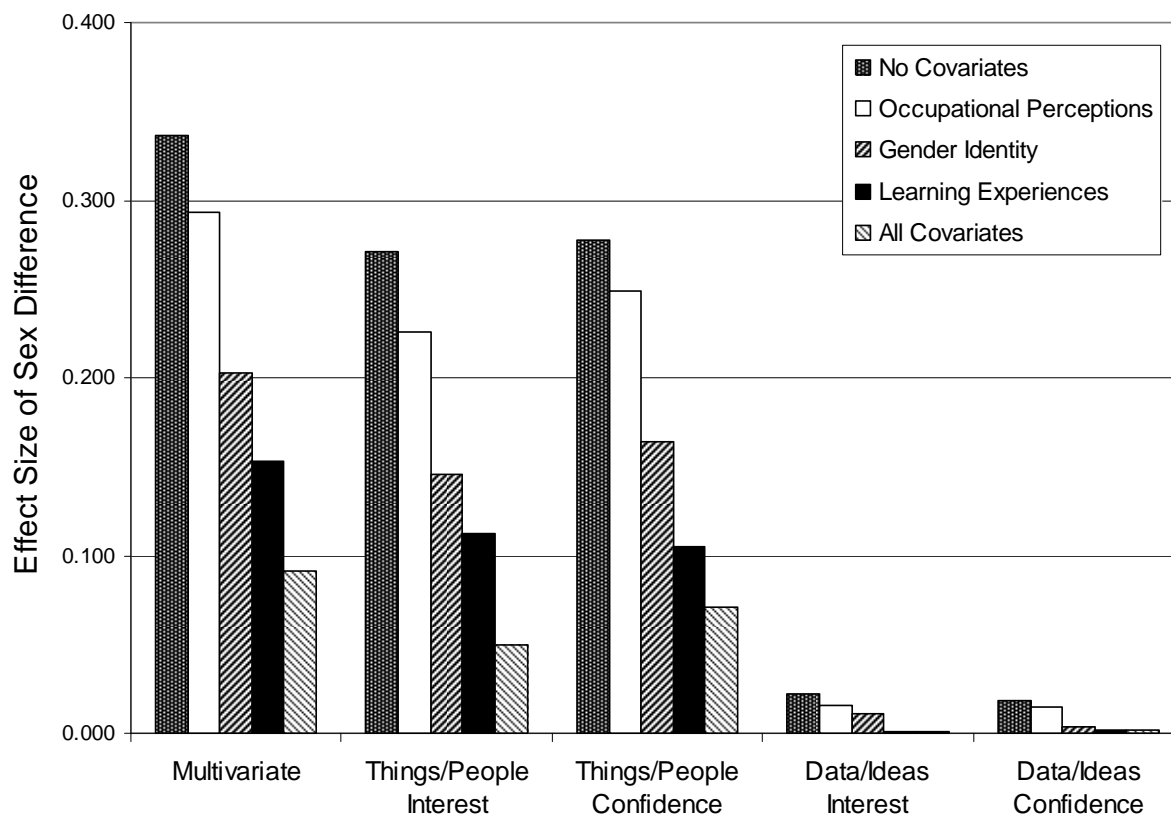
Instructions

A. Confidence. Please rate how much confidence
you have in your ability to perform each activity
listed below using the following scale:

1 = Very Low Confidence (A)
2 = Little Confidence (B)
3 = Moderate Confidence (C)
4 = Above Average Confidence (D)
5 = Very High Confidence (E)

1	Perform lawn care services
2	Repair household appliances
3	Build kitchen cabinets
4	Guard money in an armored car
5	Operate a machine on a production line
6	Repair and install locks
7	Set up and operate machines to make products
8	Test the quality of parts before shipment
9	Study ways to reduce water pollution
10	Study the movement of planets
11	Examine blood samples using a microscope
12	Study genetics
13	Determine the infection rate of a new disease
14	Diagnose and treat sick animals

15	Do laboratory tests to identify diseases
16	Develop a new medicine
17	Paint sets for plays
18	Sing in a band
19	Act in a movie
20	Conduct a symphony orchestra
21	Create special effects for movies
22	Compose or arrange music
23	Write reviews of books or plays
24	Draw pictures
25	Work with juveniles on probation
26	Take care of children at a day-care center
27	Teach an elementary school class
28	Work with mentally disabled children
29	Teach disabled people work and living skills
30	Organize field trips for disabled people
31	Teach a high-school class
32	Help conduct a group therapy session
33	Sell newspaper advertisements
34	Sell a soft drink product line to stores and restaurants
35	Give a presentation about a product you are selling
36	Sell hair-care products to stores and salons
37	Negotiate contracts for professional athletes
38	Manage a retail store
39	Start your own business
40	Market a new line of clothing
41	Keep inventory records
42	Keep accounts payable/receivable for an office
43	Calculate the wages of employees
44	Develop a spreadsheet using computer software
45	Assist senior level accountants in performing bookkeeping tasks
46	Transfer funds between banks using a computer
47	Enter information into a database
48	Keep records of financial transactions for an organization

B. Gender Ratio At Work. For each occupation, please indicate what you think the relative number of men and women employed in the occupation is at this time using the following scale:

1 = Mostly men employed in this job (A)
2 = Somewhat more men than women (B)
3 = Similar number of men and women (C)
4 = Somewhat more women than men (D)
5 = Mostly women employed in this job (E)

49	Construction Carpenters
50	Airline Pilots and Flight Engineers
51	Welders, Production
52	Commercial Pilots
53	Forest Fire Fighters
54	Mechanical Engineers
55	Ship Pilots
56	Geological Data Technicians
57	Optometrists
58	Zoologists and Wildlife Biologists
59	Obstetricians and Gynecologists
60	Pediatricians, General
61	Microbiologists
62	Astronomers
63	Medical Scientists
64	Environmental Scientists
65	Painters and Illustrators
66	Graphic Designers
67	Composers
68	Choreographers
69	Librarians
70	Foreign Language College Teachers
71	Actors
72	Creative Writers
73	Occupational Therapists
74	Fitness Trainers
75	Tour Guides and Escorts
76	Nursing Instructors
77	Waiters and Waitresses
78	Elementary School Teachers

79	Substance Abuse Counselors
80	Special Education Teachers
81	Law Clerks
82	Coaches and Scouts
83	Sales Managers
84	Personnel Recruiters
85	Bartenders
86	Lodging Managers
87	Public Relations Specialists
88	Human Resources Managers
89	Credit Analysts
90	Insurance Claims Clerks
91	Tax Preparers
92	Insurance Underwriters
93	Postal Service Clerks
94	Bookkeeping Clerks
95	Cargo and Freight Agents
96	Construction and Building Inspectors

C. Learning Experiences. This section of the survey includes a series of statements describing personal experiences and attitudes towards learning. Please rate how much you agree with each statement using the following scale:

1 = Strongly Disagree (A)
2 = Disagree (B)
3 = Neutral (C)
4 = Agree (D)
5 = Strongly Agree (E)

97	Teachers whom I respect have told me that it is important to have good organizational skills.
98	I have demonstrated skill at conducting research for my term papers.
99	While growing up, I watched adults whom I respect fix things.
100	I have seen people whom I admire write fiction stories.
101	Reading scientific articles has made me feel uneasy.
102	I have felt anxious while performing basic repairs on a car.
103	My family has encouraged me to find a job which involves performing basic office tasks.

104	I have accurately balanced a checkbook.
105	I have been successful at creating a sculpture with clay.
106	My family taught me that it is important to develop my interpersonal communication skills.
107	I have watched people whom I respect perform detail-oriented work.
108	I have been able to hold a conversation with all types of people.
109	I have felt nervous learning how to operate office machines.
110	During school, I admired teachers whom I saw create art.
111	Teachers whom I respect have encouraged me to take a business management course.
112	Adults whom I admire have urged me to enter a profession in which I manage others.
113	I have been successful at playing a musical instrument.
114	I have listened well to people who are having personal difficulties.
115	Teachers whom I respect have encouraged me to take an art class.
116	I have done a good job at things that involved physical labor (e.g., landscaping).
117	People whom I respect have encouraged me to develop my leadership skills.
118	I have felt uneasy about taking a leadership role in a group.
119	I have done a good job at operating new computer programs (e.g., word processing).
120	I have felt uptight while entering data at a computer terminal.
121	I have felt dread while using math in a job.
122	During school, I have felt uptight while working as a part of a small group.
123	While growing up, I recall seeing people I respected reading scientific articles.
124	I have seen people whom I respect hold jobs which involved performing routine office work.
125	I remember feeling anxious while working on something that required manual labor.
126	I have done a good job at performing basic office work (e.g., filing).
127	Family members have urged me to learn how to sing.
128	People have told me that it is important to be able to persuade others to do things.
129	I have become anxious initiating conversations with people I do not know.
130	I have felt uptight while writing a short story for school.

131	I have been a successful leader in school.
132	My friends have encouraged me to use my research abilities.
133	Teachers whom I admire have encouraged me to take science courses.
134	I have seen people whom I admire lead others.
135	I remember feeling uptight when I had to keep clear, precise records.
136	I observed people whom I admire work in a garden.
137	While growing up, adults I respected encouraged me to work with tools.
138	While growing up, I listened to family members play musical instruments.
139	People whom I respect have encouraged me to be a detail-oriented person.
140	I have felt uneasy while supervising the work of others.
141	I have done well in building things.
142	People whom I admire have encouraged me to be a salesperson.
143	I have done well at public speaking.
144	While growing up, adults whom I admired told me that it is important to be a good writer.
145	I have felt uneasy while drawing something.
146	I have felt uncomfortable while playing a musical instrument for other people.
147	Friends have urged me to act in a play.
148	I have become nervous while developing new friendships.
149	People whom I look up to have urged me to pursue activities that require manual dexterity.
150	I have felt anxious when I attempted to persuade someone to do things my way.
151	I have seen people I know enter work in the helping professions (e.g., social work).
152	People whom I respect have encouraged me to perform volunteer work.
153	I earned good grades in social science courses.
154	Family members have encouraged me to pursue activities that involve working outdoors.
155	My friends have urged me to help others resolve their personal difficulties.
156	I have successfully supervised the work of others.

Thank you for your time and participation
Your answers will be kept confidential

Identity Development Laboratory

Occupational Perceptions Survey – Blue Form

Please use a #2 Pencil to fill in your answers
on the Blue scantron form

Instructions

A. Interests. Please rate how much interest you have in performing each activity listed below using the following scale:

1 = Strongly Dislike (A)
2 = Dislike (B)
3 = Neutral (C)
4 = Like (D)
5 = Strongly Like (E)

1	Build a brick walkway
2	Lay brick or tile
3	Work on an offshore oil-drilling rig
4	Assemble electronic parts
5	Operate a grinding machine in a factory
6	Fix a broken faucet
7	Assemble products in a factory
8	Install flooring in houses
9	Study the structure of the human body
10	Study animal behavior
11	Do research on plants or animals
12	Develop a new medical treatment or procedure
13	Conduct biological research
14	Study whales and other types of marine life

15	Work in a biology lab
16	Make a map of the bottom of an ocean
17	Conduct a musical choir
18	Direct a play
19	Design artwork for magazines
20	Write a song
21	Write books or plays
22	Play a musical instrument
23	Perform stunts for a movie or television show
24	Design sets for plays
25	Give career guidance to people
26	Do volunteer work at a non-profit organization
27	Help people who have problems with drugs or alcohol
28	Teach an individual an exercise routine
29	Help people with family-related problems
30	Supervise the activities of children at a camp
31	Teach children how to read
32	Help elderly people with their daily activities
33	Sell restaurant franchises to individuals
34	Sell merchandise at a department store
35	Manage the operations of a hotel
36	Operate a beauty salon or barber shop
37	Manage a department within a large company
38	Manage a clothing store
39	Sell houses
40	Run a toy store
41	Generate the monthly payroll checks for an office
42	Inventory supplies using a hand-held computer
43	Use a computer program to generate customer bills
44	Maintain employee records
45	Compute and record statistical and other numerical data
46	Operate a calculator
47	Handle customers' bank transactions
48	Keep shipping and receiving records

B. **Occupational Income.** For each occupation, please indicate how much income a person would make in this job, in comparison to all other jobs, using the following scale:

1 = Lower income than most other jobs (A)
2 = Below average income (B)
3 = Average income (C)
4 = Above average income (D)
5 = Higher income than most other jobs (E)

49	Farmers and Ranchers
50	Electronics Engineering Technicians
51	Fish and Game Wardens
52	Chemical Technicians
53	Nuclear Equipment Operation Technicians
54	Fishery Workers Supervisor
55	Petroleum Engineers
56	Civil Engineers
57	Biochemists
58	Dentists, General
59	Veterinarians
60	Biologists
61	Epidemiologists
62	Surgeons
63	Orthodontists
64	Animal Scientists
65	Musicians, Instrumental
66	Professional Photographers
67	Singers
68	English Language College Teachers
69	Art, Drama, and Music College Teachers
70	Set Designers
71	Curators
72	Music Directors
73	Physical Therapist Aides
74	Mental Health Counselors
75	Athletic Trainers
76	Child Care Workers
77	Secondary School Teachers

78	Personal and Home Care Aides
79	Speech-Language Pathologists
80	Middle School Teachers
81	Purchasing Managers
82	Sales Agents, Financial Services
83	Food Service Managers
84	Telemarketers
85	Retail Salespersons
86	Insurance Sales Agents
87	Lawyers
88	Real Estate Sales Agents
89	Auditors
90	Payroll and Timekeeping Clerks
91	Shipping and Receiving Clerks
92	Meter Readers, Utilities
93	Accountants
94	Mail Clerks
95	Actuaries
96	Tellers

C. **Learning Experiences.** This section of the survey includes a series of statements describing personal experiences and attitudes towards learning. Please rate how much you agree with each statement using the following scale:

1 = Strongly Disagree (A)
2 = Disagree (B)
3 = Neutral (C)
4 = Agree (D)
5 = Strongly Agree (E)

97	I performed well in biology courses in school.
98	People whom I respect have encouraged me to work hard in math courses.
99	I remember seeing my family plan out the details of vacations.
100	I have made simple car repairs.
101	While growing up, I saw people whom I admire work in youth ministry.
102	I have become nervous while solving math problems.
103	I have become uptight while trying to repair

	something that was broken.
104	I have seen people whom I respect read business magazines.
105	I have seen family members perform work which involved organizing information.
106	People I respect have urged me to learn how to fix things that are broken.
107	I was successful performing science experiments in school.
108	In school, I saw teachers whom I admired work on science projects.
109	I have felt uneasy when people would come to me with their problems.
110	I have seen people whom I trust successfully manage a business.
111	The artwork I have created usually turned out well.
112	I remember my family telling me that it is important to be able to solve science problems.
113	People whom I looked up to told me that it is important to read scholarly articles.
114	I remember watching members of my family create art.
115	My teachers have encouraged me to explore jobs in the helping professions (e.g., counseling).
116	I have kept accurate records of my financial documents.
117	I have been able to sell a product effectively.
118	I have observed members of my family build things.
119	I have made repairs around the house.
120	I have become anxious while learning new computer software.
121	I received good grades in my art courses in school.
122	I have become nervous when working on mechanical things (e.g., appliances).
123	I have seen people whom I respect enter the teaching profession.
124	I have done a good job at proofreading my papers for mistakes.
125	I have seen my parents keep organized records of their important financial documents.
126	I have been successful when I used tools to work on things.
127	I have felt anxious when I had to act in a play.
128	I have been successful at caring for children.
129	I have listened to members of my family speak in public.
130	I received high scores on the math section of my college entrance exam (e.g., SAT).
131	I have felt nervous when I had to sell something.

132	I have been successful at teaching people.
133	I have felt nervous while debating a topic.
134	I watched people whom I respect work in the outdoors.
135	I have felt anxious about creating artwork.
136	Teachers I admired encouraged me to take classes in which I can use my mechanical abilities.
137	I watched my friends as they participated in school plays.
138	People whom I admire have told me that it is important to learn new computer software.
139	While growing up, I saw people I respected using math to solve problems.
140	I have felt anxious while taking a science course in school.
141	I have seen people whom I respect participating in activities that require math abilities.
142	I have seen people whom I respect enter politics.
143	I have become nervous while teaching something new to a classmate.
144	I have felt uneasy while using tools to build something.
145	I have felt anxious while organizing resources for a term paper.
146	I have seen people whom I admire dedicate their lives to helping others.
147	I recall seeing adults whom I admire working in a research laboratory.
148	I have successfully persuaded people to do things my way.
149	I have done a good job at writing poetry.
150	People whom I respect have encouraged me to play a musical instrument.
151	I have observed people whom I admire perform volunteer work.
152	I have felt uneasy while learning new topics in biology courses.
153	I have easily understood new math concepts after learning about them in class.
154	My parents have encouraged me to pursue jobs that involve keeping track of records.
155	I observed people whom I respect repair mechanical things.
156	My family encouraged me to take social science courses (e.g., psychology).

Thank you for your time and participation
Your answers will be kept confidential

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