

VOCATIONAL INTERESTS: CONSTRUCT VALIDITY AND MEASUREMENT

by

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A thesis  
submitted in partial fulfillment  
of the requirements for the degree  
Doctor of Philosophy

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## ABSTRACT

This dissertation addressed several questions relevant to vocational interests and personality characteristics, examining (a) the roles of personality, vocational interests, and sexual fantasies in defining a general factor of Masculinity/Femininity (M/F) (Study 1), (b) the validity of a new measure of vocational interests (Study 2), and (c) the individual difference characteristics that discriminate between students in various academic majors, and that predict academic outcomes (Study 3). In Study 1, vocational interests, personality, and sexual fantasies were examined to find whether these variables would yield a general Masculinity/Femininity (M/F) factor, and whether that factor would still emerge when controlling for participant sex. The results of Study 1 revealed that a general factor of M/F did emerge. When sex was removed, the loadings of vocational interests decreased from high to very low, suggesting that the link of vocational interests with other indicators of M/F is mainly due to sex differences in these variables. The purpose of Study 2 was to validate the Oregon Vocational Interest Scales (ORVIS), a new public domain vocational interests questionnaire designed to measure eight vocational interest scales. ORVIS scores obtained in a college and community sample were compared with those of two personality measures and two cognitive ability tests. Results from this study showed that the ORVIS scales were reliable and showed good construct validity. The purpose of Study 3, using the ORVIS along with the HEXACO-PI and tests of cognitive ability, was to examine the individual difference characteristics of students in different academic majors, and to use the congruence between a student's academic major and vocational interests as a predictor of academic outcomes, such as GPA, academic major change, and satisfaction with major. The results of Study 3 revealed that students in different academic majors show theoretically meaningful differences in personality, abilities, and interests. Conscientiousness and math

ability were found to be the best predictors of academic outcomes. However, congruence between major and interests did not add significant predictive validity to any of these outcomes beyond personality and ability. Together, these three studies show the role of vocational interests in defining M/F and in predicting various academic outcomes.

## ACKNOWLEDGEMENTS

I would like to acknowledge some people who have made this dissertation and entire graduate school career possible. Firstly, a HUGE thank you to my advisor and mentor Mike Ashton who has spent countless hours revising my work and explaining things to me over and over. He did this all very patiently and without complaint and with his encouragement and support I was able to complete my graduate work with my sanity intact. Also, thank you to my committee members Carolyn Hafer and Kathy Belicki who have been kind and given me valuable feedback on various drafts and study designs over the years. Other members from the Brock community that deserve special thanks are Tony Bogaert who has opened my eyes to new and fascinating areas of research, Gordon Hodson who always had a minute or two to stop and see how I was doing and to provide encouragement along the way, and finally Linda Pidduck and Linda DiRaddo who have been my pillars of administrative knowledge over the years.

The group of friends and colleagues from Brock that I have had the blessed opportunity to get to know and to learn from, will I know, be life-long friends and continue to support me in both career and life endeavors and I plan to do the same for them. So for that, I give special thanks to Beth Visser, Becky Choma, Narnia Worth, and Leanne Gosse.

Finally, and most importantly, I couldn't have done any of this without the support of my family. To my husband Travis who has basically maintained a long distance relationship with me for 12 years all because of my schooling, I love you very much. Your support in my career and schooling, and all the little things you do to ease my stress levels has not gone unnoticed; you're the best. To my parents and sister (and her family), thank you for always being proud of me, showing interest in my research, and for keeping me grounded and loved even when distance separated us. You kept me motivated and encouraged me to push forward with my goals as you always have. And finally, to my extended family who likewise always showed genuine interest and to my grandparents who lent me a bedroom and provided excellent meals for 8 years. Thank you.

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## CHAPTER 1 – GENERAL INTRODUCTION

### Purpose

Vocational interests and personality are two widely studied individual difference constructs that have been linked with a variety of life outcomes including those related to academic achievement and career selection. Vocational interests are identified by an individual's self-reported preference for a number of vocations and personality is defined as enduring patterns of behavior. Together, these two constructs will form the backbone for this dissertation. The overarching purpose of these studies was to investigate how the dimensions of vocational interests and personality can be used to define masculinity/femininity and predict academic major choices and outcomes. The first study will address how well vocational interests, personality, and sexual fantasies all define a broad factor of masculinity/femininity (M/F) within sex. Previous research has commonly used vocational interests as a proxy measure of M/F and by examining vocational interests alongside two other well-known constructs with clear sex differences, I will be able to see how well each is a true representation of M/F within sex. The second study broadens the measurement of vocational interests with a new public domain scale called the Oregon Vocational Interest Scales (ORVIS). This study validates the ORVIS using both college and community samples and compares its relations with two personality scales as well as cognitive ability. Finally, the third study used the new ORVIS scale along with HEXACO personality and cognitive ability to assess the role of these variables in predicting the characteristics of people in different academic majors and in predicting academic outcomes such as grade point average (GPA) and satisfaction with academic major.

## **Vocational Interests**

### **Structure**

Vocational interests can be identified by an individual's preferences for a number of vocations, and are often stable through adulthood. Vocational interests are thought to be a result of interactions between cultural and personal forces (Holland, 1985) with non-shared environment accounting for approximately 55 percent of the variance in vocational interest, and 30 to 50 percent of the variance being accounted for by genetic factors (Betsworth, et al., 1994). According to Holland (1985), the process by which interests develop starts with a preference for some activities over others, which then develops into strong interests, which then turns into certain competencies, which finally creates a personal disposition leading the individual to think and act in special ways.

In past research, factor analysis has been the primary exploratory tool to identify basic interest dimensions such as vocational interests. The structure of each type of vocational interest is characterised by commonalities in the preference for specific activities such as selling, teaching, or organizing, and are often represented in specific objects of interest such as science, religion, or art. Guilford, Christensen, Bond, and Sutton (1954) administered a 1000 item interest inventory to Air Force personnel in an effort to find some basic dimensions of interests. Seventeen factors emerged from which six were clearly directed towards vocational interests. The following is a list of the six factors that emerged: 1) Mechanical 2) Scientific 3) Aesthetic Expression 4) Social Welfare 5) Business and 6) Clerical. Building on the findings of this study, Holland (1966) suggested a similar set of six vocational interest dimensions that have become one of the most widely studied models of vocational interests. Holland proposed a structural model of vocational interests that defined the relations between each of his six interest types. The six types or interests were placed within a hexagonal representation of vocational interests with

adjacent types being the most related to each other, and opposite types being the least related to each other. The distances between interests or types in the hexagon are thought to approximate the intercorrelations among the interests and the distances between the types indicating the degree of the relationship. (See Figure 1 for a representation). This structural hypothesis has been confirmed by many individual studies (see Rounds, 1995 for a summary). Holland acknowledges that categorizing people into one of six types is unacceptable because this might imply that there are only six different types of people. Instead, he explains that there is a wide variety of individual variation among people and their levels of interest in different activities, but he believes that these six categories represent a simple ordering of an individual's resemblance to each type.

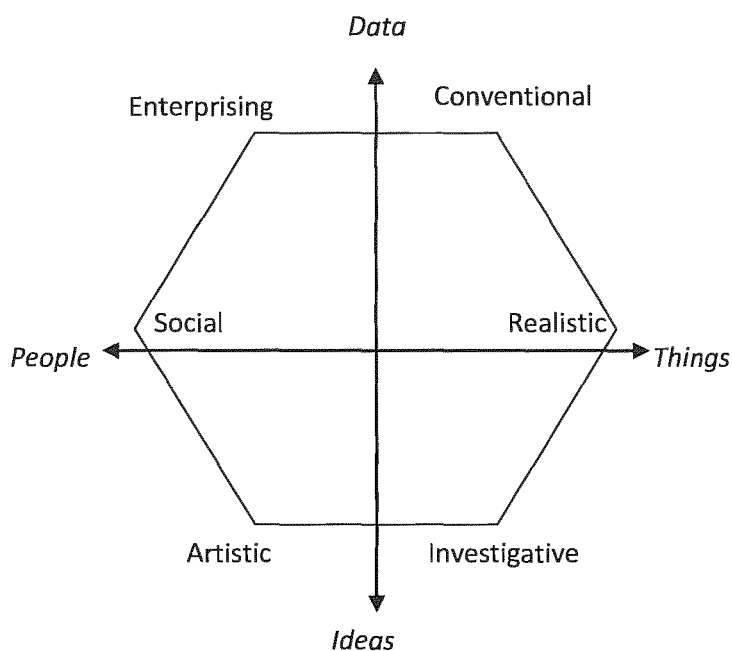


Figure 1.1

*Hexagonal representation of the relationships among Holland's types and the locations of Prediger's (1982) underlying dimensions (in italics).*

Holland (1997) proposed six interests to distinguish between different types of careers or environments, and believed that people's personalities (or preferences) could also be categorized into these six types. Table 1.1 gives an overview of the types of activities a person in each of Holland's six types might prefer and possible jobs characteristic of each of the six types. Together, these six interests are the basis of Holland's RIASEC model. Holland's hexagonal alignment of the six interest types suggested a two-dimensional model to explain the relationship among each of the types. Prediger (1982) identified two essentially independent factors in Holland's model and he labelled these dimensions Data tasks vs. Ideas tasks and Things tasks vs. People tasks. The Data pole is defined by tasks that involve the routine manipulation of facts and numbers, and following systematic procedures. The Ideas pole is defined by tasks that involve abstractions, knowledge, and new insights into expressing information and knowledge. The Things pole is defined by tasks that are non-personal in nature and involve machines, tools, and materials. The People pole is defined by interpersonal tasks that involve caring for, persuading, directing, and entertaining others. These dimensions can be positioned on Holland's hexagon (see Figure 1) with the Ideas pole representing Investigative and Artistic interests, and the Data pole representing Enterprising and Conventional interests. The Things pole is represented by Realistic interests and the People pole is represented by Social interests. These two dimensions account for approximately 50 to 60 percent of the variance in Holland's model of the six interests and have been replicated in other studies (Athanasou, O'Gorman, & Meyer, 1981; Lippa, 1998).

Table 1.1

*Preferred activities and possible jobs characteristic of each of Holland's six vocational interests. (Holland, 1985; Lippa, 1998)*

Holland Type	Preferred Activities	Possible Jobs
Realistic	working with one's hands or manipulating machinery, tools, or animals	mechanic, carpenter, farmer
Investigative	observing and systematically investigating physical, biological, or cultural phenomena in a creative way in order to understand and control them	scientist, mathematician, economist
Artistic	free, unsystematized opportunities of expression to create art or products	actor, writer, artist
Social	helping people with personal problems, training, curing, or informing other people	humanitarian, priest, teacher, social worker
Enterprising	dominance and manipulation of others to attain organizational or self-interest goals	politician, sales, leader, manager
Conventional	ordered, systematic manipulation of data according to a prescribed plan	secretary, administrator, accountant, bank teller

## Measurement

One of the pioneers in the vocational interest measurement field was Strong who in 1927 published his first career inventory called the Strong Vocational Interest Blank (SVIB). Strong used the criterion-based approach to scale construction and selected items that related to the criterion of being satisfying members of a specific occupation.

Holland's (1997) vocational interests classification came from analyzing the SVIB with a desire to have an inventory that could match parallel occupational classification systems. Holland performed factor analyses of personality and interest inventories and found that six groups of occupations emerged. To measure these six groups of interests, Holland created the



Vocational Preference Inventory (VPI; Holland, 1985) and the Self-Directed Search (SDS; Holland, Powell, & Fritzsche, 1994), the latter of which can be self-administered by participants.

Meanwhile, Campbell carried on with Strong's work with the integration of Holland scales and the creation of an inventory suitable for both men and women. Campbell's most recent inventory is the Campbell's Interest and Skill Survey (CISS; Campbell, Hyne, & Nilsen 1992; Campbell, 1995). The CISS contains Holland type scales with however, seven scales instead of six. Campbell thought that in order to include a more adult, college-educated, organized group, Holland's Conventional theme needed to be changed to more of an Organizing theme, Holland's Enterprising theme was geared more towards leadership and less on sales in Campbell's Influencing theme, and Holland's Realistic theme was split into Campbell's Producing and Adventuring theme yielding seven broad Orientation Scales in total (Influencing, Organizing, Helping, Creating, Analyzing, Producing, and Adventuring). Together, Campbell's and Holland's vocational interests instruments have been the most commonly used scales throughout the past couple decades.

### **Sex Differences**

Vocational interests have been used fairly frequently to show sex differences in preferences for different occupations. These differences are most noticeable along Prediger's (1982) People-Things dimension (Lippa, 1998; Su, Rounds, Armstrong, 2009), with women showing more interest in people-oriented careers such as nursing or teaching, and men showing more interest in thing-oriented careers such as accounting and trades. Preferences for certain occupations along the People-Things dimension can itself be used as an index of masculinity and femininity. Lippa (2005a) analyzed various subdomains of "masculine" and "feminine" vocational interests (e.g., blue-collar realistic, educated realistic, flashy risk-taking, fashion-

related, artistic, helping, and children-related) and concluded that these variables defined a single bipolar dimension of masculine versus feminine occupational interests.

### **Prediction of Academic Outcomes**

Although vocational interests originated with a categorization of careers, Apostol and Harper (1972) explain that academic majors in university or college can also be considered a form of vocational interest. Similarly, Astin (1965) and DeVoge (1975) found that academic major was one of the strongest contributors to final career choice, and oftentimes people were employed in occupations that matched their vocational type in college.

Some studies have investigated which vocational interests are more commonly endorsed by students in different academic majors. For example, Laudeman (1975) compared vocational interest scores across six different academic major groups using Holland's RIASEC model and found that engineering students scored the highest in Realistic interests, education students scored the highest in Social interests, accounting students scored the highest in Conventional interests, marketing students scored the highest in Enterprising interests, and arts and music students scored the highest in Artistic interests. In terms of performance or GPA in the case of students, Lowman and Leeman (1998) found that Investigative (sometimes known as Intellectual) interests were associated with higher grade point average as might be expected, but most of the research examining performance and satisfaction outcomes have generally done so through the examination of congruence.

**Congruence.** Congruence is a construct commonly used in vocational interests research that is defined as the similarity between an individual's vocational preferences or interests and the type of environment he or she works in (Barrick, Mount, & Gupta, 2003, p. 49). Holland's (1997) theory suggests that people who work in environments that are more congruent with their interests are more satisfied, more persistent, and achieve more than those who work in

incongruent environments. The congruence theory has been confirmed by research (Tracey & Rounds, 1993) and has been extended to choice of academic major as well (Bruch & Krieshok, 1981; Miller, Heck, & Prior, 1988). For example, Morrow (1971) examined students from math and sociology majors to investigate whether students from each of these majors would show higher levels of satisfaction with their academic major when their vocational interests were congruent with the major they were registered in. Satisfaction for students registered in mathematics was found to be positively associated with Intellectual vocational interests and negatively associated with Enterprising interests. Logue, Lounsbury, Gupta, and Leong (2007) found that Realistic, Artistic, and Investigative vocational interests were negatively correlated with academic major satisfaction in business students. Theoretically, Enterprising interests would be the most relevant to business students; however, Enterprising interests were not associated with academic major satisfaction. Nevertheless, the results are at least partly consistent with congruence theory given that Enterprising interests are quite opposite to Artistic, Investigative, and Realistic interests in Holland's hexagonal model.

Miller (1994) tested the congruence theory in an alternative way by examining congruence between individuals' least characteristic Holland type and their least desirable college major. Results of this study showed that the correspondence between least descriptive type and least liked major was fairly high (.58). Spokane (1985) reviewed a number of studies that found that satisfaction with academic major and also satisfaction with job was highly related to levels of congruence. Related to this finding, people who had vocational interests incongruent with their academic major were more likely to change academic majors than were those whose interests were more congruent (Holland, 1963; Holland & Nichols, 1964; Walsh & Lacey, 1969,

1970). Similarly, congruence leads to stability and persistence in the certainty of academic major choice (Allen & Robbins, 2008; Villwock, Schnitzen, & Carbonari, 1976).

Although there has been evidence of the relationship between congruence and academic satisfaction and success, there has also been equal numbers of studies finding either a weak or null relationship between these variables.

## **Personality**

### **Structure**

In general, personality traits can be defined by distinguishable and enduring patterns of behaviour that show cross-situational consistency (Goldberg, 1993). These patterns of behaviour are often observable to other people and can be perceived as either socially desirable or undesirable. McCrae and Costa (1999) take this clarification a bit farther to explain that traits are not merely patterns in behaviour, they are “psychological entities that can only be *inferred* from behaviour and experience.” (p. 143) Each individual can be described in terms of their levels of these various traits, and each individual has a unique combination of trait levels. Research has found personality to be quite stable (McCrae et al., 2000) and has suggested that a significant amount of the individual variation in personality traits can be attributed to genetic factors (Loehlin, McCrae, Costa, & John, 1998; McCrae & Costa, 1999).

In order to identify the basic dimensions of personality, researchers have examined lists of personality-descriptive adjectives of different languages. Individuals’ self-ratings on the adjective lists have been factor-analysed to define a set of broad dimensions that could account for the range of personality variation. This process of factor-analysing personality-descriptive adjectives stems from the lexical hypothesis, from which follows the idea that a factor analysis of ratings on adjectives in any natural language will reveal an underlying structure of personality

characteristics. The categorization of personality traits into a few major factors allows researchers to communicate more efficiently and provides a parsimonious set of personality variables, which allows systematic examination of the correlates of personality. Over the years, different researchers (Ashton et al., 2004; McCrae & John, 1992; Tupes & Christal, 1961/1992) have condensed those personality traits into a few major dimensions.

The debate concerning the number of factors has been explored by a number of researchers (Goldberg, 1990; Lanning & Gough, 1991; Piedmont, McCrae, & Costa, 1991). Based on the lexical hypothesis, some recent research has suggested that there is a six factor structure of personality characteristics. Ashton et al. (2004) factor-analysed personality-descriptive adjectives in seven different natural languages and found a six factor structure of personality characteristics. This result implies that this structure of personality characteristics is present naturally across diverse cultures and social contexts. The six factors that they discovered were named **H**onesty-Humility, **E**motionality, **eX**traversion, **A**greeableness, **C**onscientiousness, and **O**penness to Experience. (Note that Openness to Experience is the label typically used with questionnaires, whereas Intellect/Imagination/Unconventionality is the label used in lexical studies.) The bold letters of each factor form the acronym HEXACO. The main differences between the HEXACO model and the Five Factor Model include the addition of a sixth factor, Honesty-Humility, and also include variations on the factors Neuroticism (labelled Emotionality in the HEXACO) and Agreeableness. In the HEXACO model, the Emotionality factor is not defined by anger-related content as it is in the Five-Factor model; rather, it is characterized by content related to sentimentality. The Agreeableness factor in the HEXACO model is defined by content related to an even-temper, whereas in the Five-Factor model, Agreeableness includes

content involving sentimentality (see Lee & Ashton, 2004 for further descriptions). See Table 1.2 for a listing of the facet scales within each of the HEXACO factors.

Table 1.2

*Facet scales within each HEXACO factor*

HEXACO Factor	HEXACO Facets
Honesty-Humility	Sincerity, Fairness, Greed Avoidance, Modesty
Emotionality	Fearfulness, Anxiety, Dependence, Sentimentality
eXtraversion	Expressiveness, Social Boldness, Sociability, Liveliness
Agreeableness	Forgiveness, Gentleness, Flexibility, Patience
Conscientiousness	Organization, Diligence, Perfectionism, Prudence
Openness to Experience	Aesthetic Appreciation, Inquisitiveness, Creativity, Unconventionality

## Measurement

These groupings of personality adjectives have led to the development of questionnaires designed to measure personality. An inventory titled the Sixteen Personality Factor Questionnaire (16PF; Cattell, Eber, & Tatsuoka, 1970) was used as a basis for a factor analysis by Costa and McCrae (1980) to find the underlying dimensions of personality. Through the combination of results from a lexically-derived questionnaire and from lexical research by Digman and Takemoto-Chock (1981) and Goldberg (1983), McCrae and Costa identified a five-factor structure of personality called the Five-Factor Model or the Big 5 (McCrae & Costa, 1985; see McCrae, 1989 for a detailed review of the history behind the Five-Factor Model.) The Five-Factor model structure or FFM has been the most widely used model of personality structure and

was developed and refined by McCrae and Costa (1987) from past research using the questionnaire method. The FFM consists of five factors of personality which are titled: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness. In order to measure these five factors, the NEO Personality Inventory (NEO-PI and NEO-PI-R; Costa & McCrae, 1985, 1992) and the NEO Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992) were created.

With the emergence of the HEXACO model of personality, Ashton and Lee (2008) constructed a personality inventory called the HEXACO-PI-R to measure these six personality factors. The practicality of having a public-domain measure of personality that has been widely validated in past research has shown its utility in current research. The HEXACO-PI-R has been shown to have advantages over the FFM in predicting many behaviours and constructs (Ashton, Lee, Visser, & Pozzebon, 2008; Lee, Ashton, & de Vries, 2005; Lee, Gizzarone, & Ashton, 2003).

### **Sex Differences**

Men and women tend to show distinct mean differences on some personality traits. Some possible explanations as to why these sex differences emerge point to biological and social psychological theories. According to the biological theories, evolution could have shaped the way temperament is developed with women evolving to be more agreeable and nurturing to protect their children. Another biological theory points to hormones contributing to differences in interests, activities, and aggression. Some social theories point to social roles that are internalized in childhood of the socially accepted ways in which men and women are supposed to act and feel.

Agency and communion have been proposed as fundamental personality traits that differentiate men and women (Bakan, 1966). Agency is defined by characteristics such as self-

assertion, personal competency, goal orientation, and self-protection. Communion is defined by characteristics such as selflessness, a desire to be at one with others, social-emotional sensitivity, and interpersonal orientation. Agency is considered a typically masculine trait, whereas communion is typically viewed of as a feminine trait. Research has suggested that individuals can have both agentic and communal traits (e.g., Block, 1973; Carlson, 1971; Spence, Helmreich, & Stapp, 1975) but within sex the correlations between scales measuring agentic and communal traits are close to zero.

In terms of the Big Five and respective facets, the existence of sex differences in some of the factors has been found. Feingold (1994) found that men were more likely to be assertive and have higher self-esteem, whereas women were more likely to be high in extraversion, anxiety, trust, and tender-mindedness. This effect is seen cross-culturally as well. In particular, a study by Schmitt, Realo, Voracek, and Allik (2008) examined sex differences in Big Five traits across many different cultures and found that the main sex differences were prevalent in more prosperous cultures where the rights of men and women were more egalitarian. Of the Big Five, women tended to score higher on neuroticism, extraversion, agreeableness, and conscientiousness but in cultures that are less developed, men were found to have basic personality tendencies similar to women.

### **Prediction of Academic Outcomes**

The Big Five personality factors have been found to be important predictors of academic achievement. Paunonen and Ashton (2001), Paunonen (2003), and Nofle and Robins (2007) found that the Big Five factor Conscientiousness was a significant predictor of university grades. At the facet level, Paunonen and Ashton (2001) found that Achievement (a facet of Conscientiousness) and Understanding (a facet of Openness to Experience) showed stronger correlations than did Conscientiousness with university grades. Nofle and Robins (2007) found



Conscientiousness to be a slightly stronger predictor of GPA than were SAT scores, and Openness to Experience was found to be a significant predictor of verbal SAT scores even after controlling for GPA.

Very little research has examined the differences in personality characteristics of students who choose different academic majors. Most of the research examining the personality characteristics of students in different academic majors is outdated and focused on haphazard collections of specific traits rather than more representative sets such as those in the Big Five or HEXACO model. Kipnis, Lane, and Berger (1967) found that students in business majors were more impulsive than students in math or physical science majors. More impulsive students were also more likely to drop out of college, whereas students low in impulsivity were more likely to contact the counselling centre if they were having problems. When examining students in social science fields versus students in natural science fields, Sherrick, Davenport, and Colina (1971) found that social science students were more flexible and liberal in their thinking than were natural science students.

### **Focus of the Three Studies**

The main goal of these three studies is to examine the structure of vocational interests and their relations with personality and how together they can predict specific academic outcomes (see Table 1.3 for an overview of the research questions). The findings from these studies contribute to the literature on vocational interests and individual differences through the introduction of a new vocational interests measure and the induction of the HEXACO personality model into the vocational interests domain. These two scales improve and expand on previous measurement of vocational interests and personality, and will help to investigate the role of these two constructs in the prediction of academic outcomes.

In Study 1, the structure of masculinity/femininity as defined by personality (agency and communion), vocational interests, and sexual behaviours was examined both across sex and with sex removed to investigate whether a general factor of M/F emerged. In Study 2, a new vocational interest measure (Oregon Vocational Interest Scales; ORVIS) was introduced as a public domain measure and was validated with college and community samples. The construct validity of the ORVIS was tested by comparing its relations to another vocational interest scale as well as to personality and ability. In Study 3, using the ORVIS, the HEXACO-PI-R, and cognitive ability measures, we examined the individual difference characteristics of students in different academic major groups. I also investigated the degree to which congruence between vocational interests and one's chosen academic major were able to predict academic outcomes above and beyond personality and ability.

Table 1.3

*Summary of Study Questions*

Study	Measures	Research Questions
1	<ul style="list-style-type: none"> <li>• Extended Personal Attributes Questionnaire (EPAQ)</li> <li>• Unmitigated Communion Scale</li> <li>• Occupational Preferences Scale</li> <li>• Sexual Fantasy Questionnaire</li> </ul>	<ol style="list-style-type: none"> <li>1. Is there a higher order masculinity/femininity factor that exists within each sex?</li> <li>2. And if this factor does exist on a within-sex basis, is it defined strongly by occupational interests, personality, and sexual fantasies?</li> </ol>
2	<ul style="list-style-type: none"> <li>• Oregon Vocational Interest Scales (ORVIS)</li> <li>• Campbell Interest and Skill Survey (CISS)</li> <li>• HEXACO-PI-R</li> <li>• International Personality Item Pool (IPIP)</li> <li>• Cognitive Ability Tests</li> </ul>	<ol style="list-style-type: none"> <li>1. Construct validation of ORVIS scales</li> </ol>
3	<ul style="list-style-type: none"> <li>• ORVIS</li> <li>• HEXACO-PI-R</li> <li>• Cognitive Ability</li> <li>• Satisfaction and demographics</li> </ul>	<ol style="list-style-type: none"> <li>1. Do students in different majors differ in personality, vocational interests, and ability?</li> <li>2. Does congruence between an individual's vocational interests and choice of academic major add incremental predictive validity of academic outcomes, beyond personality and ability, in the prediction of GPA, satisfaction with major, and academic major?</li> </ol>

**CHAPTER 2 – STUDY #1 – VOCATIONAL INTERESTS, PERSONALITY, AND  
SEXUAL FANTASIES AS INDICATORS OF A GENERAL  
MASCULINITY/FEMININTY FACTOR**

Note: This section is based on the following article, with permission: Pozzebon, J. A., Ashton, M. C., Visser, B. A., Bogaert, A. F. (under review). Vocational Interests, Personality, and Sexual Fantasies as Indicators of a General Masculinity/Femininity Factor.

Abstract

Several individual difference domains include variables that show substantial sex differences and may be considered as indicators of masculinity/femininity (M/F). I examined the structure of sex-related characteristics from three domains (vocational interests, personality characteristics, and sexual fantasies) to find whether a general factor of M/F can be derived even when participant sex is controlled, and if so, to determine which domains, and which variables within those domains, are the best indicators of that factor. In a sample of 198 undergraduate students, I found strong intercorrelations between the indicators of M/F in the combined-sex sample but only weak intercorrelations within sex. The results indicated that a general masculinity/femininity factor could be obtained, even when participant sex was controlled, but was defined more strongly by personality characteristics and sexual fantasies than by vocational interests, which showed only weak loadings.

## Introduction

For several decades, psychologists have attempted to understand and to measure the constructs of masculinity and femininity (see Lippa, 2001, for a review). Several bipolar masculinity-versus-femininity scales were developed in the mid-20<sup>th</sup> century, using vocational interest items (Strong, 1936, 1943), personality items (Gough, 1957; Guilford & Zimmerman, 1956; Hathaway & McKinley, 1951), and items representing a wide range of psychological characteristics (Terman & Miles, 1936). Generally, psychological individual difference variables that exhibit large sex differences are considered as being relevant to masculinity/femininity (M/F). In the 1970s, researchers conceptualized masculinity and femininity as two independent dimensions, and constructed scales to reflect this conceptualization (Bem, 1974; Spence, Helmreich, & Stapp, 1974). More recently, Lippa (2001) has rehabilitated the concept of a single bipolar M/F dimension, and has measured it using vocational interest items that are highly “gender diagnostic”, showing large sex differences. The resulting scales have been largely independent of personality characteristics, even though those latter characteristics also show some sex differences.

In the present research, I examine potential indicators of M/F from three different domains: vocational interests, personality characteristics, and sexual fantasies. Previous work by Lippa (1998) has suggested that M/F as assessed by vocational interests is only moderately associated with personality characteristics, even with those that do show some sex differences. Here, I investigate M/F in terms of both of the above domains as well as a third domain in which important sex differences are both expected and observed, namely, that of sexual fantasies. In particular, I examine the question of whether indicators of M/F from each of these three domains

will define a general M/F factor, and I compare the three domains in the extent to which they define this factor.

Any given measure of M/F would be expected to show substantial sex differences. But because M/F is also conceptualized as showing wide variation within each sex, it is important to analyze the relations among potential indicators of M/F both with and without controls for participant sex. Valid measures of M/F should be substantially intercorrelated not only because of the effects of participant sex, but also because of an underlying M/F tendency that operates within the sexes. In the present research, therefore, I examine the extent to which the indicators of M/F from the various domains can define a general M/F factor even when participant sex is controlled.

### **Masculinity/Femininity of Vocational Interests**

Previous research has shown consistent sex differences in vocational interests (Johansson & Harmon, 1972). These differences are noticeable along Prediger's (1982) People-Things dimension (Lippa, 1998; Su, Rounds, Armstrong, 2009), with women showing more interest in people-oriented careers and men showing more interest in thing-oriented careers. Because of the large sex differences in these areas of vocational interest, the People-Things dimension can itself be used as an index of masculinity and femininity. Lippa (1998) developed a measure of M/F—the Gender Diagnosticity scale—using a variety of vocational interest items that differentiate men and women, including many items that represent the People-Things dimension. Lippa found that this Gender Diagnosticity scale was able to predict sexual orientation (Lippa, 2002) and self-ratings of M/F (Lippa, 1991) better than personality-based masculinity/femininity scales and was independent of the Big Five personality factors.

Lippa (2005a) analyzed various subdomains of “masculine” and “feminine” vocational interests (e.g., blue-collar realistic, educated realistic, flashy risk-taking, fashion-related, artistic, helping, and children-related) and concluded that these variables defined a single bipolar dimension of masculine versus feminine occupational interests even when data were analyzed separately by sex. Ashton and Lee (2008) raised some methodological concerns about the findings of Lippa (2005a) and examined the structure of sex-related occupational interests in a new sample using the Campbell Interest and Skill Survey (CISS; Campbell, Hyne, & Nilsen, 1992). They found the occupational interest scales did not define a larger factor of masculinity-femininity within sexes and that the gender-related subscales were uncorrelated within sex. In the current study, I will further examine the within-sex structure of sex-related occupational interests, and also examine whether these variables are related to other indicators of masculinity/femininity, specifically, personality characteristics and sexual fantasies.

### **Masculinity/Femininity of Personality (Agency and Communion)**

Agency and communion have been proposed as fundamental personality traits that differentiate men and women (Bakan, 1966). A sense of agency is exhibited through characteristics such as self-assertion, personal competency, goal orientation, and self-protection, which are viewed as stereotypically male. A sense of communion is exhibited through characteristics such as selflessness, a desire to be at one with others, social-emotional sensitivity, and interpersonal orientation, which are viewed as stereotypically female. Similarly, unmitigated agency and unmitigated communion are considered the extreme, socially undesirable ends of these personality characteristics (Buss, 1990; Spence, Helmreich, & Holahan, 1979). Although early research was based on the assumption that agentic and communal traits were opposite and bipolar, more recent research has suggested that individuals can have both agentic and communal

traits (e.g., Block, 1973; Carlson, 1971; Spence, Helmreich, & Stapp, 1975) and that within sex, the correlations between scales measuring agentic and communal traits are close to zero. Given the roots of agency, communion, unmitigated agency, and unmitigated communion in stereotypical sex-typed personality characteristics, these constructs provide an important basis for measuring masculinity/femininity.

### **Masculinity/Femininity of Sexual Fantasies**

Assessing individual differences in the domain of sexuality can be a useful way to examine the construct of masculinity/femininity given that there are generally distinguishable differences in the way men and women behave, think, and feel about sex related matters. Sexual fantasies provide a useful way to assess sexuality-related interests because, unlike sexual behaviors, which may be constrained by the preferences of potential partners and by moral considerations, sexual fantasies can provide a relatively pure indication of basic sexual motivations (Ellis & Symons, 1990; Wilson, 1997). Although preferences for certain sexual fantasies have not been used specifically as indicators of masculinity/femininity, research has shown that there are definite sex differences in the types of fantasies preferred. Hicks and Leitenberg (2001) reported that in a sample of university students, 98 percent of men versus 80 percent of women fantasized about sex with people other than their committed partner. The fantasy theme of extradyadic affairs is commonly reported in men. For example, when Wilson (1987) asked participants to describe their favorite sexual fantasy, 31 percent of men (compared to 15% of women) listed group sex whereas 21 percent of women (compared to 14% of men) incorporated their current steady partner. Likewise, Ellis and Symons (1995) showed that men (29% compared to 9%) tended to fantasize more about sex with strangers, whereas women (59% compared to 28%) fantasized more about romantic sex with their current or previous partner.



This pattern of results would seem to be consistent with evolutionary interpretations of human behavior in which males are expected to be predisposed to mate relatively indiscriminately with many partners and females are expected to be more focused on close pair-bonds that would help to ensure the protection and provisioning of their offspring. Given that these theoretically consistent sex differences in sexuality have been observed in empirical research, sexual fantasy themes are plausible indicators of masculinity/femininity.

### **The Current Study**

The purpose of this study is to examine masculinity/femininity as measured by vocational interests, personality characteristics (focusing on agency and communion), and preferences for specific sexual fantasy themes. I investigate the question of whether the M/F factors of these domains are similar to one another (and hence strongly define a general factor of M/F) even when participant sex is controlled. Further, given the use of vocational interests as a proxy measure of M/F in previous research, I will focus especially on the extent to which this construct defines any such general M/F factor. This research builds on previous work by further exploring the measurement of M/F within sex and by evaluating the importance of different aspects of M/F in the definition of a general M/F factor.

I examined two questions: Does a higher order M/F factor exist within sex, or is this factor merely a function of individual differences across sexes? And, do all three domains load similarly on the general factor of M/F, or do some domains represent the general M/F factor better than do others?

## **Method**

### **Participants**

Two hundred students (100 men and 100 women) at a Canadian university participated for course credit or \$20. Of these 200, data from two male participants were excluded because of obviously invalid responses (e.g., geometric patterns in the circling of responses). Separate data from these participants were used in other studies examining body image and psychopathy (see Choma, Visser, Pozzebon, Bogaert, Busseri, & Sadava, 2010, and Visser, Pozzebon, Bogaert, & Ashton, 2010). The ages of the 198 participants ranged from 18 to 32 years ( $M = 19.80$ ,  $SD = 2.17$ ). Of the 188 participants who indicated their racial background, 164 (82.8%) indicated they were Caucasian, 9 (4.5%) Asian, 8 (4.0%) East Indian, and 7 (3.5%) African. See Appendices A and B for the ethics approval and consent form respectively.

### **Procedure**

Participants were tested in small same-sex groups of approximately 3 to 10 in a room where each was seated in a private enclosure with a curtain drawn.

### **Measures**

**Occupational Preferences Scale (Lippa, 2005a; see Appendix C).** Participant interests in the 40 occupations listed in this scale have previously been found to show sex differences and have been interpreted as indicators of masculine or feminine vocational interests. For each occupation (item), participants indicated to what extent they would like to do the kind of work indicated. Participants responded on a five-point scale (*Strongly Disagree* to *Strongly Agree*). The means of items referring to “feminine” occupations (e.g., beauty consultant) were reverse-scored and then combined with the means of items referring to “masculine” occupations (e.g., electrical engineer) to produce a total score on overall masculine versus feminine vocational interests, such that high scores indicate masculine vocational preferences.

Subscales that were hypothesized to represent specifically masculine and feminine vocational interests were created from Lippa's Occupational Preferences Scale. I created subscales each consisting of two to five conceptually similar interest items using items that Lippa (2002) found to be associated with sex, with subscale scores computed as the mean of the relevant items. The subscales were labeled blue collar realistic (containing items such as auto mechanic, machinist), educated realistic (e.g., mechanical engineer, computer programmer), "flashy" (e.g., jet pilot, military officer), helping/child oriented (e.g., children's author, nurse), and fashion-related/artistic (e.g., costume designer, dance teacher). The internal consistency reliabilities of these scales are reported in Table 2.1; note that the subscales with only two or three items had reliabilities only in the .50s and .60s.

**Unmitigated Communion Scale (Korabik & McCreary, 2000; see Appendix D).** This eight-item scale measures unmitigated communion [the extreme focus on others to the exclusion of the self (e.g., *I find myself getting overly involved in other people's problems*)]. This construct is thought to reflect a typically feminine characteristic (Ghaed & Gallo, 2006). Participants indicated the degree to which each item describes themselves on a five-point scale (*not at all like me to very much like me*).

**Personal Attributes Questionnaire (EPAQ; see Appendix E).** The participants completed items from the extended version of the EPAQ (Spence, Helmreich, & Stapp, 1974). The EPAQ consists of 24 items yielding three subscales: Agency (focus on self), Communion (focus on others), and Unmitigated Agency (extreme focus on the self to the exclusion of others). These constructs reflect typically masculine (Agency and Unmitigated Agency) and feminine (Communion) characteristics (Ghaed & Gallo, 2006). Participants indicated the degree to which each item describes themselves on a five-point scale (e.g., *Not at all Arrogant to Very Arrogant*).

The four previous personality scales (agency, communion, unmitigated agency, and unmitigated communion) were treated as subscales of a broader personality factor measuring masculinity/femininity. The general M/F personality scale was computed by finding the mean across the agency and unmitigated agency items, and then subtracting the mean across the communion and unmitigated communion items. Internal-consistency reliabilities (see Table 2.1) ranged from the .50s to the .70s for the personality subscales and reached .80 for the overall M/F personality scale.

**Sexual Fantasy Questionnaire (see Appendix F).** The sexual fantasy questionnaire was created by the authors. Items were written to measure interest in a variety of sexual fantasy themes including Object of Desire Self-Consciousness, multiple partners, dominance/submission, romance, and fantasizing. Each of the 62 items listed a possible sexual fantasy scenario (e.g., receiving sexual pleasure from many people, having casual sex with a person I just met and who finds me irresistible, a special person is devoted to me and showers me with love and attention) and participants indicated how sexually exciting each scenario would be to them personally on a seven-point scale (*Not at all Exciting* to *Extremely Exciting*).

Several of the items from the sexual fantasy questionnaire were designed to measure other components of sexuality fantasy not relevant to M/F. A principal components analysis of all 62 items extracting two rotated factors revealed a split of masculine and feminine items. For the purpose of this study, items were retained that contained clear M/F content and showed substantial loadings on the two factors. From the chosen 30 items, a principal components analysis produced a scree plot that suggested at most four factors. (The first eight eigenvalues were 12.45, 2.81, 1.66, 1.37, 1.15, 1.05, .95, and .88). However, when I rotated four factors, the fourth factor was defined by only one item. I therefore rotated three factors using orthogonal

(varimax) or oblique (promax) rotations and identified items that loaded strongly and near-univocally on the factors. These items were then selected for inclusion in three sexual fantasies subscales. On the basis of their content, these subscales were labeled multiple partners (eight items), casual sex (seven items), and romantic/devoted sex (three items). The internal consistency reliabilities of these subscales were all high (see Table 2.1), with men scoring higher in multiple partners and casual sex, and women scoring higher in romantic/devoted sex. Together, the items from the three M/F sexual fantasy subscales (with the feminine items reversed) produced an overall M/F sexual fantasies scale with an alpha of .95.

## **Results**

### **Descriptive Statistics and Reliabilities**

The descriptive statistics and internal consistency reliabilities (coefficient alpha) for each of the vocational interest, personality, and sexual fantasies scales are reported in Table 2.1 for both sexes combined and for each sex separately, along with the sex differences on each scale expressed in *d* units. As seen in the table, sex differences were large for most vocational interests scales and sexual fantasy scales (with the exception of romantic/devoted sexual fantasies, which showed only moderate sex differences). The personality scales showed low to moderate sex differences with the largest differences being observed for agency and communion. Internal-consistency reliabilities ranged from the .50s to the .80s.

### **Scale Intercorrelations**

Correlations among the vocational interests scales, personality scales, and sexual fantasies scales are shown in Table 2.2. In the full combined-sex sample, Lippa's occupational interests scales correlated with other interest scales and with personality and sexual fantasies in the expected directions: "masculine" scales correlated positively with other masculine scales

(both within the same domain and in the other domains); likewise, “feminine” scales generally correlated positively with other feminine scales (both within the same domain and in the other domains). The overall M/F scale derived from Lippa’s vocational interests showed strong correlations with the subscales representing M/F sexual fantasies as well as the overall scale M/F sexual fantasy scale, and moderate correlations with the subscales and overall scale representing M/F personality traits. The relations between personality and sexual fantasies indicated that the masculine and feminine personality characteristics of agency and communion were moderately correlated with sexual fantasy subscales in the expected direction.

Table 2.1

*Means, Standard Deviations, and Internal Consistency Reliabilities, and Sex Differences for Vocational Interests, Personality, and Sexual Fantasy Preferences*

Scale	Men		Women		Combined			
	$\alpha$	M (SD)	$\alpha$	M (SD)	$\alpha$	M (SD)	<i>T</i>	<i>D (men-women)</i>
M/F (Vocational Interests)	.64	3.30 (0.47)	.60	2.23 (0.42)	.84	2.76 (0.70)	16.73	2.40
Blue collar realistic	.79	2.56 (0.97)	.73	1.67 (0.73)	.81	2.11 (0.96)	7.26	1.04
Educated realistic	.75	2.53 (1.11)	.82	1.57 (0.81)	.82	2.05 (1.08)	6.94	0.99
Flashy interests	.53	3.22 (1.15)	.61	2.06 (1.05)	.66	2.63 (1.24)	7.37	1.05
Helping/child oriented	.67	2.45 (0.89)	.42	3.25 (0.84)	.62	2.85 (0.95)	-6.57	-0.94
Fashion-related/artistic	.72	1.80 (0.76)	.72	3.26 (0.86)	.84	2.54 (1.09)	-12.76	-1.82
M/F (Personality)	.80	-0.34 (1.54)	.75	-1.45 (1.39)	.80	-0.90 (1.56)	5.33	0.76
Agency	.67	3.87 (0.54)	.68	3.52 (0.59)	.70	3.70 (0.59)	4.33	0.62
Unmitigated Agency	.60	2.82 (0.53)	.53	2.65 (0.52)	.57	2.73 (0.53)	2.32	0.32
Communion	.74	3.87 (0.53)	.78	4.21 (0.54)	.77	4.04 (0.56)	-4.42	-0.63
Unmitigated Communion	.72	3.16 (0.65)	.72	3.42 (0.67)	.72	3.29 (0.67)	-2.69	-0.38
M/F (Sexual Fantasies)	.87	4.96 (0.88)	.90	2.60 (1.05)	.95	3.77 (1.53)	17.22	2.44
Multiple partners	.88	5.38 (1.24)	.89	2.40 (1.33)	.95	3.88 (1.97)	16.31	2.33
Casual sex	.81	5.44 (0.97)	.86	3.10 (1.36)	.92	4.25 (1.67)	13.90	1.99
Romantic/devoted	.81	5.27 (1.35)	.84	6.05 (1.10)	.83	5.66 (1.29)	-4.44	-0.63

*Note.* All vocational interest and personality subscale response keys ranged from 1 to 5. Personality agency/communion scales had possible scores from -10 to 10. Sexual fantasy scales all had response keys ranging from 1 to 7.

Table 2.2

*Intercorrelations of Vocational Interests, Personality, and Sexual Fantasy Scales in Combined Sex Sample and with Sex Partialled out*

Scales	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. MF (Vocational Interests)	1.00	.68	.68	.61	-.56	-.75	.38	.31	.19	-.32	-.21	.64	.62	.57	-.31
2. blue collar realistic	.58	1.00	.66	.56	-.05	-.20	.21	.14	.17	-.14	-.12	.42	.39	.41	-.17
3. educated realistic	.59	.57	1.00	.55	-.03	-.24	.12	.06	.15	-.12	-.01	.31	.29	.32	-.10
4. flashy interests	.45	.43	.44	1.00	-.05	-.20	.21	.17	.16	-.16	-.07	.38	.37	.35	-.18
5. helping/child oriented	-.41	.18	.20	.19	1.00	.53	-.29	-.28	-.08	.22	.19	-.40	-.41	-.32	.22
6. fashion, artistic	-.50	.17	.09	.18	.36	1.00	-.37	-.31	-.10	.33	.23	-.54	-.53	-.46	.30
7. MF (personality)	.19	.06	-.04	.05	-.16	-.19	1.00	.56	.64	-.70	-.74	.37	.31	.30	-.46
8. agency	.14	.00	-.08	.03	-.17	-.16	.51	1.00	.10	-.08	-.27	.26	.23	.22	-.24
9. unmitigated Agency	.10	.11	.09	.09	-.01	.01	.64	.06	1.00	-.45	-.23	.21	.16	.20	-.29
10. communion	-.14	.00	.02	-.03	.11	.18	-.67	.01	-.43	1.00	.37	-.33	-.29	-.28	.33
11. unmitigated communion	-.11	-.04	.08	.02	.12	.15	-.74	-.23	-.21	.34	1.00	-.19	-.15	-.11	.37
12. MF (sexual fantasies)	.11	.11	-.06	.04	-.12	-.04	.16	.05	.14	-.17	-.06	1.00	.96	.92	-.45
13. multiple partners	.08	.07	-.09	.02	-.14	-.04	.07	.01	.05	-.10	-.02	.89	1.00	.80	-.32
14. casual sex	.07	.13	.00	.03	-.03	.02	.07	.02	.12	-.11	.03	.84	.56	1.00	-.30
15. romantic sex	-.13	-.04	.04	-.05	.10	.14	-.40	-.16	-.25	.26	.33	-.36	-.15	-.13	1.00

*Note.* Above the diagonal are zero-order correlations in the combined-sex sample; below the diagonal are partial correlations with sex removed.  $p < .01$  for  $|r| > .18$ . Correlations of composite Masculinity/Femininity scales are highlighted in grey.



The scale intercorrelations described above become substantially weaker when participant sex was statistically controlled, with most of the cross-domain partial correlations approaching zero. When each sex was examined independently, correlations again were small (see Table 2.3) between the different scales representing masculinity and femininity.

### **Confirmatory Factor Analysis of Masculinity/Femininity Subscales**

I constructed a higher-order CFA model in which the various subscales defined masculinity/femininity factors for their corresponding domains and in which the three masculinity/femininity factors in turn defined a general M/F factor (see Figure 1). To control for elevation in item responses I included elevation factors for the general vocational interests and sexual fantasy factor (note that there was no evidence of elevation in the personality responses). I examined this model both before and after controlling for participant sex (i.e., by standardizing variables within each sex). As expected, most of the factor loadings decreased substantially when sex was statistically removed (see Table 2.4). Of particular interest, the loadings for the general M/F factor were all quite high prior to controlling for participant sex, with M/F sexual fantasies and M/F vocational interests having the highest loadings on that higher-order M/F factor. When sex was removed from the analyses, the loadings for M/F sexual fantasies and M/F vocational interests dropped considerably, whereas the loading for M/F personality increased slightly.

The loadings for each subscale on the general masculinity/femininity factor are shown on the far right side of Table 2.4.<sup>1</sup> Before controlling for participant sex, the loadings all exceeded .35

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<sup>1</sup>The loadings of the elevation factors ranged from .40 to .52 for vocational interests and from .40 to .64 for sexual fantasies, both across sex. Within sex, personality elevation factor loadings ranged from .23 to .55 and sexual fantasy elevation loadings were all .54.

Table 2.3

*Intercorrelations of Vocational Interests, Personality, and Sexual Fantasy Scales in Each Sex Independently*

Scales	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. MF (Lippa)	1.00	.63	.60	.44	-.42	-.42	.12	.10	-.01	-.14	-.07	.12	.08	.11	-.09
2. blue collar realistic	.51	1.00	.59	.44	.19	.21	-.02	-.03	.05	.04	.03	.05	.06	.05	.01
3. educated realistic	.57	.54	1.00	.40	.23	.14	-.09	-.15	.06	.00	.14	-.12	-.15	-.01	.08
4. flashy interests	.45	.43	.51	1.00	.15	.29	.01	-.05	.06	-.10	.07	.03	.01	.05	-.02
5. helping/child oriented	-.40	.17	.15	.23	1.00	.48	-.19	-.22	.03	.13	.19	-.21	-.16	-.16	.16
6. fashion, artistic	-.58	.14	.04	.08	.25	1.00	-.18	-.22	.09	.18	.17	-.12	-.11	-.05	.12
7. Personality agency-communion	.27	.16	.03	.09	-.13	-.20	1.00	.50	.65	-.74	-.81	.26	.10	.21	-.43
8. agency	.17	.04	.01	.11	-.13	-.12	.52	1.00	.10	-.04	-.24	.20	.14	.14	-.22
9. unmitigated Agency	.20	.18	.12	.13	-.05	-.06	.62	.03	1.00	-.41	-.30	.18	.07	.15	-.26
10. communion	-.14	-.06	.04	.05	.09	.18	-.59	.05	-.45	1.00	.58	-.21	-.07	-.19	.32
11. unmitigated communion	-.14	-.11	.00	-.03	.05	.12	-.66	-.22	-.12	.12	1.00	-.13	.01	-.11	.36
12. MF (sex behaviors)	.10	.18	.01	.04	.05	.01	.07	-.07	.11	-.13	-.01	1.00	.90	.82	-.32
13. multiple partners	.08	.09	-.01	.03	-.13	.02	.04	-.10	.03	-.13	-.04	.89	1.00	.59	-.06
14. casual sex	.03	.22	.02	.02	.07	.06	-.03	-.06	.10	-.05	.13	.85	.55	1.00	-.06
15. romantic sex	-.19	-.12	-.02	-.09	.04	.17	-.36	-.11	-.24	.20	.31	-.42	-.26	-.20	1.00

Note. Above the diagonal are correlations for men; below the diagonal are correlations for women.  $p < .01$  for  $|r| > .18$ . Correlations of composite Masculinity/Femininity scales are highlighted in grey.

Figure 2.1. Higher order model of masculinity/femininity scales

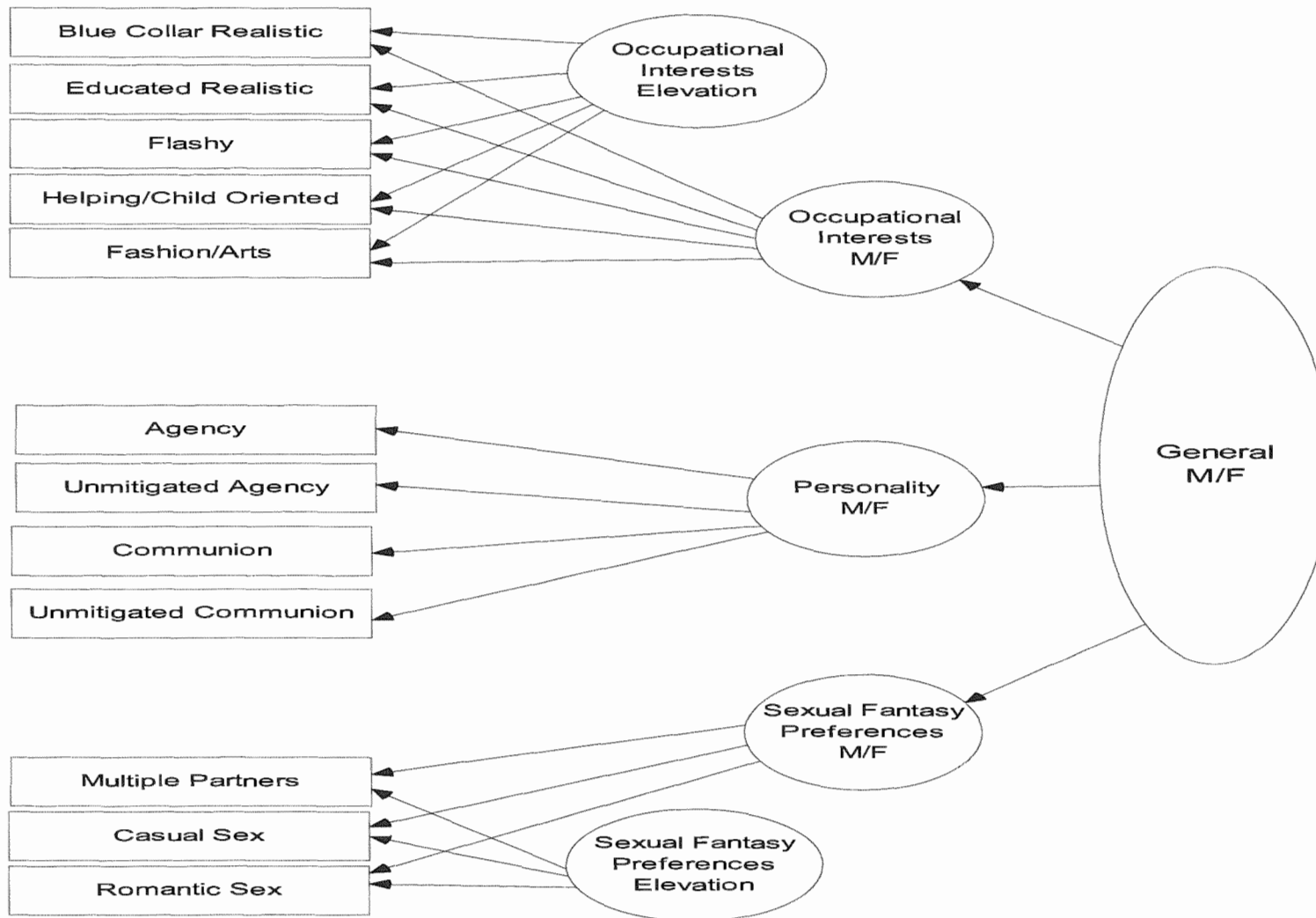


Table 2.4

*Standardized Estimates from Confirmatory Factor Analysis of Higher Order Factor Model of Masculinity/Femininity Scales*

Variable	Vocational Interests	Personality	Sexual Fantasies	General M/F Factor
Blue Collar Realistic	.56 (.47)			.45 (.15)
Educated Realistic	.53 (.51)			.42 (.16)
Flashy	.48 (.31)			.38 (.10)
Helping/Child Oriented	-.53 (-.23)			-.42 (-.07)
Fashion/Arts	-.74 (-.37)			-.59 (-.12)
Unmitigated Communion		-.57 (-.49)		-.40 (-.38)
Agency		.26 (.14)		.18 (.11)
Communion		-.61 (-.69)		-.43 (-.54)
Unmitigated Agency		.29 (.57)		.21 (.44)
Multiple Partners			.79 (.53)	.68 (.31)
Casual Sex			.75 (.51)	.65 (.30)
Romantic Sex			-.77 (-.84)	-.66 (-.49)
Vocational Interests				.80 (.32)
Personality				.71 (.78)
Sexual Fantasies				.86 (.58)

*Note.*  $N = 198$ . Elevation was controlled for vocational interests and sexual fantasies (there was no significant elevation factor for personality); not shown in the table are loadings on elevation factors defined positively by all vocational interest subscales and by all sexual fantasy subscales, respectively. Values in parentheses show estimates with sex removed. Values in italics show loadings of individual subscales on general M/F factor (i.e., product of subscale loadings on lower-order factors with loadings of lower-order factors on higher order factors).  $\chi^2(50) = 111.18(70.18)$ , CFI = .91 (.94), RMSEA = .08 (.05), SRMR = .07 (.07).

except those of both Agency variables. When sex was controlled, most loadings decreased substantially, with vocational interests in particular showing the largest decrease. The personality subscales did not follow the same pattern of results when sex was controlled: the loadings of communion and unmitigated agency increased, and those of agency and unmitigated communion only decreased marginally.

### **Discussion**

The purpose of this study was to examine how variables within three domains of masculinity/femininity would define a general factor of M/F, whether that higher-order factor could be recovered even when sex was partialled out of the analyses, and whether the M/F factors of the three domains would load similarly on the general factor of M/F within sex. The results showed that scales assessing “masculine” or “feminine” vocational interests, personality characteristics, and sexual fantasies all showed fairly high loadings on a broad masculinity/femininity factor in our mixed-sex sample. However, when participant sex was controlled, many of these loadings became very small; nevertheless, a higher-order masculinity/femininity factor was still recovered with M/F personality emerging as the highest loading construct over M/F vocational interests and M/F sexual fantasy preferences. Although there were strong intercorrelations among the various indicators of M/F in the combined-sex sample with the overall strongest indicators of general M/F being vocational interests and sexual fantasies, the correlations between M/F subscales decreased considerably when sex was partialled out of the analyses, and the general M/F factor then was defined mainly by personality characteristics and sexual fantasies. Thus, the results described above suggest that the common element of M/F as derived from variables in the domains of vocational interests, personality

characteristics, and sexual fantasies is shared mainly by the latter two domains, with M/F vocational interests being nearly independent.

The above results can be compared with previous findings examining differences in sexual orientation in relation to self-rated Masculinity and Femininity, vocational interests, and personality. In a meta-analysis, Lippa (2005b) revealed that the constructs with the largest differences between homosexual and heterosexual participants were vocational interests and self-rated M/F. Although there were homosexual-heterosexual differences in personality characteristics—including Instrumentality and Expressiveness, as well as some of the Big Five traits—the effect sizes were small to moderate. If the current study were to be replicated with a larger sample of participants that included substantial numbers of nonheterosexual persons, a two-factor M/F structure might emerge from sex-partialled data, with one factor being defined by M/F personality traits and M/F fantasies, and the other factor being defined by sexual orientation and M/F vocational interests; self-rated M/F might be expected to define the latter factor more strongly than the former. Future research should examine this possibility of two relatively independent dimensions of M/F, each of which would represent a bipolar contrast between masculine and feminine tendencies.

## **Rationale for Study #2**

Results from Study 1 indicated that although a general factor of Masculinity/Femininity did emerge from vocational interest, personality, and sexual fantasy items, the factor was more strongly defined within sex by personality and sexual fantasies than by vocational interests. The measures of vocational interests in Study 1 were limited to a few short scales assessing interests that typically show large sex differences. For Study 2, however, I focused on the measurement of the whole domain of vocational interests, using items written by Goldberg on the basis of recent factor analyses of the Campbell Interest Skills Survey. The main goals of Study 2 were to validate the Oregon Vocational Interest Scales by examining their links with established interest measures, with personality characteristics, and with mental ability. Also, the personality measures used in Study 1 were only designed to measure a few traits associated with M/F (Agency, Communion, Unmitigated Agency, and Unmitigated Communion), but in Study 2, I wanted to expand the measurement of personality to include the six HEXACO personality factors.

**CHAPTER 3 – STUDY #2 – PSYCHOMETRIC CHARACTERISTICS OF A PUBLIC-DOMAIN SELF-REPORT MEASURE OF VOCATIONAL INTERESTS: THE OREGON VOCATIONAL INTEREST SCALES**

Note: This section is based on the following article, with permission: Pozzebon, J. A., Visser, B. A., Ashton, M. C., Lee, K., and Goldberg, L. R. (2010). Psychometric characteristics of a public-domain self-report measure of vocational interest: The Oregon Vocational Interest Scales. *Journal of Personality Assessment*, 92, 168-174.

Abstract

I investigated the psychometric properties of the Oregon Vocational Interest Scales (ORVIS), a brief public-domain alternative to commercial inventories, in a large community sample and in a college sample. In both samples, I examined the factor structure, scale intercorrelations, and personality correlates of the ORVIS, and in the community sample I also examined the correlations of the ORVIS scales with cognitive abilities and with the scales of a longer, proprietary interest survey. In both samples, all eight scales—Leadership, Organization, Altruism, Creativity, Analysis, Producing, Adventuring, and Erudition—showed wide variation in scores, high internal-consistency reliabilities, and a pattern of high convergent and low discriminant correlations with the scales of the proprietary interest survey. Overall, the results support the construct validity of the scales, which are recommended for use in research on vocational interests and other individual differences.



## **Introduction**

In this report, I introduce the Oregon Vocational Interest Scales (ORVIS). This new instrument measures eight important types of occupational interest, similar to those identified by Holland (1973) and Campbell, Hyne, and Nilsen (1992), but has the additional advantages of being brief and available in the public domain. I will examine the construct validity of the ORVIS by investigating the relations of the ORVIS variables with another vocational interest scale (the Campbell Interest Skills Survey), with personality, and with cognitive ability. It is hypothesized that the ORVIS will show evidence of good construct validity by having strong convergent correlations and weak discriminant correlations with the other variables.

### **Assessment of Vocational Interests**

Vocational interests represent an important domain of individual differences, one that overlaps only partially with the ability or personality domains (e.g., Ackerman & Heggestad, 1997). Measures of the major areas of vocational interest can discriminate among persons of different occupational groups or academic majors, providing incremental validity beyond that provided by ability or personality variables (e.g., Logue, Lounsbury, Gupta, & Leong, 2007). Some research even indicates that vocational interests can discriminate between persons of different sexual orientations much more strongly than can personality characteristics (Lippa, 1998). Given the importance of vocational interests as individual difference variables, a brief public-domain measure of the main areas of vocational interest would be useful for researchers.

Prior to developing a self-report measure of vocational interests, the researcher must choose a strategy for constructing scales and a format for presenting items. Some inventories are based on a criterion-oriented strategy, whereby items are selected on the basis of their empirical ability to discriminate between occupational groups; other inventories are based on a construct-oriented strategy, whereby items are selected on the basis of their conceptual relevance to a given

domain of interest (see Cronbach, 1990, p. 467). Some inventories involve a forced-choice item format, whereby respondents must indicate which item is most or least endorsed; other inventories involve a single-stimulus item format, whereby respondents must indicate their level of endorsement of each item in turn (see Cronbach, 1990, p. 470). The scales of the present report were developed according to a construct-oriented strategy with a single-stimulus response format. These approaches have the advantage of producing scales whose scores are readily interpretable; the construct-oriented strategy increases the likelihood that empirical validity will generalize across respondent samples, and the single-stimulus item format avoids the difficulties of interpreting responses that represent contrasts between the respondent's levels of two or more different areas of interest.

### **Development of the ORVIS**

The ORVIS measures the following eight dimensions of vocational interest: Leadership, Organization, Altruism, Creativity, Analysis, Producing, Adventuring, and Erudition. The first five ORVIS variables of the list above are similar in content to five of Holland's (1973) "RIASEC" interest types, namely Enterprising, Conventional, Social, Artistic, and Investigative. The next two ORVIS scales, Producing and Adventuring, represent a division of Holland's Realistic interest type as operationalized in two Orientation scales from the Campbell Interest and Skill Survey (CISS; Campbell et al., 1992). Finally, the ORVIS Erudition scale measures interests in scholarly activities, which were found to be differentiated from the remaining CISS Orientations. Below, I provide a brief history of the development of the ORVIS variables.

In the summer of 1996, the Campbell Interest and Skill Survey (CISS) was administered by Goldberg via mail to participants in the Eugene-Springfield Community Sample (ESCS), and approximately 600 of them completed the survey.<sup>1</sup>

Over the years, Goldberg has carried out a number of analyses of CISS scales, the most important of which for present purposes were analyses of the seven CISS “Orientation” scales. To develop public-domain measures of each of the CISS Orientations, 2,035 items from the International Personality Item Pool (IPIP) were correlated with the seven scale scores, and IPIP items were classified by the CISS scale with which they were most highly associated. IPIP items falling within each category were then selected rationally based on the extent of their correlations with the CISS scale, the seeming relevance of their content to the construct, and their lack of redundancy with other items already selected for that IPIP scale. Finally, the reliability of preliminary versions of the new scales were analyzed, and any items that served to attenuate scale reliability were omitted and in some cases replaced with other IPIP items that functioned more adequately.

All IPIP items are short phrases, beginning with a verb (e.g., Take risks, Talk softly). Those IPIP items that turned out to be most highly associated with the CISS scales typically included verbal phrases involving interest or preference (e.g., Like, Do not like, Enjoy, Do not enjoy, Prefer, Am [not] interested in). To discover whether the self-reported relative frequencies of individuals’ actual behavioral acts might turn out to be even better measures of interests, Goldberg used the 400 items in the Behavioral Report Inventory (BRI), which had been administered to the ESCS in 1997, to develop BRI scales associated with the seven CISS Orientation scales, using the exact same procedures used to develop the IPIP scales. Both the IPIP and BRI scales were developed in parallel in 2004, and compared as predictors of the CISS constructs. Information about both sets of scales is available from Goldberg.

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<sup>1</sup> Of the more than 30 questionnaires administered to the ESCS during the 1993 to 2006 period, the CISS was the only one for which no honorarium payment was provided, and doubtless because of this participation was lower than for the other surveys.

In factor analyses of the original CISS Orientation scales, separately for skills and interests, as well as for the new IPIP and BRI versions of those seven constructs, it was always necessary to extract eight factors in order for the seven scales to each load most highly on a separate factor. If less than eight factors were extracted, the scales measuring the Producing and Analyzing Orientations always loaded most highly on the same factor. In the eight-factor analyses of the original CISS scales, the additional factor included CISS scales measuring interests and skills related to such occupations as Translator/Interpreter, Writer/Editor, Librarian, Liberal Arts Professor, and Musician and to such basic interests as Writing and International Activities. Seemingly, then, the addition of an eighth dimension (which Goldberg called “Erudition”) to the Holland six and the Campbell seven might be warranted. Although such an additional dimension is unlikely to be completely independent of the other constructs, it might serve to capture important individual differences unavailable in previous vocational inventories.

The Oregon Vocational Interest Scales (ORVIS) were developed as direct measures of these eight constructs. Items for each of the eight new scales were generated by Goldberg to include both interests and activities that were conceptually associated with each dimension, based on the corresponding IPIP and BRI scales, and on the content of the CISS scales most highly associated with the additional eighth factor. All items from the preliminary versions of these new ORVIS scales were administered to the ESCS as part of an Omnibus Personal Attributes Survey (OPAS) in 2006. This article is the first report of our analyses of these scales in this community sample, along with a cross-validation of our findings in another quite different kind of sample, one consisting of college students. Thus, this article represents the first empirical validation of this construct-driven measure of vocational interests.

## Method

### Participants

**Community sample.** From Goldberg's (1999) Eugene-Springfield (Oregon) Community Sample (ESCS), 665 participants completed the ORVIS, of whom 379 (57%) were women and 286 (43%) were men. In 2006, the participants' mean age was 62 years ( $SD = 11.7$ ). Over 98% of respondents were Caucasian, and 85% had at least some college education.

**College sample.** Canadian college students in their first year of study participated in an ongoing longitudinal investigation of academic performance, college satisfaction, and choice of major. Of the 346 students, there were 245 women (71%) and 101 men (29%), with a mean age of 18.5 years ( $SD = 1.7$ ). See Appendices G and H for the ethics clearance and consent form respectively.

### Measures

**ORVIS (See Appendix I).** Participants in both samples completed the 92 ORVIS items (see the Appendix for items sorted by scale). For each item, participants rated their level of interest in each occupational description (e.g., *Care for sick people*) on a 5-point scale from 1 (strongly dislike) to 5 (strongly like).

**CISS.** Most participants of the community sample also completed the CISS (Campbell et al., 1992), which contains 320 self-report items, each using a six-point response scale. I used participants' scores on the seven CISS Orientation scales: Influencing, Organizing, Helping, Creating, Analyzing, Producing and Adventuring. These scales correspond conceptually to the first seven ORVIS scales listed above. (There is no direct counterpart of the ORVIS Erudition scale in the CISS, but much of the content of ORVIS Erudition is represented within CISS Creating.)

**Personality.** Participants in the community sample completed various personality measures, including the International Personality Item Pool (IPIP; See Appendix N) Big Five scales (Goldberg, 1999). Internal-consistency reliabilities (alpha) of the IPIP Big Five scales ranged from .88 to .91 in this sample. Participants in both samples also provided self-reports on measures of the HEXACO personality factors: specifically, community sample participants provided self-reports on the full-length (192-item) form of the HEXACO Personality Inventory (HEXACO-PI; Lee & Ashton, 2004; see Appendix J), whereas college sample participants provided self-reports on the half-length (100-item) form of the same inventory (HEXACO-PI-R). Both versions of the HEXACO inventory assess six broad personality factors: Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience. In the short version of the inventory, one of the four facet-level scales defining the Extraversion factor has been replaced. For the purpose of consistency across samples, I computed scores on the Extraversion factor from the three common facet-level scales only, and I computed scale scores from the items of the half-length form. All items were administered using a response scale with options ranging from 1 (strongly disagree) to 5 (strongly agree). Internal-consistency reliabilities (alpha) of the six HEXACO scales ranged from .79 to .84 in the community sample and from .81 to .84 in the college sample.

**Cognitive Ability.** In the community sample, reasoning ability was measured by Factor B, a 15-item Reasoning scale, from the 16 Personality Factor Questionnaire (16PF; Conn & Rieke, 1994). Although the 16PF is a personality inventory, the items of its Reasoning scale are cognitive ability items, scored as correct or incorrect. The internal-consistency reliability of the Reasoning scale was .75 in this sample.

In the college sample, two measures of ability were administered: Verbal ability was measured with the 46 items of the Vocabulary scale from the Multidimensional Aptitude Battery (MAB; Jackson, 1984, see Appendix L). Mathematical ability was measured with a test consisting of 20 items taken from the Gauss Mathematics Contest (Center for Education in Mathematics and Computing, 2007, see Appendix K); the mathematics items assessed problem-solving in arithmetic and in basic algebra and geometry. Internal-consistency reliabilities of the verbal and mathematical ability measures were .78 and .65, respectively.

## **Results and Discussion**

### **Internal-Consistency Reliabilities**

Internal-consistency reliabilities and descriptive statistics for the ORVIS scales are reported in Table 3.1 for both the community and college samples. The reliabilities were generally high in both samples, ranging from .79 and .75 for Erudition to .90 and .91 for Organization.

As shown in Table 3.1, the means for all scales in both samples were reasonably close to the theoretical midpoints (i.e., 3.00 for the 1-to-5 scales), and the standard deviations were reasonably wide, covering at least one-fifth of the theoretical range. The mean scores for women and men indicated some sex differences in the scales. In both samples, the largest sex difference was in Adventure, with men's scores more than a standard deviation higher than women's scores. Men's Analysis scores were also substantially higher than were women's ( $d > .5$ ), whereas women scored higher on Altruism than did men ( $d > .5$ ).

### **Factor Structure of the ORVIS Items**

I also conducted item-level factor analyses of the 92 ORVIS items in each of the two samples. In both samples, I extracted eight principal components and rotated them to an

orthogonal Procrustes solution based on a target matrix in which each item was assigned a target loading of 1 for its designated scale and 0 for all other scales (see Appendix M for the loading of each item on its targeted factor). In both samples, factor scores on the resulting factors correlated strongly with the corresponding scale scores: Correlations ranged from .69 (Erudition) to .94 (Altruism) in the college sample and from .77 (Erudition) to .94 (Organization and Altruism) in the community sample. Thus, the factor analysis results generally supported the division of the ORVIS items into the eight specified scales.<sup>2</sup>

### **Correlations among the ORVIS Scales**

Table 3.2 provides the correlations among the eight ORVIS scales. These correlations were generally positive, with substantial correlations (approximately .50) between the Production and Adventure scales, the Leadership and Organization scales, and the Creativity and Erudition scales. When sex was partialled out of the correlations, the largest decrease in value was only .03, suggesting that the overlap cannot be attributed to sex differences in these vocational interest scales.

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<sup>2</sup> A confirmatory factor analysis of the ORVIS items is unsuitable for the following reasons. First, the ORVIS scales will not be strictly unidimensional, because each scale would likely contain several implicit (i.e., not explicitly hypothesized) “facets” or lower-order factors representing various subdomains. Second, most ORVIS items would be expected to show appreciable associations with one or more scales other than the intended scale, because some activities and occupations will involve two or more areas of interest. Our aim in conducting the factor analyses was simply to evaluate how closely the eight ORVIS scales correspond to the eight largest factors underlying the ORVIS items, not to find a model that would provide close fit to the data.



### **Correlations between the ORVIS and CISS Scales**

Table 3.3 shows the correlations of the ORVIS scales with the Orientation scales from the CISS. For the seven ORVIS scales that have counterparts in the CISS (i.e., all except ORVIS Erudition), the convergent correlations were all very high, ranging from .67 to .76 with a mean of .72. The discriminant correlations were substantially weaker (mean of .16) with the highest being .44 (ORVIS Leadership with CISS Adventuring) and .43 (ORVIS Adventure with CISS Producing). The remaining ORVIS variable, Erudition, correlated .58 with CISS Creating, the scale that subsumes some Erudition-related content.

Table 3.1

*Means, Standard Deviations, and Sex Differences in the Oregon Vocational Interest Scales*

Scale ( $\alpha$ )	Total		Women		Men		$d$ (Women – Men)
	Mean	<i>SD</i>	Mean	<i>SD</i>	Mean	<i>SD</i>	
<i>Community Sample</i>							
Leadership (.87)	2.78	.76	2.66	.75	2.94	.75	-.37
Organization (.90)	2.52	.79	2.48	.80	2.58	.77	-.12*
Altruism (.86)	3.15	.70	3.32	.65	2.93	.70	.60
Creativity (.88)	3.22	.80	3.39	.81	2.99	.73	.53
Analysis (.88)	2.60	.87	2.38	.82	2.90	.84	-.62
Production (.81)	3.17	.72	3.05	.71	3.34	.71	-.40
Adventure (.82)	2.50	.77	2.20	.66	2.89	.73	-1.03
Erudition (.79)	3.58	.69	3.40	.70	3.12	.65	.41
<i>College Sample</i>							
Leadership (.85)	2.90	.74	2.82	.74	3.10	.70	-.36
Organization (.91)	2.38	.81	2.29	.77	2.58	.87	-.45
Altruism (.84)	3.24	.70	3.40	.64	2.87	.69	.73
Creativity (.89)	2.96	.86	3.01	.86	2.84	.86	.18*
Analysis (.84)	2.08	.73	1.94	.64	2.42	.81	-.86
Production (.82)	2.33	.73	2.22	.68	2.60	.76	-.49
Adventure (.83)	2.78	.82	2.52	.69	3.40	.78	-1.11
Erudition (.75)	2.84	.68	2.91	.68	2.69	.66	.29

*Note.* Community  $N = 379$  women, 286 men; college  $N = 245$  women, 101 men. Internal-consistency reliabilities are in parentheses. \* *ns*; for all other  $d$  values,  $p < .01$ .

Table 3.2

*Intercorrelations among the ORVIS Scales in the Community and College Samples*

ORVIS scale	1	2	3	4	5	6	7	8
1. Leadership		<b>.44 (.44)</b>	.31 (.38)	.23 (.29)	.31 (.27)	.10 (.07)	.39 (.35)	.33 (.38)
2. Organization	<b>.60 (.59)</b>		.16 (.18)	-.04 (-.03)	<b>.41 (.41)</b>	.15 (.14)	.20 (.20)	.13 (.15)
3. Altruism	.10 (.17)	-.09 (-.03)		.36 (.32)	.14 (.24)	.17 (.24)	.08 (.23)	<b>.44 (.41)</b>
4. Creativity	.32 (.34)	.02 (.04)	.34 (.33)		.15 (.24)	.22 (.28)	.05 (.18)	<b>.54 (.52)</b>
5. Analysis	.15 (.10)	.23 (.19)	.05 (.17)	.09 (.13)		.38 (.34)	.34 (.24)	.28 (.36)
6. Production	.20 (.16)	.08 (.04)	.16 (.26)	.36 ( <b>.40</b> )	<b>.42 (.37)</b>		<b>.50 (.47)</b>	.18 (.22)
7. Adventure	.27 (.21)	.08 (.00)	.07 (.29)	.17 (.25)	.32 (.21)	<b>.58 (.55)</b>		.04 (.14)
8. Erudition	.36 (.39)	.16 (.19)	.31 (.28)	<b>.57 (.57)</b>	.08 (.13)	.35 ( <b>.40</b> )	.07 (.16)	

*Note.* Above diagonal are intercorrelations in the community sample ( $N = 665$ ),  $p < .05$  for  $|r| \geq .07$ . ; below diagonal are intercorrelations in the university sample ( $N = 346$ ),  $p < .05$  for  $|r| \geq .14$ . Partial correlations with sex controlled are in parentheses. Correlations with absolute values of .40 or greater are in bold.

Table 3.3

*Correlations of the ORVIS Scales with the CISS Scales*

CISS	ORVIS							
	Leadership	Organization	Altruism	Creativity	Analysis	Production	Adventure	Erudition
Influencing	<b>.75</b>	.25	.16	.09	.15	.02	.32	.16
Organizing	.37	<b>.67</b>	.09	-.11	.27	.05	.20	-.01
Helping	.20	.11	<b>.69</b>	.21	.01	.09	.05	.27
Creating	.14	-.07	.36	<b>.67</b>	-.01	.06	-.13	.58
Analyzing	.21	.30	-.04	-.07	<b>.75</b>	.27	.29	.11
Producing	.03	.17	.04	.03	.38	<b>.75</b>	.44	.03
Adventuring	.43	.20	-.05	-.12	.31	.29	<b>.76</b>	-.09

*Note.*  $N = 449$ .  $p < .05$  for  $|r| \geq .10$ . Convergent correlations are in bold.

### Correlations of Vocational Interests with Personality and Cognitive Ability

Table 3.4 provides the correlations of the ORVIS scales with the personality scales and the cognitive ability variables. With regard to the IPIP Big Five scales (administered in the community sample only), the largest correlations ( $r \geq .25$ ) were observed between IPIP Extraversion and ORVIS Leadership, IPIP Agreeableness and ORVIS Altruism, and IPIP Intellect and ORVIS Leadership, Creativity, and Erudition. With regard to the HEXACO-PI scales (administered in both samples), the strongest relations ( $r \geq .45$ ) were those of HEXACO-PI Openness with ORVIS Creativity and Erudition. The HEXACO-PI Extraversion scale showed moderate positive correlations with ORVIS Leadership (particularly in the community sample) and with ORVIS Altruism (particularly in the college sample). There were also moderately strong negative relations between HEXACO-PI Emotionality and ORVIS Adventuring in both samples, although these correlations were partly attributable to sex differences on both variables (when participant sex was controlled,  $r$ s decreased from  $-.36$  to  $-.19$  in the community sample and from  $-.49$  to  $-.27$  in the college sample). Many other correlations between ORVIS and HEXACO-PI scales exceeded  $.20$  in absolute value, and these generally were consistent with the content of the respective scales.

Most of the correlations between ORVIS scales and cognitive ability tests were rather weak, but the strongest relations involved the ORVIS Analysis and Erudition scales. In the community sample, 16PF Reasoning correlated strongly with Erudition and with Analysis. In the college sample, verbal ability (MAB Vocabulary) correlated strongly with Erudition, and mathematical ability was correlated with Analysis.<sup>3</sup>

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<sup>3</sup> The ORVIS items that correlated most strongly with mathematical ability were “Be a mathematician” and “Solve complex puzzles,” with correlations of  $.25$  and  $.27$ , respectively.

Table 3.4

*Correlations of the Oregon Vocational Interest Scales with Personality and Cognitive Ability Variables*

Personality & Ability	ORVIS															
	Leadership		Organization		Altruism		Creativity		Analysis		Production		Adventure		Erudition	
	C	S	C	S	C	S	C	S	C	S	C	S	C	S	C	S
<i>HEXACO-PI(-R) Scales</i>																
Honesty-Humility	-.30	-.27	-.14	-.22	.08	.25	-.10	-.01	-.19	-.02	.00	.03	-.25	-.13	-.02	.08
Emotionality	-.15	-.15	-.05	-.06	.20	.29	.19	.11	-.25	-.22	-.20	-.22	-.36	<b>-.46</b>	.09	.03
Extraversion	<b>.40</b>	.25	.03	-.02	.20	.39	.11	.14	-.06	-.04	-.09	.07	.05	.19	.12	.06
Agreeableness	-.08	-.15	-.06	-.12	.21	.11	.05	.06	-.07	.11	-.03	.12	-.15	.19	.06	-.02
Conscientiousness	.06	-.05	.15	.07	-.05	.22	-.05	-.13	.06	.00	-.04	-.18	-.04	-.26	-.02	.02
Openness	.24	.25	-.14	-.02	.20	.04	<b>.46</b>	<b>.57</b>	.27	.14	.22	.33	.08	.07	<b>.45</b>	<b>.49</b>
<i>IPIP Big Five Scales</i>																
Extraversion	.38		-.01		.16		.14		-.07		-.15		.01		.10	
Agreeableness	.06		-.05		<b>.42</b>		.21		-.11		-.02		-.15		.18	
Conscientiousness	.10		.20		-.04		-.12		.01		-.08		-.04		-.08	
Emotional Stability	.07		-.04		.01		-.05		.09		.00		.04		-.02	
Intellect	.29		-.06		.10		.30		.23		.07		.02		.34	
<i>Cognitive Abilities</i>																
Reasoning	.11		-.03		.05		.14		.27		.07		.07		.31	
Math		.05		.09		-.15		-.04		.21		.05		.16		.03
Verbal		.11		-.07		-.10		.21		.06		.16		.03		<b>.40</b>

*Note.* Community (C):  $N = 408$  (IPIP);  $N = 646$  (HEXACO-PI);  $N = 541$  (reasoning ability).  $p \leq .05$  for  $|r| \geq .09$ ,  $p \leq .01$  for  $|r| \geq .11$ . College Student (S):  $N = 346$ . Correlations with absolute values of .40 or greater are in bold.  $p \leq .05$  for  $|r| \geq .11$ ,  $p \leq .01$  for  $|r| \geq .15$ .

### Discussion

In the present investigation I examined the psychometric properties of the Oregon Vocational Interest Scales, a new public-domain measure of several broad types of vocational interests. The brevity of the ORVIS instrument and the simplicity of its IPIP-based item format make it well suited for use in vocational interests research and as a supplement to the variables examined in other individual differences research. As I discuss below, the results suggest that this instrument will be a useful tool for assessing this important area of individual differences.

The descriptive statistics and internal-consistency reliabilities of the eight ORVIS scales indicated that, within both the community and the college samples, there was wide variation in participants' scores and high internal-consistency reliabilities. The ORVIS scales showed appropriate patterns of convergent and discriminant correlations with the scales of the CISS, a published interest inventory.

The relations of the ORVIS scales with the personality and cognitive ability variables were theoretically meaningful. For example, the personality dimension of Openness appears to be heavily implicated in occupational interests involving Creativity or Erudition. However, these two areas of interest can be distinguished by their relations with verbal ability, which is associated rather strongly with ORVIS Erudition but only modestly with ORVIS Creativity. Similarly, the ORVIS Production and ORVIS Adventure variables are differentiated by their patterns of personality correlations: Openness to Experience was more strongly associated with Production than with Adventure, whereas Emotionality was more strongly (negatively) associated with Adventure than with Production. Finally, other relations are also of some interest given the conceptual overlap between variables, such as the modest link between mathematical ability and ORVIS Analysis, and the moderate links between the Extraversion

factor of personality and the ORVIS Leadership and ORVIS Altruism scales. Taken together, these results support the construct validity of the ORVIS scales, insofar as the empirical relations were consistent with the apparent conceptual overlap between the ORVIS scales and the other individual difference variables. Moreover, the generally modest size of the observed correlations indicates that the ORVIS scales are not redundant with the measures of personality and cognitive ability.

In summary, the results of the present investigation support the construct validity of the Oregon Vocational Interest Scales, and suggest that these scales are suitable for research on vocational interests and related individual differences. In samples of community adults and college students, the ORVIS scales showed high levels of reliability, an appropriate pattern of convergent and discriminant correlations with published vocational interest measures, and an array of theoretically meaningful relations with other individual difference variables. The ORVIS thus stands as the most thoroughly validated measure of vocational interests available in the public domain.



### **Rationale for Study #3**

The results from Study 2 validated the ORVIS as a reliable measure of vocational interests, as its scales showed theoretically appropriate relations with personality characteristics and mental abilities. After having established the ORVIS as a valid measure of vocational interests and examining its relations with personality and ability in a student sample, I was interested in Study 3 in investigating how vocational interests and personality would differ in students from different academic majors. Doing so would help to further validate the ORVIS by confirming theoretical predictions as to which interests would be stronger in students of different academic majors. Continuing the examination of the link between vocational interests and academic major, in Study 3 I wanted to examine, in an academic setting, Holland's concept of congruence—the similarity between an individual's interests and the environment in which they work. It is hypothesized that when congruence is high, individuals are more likely to be satisfied and proficient in their work. For Study 3, I investigated how well congruence added to the predictive validity of personality and ability in different academic outcomes to find out whether those who had higher levels of congruence would perform better and be more satisfied in their major.

**CHAPTER 4 – STUDY # 3 – MAJOR CHANGES: PERSONALITY, ABILITY, AND CONGRUENCE IN THE PREDICTION OF ACADEMIC OUTCOMES**

Note: This section is based on the following article, with permission: Pozzebon, J. A., Ashton, M. C., & Visser, B. A. (under review). Major Changes: Personality, Ability, and Congruence in the Prediction of Academic Outcomes.

Abstract

In a sample of 346 college students, I compared students of different academic major areas in their personality characteristics, mental abilities, and vocational interests, and I examined the congruence between vocational interests and academic major as a predictor of academic outcomes (GPA, satisfaction, and change of major). Results were mainly consistent with predicted differences between the four academic major groups (arts/humanities, business, science, and helping/child-related), and several of the observed differences were moderately large. However, congruence between interests and major was unrelated to academic outcomes.

### **Major Changes: Personality, Ability, and Congruence in the Prediction of Academic Outcomes**

Many students enter post-secondary education without a clear idea of their future career plans. Approximately 50 to 75 percent of all college students change their academic major at some point over the course of their degree, with dissatisfaction being one of the main reasons for switching (Pascarella & Terenzini, 1991; Steel & McDonald, 2000). The obvious practical research question that arises from this problem is that of which people are suited for which majors. Moreover, it would be useful to understand how students' choice of academic major depends on psychological individual differences, such as personality characteristics, mental abilities, and vocational interests. In the present study I examine the extent to which these psychological characteristics can differentiate between students of different academic major areas. I also examine whether the congruence between one's vocational interests and one's academic major can predict important academic outcomes, such as grades, satisfaction with major, and academic major change.

#### **Personality, Academic Major, and Academic Outcomes**

Several researchers have examined the personality differences between students in different academic majors, but these studies have assessed different sets of personality variables and have compared different sets of majors, thereby making summaries difficult (Banth & Mohan, 1985; Goldschmid, 1967; Kipnis, Lane, & Berger, 1967; Lounsbury, Smith, Levy, Leong, & Gibson, 2009; Nixon & Parsons, 1989; Norman & Redlo, 1952; Pringle, Dubois, & Yankey, 2010; Sherrick, Davenport, & Colina, 1971). Although previous research has compared the personality differences between students of various academic majors using different instruments, these differences have not often been examined in the context of widely used

contemporary models of personality structure, such as the Big Five or the HEXACO frameworks.

With regard to academic outcomes, several researchers have found the personality factor of Conscientiousness to be a significant predictor of university grades (e.g., Nofle and Robins, 2007; Paunonen, 2003; Paunonen & Ashton, 2001). For example, in several samples totalling several thousand students, Nofle and Robins found that the Conscientiousness scales of instruments measuring the Big Five and HEXACO factors significantly and consistently predicted college grade point average (GPA) above and beyond scores on the scholastic aptitude test (SAT).

In the present study, I examine differences in students' personalities across academic major using the HEXACO model of personality (e.g., Ashton & Lee, 2007), which comprises six factors: Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience. Using the dimensions of this model, I hypothesize some unique associations between personality and choice of major based on their conceptual similarities. First, I hypothesize that students in academic majors in the arts and humanities will show high levels of Openness to Experience compared to students in other major groups, because these programs emphasize creativity, aesthetic appreciation, philosophical depth, or inquisitiveness about the human world.

Second, I hypothesize that students in business programs will show high levels of Extraversion compared to students in other major groups, because these majors involve speaking in front of groups, having high levels of enthusiasm and energy, and interacting in social situations. Students in business programs are also hypothesized to report low levels of Honesty-Humility, because of an emphasis in the business world on material wealth and social status, and

also low levels of Emotionality, due to the self-assurance and independence expected in managerial or sales positions.

Third, I hypothesize that students in majors relevant to interpersonal interaction or counseling, such as psychology, sociology, child and youth studies, and nursing, will have higher levels of Emotionality and Agreeableness than those in the other major groups. This prediction is based on the importance in counseling, social work, and child care on forming attachments and on being empathetic, accommodating to others, and patient. Fourth, I hypothesize that students in science majors will report low levels of Extraversion and Emotionality, and high levels of Conscientiousness, because many scientific fields emphasize solitary, independent problem-solving that requires precision and persistence.

### **Mental Abilities, Academic Major, and Academic Outcomes**

Students in different academic majors differ in their average levels of verbal and mathematical abilities. For example, nationwide US data indicate high SAT Verbal scores for high school students entering college with the intention to major in language and literature, library science, or foreign and classical languages. Likewise, high SAT Mathematics scores are observed for students intending to major in mathematics, engineering, and physical sciences (National Center for Education Statistics, 2005).

Mental abilities have been consistently found to be predictive of academic outcomes, particularly grades. For example, Nofle and Robins (2007) found that both SAT Verbal and SAT Mathematics scores predicted college GPA (mean  $\beta = .22$  and  $.22$ , respectively, across three samples in which personality variables and participant sex were included as predictors). Recent data reported by the College Board for the recently revised SAT show similar validities:

first-year GPA correlated .26 with SAT Mathematics, .29 with SAT Critical Reading, and .33 with SAT Writing (Kobrin, Patterson, Shaw, Mattern, & Barbuti, 2008).

In the present research, I examine verbal and mathematical abilities in relation to academic major and in the prediction of academic outcomes. I hypothesize that scores on math and verbal ability tests will predict choice of some academic majors. Specifically, it is hypothesized that students who score high on the math test will be more likely to choose and be successful in science majors whereas students who score high on the verbal test will be more likely to choose and be successful in humanities majors. I also hypothesize that both of these aspects of mental ability will predict grades across academic majors.

### **Vocational Interests, Academic Major, and Academic Outcomes**

Vocational interests can be identified by patterns in an individual's interest in various vocations. Holland's (1997) RIASEC structural model of vocational interests defined the relations between each of six interest types: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. Laudeman (1975) compared vocational interest scores across six different academic major groups using Holland's RIASEC model and found that, as compared with students in other majors, mechanical engineering students scored the highest in both Realistic and Intellectual interests, education students scored the highest in Social interests, accounting students scored the highest in Conventional interests, marketing students scored the highest in Enterprising interests, and arts and music students scored the highest in Artistic interests. These results provide support for Holland's theory that individuals choose vocational environments that are similar to their interests.

**Congruence.** In relation to the current study, congruence is defined as the similarity between an individual's vocational preferences or interests and the type of environment in which

they work (see Barrick, Mount, & Gupta, 2003, p. 49). Holland's (1997) congruence theory suggests that people who work in environments that are more congruent with their interests are more satisfied, more persistent, and achieve more than those who work in incongruent environments. Congruence theory has also been extended to choice of academic major (Bruch & Krieshok, 1981; Miller, Heck, & Prior, 1988). For example, Morrow (1971) examined whether students from math and sociology majors would show higher levels of satisfaction with their academic major when their vocational interests were congruent with their registered major. Satisfaction for students registered in mathematics was found to be positively associated with Intellectual (i.e., Investigative) vocational interests and negatively associated with Enterprising interests. Although sociology students' self-reported ratings of satisfaction with major was not significantly higher for Social vocational interests than other vocational interests, there was some trend toward this pattern.

Logue, Lounsbury, Gupta, and Leong (2007) found that Realistic, Artistic, and Investigative vocational interests were negatively correlated with academic major satisfaction in business students. Conceptually, Enterprising interests would be the most relevant to business students; however, Enterprising interests were not associated with academic major satisfaction. Nevertheless, the results are at least partly consistent with congruence theory given that Enterprising interests are opposite to Artistic, Investigative, and Realistic interests in Holland's hexagonal model.

Miller (1994) tested congruence theory by examining congruence between individuals' least characteristic Holland personality type and their least desirable college major. Results of this study showed that the correspondence between least descriptive type and least liked major was fairly high (.58). Spokane (1985) reviewed 15 studies investigating satisfaction with job or

with academic major and reported that, although there were some mixed findings, for the most part there were positive relationships between congruence and both academic and job satisfaction. Furthermore, people who had incongruent personality types to their chosen academic major were more likely to change academic major than were those who had made congruent choices (Holland, 1963; Holland & Nichols, 1964; Walsh & Lacey, 1969, 1970). Similarly, congruence was related to persistence in academic major choice (Allen & Robbins, 2008) and to GPA (Tracey & Robbins, 2006).

Although there has been evidence that congruence is related to academic satisfaction and success, there have been several studies finding either a weak or null relationship between these variables. In a meta-analysis (Assouline & Meir, 1987), the correlations between academic stability and achievement with congruence were low and non-significant. However, in this same analysis, the correlation between congruence and satisfaction did reach significance according to the authors' .30 threshold. In contrast, a different pattern of results was found in a meta-analysis by Tranberg, Slane, and Ekeberg (1993) who reported that the overall mean correlation between congruence and satisfaction (job or academic) was not significant and was not moderated by type of measure, sex, vocational type, or environmental setting.

The present study will examine whether academic outcomes—grade-point average, satisfaction with academic major, and change of academic major—are predicted by congruence between vocational interests and academic major choice. In investigating these relations, I will use a model of vocational interests that expands upon Holland's RIASEC framework. Goldberg (see Pozzebon, Visser, Ashton, Lee, & Goldberg, 2010) proposed a model of vocational interests consisting of eight dimensions—Leadership, Organization, Altruism, Creativity, Analysis, Producing, Adventuring, and Erudition—on the basis of analyses of responses to the Campbell



Interest and Skill Survey (CISS; Campbell, Hyne, & Nilsen, 1992). The first five variables have very similar content to five of Holland's RIASEC interests: Enterprising, Conventional, Social, Artistic, and Investigative. The variables Producing (interests in practical, hands-on activities) and Adventuring (interests in physically risky and/or competitive activities) together would be similar to RIASEC Realistic, and finally, Erudition measures interest in scholarly activities. The Oregon Vocational Interest Scales (ORVIS) were designed to measure these eight dimensions of interests.

### **Purpose**

The main purposes of this study are to examine (a) how people's orientations toward different areas of academic study are related to their personality characteristics, mental abilities, and vocational interests, and (b) to examine the incremental validity of the congruence between vocational interests and academic major, beyond personality and ability, in the prediction of academic outcomes.

## **Methods**

### **Participants and Procedure**

Participants were 355 students from a medium sized Canadian university who participated in small groups for course credit or \$20. Some individual difference variables of this dataset (but not the academic outcomes variables) were previously used in an article introducing the ORVIS as a public domain instrument (Pozzebon et al., 2010) and an investigation of the relations between anxiety and psychopathy (Visser, Ashton, & Pozzebon, 2012). Data from nine participants were removed because the individuals did not meet the study requirements of being registered in the first year of undergraduate studies and being fluent in English. The remaining sample of 346 first year students consisted of 245 women (71%) and 101

men (29%), ranging from 16 to 35 years of age ( $M = 18.5$ ,  $SD = 1.7$ ). At the beginning of the second year of studies for these same participants, records were obtained from the university registrar's office as to their status in their declared major, whether they had switched majors, and their GPA.

### Measures

**Personality.** The 100-item self-report form of the HEXACO Personality Inventory-Revised (HEXACO-PI-R; Ashton & Lee, 2008) was used to measure personality. The HEXACO-PI-R contains 25 facet scales, yielding six broad personality factors: Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience. Participants responded to items using a five-point scale (*strongly disagree* to *strongly agree*). Internal consistency reliabilities for each factor were .84, .82, .83, .82, .82, and .82, respectively. The highest correlation among HEXACO scales was .29 (Agreeableness with Honesty-Humility).

**Vocational interests.** The Oregon Vocational Interest Scales (ORVIS; Pozzebon, Visser, Ashton, Lee, & Goldberg, 2010) was used to assess participants' preferences for certain vocations. The 92-item inventory had participants rate their level of interest in each occupational description (e.g., "Care for sick people") on a 5-point scale (*strongly dislike* to *strongly like*). The ORVIS contains 8 scales: Leadership, Organization, Altruism, Creativity, Analysis, Production, Adventure, and Erudition. Internal consistency reliabilities for each scale were .86, .91, .84, .89, .84, .82, .83, and .75, respectively. See Table 3.2 for the intercorrelations among ORVIS variables and Table 3.4 for the correlations of ORVIS scales with personality and ability variables.

**Cognitive ability.** Two measures of ability were assessed in this study. Verbal ability was measured with the 46 items of the Vocabulary scale from the Multidimensional Aptitude Battery (MAB; Jackson, 1984). Mathematical ability was measured with a test consisting of 20 items taken from the Gauss Mathematics Contest (Center for Education in Mathematics and Computing, 2007) for Canadian students in grade eight; the mathematics items assessed problem solving in arithmetic and in basic algebra and geometry. Internal-consistency reliabilities of the verbal and mathematical ability measures were .78 and .65, respectively. The correlation between math and verbal ability was .21 in this sample.

**Grade Point Average (GPA) and academic standing.** Each participant's GPA (overall and academic major) for their first year of studies was obtained from the registrar's office. Also obtained from the registrar's office was the status of the students in their declared major, in order to determine whether the students had changed majors for their second year or continued in their original major. In the current sample, 68 percent continued with their original major, and overall GPA was negatively correlated with major change ( $r = -.34$ ).

**Satisfaction with academic major.** Participants were asked to rate their satisfaction with their current major ("*I am satisfied with the academic major I have chosen*") on a five-point scale (*strongly disagree* to *strongly agree*). See Appendix O for the item. Satisfaction with major was modestly related to major change and GPA but none of the correlations exceeded .20.

**Academic Major and Academic Major Groups.** Participants indicated which academic major they had declared in their first year of study and were subsequently classified into one of four academic major groups: arts/humanities (e.g. dramatic/visual arts, film, history, classics, communication), business (e.g. business administration, economics, management), science (e.g. biology, chemistry, computer science, neuroscience, oenology), and helping/child

oriented (e.g. child and youth studies, education, psychology, nursing). The use of broad major groups, identified on the basis of conceptual similarities among majors, was necessary because the number of students in each specific major was small.

## **Results**

### **Descriptive Statistics**

Descriptive statistics for the HEXACO-PI-R scales, the ORVIS scales, and the ability tests (as shown in Table 4.1) all indicated means close to the scale midpoints (i.e., 3.00 for the 1–5 scales), and the standard deviations were fairly wide, covering at least one fifth of the possible range. The internal consistency reliabilities were all acceptable as noted earlier in the Methods section.

### **Differences Among Academic Major Groups in Personality Characteristics, Mental Abilities, and Vocational Interests**

The means of each personality factor across each major group are shown in Table 4.2. Compared to students in the other major groups, students in the arts/humanities majors scored high in Openness to Experience, business students scored lowest in Emotionality, science students scored low in Extraversion, and helping/child focused students scored high in Honesty-Humility, Extraversion, and Emotionality.

Table 4.1

*Descriptive Statistics for Personality Characteristics, Mental Abilities, and Vocational Interests*

Variable	Mean ( <i>SD</i> )
Personality Characteristics	
Honesty-Humility	3.28 (0.61)
Emotionality	3.39 (0.60)
Extraversion	3.56 (0.56)
Agreeableness	2.91 (0.56)
Conscientiousness	3.43 (0.55)
Openness to Experience	3.17 (0.62)
Mental Abilities	
Verbal	.40 (0.13)
Math	.56 (0.14)
Vocational Interests	
Leadership	2.90 (0.74)
Organization	2.38 (0.81)
Altruism	3.24 (0.70)
Creativity	2.96 (0.86)
Analysis	2.08 (0.73)
Production	2.33 (0.73)
Adventure	2.78 (0.82)
Erudition	2.84 (0.68)

*Note.*  $N = 343-346$ .

Table 4.2

*Means of Individual Difference Characteristics by Academic Major Group*

	Arts/Humanities	Business	Science	Helping/Child
<b>Personality</b>				
Honesty-Humility	3.29 <sup>a,b</sup> (0.69)	2.94 <sup>a</sup> (0.56)	3.19 <sup>a,b</sup> (0.59)	3.41 <sup>b</sup> (0.56)
Emotionality	3.44 <sup>b</sup> (0.59)	3.07 <sup>a</sup> (0.55)	3.38 <sup>a,b</sup> (0.61)	3.45 <sup>b</sup> (0.61)
Extraversion	3.55 <sup>a,b</sup> (0.57)	3.63 <sup>a,b</sup> (0.54)	3.40 <sup>a</sup> (0.60)	3.69 <sup>b</sup> (0.49)
Agreeableness	2.87 <sup>a</sup> (0.51)	2.98 <sup>a</sup> (0.60)	2.91 <sup>a</sup> (0.62)	2.87 <sup>a</sup> (0.56)
Conscientiousness	3.38 <sup>a</sup> (0.57)	3.33 <sup>a</sup> (0.48)	3.53 <sup>a</sup> (0.55)	3.51 <sup>a</sup> (0.57)
Openness to Experience	3.45 <sup>b</sup> (0.68)	3.14 <sup>a,b</sup> (0.61)	3.00 <sup>a</sup> (0.56)	3.02 <sup>a</sup> (0.60)
<b>Ability</b>				
Verbal	.45 <sup>b</sup> (.12)	.37 <sup>a,b</sup> (.11)	.42 <sup>b</sup> (.12)	.37 <sup>a</sup> (.12)
Math	.54 <sup>a</sup> (.14)	.63 <sup>b</sup> (.14)	.62 <sup>b</sup> (.13)	.52 <sup>a</sup> (.14)
<b>Vocational Interests</b>				
Leadership	3.09 <sup>b</sup> (0.65)	3.54 <sup>c</sup> (0.57)	2.78 <sup>a,b</sup> (0.81)	2.73 <sup>a</sup> (0.64)
Organization	2.29 <sup>a,b</sup> (0.71)	3.33 <sup>c</sup> (0.64)	2.54 <sup>b</sup> (0.93)	2.10 <sup>a</sup> (0.58)
Altruism	3.27 <sup>b,c</sup> (0.72)	2.84 <sup>a</sup> (0.55)	3.02 <sup>a,b</sup> (0.73)	3.51 <sup>c</sup> (0.61)
Creativity	3.40 <sup>b</sup> (0.75)	2.87 <sup>a</sup> (0.85)	2.69 <sup>a</sup> (0.91)	2.89 <sup>a</sup> (0.83)
Analysis	1.86 <sup>a</sup> (0.56)	2.32 <sup>b</sup> (0.69)	2.60 <sup>b</sup> (0.87)	1.90 <sup>a</sup> (0.62)
Production	2.37 <sup>a</sup> (0.72)	2.37 <sup>a</sup> (0.85)	2.28 <sup>a</sup> (0.72)	2.22 <sup>a</sup> (0.71)
Adventure	2.67 <sup>a</sup> (0.75)	3.21 <sup>b</sup> (0.79)	2.85 <sup>a,b</sup> (0.97)	2.70 <sup>a</sup> (0.73)
Erudition	3.23 <sup>b</sup> (0.65)	2.77 <sup>a</sup> (0.59)	2.64 <sup>a</sup> (0.66)	2.73 <sup>a</sup> (0.66)

*Note.*  $N = 69$  for Arts/Humanities,  $N = 28$  for business (except for the ability variables where  $N = 27$ ),  $N = 66$  for science, and  $N = 96$  for helping/child-oriented. Values in parentheses indicate variable standard deviations. Letters in superscript indicate pairwise comparison of means across groups. Means that share a superscript do not differ at  $p < .05$ .

The means of verbal and math ability scores across majors are also reported in Table 4.2. Arts/humanities and science students both scored high on the verbal test, and business and science students both scored high on the math test.

The means of each vocational interest scale across each major group are also shown in Table 4.2. Students in arts/humanities majors rated interests in Creativity and Erudition higher than did students in other majors. Students in business majors rated interests in Leadership and Organization higher than did students in other majors. Students in science majors had high scores in Analysis interests, and students in helping/child oriented majors had high Altruism interests.

To examine the extent to which personality characteristics, mental abilities, and vocational interests could collectively discriminate among students in the four broad academic major groups, a discriminant function analysis was carried out. The analysis produced three discriminant functions accounting for 64%, 25%, and 11%, respectively, of the variance captured by the three functions. The discriminant functions as a whole were statistically significant. The first discriminant function (Wilks'  $\lambda = .36$ ,  $\chi^2 = 251.28$ ,  $p < .01$ ) was positively defined by Analysis and Organization interests, by math ability, and by Agreeableness, and negatively by Altruism interests and Honesty-Humility. This function discriminated business and science majors from arts/humanities and helping majors. The second discriminant function (Wilks'  $\lambda = .66$ ,  $\chi^2 = 103.11$ ,  $p < .01$ ) was positively defined by interests in Leadership, Erudition, Creativity, and Production, and by Openness to Experience, and was negatively defined by Conscientiousness. This function discriminated arts/humanities and business majors from science and helping majors. The third discriminant function (Wilks'  $\lambda = .87$ ,  $\chi^2 = 33.76$ ,  $p < .01$ ) was positively defined by verbal ability and Emotionality and was negatively defined by

Extraversion and Adventure interests. This function discriminated arts/humanities and science majors from business and helping majors.

When participants' academic major groupings were predicted from their scores on the three discriminant functions (taking the relative group sizes as the prior probability of membership in each group), the classification accuracies were 54% for arts/humanities majors, 56% for business majors, 61% for science majors, and 76% for helping/child oriented majors.

### **Congruence**

Previous analyses of the theoretical links between academic majors and vocational interests have been conducted with reference to Holland's RIASEC variables. Therefore, to examine congruence, we converted the ORVIS scale scores into Holland RIASEC scale scores. The ORVIS scales Leadership, Organization, Altruism, and Analysis all correspond directly to the RIASEC scales Enterprising, Conventional, Social, and Investigative, respectively. The mean of ORVIS Production and Adventure was calculated to represent the RIASEC Realistic scale, and the mean of ORVIS Creativity and Erudition was calculated to represent the RIASEC Artistic scale.

To examine how well students' vocational interests matched their chosen academic majors, congruence scores were calculated by combining the ORVIS vocational interests to match a three-letter code (Holland, 1963) for each major indicating the order of the three most highly rated RIASEC interests, with higher scores indicating greater interest in vocational interests scales relevant to that major. The three-letter Holland code corresponding to each academic major was identified in Rosen, Holmberg, and Holland (1997). Two scores were computed for each congruence code: one based on the sum of the corresponding three vocational interests and one based on the sum of the three corresponding interests minus the other three



vocational interests not included in the code. The latter congruence score, based on all six RIASEC interests, controls for individual differences in the overall elevation of responses; I used this score as the main congruence variable in reporting results. However, in case where there are differences in the results based on the use of the six- or three-interest congruence scores, I mention both results.

**The prediction of GPA from personality, ability, and congruence.** Zero-order correlations of the personality characteristics, mental abilities, and interest congruence variable with both overall GPA and major GPA are shown in Table 4.3. As expected, Conscientiousness was positively correlated with overall GPA and major GPA, as were both verbal and mathematics ability scores. Contrary to expectations, congruence was not correlated with GPA. In a multiple regression analysis, Conscientiousness, verbal ability, and mathematics ability all contributed significantly to the prediction of overall GPA (see beta weights and squared multiple correlations in Table 4.3). Likewise, in the prediction of major GPA, Conscientiousness, verbal ability, and mathematics ability all contributed significantly in the equation using the three-interest congruence variable, but verbal ability did not reach significance using the six-interest congruence variable. When entered at a second step in the regression equations, congruence did not add to the prediction of either GPA variable. Overall, personality characteristics, mental abilities, and interest congruence produced a multiple correlation of .47 ( $R^2 = .22$ ) with overall GPA and a multiple correlation of .43 ( $R^2 = .19$ ) with major GPA.

Table 4.3

*Prediction of GPA from Personality, Ability, and Congruence*

Variable	<i>r</i>	Overall GPA		<i>r</i>	Major GPA	
		Step 1 $\beta$	Step 2 $\beta$		Step 1 $\beta$	Step 2 $\beta$
Honesty-Humility	.03	-.02 (-.03)	-.02 (-.04)	.00	-.07 (-.03)	-.07 (-.03)
Emotionality	.09	.13 (.09)	.13 (.08)	-.06	.10 (.01)	.09 (-.01)
Extraversion	-.02	.00 (.03)	.00 (.04)	.08	.05 (.10)	.05 (.12)
Agreeableness	-.07	-.06 (-.06)	-.06 (-.06)	-.04	-.04 (-.06)	-.04 (-.07)
Conscientiousness	.29**	.33** (.31**)	.33* (.31**)	.14*	.20** (.18*)	.21** (.20**)
Openness to Experience	.04	-.02 (-.01)	-.02 (-.01)	.10	.08 (.09)	.09 (.12)
Verbal	.18**	.19** (.18**)	.18** (.18**)	.18**	.13 (.15*)	.13 (.16*)
Math	.23**	.26** (.26**)	.26* (.26**)	.32**	.34** (.31**)	.34** (.31**)
Congruence	.08 (.03)	-	.04 (-.02)	-.03 (.00)	-	-.05 (-.11)
$R^2$		.22 (.19)	.22 (.19)		.18 (.18)	.19 (.19)

*Note:*  $N = 179-240$ . \* indicates  $p < .05$ . \*\* indicates  $p < .01$ . Values in parentheses are based on the congruence variable computed from three interest scales only; see text for details.

Table 4.4

*Prediction of Satisfaction with Major and Academic Major Change from Personality, Ability, and Congruence*

Variable	Satisfaction			Academic Major Change		
	<i>r</i>	Step 1	Step 2	<i>r</i>	Step 1	Step 2
		$\beta$	$\beta$		$\beta$	$\beta$
Honesty-Humility	.08	-.01 (.01)	-.01 (.00)	-.02	.02 (.02)	.02 (.01)
Emotionality	-.06	-.06 (-.11)	-.07 (-.12*)	-.07	-.05 (-.05)	-.06 (-.06)
Extraversion	.15**	.11 (.14*)	.11 (.16*)	.07	.01 (.01)	.01 (.02)
Agreeableness	.14**	.14 (.09)	.13 (.09)	.06	.02 (.02)	.02 (.02)
Conscientiousness	.13*	.07 (.10)	.08 (.11)	-.12	-.14 (-.14)	-.14 (-.14)
Openness to Experience	-.04	.01 (-.03)	.02 (.01)	-.01	.07 (.07)	.08 (.08)
Verbal	-.02	.00 (.03)	.02 (.04)	-.13*	-.20** (-.20**)	-.19* (-.19*)
Math	.03	.08 (.03)	.07 (.03)	.07	.06 (.06)	.05 (.06)
Congruence	-.08 (-.03)	-	-.10 (-.10)	-.08 (-.03)	-	-.05 (-.04)
$R^2$		.06 (.06)	.07 (.07)		.06 (.06)	.06 (.06)

*Note:*  $N = 179-240$ . \* indicates  $p < .05$ . \*\* indicates  $p < .01$ . Values in parentheses are based on the congruence variable computed from three scales only; see text for details.

**The prediction of major satisfaction and academic major change from personality, ability, and congruence.** Zero-order correlations of the personality characteristics, mental abilities, and interest congruence with academic major satisfaction and academic major change are shown in Table 4.4. Satisfaction with academic major was positively and significantly related to Extraversion, Agreeableness, and Conscientiousness. Verbal ability was negatively related to academic major change.

In multiple regression analyses predicting satisfaction with academic major, Emotionality (negative) and Extraversion were significant predictors of satisfaction with academic major using the three-interest congruence variable, but not did not reach significance using the six-interest congruence variable. In the prediction of academic major change, verbal ability was a significant (negative) predictor of academic major change. When entered at a second step in the regression equation, congruence did not add to the prediction either of satisfaction with major or academic major change. Overall, personality characteristics, mental abilities, and congruence produced a multiple correlation of .26 ( $R^2 = .07$ ) with satisfaction with major and a multiple correlation of .25 ( $R^2 = .06$ ) with academic major change.

### Discussion

Choice of academic major is an important decision that many students struggle with when entering university. In fact, consistent with past research (Feldman & Newcomb, 1969), approximately one third of the present sample ended up changing their academic major after their first year of university. The present study investigated the role of personality, ability, and vocational interests in choice of academic major and in predicting academic outcomes such as grades, satisfaction with major, and change of major. In addressing the second issue, I examined the congruence between an individual's vocational interests and their chosen major as a predictor

of grades, satisfaction with major, and change of major above and beyond personality and ability. These results add to the vocational interests literature by including both the ORVIS and the HEXACO models as predictors of academic outcomes and by identifying the vocational interests, personality, and ability characteristics of students in different college major groups. The results of this study indicate that there are indeed significant differences in personality, vocational interests, and ability across academic major groups, with most differences in keeping with our hypotheses. Students in arts/humanities majors showed high levels of vocational interest in Erudition, Creativity, Leadership, and Altruism. They reported high Emotionality and Openness to Experience, and possessed strong verbal ability. Business majors had high levels of math ability and of vocational interest in Leadership and Organization. As compared to other students, business students reported lower levels of Honesty-Humility and Emotionality, and higher levels of Extraversion. Science majors showed strong interests in Analysis and Organization, higher levels of Conscientiousness, higher scores in math ability, and reported the lowest levels of Extraversion. Helping and child focused majors reported strong interests in Altruism and Creativity, and high levels of Honesty-Humility, Emotionality, and Extraversion. As expected, the ability measures distinguished among students of the four major groups such that art/humanities and helping/child majors scored higher on verbal ability and lower on math ability than the science and business majors. In terms of vocational interests, students' interests in different vocational activities were in keeping with our expectations for each major group. Arts/humanities majors showed the strongest interests in Creativity, Altruism, and Erudition. Business majors reported the strongest interests in Leadership and Organization. Science majors reported the strongest interests in Analysis, and helping/child majors had the strongest interests in Altruism.

Together, these results suggest that this sample of students showed a modest tendency to have chosen majors that theoretically match their personalities, mental abilities, and vocational interests. Furthermore, I was able to begin the process of defining the individual difference characteristics of students in various types of academic major. Moreover, as noted in the Results section, the classification accuracies for academic major groups based on the three discriminant functions were 54% for arts/humanities majors, 56% for business majors, 61% for science majors, and 76% for helping/child oriented majors. Thus, in combination, the personality, ability, and interest variables were reasonably successful in discriminating among the four groups, particularly in differentiating helping/child majors from other academic majors.

Holland (1997) suggested that congruence—that is, the fit between one's interests and one's environment—can be linked to satisfaction. However, this hypothesis has received only mixed support in previous research. Some studies (Bruch & Krieshok, 1981; Logue et al., 2007; Miller, Heck, & Prior, 1988) have found that congruence between interests and major has been linked to satisfaction whereas others have not (e.g., Assouline & Meir, 1987; Laudeman, 1975).

In the present study, I examined the personalities and abilities of university students in different majors and tested whether the congruence between vocational interests and chosen academic major would add to the former variables in the prediction of academic outcomes such as satisfaction and grades. Results from the current study showed that although variables such as Conscientiousness and ability were related to overall GPA, congruence was not. Similarly, in the prediction of satisfaction with major, although some personality variables (Emotionality and Extraversion) accounted for a significant proportion of variance, congruence did not. The same pattern was observed with major change in that (low) verbal ability was the only variable that significantly predicted change. It appears that the degree to which one's interest in certain

vocations matches the major one has chosen is not related to how satisfied one is with that major or to the grades one achieves in one's courses.

Regarding the lack of any link between satisfaction with major and interest/major congruence, it is possible that overall endorsement of satisfaction with major is confounded with other factors that the student may take into consideration, such as the liking of professors and specific classes, the amount of work required in each course, familiarity with the subject, or potential employment opportunities. However, it is also possible that the item used in this study to measure satisfaction was not specific enough to address true satisfaction with academic major course content. In the decision to use this single item, I considered two previous studies measuring academic major satisfaction. Rochester and McBride (1970) found that a yes/no scored item did not accurately represent students' satisfaction with major, but Lounsbury, Saudargas, Gibson, and Leong (2005) found that having a larger number of items to measure satisfaction did not improve the reliability of the scale significantly in comparison with fewer Likert-type items. Therefore, in the current work, using a single-item Likert scale question was justified.

Even if a student's interests influence his or her choice of major, those interests may not be a significant factor in the outcomes associated with that major. Instead, other factors may play a larger role in whether the student achieves high grades and also whether he or she decides to stay in the major. For example, the results of the current study show that Conscientiousness and mental ability are good predictors of academic achievement across course content areas. In addition, some research has shown that students who do not achieve good grades are unlikely to be satisfied with their major (Howard & Maxwell, 1980; Pennington, Zvonkovic, & Wilson, 1989; Svanum & Aigner, 2011). Also, given current economic conditions and job availability,

the prospect of attaining well-paying and secure job may be a better predictor of persistence with a major rather than true interest in that major.

To summarize, this study provided new information on the individual difference characteristics of students in different academic majors and some of the factors contributing to their academic success and major satisfaction. Students in each of the four academic major groups were noticeably different from one another in terms of their personality traits, vocational interests, and cognitive abilities. Although personality and ability predicted grades and personality alone predicted satisfaction with major, the congruence match between vocational interests and chosen major did not add any incremental validity to these predictions.



## **CHAPTER 5 - GENERAL DISCUSSION**

The goal of this dissertation was to improve our knowledge of several aspects of vocational interests: their relations with the construct of masculinity/femininity (M/F), their measurement and structure, and their role in predicting academic outcomes (see Table 5.1 for a summary of the findings from the three studies). In Study 1, the relations among masculine and feminine vocational interest, personality, and sexual fantasy items were examined. Given the use of a somewhat limited measure of vocational interests in that study, the utility of having a public-domain measure of the main dimensions of vocational interest became apparent. Study 2 defined and validated a new measure of vocational interests, one that assesses a set of basic interest dimensions that expands on Holland's RIASEC system. This instrument was appropriate for examining the questions of Study 3: How do students of different academic major areas differ in their personality characteristics, mental abilities, and vocational interests? Does congruence between one's academic major and vocational interests contribute to the prediction of academic outcomes, such as GPA, satisfaction with one's major, and persistence in one's chosen major, beyond personality and ability?

Table 5.1

*Summary of Findings*

Study #	Research Findings
1	Analyses of sex-correlated variables from the domains of vocational interests, personality, and sexual fantasies showed a general masculinity/femininity (M/F) factor in a mixed-sex participant sample. When participant sex was controlled, the loadings on the general M/F factor decreased moderately for sexual fantasies, dramatically for vocational interests, and increased for personality. Results indicate that M/F of vocational interests is nearly independent of M/F of personality and sexual fantasies.
2	The ORVIS was found to be a reliable measure of vocational interests in both college and community samples. The relations of the ORVIS with the CISS, the personality variables of the HEXACO-PI-R and the IPIP, and the cognitive ability tests all gave evidence of good construct validity of ORVIS variables.
3	Students in different academic major groups showed different levels of personality characteristics, ability, and vocational interests, with the differences generally being consistent with predictions. Congruence between interests and academic major did not predict GPA, satisfaction with major, and major change beyond the prediction provided by personality and ability.

**Review of Findings**

**Study 1.** In Study1, I investigated how well sex differences in vocational interests, personality, and sexual fantasies defined a general factor of masculinity/femininity. Results from this study revealed that although vocational interests, personality, and sexual fantasies showed large sex differences and could be considered as indicators of masculinity/femininity in a

combined-sex sample, when sex was statistically removed from the analyses, vocational interests did not load as highly on the general M/F factor as did personality and sexual fantasies. After sex was removed, the general M/F factor was defined mainly by personality characteristics and sexual fantasies. Thus, the common element of M/F as derived from variables in the domains of vocational interests, personality characteristics, and sexual fantasies was shared mainly by the latter two domains, with M/F vocational interests being nearly independent.

Although M/F of vocational interests may be almost unrelated to M/F of personality and sexual fantasies, the former variety of M/F appears to have some important correlates, as suggested by previous research. Lippa (2005b) found that self-rated M/F and vocational interests were able to differentiate between homosexual and heterosexual participants better than were personality characteristics. Although Lippa's research did find homosexual-heterosexual differences in personality characteristics, the effect sizes were small to moderate. The results of Lippa's research, in combination with findings from Study 1, might suggest that sexual orientation and M/F of vocational interests would define a factor separate from that defined by M/F of personality and M/F of sexual fantasies.

**Study 2.** In Study 2, the ORVIS scales were introduced and validated as a measure of vocational interests available in the public domain. The correlations shown in Table 2.2 indicate that the ORVIS scales are largely independent of one another. This supports the idea that there are several distinct areas of vocational interests that cannot be reduced to a couple of dimensions.

The results from Study 2 suggest that the ORVIS can be established as a reliable and valid scale useful for measuring vocational interests in both community and college samples. One of the benefits of the ORVIS over other previously used vocational interest scales in the literature is the addition of the Erudition scale as well as the distinctions adopted from the CISS

of the Leadership, Adventure, Production, and Organization scales (which differ from Holland's original Enterprising, Realistic, and Conventional scales) representing content suitable to a more modern middle-class society. In addition, the Erudition scale is especially informative in a college sample where many of the individuals completing the instrument are students.

The construct validity of the ORVIS was supported by the scales' theoretically appropriate relations with personality characteristics (as assessed by both the IPIP and the HEXACO-PI-R) and cognitive ability. Moreover, the generally modest size of the observed correlations indicates that the ORVIS variables are not redundant with the measures of personality and cognitive ability.

In several cases, the conceptual distinctions between ORVIS variables were supported by their differential associations with the personality and ability variables. For example, ORVIS Erudition was associated with greater verbal ability, whereas ORVIS Creativity was not. Similarly, ORVIS Production and Adventure had differing correlations with personality variables: Production was more strongly related to Openness to Experience than was Adventure, and Emotionality was more strongly related to Adventure (negatively) than to Production. These differing patterns of correlations with personality and ability variables support the construct validity of these scales, which provide a more differentiated assessment of vocational interests than do those based on the RIASEC model.

**Study 3.** In Study 3, students from different academic majors were compared on their levels of HEXACO personality factors, verbal and math ability, and ORVIS vocational interests. The level of congruence between individuals' choice of academic major and their vocational interests were used to predict GPA, satisfaction with major, and academic major change. The results of this study showed that students in different groups of academic majors were

significantly different on a number of personality, vocational interest, and ability scales. Most of these differences were in line with our expectations. These results suggest that, overall, this sample of students showed some tendency to choose majors that are consistent with their personalities, cognitive abilities, and vocational interests. As a result, we are able to begin to define the individual difference characteristics of students in certain types of majors. The discriminant function analysis confirmed that combinations of personality, ability, and vocational interests were able to predict many of the students' academic major groups, and were especially accurate in differentiating helping and child-focused majors from other academic majors.

In order to test how well the congruence theory is predictive of academic outcomes, I examined the degree to which congruence between vocational interests and chosen academic major would add to personality and cognitive ability in the prediction of academic outcomes such as satisfaction and grades. The results from Study 3 did not provide evidence that the congruence between interests and major was a significant predictor of academic outcomes (whether grades or satisfaction). Results showed that although variables such as Conscientiousness and cognitive ability were related to overall GPA, congruence was not. Similarly, in the prediction of satisfaction with major, although some personality variables (Emotionality and Extraversion) added a significant amount of variance, congruence did not. The same pattern was observed with change of major where vocabulary was the only variable that significantly predicted change (negative), whereas congruence did not. Although it was hypothesized that congruence would add some predictive validity to academic outcomes, inconsistent findings seen in previous research (see Assouline & Meir, 1987; Bruch & Krieshok, 1981; Laudeman, 1975; Logue, Lounsbury, Gupta, & Leong, 2007; Miller, Heck, & Prior, 1988) linking congruence to outcomes such as satisfaction and performance generally mirror the

findings here. It appears that the degree to which one's interest in certain vocations matches the major one has chosen is generally not related to how satisfied one is with that major or the grades one achieves in one's courses. The lack of any link between satisfaction with major and interest/major congruence could be a result of other influences on satisfaction with major, including the liking of professors and specific classes, the amount of work required by each course, familiarity with the subject, or potential employment opportunities.

Overall, Study 3 provided new information on the defining individual difference characteristics of students in different academic majors and some of the factors contributing to their academic success and major satisfaction.

### **Implications**

The findings from the current set of studies indicate that vocational interests show some substantial relations with personality characteristics and mental abilities, but that these relations are not strong enough to suggest that vocational interests can be reduced to these individual differences. Table 2.4 from the ORVIS validation (Study 2) and the findings from Study 3, in which vocational interests helped to discriminate between students in different major groups, give evidence that vocational interests are not redundant with either personality or cognitive ability and that they meaningfully contribute to the predictions of academic outcomes and choice of major. Together, these three studies helped to clarify how personality, ability, and vocational interests are distinct and meaningful individual difference constructs.

Theoretically, the congruence between one's interests and the type of environment one chooses would predict one's performance and one's satisfaction in that career or major. The results of this dissertation did not find congruence to add any predictive validity in terms of academic outcomes. Nevertheless, we can speculate about whether congruence would predict

occupational outcomes. Given the mixed results of prior empirical research in the area of congruence and academic outcomes (e.g., Assouline & Meir, 1987; Logue, Lounsbury, Gupta, & Leong, 2007; Spokane, 1985), one might not expect congruence to be a better predictor of occupational outcomes. It seems that the other factors that influence satisfaction and performance could weigh more heavily than congruence in both academic and occupational settings. Some of these other factors might include familial, situational, financial motivations for choosing a specific career. For example, Lent, Brown, and Hackett (1994) emphasized the role of self-efficacy in mediating the links of personal factors, situational experiences, and contextual backgrounds with career choice.

There are many applied situations that might benefit from the results of this dissertation. The findings are particularly relevant for people in career services, guidance, and academic advising roles. By having an idea of the types of characteristics that are representative of students in each academic major, we are better able to see if students are suited to the majors they are thinking about choosing. Helping students choose majors that are best suited to their individual difference characteristics should help increase retention in the academic program and help to decrease the number of students that either fail out of their program or decide to switch majors half way through. Also, having a reliable and valid public domain measure of vocational interests such as the ORVIS will be very useful to people in these positions that regularly make use of similar vocational interest tests. As well, the definition of eight distinct factors of vocational interest, as presented in the ORVIS, allows for a categorization of careers and academic majors that is more differentiated than that of the RIASEC model, and therefore more useful to counselors.

### **Limitations**

There were a few limitations in this dissertation that could be improved upon for future research in this area. As is common with the use of undergraduate student samples, the generalizability to other members of the population might be limited. Study 2 of this dissertation did utilize both a community and college sample, but Studies 1 and 3 should be replicated with a wider and larger sample. In particular, for Study 1, a larger sample of participants that included substantial numbers of nonheterosexual persons might have helped define a two-factor M/F structure that potentially could have explained the findings that emerged from sex-partialed data.

In Study 3, although there were distinct differences among the students in each academic major group, a much larger sample of students from each of the different academic major groups would help to differentiate the characteristics of students who choose each major.

### **Summary**

The present studies have extended the body of research on vocational interests by examining the structure and relations of those variables with M/F and with academic outcomes. The last study in particular expanded upon previous research in the vocational interests literature by investigating the predictive validity of congruence between interests and academic major in predicting academic outcomes. Research in this area will play a role in the counseling of students in order to help them choose a major that is suited to their interests, personality, and cognitive abilities. This in turn could decrease the number of students who change majors, thereby increasing the efficiency of the educational system.



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## APPENDICES

## APPENDIX A

DATE: March 10, 2008

FROM: Michelle McGinn, Chair  
Research Ethics Board (REB)

TO: Tony Bogaert, Community Health Sciences; Psychology;  
Julie Pozzebon, Beth Visser

FILE: 07-182 BOGAERT

TITLE: Sexual Fantasy & Language

The Brock University Research Ethics Board has reviewed the above research proposal.

**DECISION: Accepted as clarified**

**Please Note:** Given the sensitivity of ratings about physical attractiveness, we encourage you to be less ambiguous in your debriefing statement. For example, you could write, “*We are also including a measure of other-perceived attractiveness, which means that we rated you on attractiveness as well. We are expecting that these measures of attractiveness [self-perceived and other-perceived] will correlate with each other, and similarly predict your body type preferences and attitudes. However, it is important to keep in mind that standards of attractiveness differ between people, so what is attractive for one person is not necessarily attractive to another*”, as you did in the debriefing form for file # 05-017. Regardless of the explicitness of this statement, you should be prepared to justify your decision to include such ratings and to withhold prior information about those ratings in response to any participant questions. This could very well lead to participants' decisions to withdraw from the study, so all members of the research team will need to be prepared to respond in a sensitive and professional manner. Please submit a final copy of the debriefing form to be used.

This project has received ethics clearance for the period of March 10, 2008 to September 30, 2008 subject to full REB ratification at the Research Ethics Board's next scheduled meeting. The clearance period may be extended upon request. ***The study may now proceed.***

Please note that the Research Ethics Board (REB) requires that you adhere to the protocol as last reviewed and cleared by the REB. During the course of research no deviations from, or changes to, the protocol, recruitment, or consent form may be initiated without prior written clearance from the REB. The Board must provide clearance for any modifications before they can be

implemented. If you wish to modify your research project, please refer to <http://www.brocku.ca/researchservices/forms> to complete the appropriate form Revision or Modification to an Ongoing Application.

Adverse or unexpected events must be reported to the REB as soon as possible with an indication of how these events affect, in the view of the Principal Investigator, the safety of the participants and the continuation of the protocol.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and clearance of those facilities or institutions are obtained and filed with the REB prior to the initiation of any research protocols.

The Tri-Council Policy Statement requires that ongoing research be monitored. A Final Report is required for all projects upon completion of the project. Researchers with projects lasting more than one year are required to submit a Continuing Review Report annually. The Office of Research Services will contact you when this form *Continuing Review/Final Report* is required.

Please quote your REB file number on all future correspondence.

MM/kw

Kate Williams  
Research Ethics Assistant  
Brock University  
Office of Research Services



## APPENDIX B

Date: March 14, 2008  
Project Title: Sexual Fantasy and Language

Principal Investigator/Faculty Supervisor:  
Tony Bogaert, Professor  
Department of Community Health  
Brock University  
(905) 688-5550 Ext. 4085  
tbogaert@brocku.ca

Student Investigators:  
Julie Pozzebon & Beth Visser  
PhD Students, Department of Psychology  
Brock University  
(905) 688-5550 Ext. 5451  
Julie.Pozzebon@brocku.ca  
Beth.Visser2@brocku.ca

**INVITATION**

You are invited to participate in a study that involves research. The purpose of this study is primarily to investigate the nature of sexual fantasies in male and female students.

**WHAT'S INVOLVED**

As a participant, you will be asked to respond to a package of questionnaires which will include items regarding height, weight, ethnicity, body image, attractiveness, personality, and previous sexual experiences. You will also be asked to describe a sexual fantasy, and also to rate other items in terms of how sexually arousing you find them. In addition, we will take measures of physical characteristics, including your finger length and weight. Participation will take approximately 2 hours of your time.

**POTENTIAL BENEFITS AND RISKS**

Possible benefits of participation include an increased understanding of the nature of fantasy in human sexuality as well as a choice of \$20 or credit for course participation. There also may be risks associated with participation in that you might feel somewhat embarrassed or uncomfortable about responding to questions about your sexuality and sexual fantasies.

Please indicate your choice between (a) payment and (b) proof of two hours' research participation for course credit by checking ONE of the two spaces below:

**I wish to receive \$20 for participation**    **OR**  
 **I wish to use this form for 2 hours of research participation**

**CONFIDENTIALITY**

Your name will only be associated with this consent form. There will be no way of knowing your responses to the questionnaire or your physical measurements. All consent forms and data will be kept in a locked room at all times and destroyed 5 years after publication. Julie Pozzebon, Beth Visser, Dr. Tony Bogaert, and his research assistants will have access to this data. Note

that some data collected today may be used at a later date to explore other hypotheses. But, as mentioned above, no one will ever be able to know your responses to the questionnaire or your physical measurements, as this will be kept separate from your consent form. Any quotes or information gathered from this research used in writing a report or publishable article will be anonymous.

### **VOLUNTARY PARTICIPATION**

Participation in this study is voluntary. If you wish, you may decline to answer any questions or participate in any component of the study. Further, you may decide to withdraw from this study at any time. Should you do so, monetary compensation will be pro-rated at \$10/hour and research participation credit will be pro-rated at 1 credit/hour. You cannot withdraw from the study once you have submitted your questionnaire, as the questionnaires are anonymous and your identifying information will not be available.

### **PUBLICATION OF RESULTS**

Results of this study may be published in professional journals and presented at conferences. Feedback about this study will be available from any member of the research team (Tony Bogaert, Julie Pozzebbon, or Beth Visser) in September, 2008.

### **CONTACT INFORMATION AND ETHICS CLEARANCE**

If you have any questions about this study or require further information, please contact the student investigators or the faculty supervisor using the contact information provided above. This study is funded by a Social Sciences and Humanities Research Council (SSHRC) grant. This project has been reviewed and received ethics clearance through the Research Ethics Board at Brock University (file #07-182). If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.

Thank you for your assistance in this project. Please keep a copy of this form for your records.

### **CONSENT FORM**

I agree to participate in this study described above. I have made this decision based on the information I have read in the Information-Consent Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

### **RESEARCHER'S SIGNATURE**

Signature: \_\_\_\_\_

## APPENDIX C

Occupational Preferences Scale

**The following questions ask you how much you would like to do different kinds of work. Don't worry about whether you are currently trained to do different kinds of work, how much money you would make, or the prestige associated with each kind of work. Think only about how much you would like to do each kind of work, and respond accordingly (SD = Strongly disagree, D= disagree, N= neutral, A=agree, SA = strongly agree)**

1. I would like to be an ACCOUNTANT	SD	D	N	A	SA
2. I would like to be an ART MUSEUM DIRECTOR	SD	D	N	A	SA
3. I would like to be an AUTO MECHANIC	SD	D	N	A	SA
4. I would like to be a CAR SALES PERSON	SD	D	N	A	SA
5. I would like to be a BEAUTY CONSULTANT	SD	D	N	A	SA
6. I would like to be a BIOLOGIST	SD	D	N	A	SA
7. I would like to be a BOOKKEEPER	SD	D	N	A	SA
8. I would like to be a BUILDING CONTRACTOR	SD	D	N	A	SA
9. I would like to be a BUSINESS EXECUTIVE	SD	D	N	A	SA
10. I would like to be a CASHIER IN A BANK	SD	D	N	A	SA
11. I would like to be a CLERK	SD	D	N	A	SA
12. I would like to be a CHEMIST	SD	D	N	A	SA
13. I would like to be a CHILDREN'S AUTHOR	SD	D	N	A	SA
14. I would like to be a COMPUTER PROGRAMMER	SD	D	N	A	SA
15. I would like to be a COSTUME DESIGNER	SD	D	N	A	SA
16. I would like to be a DANCE TEACHER	SD	D	N	A	SA
17. I would like to be an EDITOR	SD	D	N	A	SA

18. I would like to be an ELECTRICAL ENGINEER	SD	D	N	A	SA
19. I would like to be an ELEMENTARY SCHOOL TEACHER	SD	D	N	A	SA
20. I would like to be a FARMER	SD	D	N	A	SA
21. I would like to be a FASHION MODEL	SD	D	N	A	SA
22. I would like to be a FLIGHT ATTENDANT	SD	D	N	A	SA
23. I would like to be a FLORIST	SD	D	N	A	SA
24. I would like to be an INTERIOR DECORATOR	SD	D	N	A	SA
25. I would like to be an INVENTOR	SD	D	N	A	SA
26. I would like to be a JET PILOT	SD	D	N	A	SA
27. I would like to be a LAWYER	SD	D	N	A	SA
28. I would like to be a LIBRARIAN	SD	D	N	A	SA
29. I would like to be a LOAN OFFICER	SD	D	N	A	SA
30. I would like to be a MACHINIST	SD	D	N	A	SA
31. I would like to be a MANAGER OF A CLOTHING STORE	SD	D	N	A	SA
32. I would like to be a MECHANICAL ENGINEER	SD	D	N	A	SA
33. I would like to be a MILITARY OFFICER	SD	D	N	A	SA
34. I would like to be a MINISTER, RABBI, OR CLERGY PERSON	SD	D	N	A	SA
35. I would like to be a NEWSPAPER REPORTER	SD	D	N	A	SA
36. I would like to be a NURSE	SD	D	N	A	SA
37. I would like to be a PHOTOGRAPHER	SD	D	N	A	SA
38. I would like to be a PHYSICIAN	SD	D	N	A	SA
39. I would like to be a PHYSICIST	SD	D	N	A	SA
40. I would like to be a POET	SD	D	N	A	SA

## APPENDIX D

**Unmitigated Communion Scale**

**To what extent do these next few items describe you? Use the scale below ("very much like me" to "not at all like me") to determine the extent to which you feel each item describes you, and write the number in the space beside each statement.**

**1 = not at all like me**    **3 = sort of like me**  
**2 = a little like me**

**4 = like me a fair bit**  
**5 = like me a lot**

1. I place the needs of others above my own. \_\_\_\_
2. I cannot be happy unless others are happy. \_\_\_\_
3. When I'm away, I worry about how those close to me are getting along without me. \_\_\_\_
4. I find myself getting overly involved in other peoples' problems. \_\_\_\_
5. I have great difficulty getting to sleep at night when someone close to me is upset. \_\_\_\_
6. I have difficulty satisfying my own needs when they interfere with the needs of others \_\_\_\_
7. I am unable to say no when someone asks me for help. \_\_\_\_
8. Even when exhausted I will help a friend. \_\_\_\_

## APPENDIX E

**Extended Personal Attributes Questionnaire**

The items below inquire about what kind of person you think you are. Each item consists of a pair of characteristics, with the letters A-E in between. For example:

Not at all artistic      A....B....C....D....E      Very artistic

Each pair describes contradictory characteristics -- that is, you cannot be both at the same time, such as not artistic and artistic.

The letters form a scale between two extremes. Please choose a letter which describes where you fall on the scale and record your choice on the answer sheet.

**REMEMBER TO ANSWER QUICKLY BECAUSE YOUR FIRST IMPRESSION IS BEST**

---

Not at all independent	A....B....C....D....E	Very independent
Not at all arrogant	A....B....C....D....E	Very arrogant
Not at all emotional	A....B....C....D....E	Very emotional
Very boastful	A....B....C....D....E	Not at all boastful
Very passive	A....B....C....D....E	Very active
Not at all egotistical	A....B....C....D....E	Very egotistical
Not at all able to devote self to others	A....B....C....D....E	Very much able to devote self to others
Very rough	A....B....C....D....E	Very gentle

Not at all helpful to others	A....B....C....D....E	Very helpful to others
Not at all competitive	A....B....C....D....E	Very competitive
Very greedy	A....B....C....D....E	Not at all greedy
Not at all kind	A....B....C....D....E	Very kind
Very dictatorial	A....B....C....D....E	Not at all dictatorial
Not at all aware of the feelings of others	A....B....C....D....E	Very aware of the feelings of others
Makes decisions easily	A....B....C....D....E	Difficulties making decisions
Gives up easily	A....B....C....D....E	Never gives up easily
Very cynical	A....B....C....D....E	Not at all cynical
Not at all self-confident	A....B....C....D....E	Very self-confident
Does not look out only for self; principled	A....B....C....D....E	Looks out only for self; unprincipled
Feels very inferior	A....B....C....D....E	Feels very superior

Not at all  
hostile

A....B....C....D....E

Very  
hostile

Not at all  
understanding  
of others

A....B....C....D....E

Very  
understanding  
of others

Very cold in  
relations with  
others

A....B....C....D....E

Very warm in  
relations with  
others

Goes to pieces  
under  
pressure

A....B....C....D....E

Stands up well  
under  
pressure



APPENDIX F

**Sexual Fantasy Questionnaire**

Most men and women have sexual fantasies. Using the following scale, please evaluate how sexually exciting each of the items would be to you in the context of a sexual fantasy. Circle the number that best represents your level of excitement in the space beside the item. Note that these scenarios specify a partner of the opposite sex. If you are more sexually attracted to a partner of the same sex, please mentally substitute female terms and pronouns.

1	2	3	4	5	6	7
Not at all Exciting			Somewhat Exciting			Extremely Exciting
1.					1	2 3 4 5 6 7
2.					1	2 3 4 5 6 7
3.					1	2 3 4 5 6 7
4.					1	2 3 4 5 6 7
5.					1	2 3 4 5 6 7
6.					1	2 3 4 5 6 7
7.					1	2 3 4 5 6 7
8.					1	2 3 4 5 6 7
9.					1	2 3 4 5 6 7
10.					1	2 3 4 5 6 7
11.					1	2 3 4 5 6 7
12.					1	2 3 4 5 6 7
13.					1	2 3 4 5 6 7
14.					1	2 3 4 5 6 7
15.					1	2 3 4 5 6 7
16.					1	2 3 4 5 6 7

1	2	3	4	5	6	7	
<b>Not at all Exciting</b>		<b>Somewhat Exciting</b>			<b>Extremely Exciting</b>		
17. Using force or humiliating a person who desires me.	1	2	3	4	5	6 7	
18. Pleasuring many other people while having group sex.	1	2	3	4	5	6 7	
19. My partner showing me how much he desires my body.	1	2	3	4	5	6 7	
20. I sweep a man off his feet and teach him all about romance and sex.	1	2	3	4	5	6 7	
21. Having sex with a stranger who is very attracted to me.	1	2	3	4	5	6 7	
22. Being overpowered or forced to surrender because I am so irresistible.	1	2	3	4	5	6 7	
23. Dressing in sexy, transparent underwear for my partner.	1	2	3	4	5	6 7	
24. Having sex with two or more partners, who are very attracted to me, at the same time.	1	2	3	4	5	6 7	
25. Giving sexual pleasure to many people.	1	2	3	4	5	6 7	
26. Talking dirty to my partner.	1	2	3	4	5	6 7	
27. Revealing my body to an attractive stranger.	1	2	3	4	5	6 7	
28. Exerting dominance and control over a partner who is highly attracted to me.	1	2	3	4	5	6 7	
29. Teasing a man (or men) until I can no longer contain my sexual desire for him/them.	1	2	3	4	5	6 7	
30. Being the centre of attention while having group sex.	1	2	3	4	5	6 7	
31. Being passive and submissive to someone whose body I want.	1	2	3	4	5	6 7	
32. Having sex with many men, all of them overcome with lust for my body.	1	2	3	4	5	6 7	
33. Being forced to surrender to someone while I'm overcome with lust for him.	1	2	3	4	5	6 7	
34. Being a promiscuous person who attracts the attention of many partners with my irresistibility.	1	2	3	4	5	6 7	
35. Undressing for my partner.	1	2	3	4	5	6 7	
36. Using force or humiliating a person who I desire.	1	2	3	4	5	6 7	
37. Being an exotic dancer.	1	2	3	4	5	6 7	
38. Having sex in a different place like a car, hotel, beach, woods.	1	2	3	4	5	6 7	

	1	2	3	4	5	6	7
	Not at all Exciting		Somewhat Exciting			Extremely Exciting	
39. Exerting dominance and control over a very desirable partner.	1	2	3	4	5	6	7
40. I am devoted to a special man and shower him with love and devotion.	1	2	3	4	5	6	7
41. Having casual sex with a person I just met and find irresistible.	1	2	3	4	5	6	7
42. Receiving sexual pleasure from many people.	1	2	3	4	5	6	7
43. My partner tells me what he wants to do to me during sex.	1	2	3	4	5	6	7
44. I imagine that I am attracted to a sexual partner because of his greater age and experience.	1	2	3	4	5	6	7
45. Men talk about how sexy and irresistible I am before forcing me to sexually pleasure them.	1	2	3	4	5	6	7
46. Showing my partner how much I desire his body.	1	2	3	4	5	6	7
47. Having sex with many men, all of whom are very attractive.	1	2	3	4	5	6	7
48. Teasing a man (or men) until he is consumed with sexual desire for me.	1	2	3	4	5	6	7
49. Having an attractive stranger reveal his body to me.	1	2	3	4	5	6	7
50. A man sweeps me off my feet and teaches me all about romance and sex.	1	2	3	4	5	6	7
51. Having anal intercourse.	1	2	3	4	5	6	7
52. Having sex with my current partner.	1	2	3	4	5	6	7
53. Watching my partner undress.	1	2	3	4	5	6	7
54. Feeling affection and emotional connection while having sex.	1	2	3	4	5	6	7
55. Exerting dominance and control over a partner who finds me very desirable.	1	2	3	4	5	6	7
56. Having sex without making eye contact.	1	2	3	4	5	6	7
57. Taking the initiative and dominant role while having sex.	1	2	3	4	5	6	7
58. Telling my partner how good-looking and sexy he is.	1	2	3	4	5	6	7
59. Reliving a previous sexual experience.	1	2	3	4	5	6	7
60. Being forced to sexually pleasure attractive men.	1	2	3	4	5	6	7
61. Imagining my partner in sexy underwear.	1	2	3	4	5	6	7
62. Pretending that I am doing something wicked or forbidden.	1	2	3	4	5	6	7

## APPENDIX G

DATE: September 17, 2007

FROM: Linda Rose-Krasnor, Acting Chair  
Research Ethics Board (REB)

TO: Mike Ashton, Psychology  
Beth Visser, Julie Pozzebon

FILE: 07-053 ASHTON et al

TITLE: Personality, Interests, and Academic Preferences

The Brock University Research Ethics Board has reviewed the above research proposal.

**DECISION: Accepted as is.**

This project has received ethics clearance for the period of September 17, 2007 to December 30, 2008 subject to full REB ratification at the Research Ethics Board's next scheduled meeting. The clearance period may be extended upon request.

*The study may now proceed.*

Please note that the Research Ethics Board (REB) requires that you adhere to the protocol as last reviewed and cleared by the REB. During the course of research no deviations from, or changes to, the protocol, recruitment, or consent form may be initiated without prior written clearance from the REB. The Board must provide clearance for any modifications before they can be implemented. If you wish to modify your research project, please refer to <http://www.brocku.ca/researchservices/forms> to complete the appropriate form **Revision or Modification to an Ongoing Application**.

Adverse or unexpected events must be reported to the REB as soon as possible with an indication of how these events affect, in the view of the Principal Investigator, the safety of the participants and the continuation of the protocol.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and clearance of those facilities or institutions are obtained and filed with the REB prior to the initiation of any research protocols.

The Tri-Council Policy Statement requires that ongoing research be monitored. A Final Report is required for all projects upon completion of the project. Researchers with projects lasting more than one year are required to submit a Continuing Review Report annually. The Office of Research Services will contact you when this form *Continuing Review/Final Report* is required.

Please quote your REB file number on all future correspondence.

LRK/bb

Brenda Brewster, Research Ethics Assistant  
Office of Research Ethics, MC D250A  
Brock University  
Office of Research Services

## Appendix H

Project Title: **Personality, Interests, and Academic Preferences**

September 24, 2007

Principal Investigators: M. C. Ashton  
(Professor)  
J. A. Pozzebon &  
B. A. Visser (Ph. D. candidates)  
Department of Psychology, Brock University

Faculty Supervisor: M. C. Ashton  
Department of Psychology, Brock  
University  
e-mail: ashtonlab@brocku.ca

### INVITATION

You are invited to participate in a study that involves research. The purpose of this study is to learn how people's characteristics—their personalities, interests, and abilities—are related to each other, and to learn how those characteristics are related to one's preferences for different academic subjects.

### WHAT'S INVOLVED

As a participant, you will be asked to complete a series of questionnaires that assess your personality characteristics, your interests, your cognitive skills, and your academic preferences. Participation will take approximately 1 hour and 45 minutes of your time. In addition to completing the questionnaires, your participation also involves giving your consent to allow the researchers to compare your responses with your future academic records at Brock (specifically, your course selections and grades).

### POTENTIAL BENEFITS AND RISKS

Benefits of participation include either (a) the payment of \$20 or (b) proof of two hours' research participation for credit in any one course that offers such credit, as well as the experience of taking part in psychological research. There are no known or anticipated risks associated with participation in this study, other than mild boredom or mild discomfort in answering a long series of questions about one's own characteristics. There is some loss of privacy that your grades and course selections will be accessed by the researchers, but please be assured that these data are used for research purposes only and will be kept entirely confidential.

Please indicate your choice between (a) payment and (b) proof of two hours' research participation for course credit by checking ONE of the two spaces below:

**I wish to receive \$20 for participation**    **OR**  
 **I wish to use this form for course research participation credit**

### CONFIDENTIALITY

All information you provide is considered confidential. Because our interest is in the average responses of the entire group of participants, neither you nor your responses will be identified individually in any way in written reports of this research. Data collected during this study will be stored in secure locations, and access will be restricted to the principal investigators and

possibly a small number of future qualified researchers. Note that your responses will NOT be made available to Brock University itself, so there will be no university records of your responses. Also, your name will not be kept in the same data file with your questionnaire responses; instead, your name will only be kept in a separate file.

### **VOLUNTARY PARTICIPATION**

Participation in this study is voluntary. If you wish, you may decline to answer any questions or participate in any component of the study. Further, you may decide to withdraw from this study at any time without any penalty or loss of benefits to which you are entitled. Note that the payment or research participation verification will only be given for completing the entire study (i.e., without early withdrawal). If at some future date, you decide to withdraw your permission for the instructors to obtain access to your academic records, you may do so by contacting the researchers, without losing your payment or proof of participation.

### **PUBLICATION OF RESULTS**

Results of this study may be published in professional journals and presented at conferences. Feedback about this study will be available by May 2009 by contacting the investigators at the e-mail address [ashtonlab@brocku.ca](mailto:ashtonlab@brocku.ca)

### **CONTACT INFORMATION AND ETHICS CLEARANCE**

If you have any questions about this study or require further information, please contact Dr. Michael Ashton, Faculty Supervisor, using the contact information provided above. This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University (07-053). If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, [reb@brocku.ca](mailto:reb@brocku.ca). Thank you for your assistance in this project. Please keep a copy of this form for your records.

### **CONSENT FORM**

I agree to participate in this study described above, by completing the questionnaires and allowing the researchers to have access to my future course selections and course grades at Brock. I have made this decision based on the information I have read in the Information-Consent Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Name (printed): \_\_\_\_\_ Signature: \_\_\_\_\_

Date: \_\_\_\_\_, 2007

### **FUTURE STUDIES**

Would you like to be contacted about taking part in follow-up surveys which may be conducted periodically over the next several years or more? If you indicate interest in participating in these follow-up surveys, then whenever a new study similar to the present one is being performed, you will be contacted by us via e-mail and will be given an opportunity to participate in the study.

What will be involved in participating in this research? If you agree to be contacted about future studies, we will periodically contact you via e-mail and ask you to complete various paid follow-up surveys. Like any other research participation, you are under no obligation to participate in the follow-up survey, and you can terminate your participation at any time without any reason. That is, agreeing today that you would like to be contacted does *NOT* mean that you must complete all the follow-up surveys that follow.

If you think that you might be interested in participating in future surveys, please provide your name and an email address that you check regularly and that is likely to remain stable over the next few years.

Thank you for considering ongoing participation in our research program.

Name (printed): \_\_\_\_\_

E-mail address: \_\_\_\_\_ (please provide an address that you check regularly and that is likely to remain stable over the next few years).



## Appendix I

## ORVIS

1	2	3	4	5
strongly dislike	dislike	neutral	like	strongly like

**I would like to...**

1. Make important things happen
2. Be the financial officer for a company
3. Help others learn new ideas
4. Create works of art
5. Be a chemist
6. Care for cattle or horses
7. Be a professional athlete
8. Be a translator or interpreter
9. Lead other people
10. Be an office manager
  
11. Care for sick people
12. Create new fashion designs
13. Design a laboratory experiment
14. Be a farmer
15. Engage in exciting adventures
16. Be a librarian
17. Be a sales or marketing director
18. Plan budgets
19. Be an elementary-school teacher
20. Be a professional dancer
  
21. Be a mathematician
22. Construct new buildings
23. Survive in the wilderness
24. Be a professor of English
25. Be the chief executive of a large company
26. Prepare financial contracts
27. Be a social worker
28. Write short stories or novels
29. Explain scientific concepts to others
30. Be a forest ranger

- | <b>1</b>                | <b>2</b>       | <b>3</b>       | <b>4</b>    | <b>5</b>             |
|-------------------------|----------------|----------------|-------------|----------------------|
| <b>strongly dislike</b> | <b>dislike</b> | <b>neutral</b> | <b>like</b> | <b>strongly like</b> |
31. Be a racing car driver
  32. Make up word puzzles
  33. Organize a political campaign
  34. Develop an office filing system
  35. Be a minister, priest, rabbi, or other religious teacher
  36. Play an instrument in a symphony
  37. Be a physicist
  38. Cultivate plants
  39. Face physical danger
  40. Edit a newspaper
  
  41. Be the master of ceremonies at a meeting
  42. Supervise the work of others
  43. Counsel persons who need help
  44. Redecorate one's house
  45. Carry out medical research
  46. Go on nature walks
  47. Be a military officer
  48. Know many languages
  49. Plan an advertising campaign
  50. Plan investment strategies
  
  51. Instruct parents on child care
  52. Select art works for a museum
  53. Be a scientific reporter
  54. Do woodworking
  55. Compete in athletic events
  56. Be a foreign correspondent
  57. Debate topics in a public meeting
  58. Establish time schedules
  59. Be a doctor or nurse
  60. Sing professionally
  
  61. Solve complex puzzles
  62. Raise flowers
  63. Be a bounty hunter
  64. Speak fluently on any subject
  65. Persuade others to change their views
  66. Monitor business expenses
  67. Be a physical therapist
  68. Be an actor or actress

**1**                      **2**                      **3**                      **4**                      **5**  
**strongly dislike**      **dislike**              **neutral**              **like**                  **strongly like**

**69.** Develop a computer program

**70.** Repair cars or trucks

**71.** Be a long-distance bicycle rider

**72.** Read many books

**73.** Be a state governor or senator

**74.** Be a purchasing agent

**75.** Provide comfort and support to others

**76.** Be an artist or architect

**77.** Be a statistician

**78.** Work with tools and machinery

**79.** Be a police officer

**80.** Keep a diary or journal

**81.** Run for political office

**82.** Keep track of a company's inventory

**83.** Participate in charity events

**84.** Act in a play

**85.** Design Internet web pages

**86.** Make decisions that affect a lot of people

**87.** Manage a computer data base

**88.** Help people make career decisions

**89.** Write songs

**90.** Keep detailed records

**91.** Be a counselor or therapist

**92.** Paint or draw

## APPENDIX J

## HEXACO-PI-R

- 1 \_\_\_\_\_ I would be quite bored by a visit to an art gallery.
- 2 \_\_\_\_\_ I clean my office or home quite frequently.
- 3 \_\_\_\_\_ I rarely hold a grudge, even against people who have badly wronged me.
- 4 \_\_\_\_\_ I feel reasonably satisfied with myself overall.
- 5 \_\_\_\_\_ I would feel afraid if I had to travel in bad weather conditions.
- 6 \_\_\_\_\_ If I want something from a person I dislike, I will act very nicely toward that person in
- 7 \_\_\_\_\_ I'm interested in learning about the history and politics of other countries.
- 8 \_\_\_\_\_ When working, I often set ambitious goals for myself.
- 9 \_\_\_\_\_ People sometimes tell me that I am too critical of others.
- 10 \_\_\_\_\_ I rarely express my opinions in group meetings.
- 11 \_\_\_\_\_ I sometimes can't help worrying about little things.
- 12 \_\_\_\_\_ If I knew that I could never get caught, I would be willing to steal a million dollars.
- 13 \_\_\_\_\_ I would like a job that requires following a routine rather than being creative.
- 14 \_\_\_\_\_ I often check my work over repeatedly to find any mistakes.
- 15 \_\_\_\_\_ People sometimes tell me that I'm too stubborn.
- 16 \_\_\_\_\_ I avoid making "small talk" with people.
- 17 \_\_\_\_\_ When I suffer from a painful experience, I need someone to make me feel comfortable.
- 18 \_\_\_\_\_ Having a lot of money is not especially important to me.
- 19 \_\_\_\_\_ I think that paying attention to radical ideas is a waste of time.
- 20 \_\_\_\_\_ I make decisions based on the feeling of the moment rather than on careful thought.
- 21 \_\_\_\_\_ People think of me as someone who has a quick temper.
- 22 \_\_\_\_\_ I am energetic nearly all the time.
- 23 \_\_\_\_\_ I feel like crying when I see other people crying.
- 24 \_\_\_\_\_ I am an ordinary person who is no better than others.
- 25 \_\_\_\_\_ I wouldn't spend my time reading a book of poetry.
- 26 \_\_\_\_\_ I plan ahead and organize things, to avoid scrambling at the last minute.
- 27 \_\_\_\_\_ My attitude toward people who have treated me badly is "forgive and forget".
- 28 \_\_\_\_\_ I think that most people like some aspects of my personality.
- 29 \_\_\_\_\_ I don't mind doing jobs that involve dangerous work.
- 30 \_\_\_\_\_ I wouldn't use flattery to get a raise or promotion at work, even if I thought it would succeed.

- 31 \_\_\_\_\_ I enjoy looking at maps of different places.
- 32 \_\_\_\_\_ I often push myself very hard when trying to achieve a goal.
- 33 \_\_\_\_\_ I generally accept people's faults without complaining about them.
- 34 \_\_\_\_\_ In social situations, I'm usually the one who makes the first move.
- 35 \_\_\_\_\_ I worry a lot less than most people do.
- 36 \_\_\_\_\_ I would be tempted to buy stolen property if I were financially tight.
- 37 \_\_\_\_\_ I would enjoy creating a work of art, such as a novel, a song, or a painting.
- 38 \_\_\_\_\_ When working on something, I don't pay much attention to small details.
- 39 \_\_\_\_\_ I am usually quite flexible in my opinions when people disagree with me.
- 40 \_\_\_\_\_ I enjoy having lots of people around to talk with.
- 41 \_\_\_\_\_ I can handle difficult situations without needing emotional support from anyone else.
- 42 \_\_\_\_\_ I would like to live in a very expensive, high-class neighborhood.
- 43 \_\_\_\_\_ I like people who have unconventional views.
- 44 \_\_\_\_\_ I make a lot of mistakes because I don't think before I act.
- 45 \_\_\_\_\_ I rarely feel anger, even when people treat me quite badly.
- 46 \_\_\_\_\_ On most days, I feel cheerful and optimistic.
- 47 \_\_\_\_\_ When someone I know well is unhappy, I can almost feel that person's pain myself.
- 48 \_\_\_\_\_ I wouldn't want people to treat me as though I were superior to them.
- 49 \_\_\_\_\_ If I had the opportunity, I would like to attend a classical music concert.
- 50 \_\_\_\_\_ People often joke with me about the messiness of my room or desk.
- 51 \_\_\_\_\_ If someone has cheated me once, I will always feel suspicious of that person.
- 52 \_\_\_\_\_ I feel that I am an unpopular person.
- 53 \_\_\_\_\_ When it comes to physical danger, I am very fearful.
- 54 \_\_\_\_\_ If I want something from someone, I will laugh at that person's worst jokes.
- 55 \_\_\_\_\_ I would be very bored by a book about the history of science and technology.
- 56 \_\_\_\_\_ Often when I set a goal, I end up quitting without having reached it.
- 57 \_\_\_\_\_ I tend to be lenient in judging other people.
- 58 \_\_\_\_\_ When I'm in a group of people, I'm often the one who speaks on behalf of the group.
- 59 \_\_\_\_\_ I rarely, if ever, have trouble sleeping due to stress or anxiety.
- 60 \_\_\_\_\_ I would never accept a bribe, even if it were very large.

Continue...

- 61 \_\_\_\_\_ People have often told me that I have a good imagination.
- 62 \_\_\_\_\_ I always try to be accurate in my work, even at the expense of time.
- 63 \_\_\_\_\_ When people tell me that I'm wrong, my first reaction is to argue with them.
- 64 \_\_\_\_\_ I prefer jobs that involve active social interaction to those that involve working alone.
- 65 \_\_\_\_\_ Whenever I feel worried about something, I want to share my concern with another person.
- 66 \_\_\_\_\_ I would like to be seen driving around in a very expensive car.
- 67 \_\_\_\_\_ I think of myself as a somewhat eccentric person.
- 68 \_\_\_\_\_ I don't allow my impulses to govern my behavior.
- 69 \_\_\_\_\_ Most people tend to get angry more quickly than I do.
- 70 \_\_\_\_\_ People often tell me that I should try to cheer up.
- 71 \_\_\_\_\_ I feel strong emotions when someone close to me is going away for a long time.
- 72 \_\_\_\_\_ I think that I am entitled to more respect than the average person is.
- 73 \_\_\_\_\_ Sometimes I like to just watch the wind as it blows through the trees.
- 74 \_\_\_\_\_ When working, I sometimes have difficulties due to being disorganized.
- 75 \_\_\_\_\_ I find it hard to fully forgive someone who has done something mean to me.
- 76 \_\_\_\_\_ I sometimes feel that I am a worthless person.
- 77 \_\_\_\_\_ Even in an emergency I wouldn't feel like panicking.
- 78 \_\_\_\_\_ I wouldn't pretend to like someone just to get that person to do favors for me.
- 79 \_\_\_\_\_ I've never really enjoyed looking through an encyclopedia.
- 80 \_\_\_\_\_ I do only the minimum amount of work needed to get by.
- 81 \_\_\_\_\_ Even when people make a lot of mistakes, I rarely say anything negative.
- 82 \_\_\_\_\_ I tend to feel quite self-conscious when speaking in front of a group of people.
- 83 \_\_\_\_\_ I get very anxious when waiting to hear about an important decision.
- 84 \_\_\_\_\_ I'd be tempted to use counterfeit money, if I were sure I could get away with it.
- 85 \_\_\_\_\_ I don't think of myself as the artistic or creative type.
- 86 \_\_\_\_\_ People often call me a perfectionist.
- 87 \_\_\_\_\_ I find it hard to compromise with people when I really think I'm right.
- 88 \_\_\_\_\_ The first thing that I always do in a new place is to make friends.
- 89 \_\_\_\_\_ I rarely discuss my problems with other people.
- 90 \_\_\_\_\_ I would get a lot of pleasure from owning expensive luxury goods.

Continue...

- 91 \_\_\_\_\_ I find it boring to discuss philosophy.
- 92 \_\_\_\_\_ I prefer to do whatever comes to mind, rather than stick to a plan.
- 93 \_\_\_\_\_ I find it hard to keep my temper when people insult me.
- 94 \_\_\_\_\_ Most people are more upbeat and dynamic than I generally am.
- 95 \_\_\_\_\_ I remain unemotional even in situations where most people get very sentimental.
- 96 \_\_\_\_\_ I want people to know that I am an important person of high status.
- 97 \_\_\_\_\_ I have sympathy for people who are less fortunate than I am.
- 98 \_\_\_\_\_ I try to give generously to those in need.
- 99 \_\_\_\_\_ It wouldn't bother me to harm someone I didn't like.
- 100 \_\_\_\_\_ People see me as a hard-hearted person.

**APPENDIX K**

Math Ability Test

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**APPENDIX L**

Verbal Ability Test

COPYRIGHTED INSTRUMENT

**APPENDIX M: Items of the Oregon Vocational Interest Scales, Sorted by Scale****Leadership (CISS: Influencing; Holland: Enterprising)**

1. Make important things happen	.54	.37
9. Lead other people	.71	.43
17. Be a sales or marketing director	.42	.45
25. Be the chief executive of a large company	.63	.52
33. Organize a political campaign	.43	.65
41. Be the master of ceremonies at a meeting	.59	.37
49. Plan an advertising campaign	.43	.54
57. Debate topics in a public meeting	.55	.59
65. Persuade others to change their views	.56	.46
73. Be a state governor or senator	.57	.73
81. Run for political office	.48	.76
86. Make decisions that affect a lot of people	.72	.54

**Organization (CISS: Organizing; Holland: Conventional)**

2. Be the financial officer for a company	.56	.63
10. Be an office manager	.61	.66
18. Plan budgets	.67	.77
26. Prepare financial contracts	.68	.72
34. Develop an office filing system	.65	.63
42. Supervise the work of others	.37	.37
50. Plan investment strategies	.52	.68

58. Establish time schedules	.67	.63
66. Monitor business expenses	.80	.72
74. Be a purchasing agent	.66	.50
82. Keep track of a company's inventory	.78	.75
87. Manage a computer data base	.52	.62
90. Keep detailed records	.69	.54

**Altruism (CISS: Helping; Holland: Social)**

3. Help others learn new ideas	.33	.37
11. Care for sick people	.66	.62
19. Be an elementary-school teacher	.52	.51
27. Be a social worker	.72	.67
35. Be a minister, priest, rabbi or other religious teacher	.43	.19
43. Counsel persons who need help	.69	.71
51. Instruct parents on child care	.65	.71
59. Be a doctor or nurse	.57	.45
67. Be a physical therapist	.57	.42
75. Provide comfort and support to others	.68	.69
83. Participate in charity events	.48	.51
88. Help people make career decisions	.44	.55
91. Be a counselor or therapist	.69	.74

**Creativity (CISS: Creating; Holland: Artistic)**

4. Create works of art	.68	.71
------------------------	-----	-----

12. Create new fashion designs	.64	.54
20. Be a professional dancer	.59	.42
28. Write short stories or novels	.43	.56
36. Play an instrument in a symphony	.43	.53
44. Redecorate one's house	.50	.41
52. Select art works for a museum	.64	.66
60. Sing professionally	.63	.60
68. Be an actor or actress	.60	.57
76. Be an artist or architect	.71	.71
84. Act in a play	.57	.64
85. Design Internet web pages	.30	.41
89. Write songs	.65	.75
92. Paint or draw	.70	.76

**Analysis (CISS: Analyzing; Holland: Investigative)**

5. Be a chemist	.73	.77
13. Design a laboratory experiment	.78	.75
21. Be a mathematician	.62	.54
29. Explain scientific concepts to others	.76	.76
37. Be a physicist	.80	.61
45. Carry out medical research	.67	.68
53. Be a scientific reporter	.73	.74
61. Solve complex puzzles	.38	.42
69. Develop a computer program	.52	.32
77. Be a statistician	.44	.26

**Production (CISS: Producing; Holland: Realistic)**

6. Care for cattle or horses	.40	.54
14. Be a farmer	.52	.66
22. Construct new buildings	.44	.30
30. Be a forest ranger	.58	.50
38. Cultivate plants	.57	.40
46. Go on nature walks	.48	.16
54. Do woodworking	.55	.51
62. Raise flowers	.48	.23
70. Repair cars or trucks	.37	.53
78. Work with tools and machinery	.51	.56

**Adventure (CISS: Adventuring; Holland: Realistic)**

7. Be a professional athlete	.57	.70
15. Engage in exciting adventures	.27	.47
23. Survive in the wilderness	.41	.49
31. Be a racing car driver	.54	.48
39. Face physical danger	.47	.46
47. Be a military officer	.46	.41
55. Compete in athletic events	.58	.71
63. Be a bounty hunter	.57	.40
71. Be a long-distance bicycle rider	.44	.54

79. Be a police officer	.58	.46
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**Erudition (no direct counterpart in CISS or Holland models)**

8. Be a translator or interpreter	.35	.51
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16. Be a librarian	.54	.18
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24. Be a professor of English	.59	.24
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32. Make up word puzzles	.48	.21
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40. Edit a newspaper	.62	.21
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48. Know many languages	.32	.58
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56. Be a foreign correspondent	.40	.48
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64. Speak fluently on any subject	.23	.56
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72. Read many books	.54	.55
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80. Keep a diary or journal	.48	.33
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Note. Numbers to the right of each item are factor loadings on the item's targeted factor in the college (left) and community (right) samples. See text for description of the factor analysis.



15. Have a vivid imagination.	0	0	0	0	0	(5+)
16. Keep in the background.	0	0	0	0	0	(1-)
17. Sympathize with others' feelings.	0	0	0	0	0	(2+)
18. Make a mess of things.	0	0	0	0	0	(3-)
19. Seldom feel blue.	0	0	0	0	0	(4+)
20. Am not interested in abstract ideas.	0	0	0	0	0	(5-)
21. Start conversations.	0	0	0	0	0	(1+)
22. Feel little concern for others.	0	0	0	0	0	(2-)
23. Get chores done right away.	0	0	0	0	0	(3+)
24. Am easily disturbed.	0	0	0	0	0	(4-)
25. Have excellent ideas.	0	0	0	0	0	(5+)
26. Have little to say.	0	0	0	0	0	(1-)
27. Have a soft heart.	0	0	0	0	0	(2+)
28. Often forget to put things back in their proper place.	0	0	0	0	0	(3-)
29. Am not easily bothered by things.	0	0	0	0	0	(4+)
30. Do not have a good imagination.	0	0	0	0	0	(5-)
31. Talk to a lot of different people at parties.	0	0	0	0	0	(1+)
32. Am not really interested in others.	0	0	0	0	0	(2-)
33. Like order.	0	0	0	0	0	(3+)
34. Get upset easily.	0	0	0	0	0	(4-)
35. Am quick to understand things.	0	0	0	0	0	(5+)
36. Don't like to draw attention to myself.	0	0	0	0	0	(1-)
37. Take time out for others.	0	0	0	0	0	(2+)
38. Shirk my duties.	0	0	0	0	0	(3-)
39. Rarely get irritated.	0	0	0	0	0	(4+)
40. Try to avoid complex people.	0	0	0	0	0	(5-)
41. Don't mind being the center of attention.	0	0	0	0	0	(1+)



42. Am hard to get to know.	0	0	0	0	0	(2-)
43. Follow a schedule.	0	0	0	0	0	(3+)
44. Change my mood a lot.	0	0	0	0	0	(4-)
45. Use difficult words.	0	0	0	0	0	(5+)
46. Am quiet around strangers.	0	0	0	0	0	(1-)
47. Feel others' emotions.	0	0	0	0	0	(2+)
48. Neglect my duties.	0	0	0	0	0	(3-)
49. Seldom get mad.	0	0	0	0	0	(4+)
50. Have difficulty imagining things.	0	0	0	0	0	(5-)
51. Make friends easily.	0	0	0	0	0	(1+)
52. Am indifferent to the feelings of others.	0	0	0	0	0	(2-)
53. Am exacting in my work.	0	0	0	0	0	(3+)
54. Have frequent mood swings.	0	0	0	0	0	(4-)
55. Spend time reflecting on things.	0	0	0	0	0	(5+)
56. Find it difficult to approach others.	0	0	0	0	0	(1-)
57. Make people feel at ease.	0	0	0	0	0	(2+)
58. Waste my time.	0	0	0	0	0	(3-)
59. Get irritated easily.	0	0	0	0	0	(4-)
60. Avoid difficult reading material.	0	0	0	0	0	(5-)
61. Take charge.	0	0	0	0	0	(1+)
62. Inquire about others' well-being.	0	0	0	0	0	(2+)
63. Do things according to a plan.	0	0	0	0	0	(3+)
64. Often feel blue.	0	0	0	0	0	(4-)
65. Am full of ideas.	0	0	0	0	0	(5+)
66. Don't talk a lot.	0	0	0	0	0	(1-)
67. Know how to comfort others.	0	0	0	0	0	(2+)
68. Do things in a half-way manner.	0	0	0	0	0	(3-)
69. Get angry easily.	0	0	0	0	0	(4-)
70. Will not probe deeply into a subject.	0	0	0	0	0	(5-)
71. Know how to captivate	0	0	0	0	0	(1+)

people.						
72. Love children.	0	0	0	0	0	(2+)
73. Continue until everything is perfect.	0	0	0	0	0	(3+)
74. Panic easily.	0	0	0	0	0	(4-)
75. Carry the conversation to a higher level.	0	0	0	0	0	(5+)
76. Bottle up my feelings.	0	0	0	0	0	(1-)
77. Am on good terms with nearly everyone.	0	0	0	0	0	(2+)
78. Find it difficult to get down to work.	0	0	0	0	0	(3-)
79. Feel threatened easily.	0	0	0	0	0	(4-)
80. Catch on to things quickly.	0	0	0	0	0	(5+)
81. Feel at ease with people.	0	0	0	0	0	(1+)
82. Have a good word for everyone.	0	0	0	0	0	(2+)
83. Make plans and stick to them.	0	0	0	0	0	(3+)
84. Get overwhelmed by emotions.	0	0	0	0	0	(4-)
85. Can handle a lot of information.	0	0	0	0	0	(5+)
86. Am a very private person.	0	0	0	0	0	(1-)
87. Show my gratitude.	0	0	0	0	0	(2+)
88. Leave a mess in my room.	0	0	0	0	0	(3-)
89. Take offense easily.	0	0	0	0	0	(4-)
90. Am good at many things.	0	0	0	0	0	(5+)
91. Wait for others to lead the way.	0	0	0	0	0	(1-)
92. Think of others first.	0	0	0	0	0	(2+)
93. Love order and regularity.	0	0	0	0	0	(3+)
94. Get caught up in my problems.	0	0	0	0	0	(4-)
95. Love to read challenging material.	0	0	0	0	0	(5+)
96. Am skilled in handling social situations.	0	0	0	0	0	(1+)
97. Love to help others.	0	0	0	0	0	(2+)



APPENDIX O

1 = strongly disagree    2 = disagree    3 = neutral (neither agree nor disagree)    4 = agree    5 = strongly agree

\_\_\_\_\_ I am satisfied with the academic major I have chosen