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Running head: NON-TRADITIONAL VS. TRADITIONAL

Prediction of Non-Traditional vs. Traditional Studies among University Students through Social, Cognitive, Attributional and Demographic Factors

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University of Ottawa

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Thesis submitted to the Department of Psychology, University of Ottawa, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Dedication

- To Chana and Braindel my namesakes whose silent presence has inspired my constant progress.
- To my parents who I cherish and are thankfully not silent in their unwavering support and pride in my accomplishments.
- To my dear husband who has joined me on all of my journeys even though I insisted we move and move and move... all for the sake of my education. He is the dearest of hearts.

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Abstract

Male and female students continue to be under or over-represented in specific study domains suggesting a selection criterion not always reflective of interest, ability, and good fit (Statistics Canada, 1992). In order to understand the social, cognitive and personal attributes which underlie the choices that maintain this imbalance, undergraduate university students were given problem solving, attitudinal and attribution measures. The aim of this study was to predict male or female dominated educational choices with the future intent of enhancing occupational suitability. The Impostor Phenomenon questionnaire, Social Problem Solving Inventory-R, Sex-Role Egalitarianism Scale, and the CAVE attribution procedure were selected for their potential utility as predictors. Study participants included male (n=185) and female (n=177) undergraduate students (N=362) majoring in traditional and non-traditional studies (i.e., computer science, engineering, psychology, education, nursing) from the University of Ottawa and Carleton University. Hypotheses testing utilized Logistic Regression Analyses (LRA) and results revealed primary measures to possess only weak predictive ability for non-traditional (NTS) vs. traditional study (TS) choice. Overall, students were not overly influenced by selected social and cognitive factors in their study choice. Exploratory LRA for the male sample identified parental SES, certain types of problem solving skills, and a desire for an alternate career as factors that resulted in the best fit (81% correct classification) and statistical significance ($p<.001$). Exploratory LRA for the female sample was non-significant. Recommendations for improving predictive ability in future studies include utilizing behaviorally driven intentional measures linked closely to past and future educational and occupational decisions (i.e., Theory of Reasoned Action (TRA) Ajzen & Fishbein, 1980). Future investigations should follow the noteworthy perceptual differences in the male and female

sample groups supported through empirical and theoretical distinctions reported in this study. This line of inquiry continues to pose a worthwhile challenge directed toward the identification of factors that potentially block ability and interest from directing educational pursuits and the harmonization of persistent imbalances in career choices.

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CHAPTER I

Prediction of Non-Traditional vs. Traditional Studies among University Students through Social, Cognitive, Attributional and Demographic factors

This research project was developed as a vehicle to investigate factors that predict the involvement of women and men in traditional vs. non-traditional areas of occupation and education. Academic pursuits with high mathematical content (i.e., computer science 19.8%; physics 15.1%; and engineering 11.7% female involvement) continue to be male-dominated (Statistics Canada, 1992). These are the same career paths that tend to be higher paying, with greater levels of responsibility, and prestige, making the payoff for these pursuits significant. However, women with equivalent math experience and ability to men continue to be underrepresented in these non-traditional academic paths (Lefevre, Kulak, & Heymans, 1992). Not only is society missing out on the contribution of these capable women in non-traditional studies, the women themselves are at risk of diminishing their own potential.

Although our focus in this study is primarily geared toward female students, we also consider the factors that hold back male students from fields currently dominated (70% or more) by women. In the fields of education, nursing, and psychology, men make up only a small percentage of the student population (less than 30%), and so we also miss the potential contribution of men in these fields. The main consideration here is that male students, as well as female students may choose not to enter non-traditional fields even if it is a desired and appropriate choice for them.

Some researchers implicate parental, teacher, and counselor influence in the development of subsequent sex-role norms that create barriers to young females who might otherwise choose male-dominated post-secondary courses of study (Chatterjee & McCarrey,

1989; Fitzpatrick & Silverman, 1989; Gaeddert, 1985; Pederson, Elmore, & Bleyer, 1986). Others have pinpointed psychological factors (i.e., impostor feelings, self-efficacy, and various personality characteristics) for causing the imbalance (Clance & Imes, 1978; Hackett & Betz, 1989; Mazen & Lemkau, 1990; Scheye & Gilroy, 1994; Topping & Kimmel, 1985). Whatever the reasons, both women and men continue to view certain occupations as being more masculine, feminine, or gender neutral.

In Beggs and Doolittle's (1993) study, male and female college students sex typed a large number of occupations. Jobs such as engineer, mathematician, and computer programmer were rated by students as close to gender neutral, while registered nurse was rated as feminine. Perceptions of certain non-traditional college programs by these students indicate that some male-dominated studies are viewed as suitable career choices for women to pursue. However, the number of women actually choosing to enter and stay in these fields does not match the appropriateness ratings given by female students of these occupations. Therefore, we must look at a number of factors (including sex-role attitudes) to explain the persistent gender imbalance in non-traditional studies.

The theoretical basis of this inequality in career choice is clearly important to examine. In this project we examined the impact of the following psychological constructs on traditional vs. non-traditional study choices: (1) Sex-role orientation; (2) Impostor Phenomenon tendency (characterized by feelings of intellectual phoniness, an inability to internalize successes and concern over success replication); (3) Social problem solving ability; and (4) Attributional style (our tendency to see our successes or failures as being due to internal reliable abilities or external factors out of our own. The impact that these variables have on university undergraduate populations was addressed as a means of clarifying their function as predictors of non-traditional vs. traditional educational choice.

By learning about the factors that contribute to elective educational choices among university students we may be able to clarify the resources needed by this population to make choices based on true desire and expertise rather than perceived limitations driven by heuristic social cognitions related to biological sex. These limitations may include sex-role bias, feelings of lack of ability, problem solving shortcomings, and debilitative attributional style. All measures were analyzed to determine the degree to which they are predictors of membership in traditional vs. non-traditional studies. Following the logic of person by environment fit, low impostor feelings, highly egalitarian sex-role attitude scores, superior problem-solving skills, and adaptive attributional styles are all anticipated to be significantly more common among and more predictive of entrance into non-traditional vs. traditional studies for female university students.

The danger here is to interpret this material as bestowing greater value or status upon women who choose male-dominated fields of study. The true message behind this research is that competent women may choose not to follow their true career aspirations and aptitudes because they feel unable to do so, or believe that the benefits do not outweigh the costs and so choose the path of least resistance (which may be traditional studies). This is not to say that non-traditional studies are superior, but, that it is better to choose one's education based on interest, ability, and competence rather than stereotypic social cognitive/schemas, unwarranted feelings of incompetence, and discouraging problem solving abilities. Given the current demographics in the fields of computer science, nursing, engineering, education, and psychology it is likely that large numbers of both male and female students are making educational decisions based on factors other than suitable personal choice.

Goal

We can credit the process of socialization, in part, for the fact that greater numbers of women enter expressive or people oriented fields like nursing and psychology while more male students enter instrumental or task oriented fields like engineering and computer science. For the purposes of this study the focus rests primarily on identifying predictors of female entrance into male-dominated non-traditional programs of study. The reason for this focus is not due to a belief in the superiority of male-dominated fields, but for the sake of the substantial number of students who enter into fields that are discordant with their own true desires and latent abilities. We will also explore the same questions looking at our male population sample, while maintaining our primary focus on female students. The immediate goal of this project is to identify predictors of entrance into non-traditional studies. The ultimate goal is to provide results that might aid students in making career choices that are appropriate and suitable. It is the author's belief that an exploration of sex-role attitudes, ability confidence, problem solving skills, and attributional style among our target population will help us attain these goals. Thus, reducing the possibility of post-decisional regret and loss to both the individual and ultimately society, due to inappropriate educational and career choices.

The Male Sample

A male sample was not initially sought during the conception stage of this research project. It was only after it became apparent that both male and female subjects could be recruited at the same time, in many but not all cases, did it become logical to extend the study further to include men entering traditional and non-traditional studies. This did two things for the project as it stands today: (1) It allowed for greater generalizability; and (2) It enhanced the knowledge base in an area not well documented in the literature. Although the additional

work required to collect this sample was initially thought to be nominal this was not the case. It was difficult to induce men in nursing, education, and psychology to take the time to fill out questionnaires and hence added considerably to data collection time, person power, and financial constraints.

At the Thesis Proposal stage, it was suggested that the male sample be collected along with female subjects but not to add unreasonably to the study mandate. We have exceeded these requirements by persisting until the male comparison group was a full parallel sample to the females, large enough to provide ample power for the proposed analyses. The motivation for this persistence was the importance of the male sample due to the paucity of literature regarding factors influencing men entering traditional versus non-traditional educational/career streams. Incorporated in the section called "Male Participants: Factors Influencing Choice" is a review of literature focused on education/career choices of men entering traditional and non-traditional careers and/or education.

Gender Related Terminology

There are a number of terms that need clarification before proceeding further into this text. According to Money (1994), gender identity refers to an individual's own perception of their femaleness or maleness while a gender role is linked more closely with stereotypes and society's perception of masculinity and femininity. Sex is used to refer to the biological differences with which men and women are born. Since the terms gender and sex were used throughout this text it was useful to begin with the standardized understanding of the terms, presented above.

Purpose/Contribution of Study

One outcome of this study was a contribution to our knowledge of the impact of Sex-Role Egalitarianism, Attribution style (internal/external), Ability Confidence (as measured on the Impostor Phenomenon Scale), and Social Problem Solving, on traditional vs. non-traditional study decisions on the part of university undergraduate students. Another contribution is an exploration into the factors that influence men pursuing non-traditional programs of study. Due to the paucity of research in the area, of male entrance into NTS vs. TS, this will result in a meaningful contribution to the literature. Current statistics paint a relatively clear demographic picture that outline areas of study that remain male and female dominated (Anderson, 1994; Statistics Canada, 1992). This makes the factors/variables which maintain this inequality in career choice an important area of research. In this project we will attempt to determine the extent to which (1) Ability Confidence (IP), (2) Social Problem Solving Ability (SPSI), (3) Sex-Role Egalitarianism (SRES) and (4) Attributional styles (CAVE Procedure) act as predictors of non-traditional versus traditional career choice among university students. On a more general level, given the gender segregated nature of the work force, the identification of the role cognitive, attitudinal and motivational constructs play in the choice of traditional and non-traditional career choice is crucial to mitigate the impact of outdated gender stereotypes. Finally, the attribution style portion of this questionnaire adds to the literature by tapping into true life experiences of study participants and thus, takes this work beyond the boundaries and limitations of likert-type questionnaires.

Hypotheses

The following is a complete list of the proposed hypotheses[1]:

Hypothesis 1: Sex-Role Egalitarianism (SRES) will be significantly more predictive of non-traditional study vs. traditional study choices among university students.

Hypothesis 2: Ability Confidence (IP/AC) will be significantly more predictive of students in non-traditional studies vs. those in traditional studies.

Hypothesis 3: Social Problem Solving (SPSI) skills will be significantly more predictive for students in non-traditional than traditional studies.

Hypothesis 4: Adaptive attributions for success and failure will be significantly more predictive of students in non-traditional vs. traditional studies.

The theoretical infrastructure for these hypotheses will be found in the following section.

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[1]A list of Exploratory Hypotheses and analyses can be located later in this document.

CHAPTER II

Literature Review

The main goal of this literature review is to answer why and how the measures of impostor feelings, sex-role egalitarianism, attributional style, and social problem solving abilities are implicated in the choices of women and men entering non-traditional (NTS) versus traditional programs of study (TS)[2].

Variables linked to Educational Choice

When choosing a career or an educational path numerous factors influence this decision. In the case of the undergraduate population targeted, certain factors appear to be quite salient. In order to arrive at an understanding of the educational choices being made some of the factors identified as most important in decision making will be discussed in brief. These factors include one's tendency toward expressiveness or instrumentality (exemplified by male or female-dominated studies respectively), sex-role orientation, career aptitude, social influence and support, and cognition.

Sex-Role Orientation.

Students entering non-traditional fields of study can be thought of as occupational pioneers paving the way through to careers typically associated and demographically dominated by the opposite sex. Men and women following studies considered traditional are in harmony with the established sex-role stereotypes for their sex. Those who enter NTS are behaving in a manner that is incongruent with the established societal gender norms. However, if these individuals hold egalitarian sex-role attitudes for education and career

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[2]The use of the abbreviated form of non-traditional (NTS) and traditional studies (TS) was first noted in the article written by Luzzo, 1993. This short-form is of particular use in this paper and may be substituted for the full term throughout this document. The use of T for traditional or NT for non-traditional may also be used as a short-form throughout.

goals, entering NTS would be congruent with their own personal gender schemas and beliefs provided they have the requisite skills.

We know that even today, certain university programs in North America are heavily dominated by either men or women (Statistics Canada, 1992). Williams and Best (1982) suggest that "when a given occupational field is highly saturated with persons of one sex, there is a tendency to think of the occupation as more 'appropriate' for that sex (p. 293)." By default, men or women are then believed to possess the characteristics most suitable for success in the given field simply by virtue of their sex. This sets the scene whereby, women entering nursing and education are being congruent with the established occupational norms or traditional sex-role stereotypes; while those entering engineering, physics and computer science are not.

A strong link between traditional careers and traditional sex-role attitudes exist for women (Murrell, Frieze, & Frost, 1991; Lemkau, 1979). Congruent with this finding, stronger egalitarian sex-role attitudes have been found among women in non-traditional occupations and training programs (Chatterjee & McCarrey, 1989; Lemkau, 1979). In addition, Mazen and Lemkau (1990) indicated that women in non-traditional occupations are more able to resist traditional socialization than women in traditional occupations. They account for this trend, in part, by noting greater irritability and excitability among traditional women. Speculatively, this may reflect feelings of lower self-esteem among traditional women (Kleinplatz, McCarrey & Kateb, 1992). Mazen and Lemkau (1990) also report that the masculinity-femininity dimension of the California Personality Inventory provides the strongest factor in differentiating between traditional and non-traditional studies among women. These studies suggest a greater apparent strength among NT women to deal with roles that surpass those typically accepted within the boundaries of traditional sex-role norms.

Expressive and Instrumental Roles.

When a woman makes career and educational choices she also makes the choice to conform with or differ from established sex-role stereotypes. The impact of occupational and educational stereotypes may have the power to sway individuals toward gender associated roles even if they have a natural aptitude and interest in non-traditional skills and attitudes. Central to our understanding of traditional vs. non-traditional career choices for women are the constructs of expressiveness or instrumentality (Broverman, Vogel, Broverman, Clarkson, & Rosenkrantz, 1972). These terms work well in describing "male" and "female" stereotypical behaviors, traits, or values, where men are characterized as aggressive, aspiring, autonomous, logical, and powerful; while women are seen as dependent, unambitious, passive, sensitive, illogical, communicative, and tactful (Broverman, et al., 1972). In 1982, these character clusters identified by Broverman et al., were validated by Williams and Best, who found men and women in 30 countries to fit an instrumental/competence cluster or an expressive cluster respectively.

In the Personal Attributes Questionnaire (PAQ) (Spence & Helmreich, 1978), instrumental and expressive qualities are measured by Masculinity and Femininity sub-scales. In 1980, Spence and Helmreich reported that instrumental attributes were more characteristic of males and expressive attributes more characteristic of females. Research has been consistent in establishing the relationship between traditional and non-traditional occupational choices and expressive vs. instrumental values for women. This is exemplified by traditional women who exhibit greater adherence to the expressive cluster and non-traditional women who are more characterized by the instrumental cluster. Based on the findings above and the definitions outlined, the terms *expressive* and *instrumental* was used

throughout this document to describe women in traditional and non-traditional occupations and "masculine" and "feminine" values or traits.

Career Aptitude.

Male-dominated fields also happen to be the fields that are moderate to high in mathematical content (i.e., physics, computer science, engineering). A recent study enlisting participants from first year introductory Psychology courses measured math anxiety, average number of years math experience, level of confidence, and interest. There were two noteworthy findings in this study: (1) the lack of significant differences across gender on the measures; and (2) sex was the best predictor of math related majors with significantly greater numbers of males enrolled in moderate and high math based majors (Lefevre, Kulak, & Heymans, 1992). This actual enrollment outcome is not surprising and is congruent with current research and statistics (Anderson, 1994; Houser & Garvey, 1985; Statistics Canada, 1992).

What is surprising is the lack of statistical significance on gender differences with measures of math anxiety, confidence, experience, and interest, which is incongruent with earlier research (Campbell & Hackett, 1986; Ware & Lee, 1988; Wigfield & Meece, 1988). Lefevre, Kulak, and Heymans (1992) believe that their findings may be due to recent changes in high school math experience and attitudes among female students, or a sampling bias created by using only students with plans to attend university. An earlier study, used a regression model to determine what factors contribute most to math achievement (Pederson, Ellmore, & Bleyuer, 1986). Once again, the student's sex was not a major contributor to math achievement at the high school level. The authors concluded that sex was important but was subsumed under other factors such as parental views and career interest which would impact later on career choice.

In another study, male and female students did not differ in math anxiety, belief in math ability, or feelings regarding the usefulness of math (Singer & Stake, 1986). Yet, female students chose math related careers significantly less often than male students. In fact, talent and experience accounted less for math career choice than current societal stereotypes. Even though math was viewed as useful and important, women succeeding in this arena did not report greater performance self-esteem than did their female peers who were not involved in mathematics. This suggests that many women may feel that success that is inconsistent with established sex-roles is not salient enough to enhance self-esteem or even encourage participation where ability is evident. This may be due to a hesitancy to place one's own egalitarian non-traditional self schema above more traditional sex-roles established by society, due to the high visibility costs involved.

Social Influence and Support.

The choice to avoid NT careers, made by capable women, can be further explained by McLure and Piel's (1978) study. Female subjects, reported insufficient encouragement from teachers and counselors for entry into NT careers as their number one reason for failure to pursue NT educational options. Houser and Garvey (1985) analyzed data from 470 female respondents enrolled in traditional and non-traditional studies. Their questionnaire included general questions regarding family background/demographics; feelings of support and encouragement from important others; peer experience; and utilized the Bem Sex-Role Inventory, Zuckerman's Fear of Success Scale, Rotter's Internal-External Control Scale and Beckman's index of perceived advantages and disadvantages. Of all these variables they found that social support was the primary social factor differentiating women in NTS versus those in TS. Women in NTS vs. TS enjoyed greater support and encouragement from family members, female and male friends, school counselors, and teachers.

These results suggest that even when the women themselves do not differ in ability from male cohorts, if they lack sufficient social support and encouragement, they may choose to pursue traditional studies despite their personal interests and abilities. Thus, deficits in social support may account, in part, for the continued gender differences existing in NTS vs. TS at the university level contrary to any lack of significant differences on levels of anxiety, confidence, and experience in math pursuits (Lefevre, Kulak, & Heymans, 1992). An important point to consider is that, some individuals may be able to aspire to their true career interests regardless of social support if a personal sense of support is already internalized.

An early study revealed teachers to be more comfortable with students who conformed to traditional sex stereotypes (Sadker & Sadker, 1974). Other researchers have noted this tendency to reinforce sex-role conforming behavior in women by people in a variety of positions including, spouses, teachers, counselors, training program developers, admissions staff, and employers (Cox & Harquail, 1991; Hakim, 1991; McLure & Piel, 1978; Redman, Saltman, Straton, Young, & Paul, 1994; Rennie & Dunne, 1994). In one extensive study, both male and female university students felt that female students were more likely to experience discrimination when applying to some professional programs (i.e., medicine, law) than male students (Baird, Clark, & Hartnett, 1973). Often, unfounded assumptions may play a role in maintaining sex-role stereotypes. Eagley and Wood (1982) found that when job status was unknown and sex was indicated, study participants assumed that women held lower status jobs than men. Consequently, it can be said that current demographics influence assumptions and subsequent norms for future sex segregation in the workplace.

Steinkamp and Maehr's (1984) literature review revealed moderate but significant motivational differences between young male and female students concerning science courses. Women held more egalitarian attitudes toward female involvement in science, but

actually participated in fewer courses of this nature[3]. Steinkamp and Maehr, also suggest that lack of female role-models (due to the current paucity of well-established women in NT occupations), hostility from male cohorts, and conflict with demands of domestic responsibility are among some of the possible reasons for the observed lack of actual involvement. This warns us that women, on average, may view the cost of assuming a non-traditional role to outweigh the benefit of following personal values. It is possible however, that a subset of egalitarian women choose NTS vs. TS because the congruency between their egalitarian sex-role attitudes regarding work and study roles has a strong motivating force leading to NT occupational choices. This strongly implicates the notion of the person-environment fit, where the benefits of following one's own true nature are seen as more powerful than the cost of failing to follow societal norms.

Social Cognition.

Clearly, social cognition plays an important role in career choice (Feather, 1984). One develops a cognitive schema (means of structuring our experience of the world) to aid in the information processes necessary for understanding our multifaceted world in a stable manner. 'Cognitive misers' use heuristic information processing as a means of arriving at understanding through the utilization of shortcuts. However, these shortcuts often rely on stereotypes as a means of fast and easy information absorption. Bem (1981) suggests that sex-typing of self and others and the tendency to conform to the gender normed expectations operating in our society can be linked to gender schema. One's relationship to the developed gender schema may prove particularly salient and thus play an important role in career cognitions (Feather, 1984; Markus, Crane, Bernstein, & Siladi, 1982). In other words, when

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[3]Therefore, it is logical to use the Sex-Role Egalitarianism Scale as a predictor variable in this study.

an individual behaves in a manner that matches their personal cognitive schemas of gender roles these roles are prominent for the person and tend to influence their behavior.

Kalin and Hodgin (1984) illustrate the importance of social cognition on judgments of occupational suitability. In their model, people are judged by others as suitable for an occupation as a result of societally based sex-role norms for that given career. This is particularly true when the individual's personal abilities are unknown. Basically, the less we know about an individual the greater importance is placed on sex-role norms and conversely the more we know about the individual the less important the gender bias becomes.

Cognitive dissonance theorists (Elliot & Devine, 1994; Festinger, 1957) suggest that if certain beliefs and actions are to be maintained without creating unreasonable levels of internal conflict, they must be consistent with other views, attitudes and actions held by the individual. If the "proper" female role is thought to be along traditional lines, entering NTS vs. TS may create undue stress. In that case, women considering entrance into non-traditional areas may experience considerable conflict. However, if self-referent egalitarian sex-role ideas are in place, venturing into non-traditional arenas would pose considerably less threat and possibly be a relief, as one's true interests are being followed. On the other hand, for women with strong sex-role identification, role-conflict may prove to be considerably more acute than it would be for those whose sex typing is less well established or rigid. At some point a strong tendency toward sex-typing (doing what is appropriate for my gender in the eyes of society at large) may completely preclude participation in non-traditional studies and occupations. Therefore, if a woman is to enter NTS she must view them as being consistent with her own ability, competence, and role in society.

Poor person by environment fit may be more readily accepted by women with low self-esteem reinforcing traditional stereotypes among otherwise highly capable women. Thus,

those with higher self-esteem may feel freer to pursue their desires regardless of established gender roles (Erickson, 1977). Kleinplatz, McCarrey, and Kateb (1992) reported results of a multiple regression that placed gender-role identity as the best predictor of self-esteem, lifestyle satisfaction, and anxiety/conflict. Traditional attitudes were linked with greater anxiety levels, lower self-esteem and lifestyle satisfaction. Lemkau's (1979) review article concluded on a positive note, suggesting that women in NT occupations are competent in both "instrumental" and "expressive" traits, and were found to have strong emotional well-being, coping skills, good social support and encouragement. Lamkau suggests that these women are "the product of unusual but positive factors" (p. 221).

King and King (1985) and Brabeck and Weisgerber (1989) found that women with a tendency toward sex-role egalitarianism had higher autonomy and achievement needs and lower succorance and social recognition needs. As expected, women in NT fields were noted as having the tendency toward higher SRES scores. Therefore, NT students appear to enjoy a more stable sense of their abilities. Even among women with a strong math background significant personality differences were found among those choosing the more traditional route of teaching mathematics versus those choosing non-teaching NT career paths (i.e. engineering, computer science) (Handley & Hickson, 1978). The women with a non-traditional career orientation were found to be significantly more creative and independent than traditional women.

Clearly, one can expect difficulties to arise when one's educational interests are in conflict with both societal norms and personal cognitions about one's role in society. Williams and Best (1982) illustrate this point in three studies conducted under their supervision. Women studying law, medicine, and business administration (professions considered NT at the time) described the ideal professional in their field as being substantially

more masculine then they described themselves[4]. These women believed that the ideal characteristics for these careers were more fully embodied in masculine than feminine characteristics, making the conflict between personal cognitions, career path, and social norms conspicuous. Along similar lines, Schein, Mueller and Jacobson (1989) found that the stereotypical male managerial style was still perceived to be the ideal among undergraduate male and female management students. In another study, the link between cognition and sex-role identity was perceived as being more salient among women in TS than those in NTS with regards to vocational decision making behavior (Charterjee, 1989; Chatterjee & McCarrey, 1991). Given these findings, one must ask at what point is the cognitive dissonance too great to maintain? Evidently, adopting more egalitarian sex-role attitudes would be adaptive for women entering and maintaining NTS.

In summary, the variables considered above appear to be logically linked to educational choice. The role of social cognition, career aptitude, and social influence and support was more fully examined in the ability confidence measure (Impostor Phenomenon), Attribution measure (CAVE Procedure) as well as the problem solving and attribution measure (Social Problem Solving Scale) incorporated in this study. The role that expressive and instrumental skills play in career choice can be linked to sex-role orientation and the Sex-Role Egalitarianism measure (SRES) utilized in this study.

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[4]Men involved in the study also described themselves as adhering less to the masculine stereotype of their profession than the ideal but less substantially so then did the women.

Study Measures

The measures chosen for use in this study have been carefully selected to best capture a set of factors that theoretically influence career choice for undergraduate students entering NTS and TS at the university level. After reviewing the literature to determine trends in career and occupational choices the following measures were identified as those believed to possess strong predictive value for traditional versus non-traditional educational/career choice. The primary measures chosen were: the Sex-Role Egalitarianism Scale (SRES); the Impostor Phenomenon Scale (IP); Social Problem Solving Inventory-Revised (SPSI-R); and an Attribution style measure entitled the CAVE Procedure. These were explored in detail along with some other demographic variables.

Sex-Role Egalitarianism Scale (SRES)

The Sex-Role Egalitarianism Scale (SRES) was developed, in part, to assist researchers interested in gender-role attitudes (King & King, 1993). Attitudinal statements about women and men in five key social roles are rated by the respondent. Normative data are available and allow the researcher to speak of a given group of people as being more or less egalitarian based on sub-scale items referring to marriage, parenting, employment, social relationships, and educational roles. Beere, King, Beere, & King (1984) defined sex-role egalitarianism as

> an attitude that causes one to respond to another individual independently of the other individual's sex. One who possesses this attitude believes that the sex of an individual should not influence the perception of an individual's abilities or the determination of an individual's rights, obligations, and opportunities. Consequently, a sex-role egalitarian does not discriminate against or relate differentially to another on the basis of the other's sex (p. 564).

Based on the definition above, it is possible to link tendency toward sex-role stereotyping with behavioral inflexibility (Bem & Lenney, 1976; Orlofsky & Windle, 1978). This in turn, can be reasonably associated with the tendency to choose careers which demand less behavioral flexibility. The assumption being made is, that non-traditional fields would require greater behavioral flexibility and traditional fields less flexibility. This strengthens the rationale for the expectation that women entering non-traditional fields would exhibit more sex-role egalitarianism than those entering traditional studies (Brabeck & Weisgerber, 1989; King & King, 1985).

As a group, women have been reported to score more egalitarian on the SRES than men (Beere, King, Beere, & King, 1984; Brabeck & Weisgerber, 1989). Unfortunately, their career decisions do not appear to match the results found in these studies. This could be due to structural discrimination, such that women have in the past been largely restricted to the so-called "female" jobs in a sex-segregated workplace. As a result most women continue to behave in a manner more congruent with traditional sex-role norms than the more egalitarian non-traditional roles, as evidenced by the paucity of women in NTS.

Williams and King (1976) found that women in NTS vs. TS achieved significantly different scores on the Attitudes Towards Women scale (AWS) (Spence & Stapp, 1973). The Attitudes Towards Women Scale asks questions about one's beliefs regarding a woman's role in society and results reveal information about an individual's tendency toward traditional or non-traditional beliefs, as well as feminist tendency. As could be expected, the more NT women tended to view career motives as more important than traditional domestic plans. Chatterjee and McCarrey (1991) reported that female subjects in NTS scored more egalitarian on the AWS than those in TS. Strange and Rea (1983) found similar results (based on the

BEM Sex Role Inventory) indicating that women enrolled in female dominated studies were significantly more expressive and women in NTS significantly more instrumental.

King and King (1985) found sex-role egalitarianism to be significantly correlated with need for achievement and autonomy (instrumental motives), and negatively correlated with desire for dependence and social recognition (expressive motives). Based on this information, the person who maintains a NT egalitarian sex-role orientation is more able to stand on their own, be inner directed, and comfortable with educational choices regardless of social norms. Clearly, there is a definite payoff for women to have options in their decision making choices with regard to traditional and non-traditional university programs. Subsequently, one might conclude that in order for some women to pursue a field of study incongruent with traditional sex-role stereotypes they would need to be more egalitarian in their own sex-role identity than women entering TS. When this is the case, both groups of women are choosing programs of study that are congruent with their own personal sex-role identities. Thus, a measure of sex-role egalitarianism in work and study roles has been included in this study as it is the hypothesis of this researcher that women entering NT fields of study are more egalitarian than those entering traditional studies.

Hypothesis 1: Sex-Role Egalitarianism (SRES) will be significantly more predictive of non-traditional studies vs. traditional study choices among university students.

Impostor Phenomenon (Ability Confidence)

At this point it is possible to see the crucial function sex-role stereotypes play in the funneling of men and women into certain traditional careers. However, this does not explain other apparent factors that also influence women to break the mold in order to pursue careers in areas traditionally closed to women. Ability self-confidence would undoubtedly be useful

for women attempting to cross these barriers. We hypothesize that women must be confident of their ability in order to pursue NTS as well as to persevere and succeed in these fields.

The Impostor Phenomenon (IP) has been studied as a psychological variable since 1978 when Clance and Imes used it to describe high achieving women who suffered from feeling like they were intellectual phonies. These "impostors" were unable to internalize previous successes, instead attributing success to external factors and generally lacking confidence in their abilities (Clance & Imes, 1978). Harvey (1982) reported that high achieving Honors students with high IP scores explained successes with less adaptive attribution styles such as externalized interpersonal skills more often than low IP scorers. Topping (1983) reported a negative relation between Impostor Phenomenon feelings and positive attributions of ability for success. Once again, cognitive distortions play a role, in that the women high in IP are often competent, intelligent, and enjoy external recognition for their success. Yet, despite this positive evidence, they feel successes are due to external factors they cannot count on replicating, and worry about being found out to be the intellectual phonies they see themselves to be. Further complicating these findings, Clance and Imes (1978) reported a link between high Impostor feelings, sex-role socialization, and family dynamics. The IP scale (Clance, 1985) taps items that include: attribution tendency; fear of failure; feeling phony; discounting successes; evaluation fear; feeling unable to replicate success; and feeling less capable than cohorts (Langford & Clance, 1993).

High scores on the Impostor Phenomenon Scale (Clance, 1985) indicate Impostor feelings, but on the flip side, low scores may be used to identify the opposite, individuals who have a robust ability self-confidence. We know at this point that high scorers exhibit low self-confidence in abilities (Baranowsky & Collins, 1997), feelings of intellectual phoniness, and an inability to internalize success. The reverse could be true for low scorers with feelings

such as: confidence in one's intellectual abilities; capable of success; and an ability to attribute successes to oneself. For the sake of consistency we can refer to this quality as Ability Confidence (AC) in this text and use it interchangeably with low IP scores cited in earlier studies. Ability Confidence was implicated in a study by Eccles, Adler, and Meece (1984). They found female and male subjects to report identical math self-assessment means, yet women rated their ability confidence significantly lower than men and responded with even lower math expectations after exposure to a math failure experience than men. Perceived lack of ability was cited as the reason for failure significantly more often for female participants than for men.

Hayes and Davis (1993) found a positive relationship between Ability Confidence (low IP scores) and a measure of *interpersonal flexibility* (BIC). High IP scorers had lower capability ratings on the BIC. This suggests that along with feelings of lowered ability confidence and intellectual phoniness comes a reduced sense of interpersonal skill or flexibility. This highlights two possibilities: (1) women with high IP scores have inferior social problem solving skills due to behavioral inflexibility (this becomes relevant later on); and (2) high IP scores may be present more often among traditional women than the more egalitarian and thus more flexible women in NTS. The link between less egalitarian individuals and behavioral inflexibility is noted by Beere, King, Beere and King (1984) in that occupational choice is not a rigid function of one's sex, but rather a fit of personal skills to job demands.

It is likely that traditional women who enter conventional fields of education and nursing are taking the path most congruent with their stereotypic sex role socialization. In one study, 49% of female undergraduate first year Psychology students and 49% of female Honors students from a number of disciplines exceeded IP cutoff scores (Baranowsky &

Collins, 1997). This suggests that a large subgroup of women are vulnerable to feelings of intellectual phoniness and inability to attribute success to stable internal causes. Also, since women in both first year and those enrolled in honor programs had the same percentage of high Impostor scorers we can speculate that recurring accomplishments do not necessarily lead to internalized attributions for success. If that had been the case, lower numbers of women exceeding IP cutoffs would have been found in the honors group. One shortcoming of that study is that women were not broken into TS and NTS. This means we do not know if this division would have changed the outcome. However, we can speculate that NT women would not exceed IP cutoff scores as often as traditional women due to NT women's more robust ability confidence mainly reflected in their academic choice of NTS. Researchers have also shown that women high in IP have limited ability to internalize their successes leaving them more sensitive to criticism and craving praise (Langford & Clance, 1993).

For women low in Ability Confidence, pursuing traditional jobs may prove to be more appealing as a means of maintaining approval and avoiding potential failure should they be judged against traditional feminine stereotypic sex-role norms. Evidence is inconsistent as, Fried-Buchalter (1992) found no significant correlation between Ability Confidence and fear of failure but did find AC and fear of success to be significantly negatively correlated at the $p<.001$ level for female mid-level corporate managers. These managers would be in positions considered non-traditional as approximately 67% of middle managers are men in the majority of organizations (Morrison, 1987). Thus, it may be more appropriate to say that large numbers of women choose traditional studies not because they may fail at non-traditional studies but because they may succeed and this might place them in the uncomfortable position of being at odds with their own gender schemas.

We speculate that, this would occur when women use traditional gender-role schemas to guide their choice of studies. They choose to study in domains where they can see women making up the majority of the work force. This reinforces the idea that it is an appropriate field of study for women and consequently for themselves.

Self-efficacy.

In 1968, Goldberg brought forth the question of whether women thought men were more competent than women on a wide range of professional occupations including those deemed female dominated. Goldberg reported that women rated men as more competent in traditionally male dominated fields and surprisingly, those dominated by women. The importance of cognition among women entering NTS was further illustrated by Hackett and Betz (1981) who incorporated Bandura's (1977, 1982) self-efficacy theory into their causal model and research on occupational choice, sex-role socialization and gender differences. Betz and Hackett were the first to begin investigations into career self-efficacy, which can be described as an individual's level of expectations of successful preparation, entrance, and completion of requirements in any given field. As mentioned above, career self-efficacy was based on Bandura's (1977; 1982) earlier work on self-efficacy theory which is an estimate of an individual's confidence to gain mastery over numerous behavioral tasks.

Bandura suggests that in order for an individual to initiate and persist at a given task self-efficacy is crucial. This is a key component to Bandura's (1977) theory whereby low levels of self-efficacy are hypothesized to lead to avoidance of a given task and subsequent low performance levels. If self-efficacy is high for a given behavior the task is approached more frequently and performance is more often successful. Betz and Hackett (1986) suggest that self-efficacy expectations are mediated by cognitive appraisals of competence which differ among women and men due to sex-role socialization.

Betz and Hackett (1981) examined self-efficacy among female and male college students. Female participants reported efficacy beliefs strongly linked to the perceived gender-appropriateness of 20 occupations (10 "female"; 10 "male") that they rated. Males saw themselves as being potentially more competent in completing educational prerequisites and job duties in any of the 20 occupations rated. Female subjects saw themselves as competent in traditional occupations but significantly less competent than men in male-dominated careers. Interestingly, there were no significant differences on math ability (as measured by the American College Test for math and English scores) crucial to success in many male-dominated careers. The important point here, is that these women were just as able as the men but differed on their ability to see themselves in this light as reflected on the self-efficacy expectations for male dominated occupations.

For male and female students currently enrolled in science and engineering majors career self-efficacy was not found to differ significantly across gender lines (Lent, Larkin, & Brown, 1984; Lent, Brown, & Larkin, 1986). They found that high self-efficacy was a good predictor of success and persistence in these academic studies. For female students, this study implies two things: (1) women in NTS are equal to male students in feelings of career self-efficacy and (2) these NT women may have a stronger sense of ability confidence than women in TS. It is also likely that career self-efficacy (as reflected through ability confidence) plays an important role in career choice.

Kelly (1993) used male and female high school students in an exploration of the relationship between career self-efficacy and gender. Prior achievement was the best predictor of career self-efficacy but female students, as a whole, reported lower self-efficacy expectations for male-dominated careers than did boys. This finding indicates the possibility of a lower sense of ability confidence for women who might otherwise pursue NT careers.

Thus, capable women may choose not to pursue NT careers due to a cognitive distortion of their actual abilities.

The link between Ability Confidence and self-efficacy theory is made when high AC scores are achieved (suggesting ability to integrate successes and belief in one's competence) and high career self-efficacy is maintained (also indicative of confidence in one's ability to succeed). Sadri and Robertson (1993) conducted a Meta-analysis reviewing the findings of studies relating self-efficacy and work behaviors. The results of this study "support Bandura's proposal that efficacy expectancies are related to performance" (Sadri & Robertson, 1993, p. 146). This further strengthens the conceptual link between the Impostor Phenomenon and Ability Confidence in relation to career choice and performance self-evaluation. Since AC is largely a measure of one's sense of ability to succeed we can take this literature on self-efficacy as further support for the rationale of the hypothesis that follows.

Hypothesis 2: Ability Confidence (IP/AC) will be significantly more predictive of students in non-traditional studies vs. those in traditional studies.

Social Problem Solving

In 1971, D'Zurilla and Goldfried presented a cohesive five part social problem solving (SPS) model that consists of: (1) general problem orientation (this provides information on problem identification, acceptance, perception, and attention to the problem); (2) definition and formulation of the problem (setting realistic and objective goals once the problem has been assessed); (3) solution alternatives generated (brainstorming solutions); (4) decision making (selecting the most appropriate solution from the solutions generated); and (5) implementation and verification (the solution is implemented, observed, evaluated, and if positive, reinforced). A definition of problem solving was offered:

> as a behavioral process which (a) makes available a variety of response alternatives for dealing with a problematic situation and (b) increases the probability of selecting the most effective response from among these alternatives (p.107).

D'Zurilla and Nezu (1982) consider SPS to be:

> a general coping strategy whose goal is the discovery of a wide range of effective behavior, and, thus, can be expected to contribute to the facilitation and maintenance of general social competence (p. 202).

More recently, Maydeu-Olivares and D'Zurilla's (1995) factor analytic study took this model one step further by establishing empirical evidence for a five factor model of social problem solving. The model consists of: Positive problem orientation (PPO); negative problem orientation (NPO); rational problem solving (RPS); impulsivity/carelessness style (ICS); and avoidance style (AS). In the SPSI-R later developed by D'Zurilla, Nezu, and Maydeu-Olivares (as cited in Maydeu-Olivares & D'Zurilla, 1995), PPO measures problem solving tendencies that include assessment of problems as challenges which are solvable by the individual given persistent determination and direct action. Conversely, NPO measures problem-solving dysfunction characterized by beliefs that problems threaten well-being, are unsolvable by the individual, and lead to frustration. RPS, is best described as the application of skillful problem-solving techniques to deal with problems in a systematic, clear, and purposeful manner. The ICS is opposite to RPS, and is characterized by problem-solving skills applied in a rash and incomplete manner. Finally, AS assesses defective problem-solving ability most directly portrayed as putting off problem solving and shifting personal responsibility onto others.

So far, it has been hypothesized that women entering non-traditional fields are able to do so due to a strong Ability Confidence (low IP scores) that gives them the internal strength

needed to be pioneers in fields currently dominated by men. At this point we don't really know to what this hardiness can be attributed, but theoretically we can implicate good social problem solving skills in these educational/career choices. The rationale being that ability to forge ahead in disregard of social norms would entail a firm sense of how to manage social situations and solve potential problems to one's advantage. Consider the research that suggests that women low in Ability Confidence tend to have reduced emotional and mental health functioning in comparison with those high in AC (Cromwell, Brown, Sanchez-Huceles, & Adair, 1990; Topping, 1983). Also, note the connection established between women enjoying superior health and more egalitarian sex-role orientation (Berzins, Welling, & Wetter, 1978; Erickson, 1977; Kleinplatz, McCarrey, & Kateb, 1992).

Mazen and Lemkau (1990) used the California Personality Inventory as a primary measure among women involved in traditional vs. nontraditional occupations. They found the non-traditional women to be "less awkward in new or unfamiliar social situations (p.54)" as well as being less confined by social stereotypes and possessing greater confidence and leadership potential when compared with women in traditional occupations. These apparent superior social skills may prove to be particularly crucial at the decision making stage of career choice. Greater social problem solving skills such as an enhanced ability to generate a wide range of alternate solutions imply a greater ability to face the challenges inherent in a NT career setting.

Beaucom and Danker-Brown (1979) conducted a study using 160 college students in which they found that sex-typed individuals exhibited deficits in cognition and motivation during stressful situations that were significantly greater than those who were less sex-typed. D'Zurilla and Nezu (1982) suggest that social problem solving is primarily cognitive in nature although other factors come into play. Therefore, we suggest that social problem solving

skills will be more restricted among women who are less flexible in their sex-typing and hence, these are likely to be the same women choosing traditional vs. non-traditional studies.

Bem (1975) brought forth the idea that individuals who have both high feminine and masculine traits are androgynous. These androgynous persons are more flexible in their interpersonal relationships as they are not limited by either masculine or feminine traits but can act in a manner that is most sensitive to the nature of the situation at hand. Thus, flexibility of behavioral responses would be more limited among individuals rigid in sex-role orientation while androgynous persons would have the advantage of being more interpersonally flexible (Paulhus & Martin, 1988). This argument parallels and gives weight to the notion of social problem solving skills being superior among women who have integrated both instrumental and expressive traits (as in the androgynous types). Moreover, we know that these androgynous women are found in non-traditional management jobs and that their work and personal values are a mix of instrumental and expressive qualities (McCarrey et al., 1989).

Superior social problem solving skills may prove more essential for non-traditional women who must struggle with existing normative pressures. Chatterjee and McCarrey (1989) found that women in non-traditional studies believed that they would be facing greater career related difficulties than women in traditional studies, suggesting a greater need for the problem-solving skills necessary to deal with these challenges. These are skills that might best be found amongst those with stronger scores on the SPSI-R subscales (described in detail in the next section) of PPO and RPS, and lower scores on NPO, ICS, and AS. Overall, we would expect that the SPSI-R Global scores (a composite of the five SPSI-R subscores) to be higher among NTS than TS reflecting superior social problem solving skills, in general.

SPSI Scale.

The Social Problem-Solving Inventory (SPSI) is based on D'Zurilla and Goldfried's (1971) Social Problem Solving (SPS) model. The SPSI-Revised consists of five unidimensional scales and is a shorter version (only 52 items) of an earlier full-scale (D'Zurilla & Maydeu-Olivares, 1995). Positive problem orientation (PPO) and negative problem orientation (NPO) are measures of problem orientation. Problem-solving styles are measured by three additional scales: the rational problem-solving style (RPS), impulsive/careless style (ICS), and avoidant style (AS). The Positive problem orientation scale accounts for a cognitive and constructive problem-solving set, including issues of self-efficacy, responsibility, challenge, and encouragement. On the other hand, Negative problem orientation attempts to capture cognitions regarding "inhibitive or disruptive thoughts and emotions" (p.25) including self-inefficacy, perceived vulnerability, discouragement, and distress.

Rational problem solving addresses a problem-solving dimension regarding versatility that includes the intentional development of mastery over competent problem-solving skills. In contrast, the Impulsivity/Carelessness style scale attempts to measure problem-solving insufficiencies that show up along with impulsive and careless behaviors. The next scale, Avoidance Style, also measures inadequacies in problem-solving. These being represented by the tendency to put off problems, ask other's to solve them, or simply avoid them until they solve themselves or go away. Given this five component model structure it is possible to make specific hypotheses based on the relationship between the SPSI-R sub-scales and choice of study.

D'Zurilla and Nezu (1990) refer to the term social problem solving to mean

> "the cognitive-affective-behavioral process by which a person attempts to identify, discover, or invent effective or adaptive coping responses for specific problematic situations encountered in everyday living" (p. 156).

The most salient point in this theory is that "personal-social competence and achievement" (D'Zurilla & Sheedy, 1992, p. 590) are enhanced through effective social problem solving which is considered a general coping strategy of considerable importance. Social problem solving is also assumed to lessen stress and other psychological symptoms. If this is the case then we could expect that stronger social problem-solving skills would be correlated with increased Ability Confidence and flexibility on the part of egalitarian women who have chosen NTS vs. TS.

Ability Confidence (as measured on the IP scale) and interpersonal flexibility were positively correlated in a study conducted by Hayes and Davis (1993). Thus, not only is interpersonal flexibility implicated in social problem-solving[5], higher Ability Confidence and interpersonal skills are as well. This implies that those with superior SPS scores are both more competent and confident. Social problem-solving skills appear to play a predictive role in academic ability, as well. For example, D'Zurilla and Nezu (1990) found significant correlations between GPA at the end of the first semester and both major SPSI scales. Researchers have found that problem-solving skills are predictive of GPA even when academic aptitude is controlled (D'Zurilla & Sheedy, 1992).

Academic underachievement was investigated by Richards and Perri (1978) in a study that incorporated the five stage problem-solving model, proposed by D'Zurilla and Goldfried in 1971, into a study skills improvement training program. Introductory psychology students were randomly assigned to one of five treatment groups, and one control group, geared

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[5]Specifically, through the ability to generate more solution alternatives and less Impulsivity/Carelessness.

toward dealing with poor study habits and academic under achievement. Of the six groups, treatment included: (1) advice on study-skills, (2) self-control instruction, (3) self-control and problem-solving training, (4) faded counselor contact (counselor contact decreasing over time) with self-control instruction, (5) faded counselor contact for self-control and problem-solving training, and (6) no contact. Groups receiving problem-solving treatment significantly surpassed all other groups on exam performance and GPA up to one year later on post treatment evaluations. The skills developed by those exposed to problem-solving training were maintained and indicate a superior ability to deal with the pressure of academic performance.

General problem-solving ability on the SPSI has been found to be negatively correlated with stress[6]. This suggests that stress reduction and a superior sense of perceived control may be possible through improved problem resolution skills (D'Zurilla & Sheedy, 1991). In another study, women in NTS were found to be more skilled in novel social situations than their traditional cohorts (Mazen & Lamkau, 1990). This included social grace, being less confined by social stereotypes, possessing greater confidence and superior leadership potential. The primary measure in that study was the California Personality Inventory. The superior social skills noted in that study may show up when comparing SPSI scores between T and NT female university students in the current study.

The studies cited in this section suggest that female students with less developed or less flexible problem-solving skills may tend to choose more traditional careers as they pose less of a threat to their gender-identity and would not cause as much stress as non-traditional studies. Women in NTS vs. TS have to overcome more obstacles, and most likely need to possess stronger or more flexible problem-solving skills needed for the task. Thus, we expect

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[6]Defined as a ratio of personal resources to perceived demands.

NTS vs. TS to possess higher SPSI-R Global scores (a composite of the SPSI-R subscores); as reflected in stronger scores on the SPSI-R subscales of PPO and RPS; and lower scores on NPO, ICS, and AS, representing superior social problem solving skills in general. These NT women would have a greater need for such skills in order to deal with conflicts that inevitably arise when defying sex-role norms. Therefore, we hypothesize that the Global SPS scores be significantly higher among women in non-traditional studies than those in traditional studies.

Hypothesis 3: Social Problem Solving (SPSI) skills will be significantly more predictive for students in non-traditional than traditional studies.

Attributional Style

Heider (1958) was instrumental in bringing the importance of causal attributions to the attention of psychologists. The generic term attribution theory refers to several theories used to describe how people explain their successes and failures. A personal or internal attribution is one in which one's own characteristics or stable traits are used to explain actions. This can include descriptions such as personality or ability. Situational or external attributions are used when one believes behavior or outcome is due to external factors such as luck, connections with other people, or task ease or difficulty. When assessing our successes and failures and those of other persons we are inclined to evaluate outcomes as being due to internal and/or external factors. Heider referred to these attributions as being due to the "environment or to the person" (p.169). In the event of a high score on an exam, attributing this success to external (environmental) factors such as luck or ease of the test makes the assumption that success was due to factors other than internal reliable characteristics such as skill and intelligence of the individual. This type of attribution style can be called less adaptive as it implores the individual to remain more on guard for challenges as they do not view their own skills as a reliable resource. On the other hand, if we make an internal

(personal) attribution for the high score we are evaluating performance as being due to the person's own characteristics that are reliable and inherent to the actor and therefore dependable. Hence, this attribution style can be deemed more adaptive. The main point to consider with causal attributions is whether they are seen to be due to the actor or the environment.

One's attribution style can be used to further understand the motivational choice differences operating between those women choosing traditional or non-traditional areas of study because it indicates the extent women internalize and take credit for their success (Weiner, 1992). Based on this literature review, this is more likely on the part of egalitarian women in NTS than TS. By exploring attribution style in response to success and failure we may be able to identify a tendency that acts as an aid to women entering fields in which they are underrepresented.

Weiner (1992), presents the following example of how motivation is channeled through attributional theory.

> Susan is undecided about her career goals. She enrolls in a math class and attains a very high mark on the final exam. She then decides to pursue a career in math. ... In [the scenario above] Susan experiences success at math. She thinks about the causes and realizes that she has also performed at the top in other math classes. She therefore attributes the high score to her mathematical abilities. This increases her self-esteem, she anticipates future success in math, and she is proud of herself. High expectation of success, high self-esteem, and pride increase her achievement interests to pursue a career in mathematics (Weiner, 1992, p. 280).

The scenario above illustrates a motivational enhancement following success. However, it is also possible to witness a reduction in motivation following success, an increase in

motivation following failure or a reduction in motivation following failure. It all depends on the causal perceptions of outcome on the part of the individual.

Weiner (1992, p. 278) illustrates a "Partial representation of an attributional theory of motivation" as follows:

Figure 1. Attribution theory of motivation partially represented.

Antecedent Conditions	**Perceived Causes**	**Causal Dimensions**	**Primary Effects**	**Consequences**
Specific information	Ability	Stability	Expectancy change (hope and helplessness)	Performance intensity
Causal schemata	Effort (typical and immediate)			Persistence
Hedonic bias				Choice
Actor versus observer perspective	Others (students family, teacher)	Locus	Esteem-related affects (pride)	Others
	Luck	Control	Social-related affects (guilt and shame)	

According to some researchers, women, more often than men in general, tend to use external attributions for success and internal for failure, when judging their own event outcomes or those of other women (Deaux & Emswiller, 1974; Eccles, Adler, & Meece, 1984; Russo, Kelly & Deacon, 1991). A more recent study, proposes a change in this bias, with no significant sex differences in attribution style reported for men and women (Taylor et al., 1993). Although Taylor et al's, findings do suggest a positive current trend it is premature to say that they completely overshadow the large body of literature that indicates an attributional sex difference.

Consequently, if women in traditional studies are using an attributional style that implies that their successes are due to luck or easy demands they may not feel confident about continued success. It would then follow that a non-traditional career path would be less appealing to more traditional women as that path may prove too stressful given their attributional style. Conversely, more egalitarian women entering non-traditional studies may have a more internal attributional style, the one deemed earlier to be more common to men, as they have already chosen a career path more common to men than women. Regardless of gender identity, women in non-traditional areas are struggling with more external obstacles, so may need to make more internal attributions for successes to provide them with the

incentive to continue. External pressures may preclude involvement in non-traditional areas if external attributions are a consistent pattern of their attributional style.

Campbell and Hackett (1986) randomly assigned male and female participants to a forced success or failure numbers task. Interest and self-efficacy ratings were significantly lower after exposure to failure and significantly higher after exposure to success. Even before exposure to failure or success, women rated themselves significantly lower on self-efficacy and attributed success more often to luck than did their male cohorts. According to results of Hackett and Campbell's (1987) study participants subjected to a failure experience (difficult anagrams) had lower self-efficacy and task interest ratings than those presented with a success experience (easy anagrams). While no significant gender differences on math or verbal abilities were found, women attributed success performance to luck significantly more often than males, and, failure performance to lack of ability. These performance attributions suggest a particular vulnerability on the part of women with reference to external attributions for success and internal attributions for failure. This is a pattern that has been reported by numerous other researchers (Campbell & Hackett, 1986; Wieger & Frieze, 1971).

Campbell and Hackett collaborated on a number of contrived success and failure task studies that consider the issue of career choice and gender differences. These studies are illustrative of the success/failure paradigm. Unfortunately, a problem exists that relates to the nature of tasks used in these studies. Often tasks are not gender neutral (math task) (Campbell & Hackett, 1986) or are only supposedly gender neutral tasks (verbal anagram task) (Hackett & Campbell, 1987). Nonetheless, this body of research has considerable value for this review. Hackett and Campbell (1987) used a forced success or failure task (verbal anagram task) with female and male participants. As expected, women were more likely to attribute success to luck (external attribution) and failure to lack of ability (internal

attribution) than were men. Since female subjects in Hackett and Campbell's (1987) study were not first broken down into traditional and non-traditional groups we do not know, based on that research, if traditional women are more vulnerable to this detrimental attribution pattern.

Welch and Huston (1982) addressed this problem by first establishing sex-role orientation, among a group of female university students, as feminine or androgynous based on the Bem Sex Role Inventory. Androgynous females attributed success to ability[7] and failure to external factors such as, task difficulty, significantly more often than feminine students. Performance by the androgynous group was further improved under manipulated success treatment but unaffected by failure. Performance by those classified as feminine was no better under the success treatment and considerably worse under failure treatment. These results have serious implications for the world of study and work where one must complete tasks that may end in perceived success or failure. The advantage of the androgynous classification for women is clear to see. If one is to work within non-traditional male established domains, the ability to remain unhampered by failure and buoyed by successes would certainly enhance one's ability to compete and achieve in fields where one is a pioneer. In these fields, women are not as readily accepted either by societies traditional gender role stereotypes, or possibly, even one's own beliefs, should one be a traditional woman.

As could be expected, a number of researchers have noted the trend for non-traditional women to exhibit attribution patterns more common to men, of success being attributed to internal ability instead of luck and failure attributed to external processes (Bar-Tal & Frieze, 1977; Deaux, 1976; Frieze, 1975). At the same time, women enrolled in TS were more likely to attribute success to luck compared to women in NTS who tended to attribute success more

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[7]Suggesting that the androgynous females are better able to generate greater self-efficacy and enjoy superior levels of self-esteem.

to ability (Wiegers & Frieze, 1977). These findings further implicate the role of attribution style into career choice.

Whether a more optimistic (internal) attribution style is also associated with superior academic performance, among those students enrolled in TS and NTS, is also a consideration at this point. In a series of experiments Peterson (1990) used a measure of attribution style to shed some light on this question. Most of these studies incorporated the Attributional Style Questionnaire developed by Peterson and his colleagues in 1982 and were geared towards bad events relevant to the population being studied. In summary, a negative explanatory (attributional) style was consistently and highly correlated with inferior academic performance, while SAT scores remained independent of attributional style (Peterson & Barrett, 1987; Peterson, 1990). Given these findings, not only may attribution style act as a predictor of academic achievement it also appears to be more adaptive among NT students. This implies a problem that has more to do with how one assigns personal responsibility for success and failure outcomes rather than with one's own competence. Research cited in this section implies the existence of a trend for women in NTS vs. TS to exhibit a more adaptive optimistic attributional style, characterized by internal attributions for success and external attributions for failure.

Hypothesis 4: Adaptive attributions for success and failure will be significantly more predictive of students in non-traditional vs. traditional studies.

Attributions and Ability Confidence (Impostor Phenomenon)

Ability Confidence (AC) can be described as an achievement stability tendency where one's accomplishments are consistently and directly associated with personal ability. Given this AC explanation one may logically speculate that students with lower AC scores will tend toward external attributions for success and internal attributions for failure. This pattern

warns the reader that low AC scorers possess a belief pattern less conducive to internalizing success and feeling confident in one's ability. If women in traditional areas of study fail to exceed AC cutoff scores significantly more often than women in non-traditional studies, it then follows that significantly greater numbers of women in TS would attribute success to external factors and failure to internal factors. Hackett and Campbell (1987) add some support to this proposal. Women in NTS exhibited this more adaptive pattern (ability for success and external functions for failure) significantly more often than women in TS, enabling the former to search inside themselves for the resources[8] necessary for NT career success.

Hirschfield's (1982) study used women working in non-traditional fields as subjects. In that study attribution style was a good predictor of AC and those with low AC scores struggled with their inability to attribute success to internal stable qualities such as ability. Whether women in TS vs. NTS are more vulnerable to low AC, and the detrimental pattern of attributions, that follow, is yet to be determined. Surprisingly, Topping and Kimmel (1985) found AC to be positively related to external attributes for success contrary to expectations. However, when scores for men alone were analyzed, attributions to ability (internal attribution) for success were negatively related to IP as hypothesized. This discrepancy may be due to a lumping of all subjects into one group regardless of gender, sex-role orientation or occupational choice, which have been moderator variables.

The assumption made in this section is that NT women have a hardier notion of themselves which implies a higher self-efficacy afforded by the optimistic internal attribution style they are likely to possess. They will not be as easily prone to low AC symptoms and daily life experiences will not decrease their AC scores significantly. The reason for this

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[8]These might include greater self-efficacy and other tools that would enhance one's chances of success in a situation where one is a highly visible minority.

proposal is due to the career choice made by women entering areas of study more typically associated with men. This is not to say that male domains are better, but that in order for women to persist there they will need an extra store of Ability Confidence and inner directedness. We expect that these NT women are more consistently confident in their internal ability to succeed and less affected by external gender-role stereotypes. Surprisingly, little research addresses this hypothesis. Hence, one contribution of this study is the empirical investigation of this issue.

Male Participants: Factors Influencing Choice

This sample represents a unique contribution to the literature, due to the paucity of research on the factors influencing male entrance into non-traditional versus traditional studies. Investigations pertaining to this area of inquiry are in their infancy with definitive work by Christine Williams (1995, 1993a,b, 1992) leading the way. Disadvantages for male entry into non-traditional studies seemingly outweigh the advantages if one is balancing the scale with prestige, wages, earning potential, and societal acceptance. However, if general job satisfaction, interest, ability, and need are the criteria we cannot draw such hasty conclusions.

Women receive advantages and suffer discrimination when pursuing non-traditional studies and careers but these differ, as discussed later, from the experiences of males entering female dominated fields (Williams, 1992). Women are more likely than men to face discrimination in the form of "feeling excluded from informal leadership and decision-making networks, and they sense hostility from their male co-workers, which makes them feel uncomfortable and unwanted (Carothers and Crull, 1984)" (Williams, 1992, p. 255). Yet, women pursue NTS in greater numbers and are more likely to make a cross-over into male-dominated fields than men (Jacobs, 1989, 1993). An equal striving on the part of

male workers entering female-dominated occupations may do much to break down career conformity barriers, reduce wage inequities, and contribute to freedom of career choice based on intrinsic motivational factors.

In a world where men are paid more, simply by venturing into male dominated jobs as opposed to female dominated jobs of equal value and training level, there is a differential that virtually irradicates notions of aptitude and desire in favor of wage benefits and prestige. Therefore, males who are greatly appreciative of and competent in expressive skills, (those most often associated with female dominated fields), might not favor job-fit satisfaction in female dominated occupations over the advantages of male-dominated occupations. Williams (1995) as derived from U.S. Department of Labor (1991), presents statistics that confirm a significant wage disparity between male-dominated fields such as engineering vs. female dominated occupations, such as, nursing, teaching, librarianship, and social work. Engineers make approximately 18% more per week on average than the highest paid female occupation (Registered Nurse) listed above. Given the weekly pay mean of the four female-dominated occupations listed above, engineers earn even more, approximately 21%.

Researchers have identified benefits for entrance into non-traditional careers for men as including: favorable job-environment, safety, preferential career advancement, less rigorous occupational demands, friendly co-workers, time flexibility, better person-environment fit, job stability particularly in times of economic frailty, and potential upward mobility for men of lower socio-economic backgrounds (Hayes, 1986, 1989; Priegert, Coulter & McNay, 1993; Williams, 1993a, 1995). In William's seminal edited book (1993b), Bradley (1993) identifies the process of "Crossing Over" where men enter female-dominated fields and the advantages of such "Invasions" when men acquire the most prestigious positions in fields where they are in the minority.

However, such cross-overs are not all positive and the limitations can be deterrents that minimize personal inclination. Disadvantages include, reduced earning power, loss of prestige or status (societal and familial), fear of succeeding in female dominated fields, homophobia and identity crisis, as well as social conformity pressures including potential discrimination from society, parent, educational institutions, counselors, employers, and/or co-workers (Hayes, 1986, 1989; Jacobs, 1993; Priegert, Coulter & McNay, 1993; Spence, Helmreich, Stapp, 1975; Williams, 1993a, 1995).

Williams (1992), conducted a research project utilizing indepth interviews along with open-ended questions regarding projected views of career status and prospects, training experiences, non-traditional career motivation and career development. The sample consisted of 76 men and 23 women in four female-dominated fields (nursing, social work, librarian, elementary school teaching). Williams (1992) attempted to explain discrimination in non-traditional fields through a theory of tokenism that posits, in fields traditionally sex dominated by greater than 85%, discrimination will befall the minority. Although she is unable to support this on an internal level (hiring practices, upward mobility, work environment) she was able to make a case for external discrimination. Men in female dominated professions were accepted within their own occupation but faced discrimination from both men and women outside the field in the form of questions of their sexual orientation, failure in a "man's world", lesser pay, and stereotyping.

As discussed earlier, the discrimination faced by men in non-traditional fields is unique and separate from the forms often faced by women in non-traditional occupations. Despite the apparent disadvantages to male entrance into non-traditional fields, men do make these decisions and are rewarded. However, Jacobs (1989, 1993) reports that significantly fewer men enter non-traditional fields than women, suggesting that benefits do not outweigh

the costs for men crossing over in comparison to women's crossing over. In the ten years between 1970 to 1980, female representation increased significantly in 33 non-traditional careers for women (Reskin & Roos, 1990). In comparison, significant increases in male entrance into non-traditional occupations for men was noted in only three fields (Reskin & Roos, 1990).

The findings above are not surprising in light of McKenna and Ferrero's (1991) study of 3,003 male and 2,934 female ninth-grade student's reports on desirability of non-traditional vocational training. This study denotes preferential attitudes to traditional occupations among the male participants. Preference becomes evident in the responses of students asked if they would consider nontraditional vocational training. Statewide, only 52.1% of boys checked that it would be "okay" versus "not okay" to work in a non-traditional career and 77.2% indicated that their work preference would be traditional. However, 85.4% of female students checked "okay" when asked about the possibility of work in a non-traditional field.

McKenna and Ferrero (1991), conclude that nontraditional career paths continue to be regarded as less desirable and less acceptable to ninth grade male vs. female students and that stereotyping maintains this situation. Role-models are believed to be in an excellent position to provide essential information based on their work and to aid in the breaking of non-traditional work barriers. Another obstacle to non-traditional cross-over among male students is counselor bias, linked to sex-role stereotyping. In a sample of 43 male and 71 female counselors or graduate level counseling students, a semi-projective technique was administered to elicit responses from participants in a non-threatening manner that was more likely to garner honest replies reflective of personal career biases (Haring, Beyard-Tyler & Gray, 1983). Counselor bias was more evident among male counselors who revealed significantly greater traditional job orientations than the female respondents. However, both

male and female participants were less accepting of men entering non-traditional careers than of women. More than a quarter of the male participants regarded non-traditional occupations for men unfavorably.

Counselors can offer a bridge toward a more gender friendly work environment respectful of whether their clients orientations are expressive or instrumental. Yet biases exist, lessening the ability of this group to affect change in career inequalities and person-environment fit. There is a need for better informed counselors willing to instruct their clients in both the pros and cons of non-traditional studies and careers (Haring, Beyard-Tyler & Gray, 1983; Hayes, 1986). It is also important to recall the need for equality across job arenas regardless of sex, thus, eradicating the tendency to choose based on factors other than interest, need, ability, and desire.

The variables incorporated into this study continue to represent a unique constellation of potential factors of influence over career choice for men entering traditional and non-traditional studies. The original hypotheses for SRES, SPSI-R, IP and Attribution are maintained as they include and surpass current postulates of influence for NTS versus TS. Just as women entering NTS are hypothesized to benefit from a hardier Ability Confidence, greater egalitarian sex-role orientations, superior problem solving skills, and more adaptive attributional patterns, so would the male students entering non-traditional studies. For a construction of the logic built on research in support of the assumptions leading to these hypotheses a review of the previous sections pertaining to the female sample is recommended.

CHAPTER III

Methodology

Participants

Registration in either the traditional studies (TS) or the non-traditional studies (NTS) group was used as the criteria to differentiate between participants in this project. On the criterion variable of educational choice women in male dominated fields was considered NTS; while those in female dominated fields was considered TS. Conversely, men in male dominated fields was considered TS; while those in female dominated fields was considered NTS. An attempt was made to maintain a relatively consistent level of number of years attending university for all groups. Earlier researchers have noted an inconsistency in previous research where students in NTS vs. TS had attained a higher level of education causing a bias in results (Fitzpatrick & Silverman, 1989; Lemkau, 1983). Grade Point Average for the students enrolled in both NTS and TS was analyzed in order to determine if the students in these two fields could be considered high achievers at the same approximate level.

Non-Traditional Group. This includes female and male students enrolled in non-traditional majors at university undergraduate programs. This is defined as programs where female or male enrollment is less than 30% as of 1990 (Statistics Canada, 1992). This includes the following fields for women[9]: Computer science, 19.8%; Forestry, 16.5%; Physics, 15.1%; and Engineering, 11.7%. For men the non-traditional fields include: Nursing, 3.9%; Education, 29.9%; and Psychology, 16%.

Traditional Group. This includes female and male students enrolled in traditional majors at university undergraduate programs. This is defined as programs where female or

[9]The statistics listed in the following two paragraphs (non-traditional group, traditional group) come directly from the University of Ottawa 1994 undergraduate student enrollment statistics. These are the original demographics on which this study was based and the most current at time of data collection.

male enrollment is greater than 70% as of 1987 (Statistics Canada, 1990). These include the field of Nursing with 96.1%; Psychology, 84%; and Education with 70.1% female enrollment. For men the traditional fields include: Computer science, 80.2%; Forestry, 83.5%; Physics, 84.9%; and Engineering, 88.3%.

Design

The inferential statistical test utilized in this study is Logistic Regression Analysis. Study participants are categorized into traditional versus non-traditional study groups based on course enrollment. The outcome of traditional or non-traditional study choice was examined by determining the predictive value of each independent measure in this non-experimental design. Independent variables include SPSI-R, SRES, IP, and an Attribution Measure. The dependent variables are traditional versus non-traditional study for both male and female university students. Subject assignment to group is described in detail above.

Instruments/Materials

All participants were given a pencil and paper questionnaire to fill in with the following measures and tasks included: A series of personal demographic questions; The Impostor Phenomenon (IP) scale; The Sex-Role Egalitarianism Scale (SRES); The Social Problem Solving Inventory-Revised (SPSI-R); and an Attributional Style measure based on the CAVE procedure (Peterson, 1990).

1. The Impostor Phenomenon Scale (IP or AC, Ability Confidence) (Clance, 1985). This measures the ability of an individual to internalize their successes and their feelings of intellectual phoniness. This paper and pencil scale takes approximately 10 minutes to complete. Holmes, Kertay, Adamson, Holland, and Clance (1993) validated the Impostor Phenomenon Scale in a study that compared participants' scores on the IP scale to clinical

judgments and scores on a similar scale. A Cronbach alpha coefficient resulted in an internal consistency of .96 (Holmes et al., 1993). Based on the results of the Holmes et al. (1993) study, we used a low score (less than 62) on this scale to signal a robust sense of Ability Confidence and a high score (62 and above) to signal Impostor Phenomenon feelings (as discussed earlier in this document). The cutoff score of 62 for IP ranking was found to result in the least number of false positives while maintaining a highly accurate hit-rate.

2. The Sex-Role Egalitarianism Scale (SRES). This scale was first introduced into psychological literature in 1984 by Beere, King, Beere, and King who developed it to measure attitudes towards traditional male and female roles. The SRES form BB is a short form (25 items) with excellent psychometric properties that takes approximately 3-5 minutes to complete for college level students (King & King, 1990a,b; 1993). The SRES short form was developed using a large sample of university students and is reported to have strong psychometric properties with internal consistency coefficients of .94 and .92 for the BB and KK versions (King & King, 1990b).

The SRES does not have established cutoff scores for "very traditional," "moderately egalitarian," or "highly egalitarian," or other similar categories. Instead, results are compared with established population norms. The higher the score in any given category the more egalitarian is the tendency. There are six domains which cover attitudes toward marital roles, parental roles, employment roles, social-interpersonal-heterosexual roles, educational roles, and family and/or work involvement. Brabeck and Weisgerber (1989) divided mean scores to form SRES groups identified as high and low. Their group mean was, X=3.97, and the SD=.45. Those above and below X=3.97 were considered high and low, respectively. Although this technique may prove useful for categorization purposes the range scores reported were used for the main logistic regression analyses.

3. The Social Problem Solving Inventory-Revised (SPSI-R). This is a measure of social problem solving style (D'Zurilla & Maydeu-Olivares, 1995). It is made up of a number of components or subscales which include: (1) positive (PPO); (2) negative problem orientation (NPO); (3) rational problem-solving style (RPS); (4) impulsive/careless style (ICS); and (5) avoidant style (AS). It takes approximately 20 minutes to complete this paper and pencil scale. D'Zurilla and Maydeu-Olivares (1995) report good results of a cross-validation of the SPSI-R five-factor structure in a large independent sample of college students. This factor analytically derived model was reported to have good validity and reliability coefficients (Maydeu-Olivares & D'Zurilla, 1995). Chang and D'Zurilla (1996) reported coefficient alphas for PPO and NPO at .76 and .91 respectively, and test-retest reliabilities at .72 and .88 respectively. They also found strong support for the construct validity of both the PPO and NPO scales on the SPSI-R. Overall, the SPSI has been reported to be a valid and reliable measure (D'Zurilla & Nezu, 1990). Scoring of this scale can be based on individual subscales or one global Social Problem Solving (SPS) score which involves calculating the following: SPS = PPO/5 + RPS/20 + (40 - NPO)/10 + (40 - ICS)/10 + (28 - AS)/7 (T. J. D'Zurilla, personal communication, September 27, 1995).

4. Attribution style measure (CAVE).

Each participant was given a series of open-ended success or failure questions geared toward their own life experiences. Participants were asked to respond to questions that draw on events that are current and relevant in their daily lives while considering the reasons they believe accounted for their past successes and failures. Attribution Style was measured using a modified CAVE procedure designed by Peterson, 1990. The CAVE procedure (content analysis of verbatim explanations) outlined by Peterson (1990) is a content analysis technique that focuses directly on attributions for events pertinent to the participant. Since the

participant is asked to respond to an open-ended statement the written response content is highly personalized and not restricted to limited choice responses such as those found on likert-type questionnaires or forced choice alternatives.

Causal explanations of events are taken directly from written responses and attribution style is rated and reported on index cards. Four research assistants, blind to the hypotheses, rated attribution style on a seven point scale for both negative and positive outcomes. Separating attributional style into positive and negative events was found to be a more reliable measure of attribution than maintaining them as polarities on a continuum (Xenikou, Furnham, & McCarrey, 1997). Interrater reliability, based on alpha coefficient results, has reached as high as .90 (on a range of 0 to 1) for this technique when four raters are used and subject's responses have been found to be consistent and reliable (Peterson, Seligman & Vaillant, 1988). This procedure also has the added advantage of tapping real life incidents and genuine subject' responses instead of functioning only within the realm of the laboratory.

It was possible to combine the CAVE procedure (Peterson, 1990) with specific open-ended questions such as "I was successful when _____ ; I believe this success was due to _____ ; I was unsuccessful when _____ ; I believe this failure was due to _____ ." Questions were geared to elicit memories of success and/or failure based on personal experience. Subjects were encouraged to relate these questions to experiences they have had in real life. A similar method was used by Gaeddert (1985) who asked each participant a number of questions that would illicit information related to personal accomplishments and failures.

Peterson, Seligman and Vaillant (1988), provide an excellent justification for the elements and scoring of the CAVE procedure.

> A stable cause invokes a long-lasting factor ("it's never going to go away"), whereas an unstable cause is transient ("it was a one-time thing"). A global cause is one that affects a wide domain of activities ("it's going to ruin everything I do"), whereas a specific cause is circumscribed ("it has no bearing on my life"). Finally, an internal cause points to something about the self ("it's me"), whereas an external cause points to other people or circumstances ("it's the heat in this place") (p. 23).

The learned helplessness model informs us of the variability of individual reactions to uncontrollable negative experiences. Emerging from a reformulation of this model is a system of assessing this variability called explanatory style (Abramson, Seligman, & Teasdale, 1978).

Peterson, Seligman, and Vaillant (1988) state that when a person explains negative events

> with stable, global, and internal causes [they show] ... more severe helplessness deficits than a person who explains them with unstable, specific, and external causes.

Along these lines, we also expect a person who explains positive events with unstable, specific, and external causes to portray greater feelings of helplessness as they are not able to internalize their successes. This leaves the individual without an on-going sense of control over their successes or positive life events. The opposite response to both positive and negative events would likely represent a healthier management over feelings of helplessness. The healthier response would be stable, global, and internal causes for successes; and unstable, specific, and external causes for failures.

Drawing from personal experience makes this a practical and relevant means of gaining information on attribution style. The key here, is to obtain information that will determine whether the respondent saw their failure as due to internal or external causes and subsequently whether their attribution style can be deemed to be adaptive or maladaptive.

For a detailed explanation of the CAVE scoring protocol see the Variable Derivation section for CAVE as well as Appendix L.

General Questions.

Each Questionnaire included a number of general questions as well as the measures mentioned above. The full questionnaire including a general questions section is located in Appendix A.

Procedure

Faculty Deans and Department heads were contacted in order to secure approval for this study and acquire referrals to professors teaching targeted 2nd to 4th year core courses[10]. Both University of Ottawa and Carleton University were approached in order to generalize beyond one university setting. Once the study approval was established individual professors were approached as a first step in addressing students in classrooms. Five minutes of class time was taken to introduce the study and ask for volunteer participants. A standardized study "Recruitment Script to Classes" was used (see Appendix D). Questionnaires with letters of informed consent attached, were circulated to interested students. Students were informed that the researcher would return within a week to the class in order to collect completed questionnaires and hand out letters of debriefing. This procedure was standardized for all the data collected for use in this study. All scripts, letters, and a copy of the questionnaire can be found in the Appendices.

Ethics Approval

This research project received ethical approval based on an internal review conducted by a review board for ethical considerations of research at the University of Ottawa. Carleton University allowed for this research based on the review conducted at the University of

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[10]These were courses classified as TS or NTS, based on the operational definition with greater than 70% or less than 30% male or female participation in a given program.

Ottawa (See Appendix M). Carleton University Psychology Department required the use of a revised informed consent form which was employed whenever these students were sampled (see Appendix E). We have taken care to maintain ethical standards with the goal of causing no harm to subjects due to participation in this research project.

Procedural Pilot

Pilot study materials were collected in the first two psychology classes where permission to sample was received. The procedure implemented closely followed the one outlined in this document for data collection implementation. Slight modifications were made to accommodate in class questionnaire administration, so as to gauge time required for questionnaire completion and to allow for questions and comments from the participants. This clarified and validated study procedures as well as highlighting any existing problems with the questionnaire.

During class time, 68 students handed in completed questionnaires. None of these questionnaires were incorporated into the data set used for the final analyses in this study. These questionnaires were used to determine whether the procedure as set out was satisfactory or whether changes were required prior to commencing upon data collection. The procedure and all materials were determined to be sufficient as they stood with the exception of the change of two items: (1) the numbering sequence of several items on the original questionnaire was incorrect and had to be changed, and (2) the time specified to participants for test completion was increased based on the average of this pilot sample. Following these changes, the letters of informed consent, questionnaire, and letters of debriefing were found to be adequately logical, legible and comprehensive to students.

Sample Size Calculation

The sample size for this study was initially calculated based on a "short rule-of-thumb" (Cohen, 1992, p. 156) power analysis treatment. The relationship between sample size (N), population effect size (ES), statistical power, and significance criterion (a), interact to guide the power analysis for this study. Logistic regression analysis is the main statistical tool. The significance level for power analyses was set at $a = .05$. A medium ES was expected for the F test of the logistic regression, or $f2 = .15$ (Cohen, 1992). Four variables (SRES, SPSI-R, IP, & CAVE) were used as the basis for determining the requisite N. Given the information above, 84 participants were required to fill each of the two female and male groups (traditional and non-traditional) in order to ensure adequate power ($\underline{N} = 84$), when the University of Ottawa and Carleton cells are collapsed. Therefore, the minimum total sample size must equal or exceed 336. The total sample size collected in this study is 362, exceeding the minimum by 26. See Appendix O, for a complete description of the power analysis conducted for this study.

Data Analysis Procedure

Logistic regression analysis (LRA) was the major statistical tool utilized in this study. LRA is frequently used in cases where classification or clarification of real life occurrences are desired. This method of analysis has been chosen as the best means of identifying the predictors among a number of possible Independent Variables (IV) for a dichotomous Dependent Variable (DV). The DV is entrance into non-traditional or traditional studies for both women and men. Since the DV is categorical, LRA[11] was selected as the most appropriate and frequently utilized statistical test for this type of data set (Menard, 1995; Norusis, 1994; Tate, 1996; Webley & Lea, 1996). LRA is the best tool as it enables the

[11]Other analyses require continuous DV's and are therefore not suitable to this study as this assumption would be violated (i.e., multiple regression analysis).

researcher to make a prediction of a categorical DV based on both continuous or dichotomous IVs. Although LRA is very similar to traditional multiple regression analysis (MRA) it is particularly amenable to discrete outcomes while MRA is not. This makes LRA a very valuable tool, capable of being applied to real-world questions where categorical DV's are identified. Since we will use LRA and not MRA it must be noted that the familiar R index will not be provided as it is not reported as an indicator of relationship strength in LRA analyses (Tate, 1996).

IP, SPS, SRES, Attribution Style are the predictor variables. Current statistics and literature, strongly suggest that biological sex is the best predictor of entrance into traditional vs. non-traditional studies for male and female undergraduate students. Based on that body of knowledge, biological sex will account for a large amount of the variance in educational choice between women and men. However, when analyzing career choice within biological sex, we do not know the degree to which other, more psychological variables, such as those chosen as measures in this study (IP, SPS, SRES, and Attribution Style) influence career choices made by undergraduate university students. Entrance into non-traditional vs. traditional studies is a dichotomous outcome, and LRA is well adapted to the task of hypotheses testing of the impact of study measures on educational choice.

The main function of the LRA is to determine whether our set of predictor variables allow us to predict the dichotomous outcome of NTS or TS among our sample population. First, our four primary hypotheses were individually tested on the male and female samples. Next, an empirically driven analysis of the "Best Fit of All Combinations" was conducted. We computed all possible regression equations in order to choose the best subset of predictors of the DV. The use of empirical drive analyses accommodates the goal of choosing the best

model to predict educational choice from the predictor variables without relying on theoretical postulates alone.

Direct (simultaneous forced entry) LRA was used for each of the chosen key variables as they relate to the primary hypotheses individually. Further use of a forced entry technique was incorporated in an examination of all possible combinations of variables in the search for the model with the best fit. The procedures described were employed for sample sets, accommodating the results of sex by domain interaction as it applied to the each variable (discussed below).

Peripheral tests, those that do not relate directly to the hypotheses of this study, include correlation (which of course is theoretically linked to regression analysis but used when the goal is to examine variable relationships and not to determine prediction of DV), interrater reliability coefficients, reliabilities of psychometric tests (Cronbach alpha, internal consistency), and a Preliminary LRA to determine if there is a Domain by Sex Interaction for any of the main variables in order to establish whether the sample should be analyzed as a whole or as subgroups for male and female separately. If this is not the case then both sample subsets (males and females) can be collapsed for the LRA. If there is a significant interaction then separate LRAs should be conducted as gender would confound the study of predictors.

The median split technique was initially thought to be useful when analyzing scale scores of specific study measures to ensure that results were meaningful. It has been suggested that reparameterization may at times be useful in order to represent categories that are meaningful and distinct (Hosmer & Lemeshow, 1989). However, one must keep in mind the need to retain continuous results wherever possible as this safeguards against loss of power, type I errors, and spurious significance (Cohen, 1983; Maxwell & Delaney, 1993). Due to the controversy associated with the use of the Median Split procedure for

dichotomizing continuous variable results, all continuous predictor variables were incorporated as reported, given that these results remain meaningful (Bissonnette, Ickes, Bernstein, & Knowles, 1990; Maxwell & Delaney, 1993). This avoids the tendency for type I errors, known to occur as a result of collapsing continuous measures into categories, increasing the likelihood of spurious statistical significance (Maxwell & Delaney, 1993). The loss of important information obtained through a continuous measure is a serious consideration as Maxwell & Delaney (1993) point out and Cohen (1983) elucidates.

> the cost in the degradation of measurement due to dichotomization is a loss of one-fifth to two-thirds of the variance that may be accounted for on the original variables, and a concomitant loss of power equivalent to that of discarding one-third to two-thirds of the sample. Such losses cannot be justified, given the availability of methods that fully exploit all the original measurement information (p. 253).

Since LRA is capable of utilizing both dichotomous and continuous measure results it is prudent to incorporate such data as it is received. Therefore, IP was the only scale that was reduced to meaningful discrete categories incorporating the findings by Holmes, et al (1993). Their cut-off score for inclusion into the impostor or non-impostor (ability confidence group) accounts for the best split-point, taking into consideration the possibility of both type I and type II errors.

The data analyses steps followed in this study are as outlined:

1. Case Analyses in search of missing data, outliers and other items that overly influence the data set, as well as an assessment of the validity of assumptions.
2. Descriptive statistics presented for the sample.
3. Internal Consistency (Cronbach α) results of main study instruments.

4. Preliminary LRA conducted to determine whether there is a significant domain by sex interaction capable of confounding main LRA analyses results.

5. LRA conducted for the sample or sample subgroups as warranted by preliminary LRA results. LRA is useful as a classification tool and means of deciphering observed phenomenon (Tate, 1996). Both of these LRA capabilities were investigated.

6. Finally exploratory analyses were conducted as a means of withdrawing additional information from the data set.

All statistical analyses were conducted on computer using SPSS for Windows software program, Release 6.0.

Preliminary Analyses.

In order to prepare the data set for the primary analyses and hypotheses testing it is essential to attend to several issues of importance (Tabachnick & Fidell, 1989; Tate, 1996). First, we must determine whether there are any problematic individual observations which influence the analyses disproportionately. Next, assumption violations must be assessed in order to appraise whether the techniques applied were valid.

In the first case, we are looking for missing data, outliers, or other cases that influence the data excessively. In the second case, we are considering the validity of the following assumptions as outlined by Tate (1996) who informs us of three formal and one tertiary assumptions associated with LRA. These are:

1. Independence of observations.
2. Exact measurement of independent variables.
3. The combination of the logistic function ... and the specified equation for the logit ... correctly describes the true functional form of the relationship between the probability of Y=1 and the IV's (Tate, 1996, p.238).
4. Large sample size.

In preparation for the principal data analyses, a thorough data screening was conducted and results reported in the following section entitled Case Analysis.

Variable Coding and Derivation Details

For the purposes of this study, variables have been coded for clarification and data analyses. The coding system that follows has been summarized for ease of utilization and referencing. Explanations of variable derivations have been left to the end of this section as this involves more complex formulations and is required, at times, to create meaningful categorizations of variables.

Table 1

Variable coding system summary for reference and analyses

Variable	Coding Description
GPA	9=A+; 8=A; 7=A-; 6=B+; 5=B; 4=C+; 3=C; 2=D+; 1=D; 0=E/F
Sex	0=Female 1=Male
University {Univ}	0=University of Ottawa 1=Carleton University
Field of Study Domination {Domin}	0=Traditional Studies 1=Non-Traditional Studies [This is broken down into non-traditional and traditional studies for both sexes] 1=Females and males in non-traditional studies 0=Females and males in traditional studies
IPrank[a]	1=Impostor Feelings 2=Ability Confidence [Scores Reversed]
SRES[b]	25 to 125 = Lesser Egalitarianism to Greater Egalitarianism [The higher the score the greater the egalitarianism]
SPSI-R[c] {SPSI}	0 to 20 = Lesser to Greater Global Problem Solving {SPSI} [Higher scores indicate greater social problem solving skills]
CAVE[d] {Failfull and Succesfl}	3 to 21 = Failure Adaptive to Maladaptive 3 to 21 = Successful Adaptive to Maladaptive [Scores Reversed]
ISEI Mom[e] {Iseimom}	16 to 90 = Possible range for international socio-economic index based on whole sample [Higher scores = higher ISEI]
ISEI Dad[f] {Iseidad}	16 to 90 = Actual and Possible range for international socio-econimic index based on whole sample [Higher scores = higher ISEI]
Number of Years of Education {yrs}	0 to 9 = Actual range of years of education from sample
Mom Career Support {Mom}	1 to 5 = Actual and possible range for the support of academic choice from mother [Higher scores reflect less support]
Dad Career Support {Dad}	1 to 5 = Actual and possible range for the support of academic choice from father [Higher scores reflect less support]
Guidance Influence {Guide}	1 to 5 = Actual and possible range for influence of a guidance counselor [Higher scores indicate less influence of counselor]
Volunteer hours {Vol}	0 to 9 = Actual range of participant volunteer hours
Different Career Choice {Choice}	1 to 5 = Actual and possible range for desiring a career change [The higher the number the less the desire for a career change]
Number of Siblings {Sibs}	0 to 9 = Actual range of siblings in subject group
Birth Order {Birth}	1 to 9 = Order in which participant was born into family
Age	18 to 48 = Actual Age range of participants

Note. All terms in { } are as they appear in the data set if not otherwise specified.

Variable Derivations

In this section, variable derivations were expounded upon, summarizing the foundations and logic for measure formulation where needed.

GPA. This is a self-report measure and was entered as conveyed with a slight change to a 9 point as opposed to a 10 point scale. Re-scaling was conducted to accommodate the optical scanning sheets and did not effect outcome results. The re-scaling involved a grouping of E and F grades together. We had no E/F students and therefore this system made no impact on overall outcome.

Sex. As described above, the sex of female and male students was coded 0 and 1, respectively.

University. The University of Ottawa and Carleton University were coded separately as O and 1, respectively.

Field of Study Domination. This variable was coded according to the operational definition for traditional versus non-traditional study (70% to 30% major enrollment by same sex students). Hence, 1=non-traditional for women and men, 0=traditional for women and men

Iprank[a]. The Impostor Phenomenon / Ability Confidence construct has been coded as 1 or 2 based on the findings in the Holmes et al. (1993) study. A cut-off score of 62 and above was found to be a reliable indicator of Impostor feelings taking into account type I and II errors. Therefore, we conjecture that those scores less than 62 account for Ability Confidence. For the purpose of data analyses, scoring has been reversed in order to maintain integrity with the positive coding found in other variable scale scores as well as the positive outcome score for entrance into non-traditional studies.

SRES[b]. Arriving at SRES scores is a simple procedure of summing responses over the 25 items. The possible range extends from 25 to 125, with no established cut-off scores for greater and lesser egalitarianism. The actual range obtained in our sample for all participants extends from 45 to 101. King and King (1993) inform us that the higher the score the more egalitarian the individual or group.

SPSI-R[c]. The scoring for the SPSI-R was developed by D'Zurilla ((T. J. D'Zurilla, personal communication, September 27, 1995). For Global SPSI-R scores the formulation that follows is applied: SPS = PPO/5 + RPS/20 + (40 - NPO)/10 + (40 - ICS)/10 + (28 - AS)/7. Higher scores are indicative of greater social problem solving skills overall. Subscale scores are extracted through totaling each of the following scale items [PPO = 52 + 54 + 64 + 73 + 83; RPS = 56 + 74 + 78 + 89 + 94 + 50 + 65 + 84 + 92 + 93 + 63 + 69 + 85 + 88 + 91 + 70 + 71 + 72 + 80 + 82; NPO = 46 + 47 + 51 + 57 + 58 + 62 + 77 + 82 + 86 +95; ICS = 48 + 49 + 53 + 60 + 66 + 67 + 79 + 90 + 96 + 97; AS = 55 + 59 + 61 + 68 + 75 + 76 + 87]. Actual Global SPSI-R range results (N=362) span from 2.2 to 19.857. Possible range span runs from 0 to 20. Scores have not been categorized as increases of 1 on the respondent's scores are believed to be meaningful.

CAVE[d]. The derivations of the variable coding for the attribution measure (based on the CAVE procedure) were influenced by the findings of Xenikou, Furnham & McCarrey (1997) and the research findings of Peterson, Seligman, & Vaillant, 1988. Xenikou, Furnham, & McCarrey (1997), found that elevated scores on attribution elements for positive outcome were not negatively correlated with attribution elements for negative outcome and vice versa. This suggests the need to utilize attributions for positive and negative events as separate variables. "Attributional style for positive events" (p. 16) and "attributional style for negative events" (p. 16) were considered two separate variables rather than poles on a

continuum. The terms success and failure were used interchangeably with those of positive and negative attributions for events. These variables were comprised of the following factors: Internality, Stability, and Globality for either positive or negative events. For a detailed explanation of the CAVE technique see the Attributional Style Measure Section and Appendix L.

The CAVE procedure utilized four blind raters for each completed questionnaire. All four ratings were then grouped and the mean score extracted for events judged as success and failure. The sub-categories of internality, globality, and specificity were summed to attain the attribution of positive and negative event ratings for each subject.

For success attributions, lower scores represent a more adaptive attribution style. The logic behind this is as follows: Stable, global, internal attributions for success are better strategically than the opposite. Higher scores indicate a less adaptive attribution style for success. This is because, attributing success to unstable, specific, external factors is less personally beneficial. For the purposes of ease of data analyses and interpretation these results have been reversed. This conclusion being a positive correspondence between higher CAVE success scores and NTS [scored as 1] compared to lower CAVE success scores and TS [scored as 0].

For failure attributions, high scores represent a more adaptive attribution style. Attributing failure to unstable, specific, external factors is more personally beneficial as well as self-protective and therefore, more adaptive. Lower scores are indicative of maladaptive attributions. This is due to the less personally beneficial attitude of stable, global, and internal attributions for failures.

Optimistic attributions for both failure and success outcomes are based on the attribution logic built above. The explanation provided above is utilized in determining

whether scores are to be deemed as representative of adaptive or maladaptive attributions for positive and negative outcomes. Possible scores range from 3 to 21; while actual scores range from 3 to 20 for success events and 3.25 to 20 for failure events.

ISEI Mom[e] and ISEI Dad[f]. Ganzeboom and Treiman's (1996) International Socio-Economic Index of Occupational Status (ISEI) is the ranking system used for assessing the income and education levels linked to the occupations of participant's parents. The possible range for ISEI is 16 to 90 with higher scores indicative of greater SES. The actual range for participant's mothers was 16 to 88; while the range for fathers was 16 to 90.

Number of Years of Education. This is a self-report measure of the number of university years completed to date. The actual range is from 0 to 9 years.

Mom and Dad Career Support. This measure reflects the participant's feeling of parental support (mother or father) on a scale of 1 to 5 where higher scores reflect less support and lower scores greater support for academic choice. The actual range spans from 1 to 5 for both mother and father.

Guidance Influence. This is a measure that reflects the degree to which the student feels a guidance counselor played a part in influencing their educational choice. Possible actual scores ranged from 1 to 5 with higher scores being equated with less influence and lower scores equaling greater influence.

Volunteer hours. This shows the actual number of volunteer hours that the participant contributes on a weekly basis. Responses range from 0 to 9 hours per week (students reporting greater than 9 hours per week were incorporated into a 9 hours plus per week grouping).

Different Career Choice. Participants may be dissatisfied with career choice and this is reflected by the following measure which asks the student the degree to which they would

choose a different career if they had the chance to do it over again given what they know now. Lower scores indicate a desire to change and higher scores indicate a preference for their chosen path. Actual and possible range spans from 1 to 5.

Number of Siblings. This is the actual number of siblings reported by participants. The actual range spans from 0 to 9 (students with more than 9 siblings are lumped together in the 9 plus category).

Birth Order. Birth order reflects the students birth in reference to their siblings. The scores range from 0 to 9 plus.

Age. This is the actual reported age and ranges from 18 to 48.

CHAPTER IV

Results

The data set was analyzed in stages that enable the researcher to evaluate validity of assumptions, locate outliers or missing data, establish descriptive statistics of the data set, perform the primary analyses utilizing LRA and finally conduct exploratory analyses. The principal purpose of this chapter is to present the LRA results reflecting the factors that influenced career choice for undergraduate students entering traditional and non-traditional studies.

Case Analysis

In conducting a case analysis, Tabachnick and Fidell (1989) recommend a checklist for screening data in preparation for analyses and hypotheses testing. Following their recommendations the data set has been processed utilizing a checklist modified for use with the LRA model (Tabachnick & Fidell, 1989, p. 89).

- ☑ 1. Inspect univariate descriptive statistics for accuracy of input
- ☑ a. Out-of-range values
- ☑ b. Plausible means and standard deviations
- ☑ c. Coefficient of variation
- ☑ 2. Evaluate amount and distribution of missing data: deal with problem
- ☑ 3. Identify and deal with nonnormal variables
- ☑ a. Check skewness and kurtosis, probability plots
- ☑ b. Transform variables (if desirable)
- ☑ c. Check results of transformation
- ☑ 4. Identify and deal with outliers
- ☑ 5. Evaluate variables for multicollinearity and singularity

Results for each of the data screening items can be located in the Appendices P numbers I through IV. Screening results can be located in the following appendices: 1a = P-I; 1b = P-III; 1c = P-III; 2 = P-I; 3 = P-III ; 4 = P-II; 5 = P-IV.

Assessing the Validity of Assumptions.

In Chapter III, under the header preliminary analyses, the validity of assumptions for Logistic Regression Analyses were discussed. It is possible that the independence assumption suffers from violations as subjects were not randomly sampled but instead asked to participate based on personal desire and interest in the study. Tate (1996) suggests that it is customary to "assume that the analysis will not be sensitive to" the Exact IV assumption. It is believed that the IV instrument reliabilities were robust enough to waive concern for this violation. The standard equation for the logit has been utilized in this study and is assumed to correctly represent the probability of Y=1 and the independent variables, as there is no contradictory evidence. The sample size collected in this study has been shown (see Appendix O) to be adequately large to accommodate the analyses conducted. In order to protect against type I errors, significance has been set as follows: $p<.05$ non-significant LRA finding (marginally significant for t-tests), $p<.01$ statistically significant LRA (Hosmer & Lemeshow, 1989; Tabachnick & Fidell, 1989; Tate, 1996).

Missing Data - Group Mean Method.

Missing data that are randomly distributed throughout a data set and consist of only a small number, do not constitute a major problem in subsequent results (Tabachnick & Fidell, 1989). In the data set used for this study (not considering the CAVE section or ISEI results which represent unique cases) the total number of missing data points equal 13 and appear to be randomly distributed over 7,602 possible data point cells across all 362 respondents, a result that is less than .002% of the total (see Appendix N for a full detailing of missing data). The data appeared to be randomly scattered.

Tabachnick and Fidell (1989) recommend the use of a group mean as a method for replacing missing data. This is the method chosen for this data set, as the missing values can

be replaced with mean values associated with the dichotomous group they reside within. In this way the dichotomous variables can maintain mean values based on the group mean as opposed to the grand total mean. Use of a grand mean for replacing missing value points is a conservative method but has some disadvantages which justify a preference for the use of a group mean. Tabachnick and Fidell (1989) suggest that the use of a grand mean leads to

> the variance of the variable [being] reduced because the mean is closer to itself than to the missing value it replaces, and the correlation the variable has with other variables is reduced because of the reduction in variance (p. 64).

Although the loss of variance is not a major consideration for 13 missing values over so many cells it does become a concern when assessing the missing data points over the CAVE section and the Socio-economic measure (ISEI). Both of these measures must be treated carefully as the number of missing values is sizeable and must be tested to ensure that these cases do not represent a significant finding in their own right. Over the 1,448 possible data points required for a complete ISEI and CAVE sections for the 362 respondents, 110 data points were found missing representing 7.6% of the total. This signifies a considerable amount and warrants a careful scrutiny of the missing data.

In assessing missing data points from the CAVE section, 24 items were missing on the failure and 22 on the success components of this measure. This represents a notable number of missing data points on respondent' forms. A likely reason for this pattern became evident while reviewing respondent's questionnaires which had the CAVE section located on the back-side. It appeared that the back-side of the final page was missed due to simple respondent error (not turning over the last page) as opposed to matters of importance.

The other measure that had to be tested to determine whether missing data represented important information was ISEI on both parents. There were 39 missing cells for mother's

ISEI and 25 for father's ISEI. There is a noticeable hike in missing data points for mother's ISEI ratings compared with father's ISEI ratings. This is logical as greater numbers of men constitute the paid workforce while women continue to maintain a stronger presence in the role of primary childcare and home care-givers. Some students might not have realized that this role would have fit quite appropriately in the space provided for Mother's occupation and instead left this space blank. The other reason for possible missing values in this section is that the respondent's parent(s) is retired, absent (divorced), or deceased. This was made explicit by some participants but blank spaces were not always clarified by subjects for the researcher.

A series of t-tests of independent means comparing groups with complete data sets and those with missing data points were analyzed for ISEIMOM, ISEIDAD, CAVE success, and CAVE failure response sets (Babbie & Halley, 1995; Tabachnick & Fidell, 1989). The mean differences for SRES, IP, and SPSI-R were selected as they represent the most important variable results and are not burdened by missing data points as found in ISEI and CAVE results. There were no significant mean differences on any of the t-tests reported for ISEI mother or father when tested on SPSI, SRES, and IP scores. T-test results for the CAVE sections of both failure and success also showed no significant differences for the mean values of SPSI, SRES, and IP scores when comparing groups with complete sets and those with missing data. For a complete breakdown of the t-test results and p values see Appendix P-I.

These findings reinforce the researcher's belief that these missing data points are random and do not signify important findings on their own. This enables the researcher to utilize the procedure (described earlier) recommended by Tabachnick and Fidell (1989) of inserting group means to replace missing data cells. This authorizes us to obtain appropriate

numbers to insert into the cells with missing data eliminating the undesirable option of discarding questionnaires with missing data and allowing us to continue on our path toward the primary data analyses.

Tabachnick and Fidell (1989) suggest conducting two principal analyses of the complete data set -- one with missing data and one with complete data. They recommend this procedure when the sample is small, there are a large number of missing data points, and these are not randomly occurring throughout the set. Since our sample is large, missing data appears to be random, and constitutes less than 8% of the total, one principal analyses is believed to be adequate for our purposes.

Outliers.

Case results that end in extreme values may overly influence complete data sets rendering analyses invalid or severely compromised. Whether the outlier is due to errors in data entry, missing data points, subjects from populations unrelated to the population being sampled, or subjects with excessive values from the population sampled, it must be identified and dealt with appropriately (Tabachnick & Fidell, 1989; Tate, 1996). Fortunately, it is possible to have an outlier that does not "exert excessive influence" (Tate, 1996, p. 46) on results, particularly with large sample sizes such as the one collected for this study. In some cases discarding data is recommended when outlier results are due to coding error, error in population sampling, or participant illness. Discarding data is not recommended when the results are legitimate and not due to one of the problems listed above (Tate, 1996).

The use of the studentized residual is recommended by Tate (1996) for identification of outliers. Tate (1996) suggests that:

> This index behaves approximately like a standardized residual with values of approximately 2.5 or 3.0 and larger reflecting possible outlier observations. ... Outlier

> identification should also involve a judgment of whether there is a distinct sense of separation between the observation in question and the remainder of the residuals. This judgment is often aided by a visual inspection of graphical representations like the Y versus X scatterplot or the residuals plot (p. 47).

Values for SPSI-R, CAVE*, IP, ISEI*, and SRES have been examined for outliers (* adjusted for missing values). Tate (1996) recommends outlier identification observations to be set at a maximum of 2.5 allowing for all cases with items larger than this to be marked tentatively as an outlier. The case analysis run through LRA for identification of studentized residuals resulted in no items exceeding 2.5, indicating no outliers in this sample. The findings of this analysis can be located in Appendix P-II, Data Screening Test for Outliers.

Measure: Internal Consistency

Measure reliability is assessed using split-half reliability and alpha co-efficients for all scales. Descriptive statistics and indices of internal consistency are presented in Table 2 for the Impostor Phenomenon, Social Problem Solving Inventory-Revised, and the Sex Role Egalitarianism Scale.

Table 2

Descriptive Statistics and Indices of Internal Consistency

Scale	N	Mean	SD	Alpha Coefficient	Split-half Reliability[a]
IP[b]	360	56.64	12.02	0.88	0.86
SRES[c]	360	90.54	18.37	0.87	0.80
SPSI-R[d]	362	81.94	8.65	0.77	0.53
NPO	362	14.54	7.72	0.88	0.87
PPO	362	12.40	3.72	0.75	0.75
ICS	361	11.13	7.03	0.86	0.83
RPS	362	45.05	13.19	0.92	0.90
AS	361	8.07	6.03	0.89	0.85

Note. [a]Guttman is the split-half technique utilized here. Number of items in each scale is [b]=20; [c]=52; [d]=25; NPO=10; PPO=5; ICS=10; RPS=20; AS=7.

An inter-rater reliability analysis was conducted for the CAVE procedure prior to the replacement of missing data points (see Table 3). Interrater Reliability based on Alpha Co-efficients for the blind ratings of the CAVE procedure resulted in moderate to high reliability[12] for all three ratings across both positive and negative events.

Table 3

Inter-rater Reliability Analysis - Scale [Alpha Coefficient] for CAVE procedure

Data Set		N	Alpha Coefficient
Success	Globality raters 1-4	339	0.65
	Internality raters 1-4	340	0.89
	Stability raters 1-4	340	0.73
Failure	Globality raters 1-4	337	0.82
	Internality raters 1-4	338	0.87
	Stability raters 1-4	338	0.77

Sample Characteristics

The total number of participants was 362, with 177 females and 185 males. The sample consists of 87 females enrolled in traditional studies and 90 females enrolled in nontraditional studies at the University of Ottawa or Carleton University. Male participants included 98 in traditional studies and 87 in nontraditional studies enrolled at both universities. The University of Ottawa produced 190 student volunteers and Carleton University produced 172. NT male and T female students included those enrolled in psychology, education, and nursing programs. NT female and T male students included those enrolled in engineering, computer science, and physics programs.

The total sample age ranged from 18 to 48 years, with a mean of 23.33 years. Female participant' ages ranged from 18 to 44 years with a mean of 22.9 years, while male participant ages ranged from 19 to 48 years with a mean of 23.8 years. There was a marginal significant

[12]Xenikou, Furnham, & McCarrey (1997) found internality to have poor reliability and suggested omitting this from measures of attribution. This was not supported in the results of our data sample and therefore internality was retained for our analyses.

difference between mean age of male students enrolled in non-traditional versus traditional studies ($p < .05$). Those male students enrolled in female dominated studies were slightly older on average than their traditional male counterparts. There were no significant age differences across TS vs. NTS, the total sample, or the female subgroups.

Mean years of university education for the complete sample equaled 2.64. The mean years of university education for the total male sample equaled 2.6 with the non-traditional male sample equaling 2.42 and the traditional sample equaling 2.73. The mean years of education for the total female sample equaled 2.69 with the non-traditional sample equaling 2.69 and the traditional sample equaling 2.69. There was no significant mean difference for number of years of education for the female sample. Mean years of education was significantly different across the male sample at the $p=.001$ level with non-traditional male students having a greater number of months of education on average.

Although attempts were made to ensure the standardization of the male and female sample enrolled in traditional and non-traditional studies at both universities some significant differences do exist. However, it can be debated that the significant differences, although extant, may not actually be meaningful. This point will be discussed in greater detail later in this section.

Mean Grade Point Average (GPA) for the total sample equaled 5.78. The Mean GPA for the female sample equaled 5.8; while the females enrolled in non-traditional studies had a mean GPA of 5.99 and those in traditional studies had a mean GPA of 5.64. Mean GPA for the total male sample equaled 5.7; while the males enrolled in non-traditional studies had a mean GPA of 5.75 and those in traditional studies had a mean GPA of 5.73. There were no significant differences in GPA across sex or traditional versus non-traditional career domain.

Table 4

Descriptive Statistics: NTS and TS Student Variables for Total Sample (N = 362)

Variable	N	M	SD	SE of M	Min	Max
GPA	362	5.78	1.52	.08	1	9
#yrs Univ	362	2.64	1.23	.06	0	9
Mom	362	1.78	1.11	.05	1	5
Dad	362	1.81	1.55	.08	0	9
Guidance	362	4.13	1.21	.06	1	5
Volunteer	362	1.50	2.08	.11	0	9
Change	362	3.67	1.30	.06	1	5
# Siblings	362	1.92	1.57	.08	0	9
Birth Order	362	1.96	1.34	.07	0	9
Age	362	23.33	5.31	.27	18	48
ISEI Mom	362	48.37	18.52	.97	16	88
ISEI Dad	362	53.38	16.14	.85	16	90

The last variable for which descriptive statistics were provided, is the International Socio-Economic Index of Occupational Status (ISEI) presented in Ganzeboom and Treiman's (1996) paper provides an up-to-date method for ranking income and education linked to occupation. This is the measure utilized to gauge Socio-Economic status of participant's parents. The mean ISEI for the total sample of Dad's equaled 53.4 and the mean ISEI for Mom's equaled 48.4. The Total female participant's mean ISEI for Mom's equaled 46.1 and for Dad's equaled 55.5. A complete listing of the mean values of ISEI for Mom's and Dad's for total sample and samples broken down into categories follows.

Table 5

Mean Values of Mom and Dad's ISEI by Category

Variable: ISEI	Mean ISEI mom	Mean ISEI dad
Total Sample	48.4	53.4
Total Female Sample	46.1	55.5
NTS Female	45.3}	56.7}^{ns}
TS Female	46.9}^{ns}	54.2}
Total Male Sample	50.1	51.4
NTS Male	57.8}***	44.9}
TS Male	44.1}	57.1}***

Note. The higher the Mean Value the greater the Socio-Economic Standing.
}signifies pairs and their significance levels as follows: *p<.05, **p<.01, ***p<.001.

For the female sample, Mom's and Dad's ISEI were not significantly different for students enrolled in traditional studies versus those in non-traditional studies. In the male sample, ISEI for Mom's and Dad's was significantly different for those enrolled in TS vs. NTS (p=.000) and (p=.000) respectively. The mean for Dad's ISEI is higher for male students enrolled in TS than NTS. The mean for Mom's ISEI is higher for male students enrolled in NTS than TS.

As reported above, t-tests show that there is a significant difference (p=.001) between number of university years completed for students in NTS vs. TS. Male and female students enrolled in traditional studies had a greater number of university years completed but the mean number differed by less than half a year from those enrolled in non-traditional studies. This in itself is not a meaningful difference in educational attainment and cannot lead us to conclude that level of education would reflect a meaningful bias in results as previous researchers determined (Fitzpatrick & Silverman, 1989; Lamkau, 1983). There were no significant differences reported following t-tests of Sex across number of university years, age or GPA. Based on these results we conclude that neither biological Sex nor Domain of study

reflect notable differences in GPA, age, or arguably years of education, and this is compatible with our desire to maintain a relatively consistent level across these variables.

Primary Analyses and Hypotheses Testing

Results are based on Logistic Regression Analyses predictive value of SRES, AC, SPSI, and Attribution Style for entrance into nontraditional vs. traditional studies. A preliminary LRA was conducted to assess whether a sex by domain interaction existed prior to conducting main LRA. Those results determined whether the complete sample was to be used in all LRA or whether male and female samples were to be analyzed separately to avoid confounding results.

The primary study measures are identified here as dependent variables and include: SRES, IP, SPSI-R, and CAVE failure and success. A sex by predictor interaction was suspected and tested through the following LRA model (domin = Sex + SRES + SPSI-R + IP + CAVE + Sex*SRES + Sex*SPSI-R + Sex*CAVE). Simple non-interactive items were included along with the interactive starred (*) items to ensure that the model was not artificially boosted through their absence. Sex*SRES interaction attained statistical significance ($p<.001$).

The preliminary LRA analysis confirms a Sex X SRES interaction. Since this analysis is for decisional purposes only (separating the total sample into male and female subgroups for the main LRA) indepth discussion of this analysis is not presented. The significant interaction evident from this analysis indicates that the "effect of one factor depends on the particular level of the other factor" (May, Masson & Hunter, 1990). Hence, these preliminary LRA results provide sufficient justification, consistent with the literature, to separate male and female participant results into two subsets for the primary study analyses.

Female and Male Sample: LRA Results

Hypotheses testing in this study consists of assessing the predictive value of SRES, SPSI-R, IP, and CAVE variables for entrance into traditional or non-traditional educational streams. This is achieved through the use of Logistic Regression Analyses for each of the chief measures. Model building was also conducted to determine which study variables achieve the best prediction model of educational choice. Both of these analyses were included in the following pages. Hosmer and Lemeshow (1989) recommend the use of a significance level that would reduce the possibility of type I errors. A $p<.01$ significance level, or better, has been adopted here for the following analyses. A significance level of $p<.05$ was considered non-significant. See Appendix Q for a full detailing of male and female results on measures. Appendix R provides details of LRA interpretation steps.

Hypotheses Testing was based on the hypotheses as outlined below. Model building was based on the best fit derived from an all combination search of the primary measures.

Hypothesis 1 (H_o1)**:** Sex-Role Egalitarianism (SRES) will be significantly more predictive of non-traditional study vs. traditional study choices among university students.

Hypothesis 2 (H_o2)**:** Ability Confidence (IP/AC) will be significantly more predictive of students in non-traditional studies vs. those in traditional studies.

Hypothesis 3 (H_o3)**:** Social Problem Solving (SPSI) skills will be significantly more predictive for students in non-traditional than traditional studies.

Hypothesis 4 (H_o4): Adaptive attributions for success and failure will be significantly more predictive of students in non-traditional vs. traditional studies.

Female Sample

Hypotheses Testing: Individually Entered.

Each of the Hypotheses listed above has been tested through an LRA (Direct Entry) of the variable as a predictor of domain entrance. The main question in each of the hypotheses is whether that variable would be significantly predictive of entrance into non-traditional vs. traditional studies. Table 6, testing H_o1 through 4 for the **female** sample presents a summary of relevant statistics and includes the analyses for model building and hypotheses testing. Figure 3, presents a bar graph of classification of the primary measures.

Hypothesis 1 (H_o1)**:** Sex-Role Egalitarianism (SRES) will be significantly more predictive of non-traditional study vs. traditional study choices among university students.

The Wald Statistic indicates that the SRES variable results in a non-significant difference ($p<.05$). In this case, the value for R is negative which means that as SRES increases the likelihood of student entrance into NTS decreases. In other words, the higher the egalitarianism score the less likely is NTS entrance. These results do not support our stated H_o1. The classification table provides information regarding correctly classified and misclassified cases (figure 3). Correct classifications totaled 58% for this variable with 58% correctly classified as TS and 56% correctly classified as NTS. In total, 75 out of 177 subjects were misclassified equaling 42.37%. These results are not overly optimistic or reliable for classification purposes which is consistent with the non-significant result findings. The histogram confirms the limited ability of this model for predictive purposes. When correctly and incorrectly classified cases are mixed at this rate, prediction is poor. Furthermore, when correct classifications remain close to the 0.5 range, as in this case, classification is insufficient. This is opposed to classifications that are more accurately represented by placement closer to the 0 or 1 ends according to domain (best portrayed in

figure 7). Therefore, the graphic depiction of this model's fit suggests a less than desirable outcome. Goodness of Fit of the model is further assessed through Model Chi-Square and Improvement figures. Model χ^2 and Improvement results are once again non-significant ($p<.05$). The outcome of this analysis does not suggest good model fit or predictive value for SRES.

Hypothesis 2 (H_o2)**:** Ability Confidence (IP/AC) will be significantly more predictive of students in non-traditional studies vs. those in traditional studies.

Hypothesis 3 (H_o3)**:** Social Problem Solving (SPSI) skills will be significantly more predictive for students in non-traditional than traditional studies.

Results of Hypothesis 2 and 3 individually failed to achieve statistical significance. Values are reported in Table 6.

Hypothesis 4 (H_o4): Adaptive attributions for success and failure will be significantly more predictive of students in non-traditional vs. traditional studies.

The Wald Statistic indicates that the variable CAVE failure, results in a non-significant difference ($p<.05$). The value for R is positive which means that as CAVE failure increases the likelihood of student entrance into NTS increases. The classification table provides information regarding correctly classified and misclassified cases (see figure 3) for CAVE. Correct classifications totaled 60% for this variable with 53% correctly classified as TS and 67% correctly classified as NTS. In total, 71 out of 177 subjects were misclassified equaling 40%. These results are not overly optimistic or reliable for classification purposes which is consistent with the non-significant findings reported. The histogram confirms the limited ability of this model for predictive purposes. Goodness of Fit of the model is further assessed through Model χ^2 and Improvement figures. Neither Model χ^2 nor Improvement

results attained statistical significance. The outcome of this analysis does not suggest good model fit or predictive value for CAVE individually.

Best Fit of All Combinations of Predictors

All combinations of the primary measures were entered into LRA equations to arrive at the best model fit for prediction of NTS vs. TS entrance. The best combination from these variables included the SRES and CAVE failure measures. The Wald Statistic for SRES and CAVE failure both resulted in a non-significant level ($p<.05$). The value for R is negative for SRES and positive for CAVE failure indicative of both increases and decreases in the likelihood of student entrance into NTS respectively (see table 6). Goodness of Fit of the model is assessed through Model χ^2 and Improvement figures. Both Model χ^2 and Improvement results attained statistical significance ($p<.01$). Classification table results show a 60% correct classification rate. The histogram of estimated probabilities shows a clustering of misclassified and correctly classified cases hovering together around 0.5. This graphic depiction of model fit suggests a less than desirable outcome (see figure 2). Based on the classification table and histogram outcomes this model can only provide a moderate fit and predictive value for entrance into NTS vs. TS (figure 3).

Table 6

Hypotheses Testing H_o 1 through 4 LRA results for **female** sample (n=177)

Table 6

Hypotheses Testing: H_o 1 through 4 LRA results for female sample (n=177)

Variable	B	SE	Wald's Stat	df	R	odds ratio	-2 log likelihood	df	Model χ^2 (Δ -2LL)	Δ df	Improvement χ^2	df
Constant	3.74	1.80	--	--	--	--	245.32	176	--	--	--	--
H_o1: SRES	-.04	.02	4.31*	1	-.10	.96	240.79	175	4.53*	1	4.53*	1
H_o2: AC/IP	-.24	.31	.59	1	.00	.79	244.73	175	.59	1	.59	1
H_o3: SPSI-R	-.08	.06	1.97	1	.00	.92	243.32	175	2.00	1	2.00	1
H_o4: CAVE							241.38	174	3.95	2	3.95	2
success	.02	.05	.19	1	.67	1.02						
failure	.11	.06	3.79*	1	.05	1.12						
Best Fit of All Combinations												
Constant	2.54	1.89	--	--	--	--	245.32	176	--	--		
MODEL							236.46		8.85**		8.85**	
CAVE												
Failure	.12	.06	4.13*	1	.09	1.13		175		1		1
SRES	-.05	.02	4.82*	1	-.11	.95		174		2		1

Note. *p<.05 non-significant, **p<.01 statistically significant.
For LRA definitions and an interpretation guide see Appendix S.

Figure 2. Histogram of Best Combination for **female** sample.

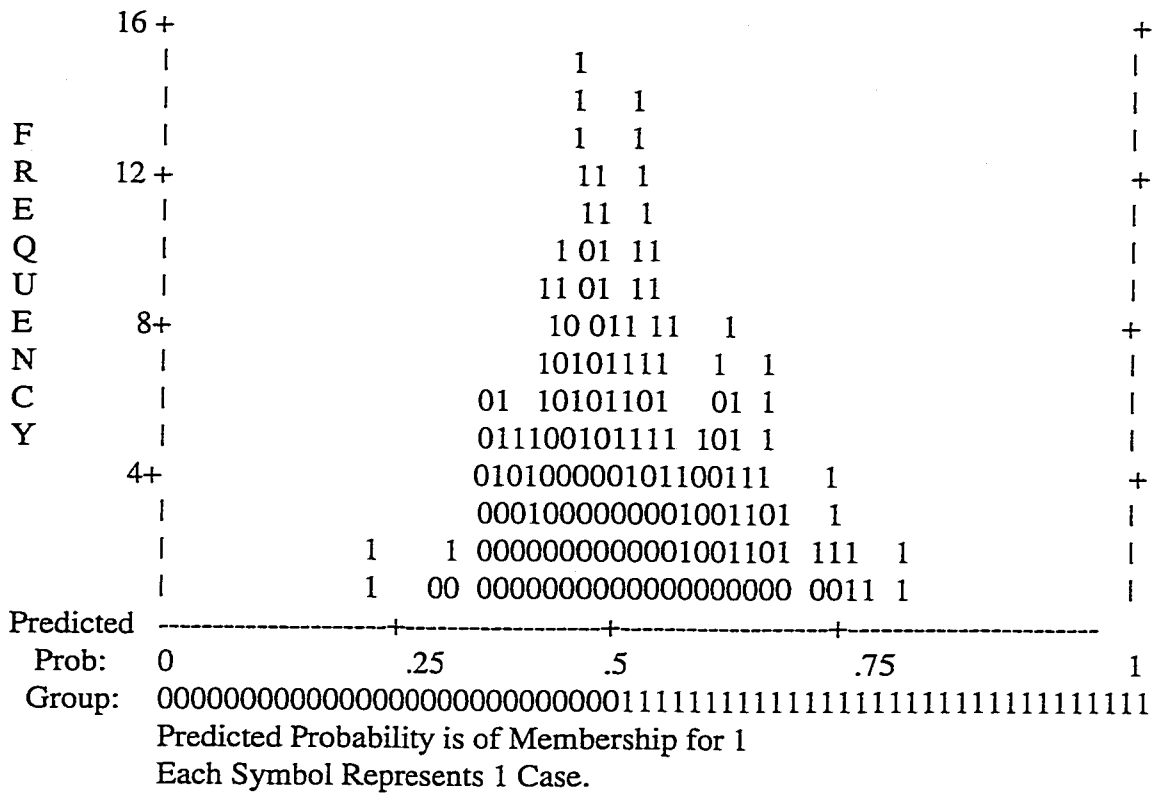
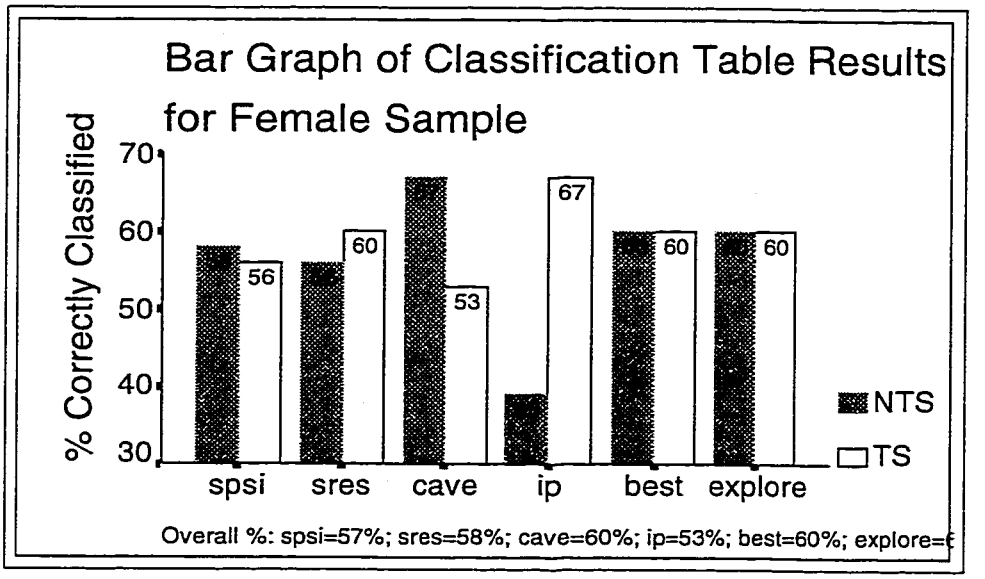


Figure 3. Bar Graph of Classification Table Results for **female** Sample.



Male Sample

Hypotheses Testing: Individually Entered.

Direct Entry of LRA for each of the original four hypotheses was the method used for hypotheses testing for domain entrance prediction. Each hypothesis was assessed to determine the predictive value of the variable in question. In table 7, testing of H_o 1 through 4 for the **male** sample is presented in summary form, along with a review of model building results. Figure 5, presents a bar graph of variable and model classification.

Hypothesis 1 (H_o1)**:** Sex-Role Egalitarianism (SRES) will be significantly more predictive of non-traditional study vs. traditional study choices among university students.

The Wald Statistic indicates that the variable SRES results in a non-significant finding ($p<.05$). In this case, the value for R is positive. This means that as SRES increases the likelihood of student entrance into NTS increases. The classification table provides information regarding correctly classified and misclassified cases (see figure 5). Correct classifications totaled 57% for this variable with 77% correctly classified as TS and 38% correctly classified as NTS. In total, 78 out of 185 subjects were misclassified equaling 43%. These results are not overly optimistic or reliable for classification purposes. The histogram confirms the limited ability of this model for predictive purposes. Goodness of Fit of the model is further assessed through Model Chi-Square and Improvement figures. Model χ^2 and Improvement results are also non-significant ($p<.05$). The outcome of this analysis does not suggest good model fit or predictive value of SRES for this sample.

Hypothesis 2 (H_o2)**:** Ability Confidence (IP/AC) will be significantly more predictive of students in non-traditional studies vs. those in traditional studies.

Hypothesis 3 (H_o3)**:** Social Problem Solving (SPSI) skills will be significantly more predictive for students in non-traditional than traditional studies.

Hypothesis 4 (H_o4): Adaptive attributions for success and failure will be significantly more predictive of students in non-traditional vs. traditional studies.

Results of Hypothesis 2, 3 and 4 were unremarkable and failed to achieve significance. Values are reported in Table 7.

Best Fit of All Combinations of Predictors

All combinations of the primary measures were entered into LRA equations to arrive at the best model fit for prediction of NTS vs. TS entrance. The best combination from these variables included the SPSI-R and SRES measures. The Wald Statistic for SPSI-R and SRES both achieved significance ($p<.01$). The value for R is negative for SPSI-R and positive for SRES indicative of both increases and decreases in the likelihood of student entrance into NTS respectively. Goodness of Fit, of the model is assessed through Model χ^2 and Improvement figures. Both Model χ^2 and Improvement results attained statistical significance ($p<.01$). Classification table results show a 55% correct classification rate. The histogram of estimated probabilities shows a clustering of misclassified and correctly classified cases together hovering around 0.5 (see figure 4). This graphic depiction of model fit suggests a less than desirable outcome. Based on the classification table and histogram outcomes this model can only provide a moderate fit and predictive value for entrance into NTS vs. TS. The outcome of this analysis does not suggest good model fit or predictive value for entrance into NTS vs. TS (see table 7 and figure 5).

Table 7

Hypotheses Testing H_o 1 through 4 LRA results for **male** sample (n=185)

Hypotheses Testing: H_o 1 through 4 LRA results for male sample (n=185)

Variable	B	SE	Wald's Stat	df	R	odds ratio	-2 log likelihood	df	Model χ^2 (Δ -2LL)	Δ df	Improvement χ^2	df
Constant	-3.22	1.41	--	--	--	--	255.81	184	--	--	--	--
H_o1: SRES	.04	.02	4.95*	1	.11	1.04	250.57	183	5.24*	1	5.24*	1
H_o2: AC/IP	-.49	.33	2.20	1	-.03	.61	253.59	183	2.22	1	2.22	1
H_o3: SPSI-R	-.10	.06	3.24	1	-.07	.90	252.46	183	3.35	1	3.35	1
H_o4 CAVE							254.00	182	1.81	2	1.81	2
success	.06	.05	1.69	1	.00	1.06						
failure	.00	.06	.00	1	.96	1.00						
Best Fit of All Combinations												
Constant	-2.23	1.48	--	--	--	--	255.81	184	--	--	--	--
MODEL							244.67		11.14**		11.14**	
SPSI-R	-.14	.06	5.63**	1	-.12	.87		183		1		1
SRES	.05	.02	7.18**	1	.14	1.05		182		2		1

Note. *p<.05 non-significant. **p<.01 statistically significant.
For LRA definitions and an interpretation guide see Appendix S.

Figure 4. Histogram of Best Combination for **male** sample.

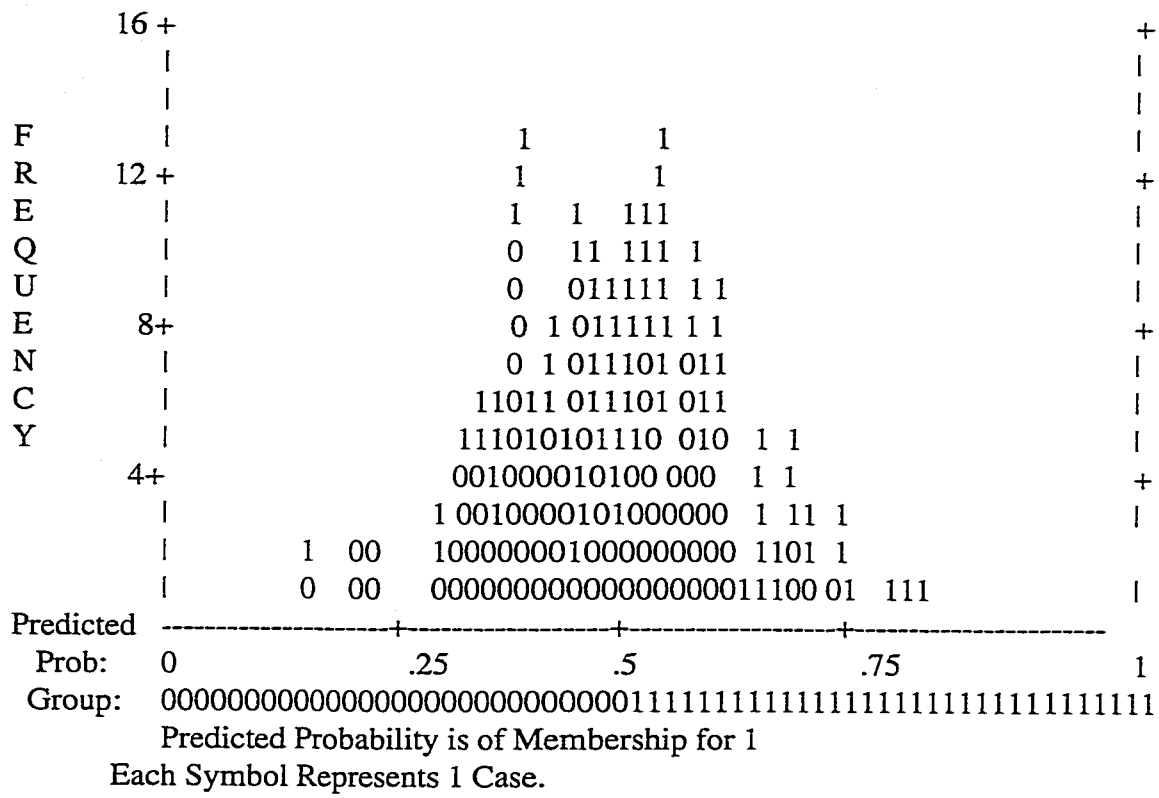
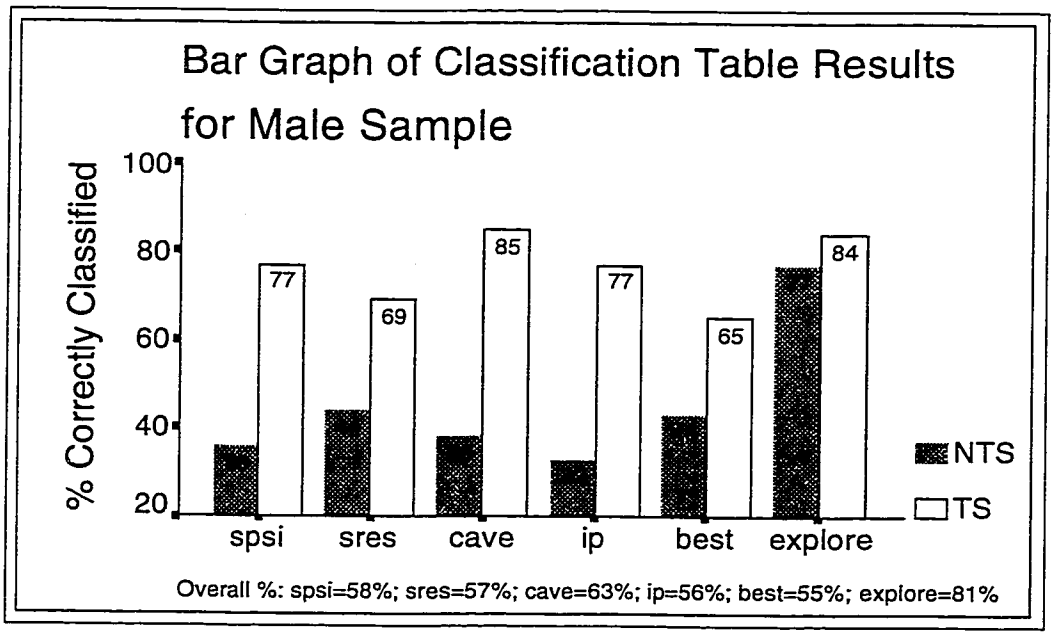


Figure 5. Bar Graph of Classification Table Results for **male** sample.



Exploratory Analyses

The exploratory analyses was limited to those that most closely maintain the goals of this project. The primary project goals include: (1) identification of the best predictors of student entrance into NTS vs. TS; and (2) establishing a model based on the variables that best fit goal number 1. In remaining close to the original goals we are able to streamline exploratory analyses to those that are most important. Thus, we eliminate the tendency to conduct superfluous analyses, increasing the potential for type I errors, in the search for unrelated significant findings.

Exploratory LRA analyses of the data set include all variables deemed potentially relevant for future research. These analyses reveal interesting results and promising model building capabilities. Analyses of **male** and **female** subgroup sample sets conclude in very different findings. The best models built for each subgroup utilize different variables and model goodness of fit significance levels are much higher for the **male** model than the **female** model.

The variable list for exploratory analyses (one each for the **male** and **female** sample) is extensive and includes: ISEI mom, ISEI dad, (all SPSI-R subscales) SP.AS, SP.ICS, SP.NPO, SP.PPO, SP.RPS, Guide, Birth, Choice, Dad, Mom, and Volunteer. The best combination of identified variables was examined to build a model most useful for predicting entrance in NTS vs. TS. No items previously entered have been included in the exploratory analyses. We started with 5 core variables (SRES, IP, SPSI, CAVE fail, and CAVE success), then the additional 13 variables were included in the exploratory search for best combination model. The p-value utilized for significance in these analyses is *now set at p<.001*. This accommodates the following equation 1-(1-.001)^18=.02 or 2%, which is slightly lower than the usual .05 risk of committing a type I error. This will account for the large number of

variables and the possibility of spurious significance. These results were used to inform future research only and not as support for hypotheses 1 through 4.

The importance of these analyses must not be underestimated. The key guiding force of this dissertation is the identification of factors that influence educational choice. The primary hypotheses were not adequately supported by our findings and hence do not offer a clear direction in which to inform future research. Utilizing the data collected to inform us of potential models that would prove superior in the prediction of educational choice may illuminate the path for future research and advise us of the key factors in educational choice.

Female Sample

Exploratory Model Building.

Exploratory Logistic Regression Analyses for the **female** sample has been conducted as follows (see table 8 and figure 6):

Exploratory LRA: Direct entry of measures constituting the best model identified for its predictive value of the student entrance into NTS vs. TS.

Exploratory LRA

Analyses select the best model for prediction of NTS vs. TS entrance of identified variable combinations. For the **female** sample, the best combination from these variables included GUIDE and SP.ICS measures. The Wald Statistic does not reveal any items that achieve significance based on our demanding requirements. Correct classifications equal 60% for this model with 60% correctly classified as TS and 60% correctly classified as NTS. In total, 71 out of 177 subjects were misclassified equaling 40%. Classification ability of this model for prediction of student entrance into NTS vs. TS fails to achieve significance (figure 3). These figures show minimal improvement in classification ability over previous models and results remain unreliable. The histogram confirms the limited ability of this model for

predictive purposes. The model is less than impressive with most of the classifications being a mix of correctly classified and misclassified cases throughout. The model's Goodness of Fit is assessed through Model χ^2 ($p<.01$) and Improvement figures ($p<.05$). Neither Model χ^2 nor Improvement χ^2 results reached statistical significance based on $p<.001$. The outcome of this analysis is not reflective of good model fit or predictive value for the Exploratory Analysis with the **female** sample (see table 8).

Table 8

Exploratory Model Building results for **female** sample (n=177)

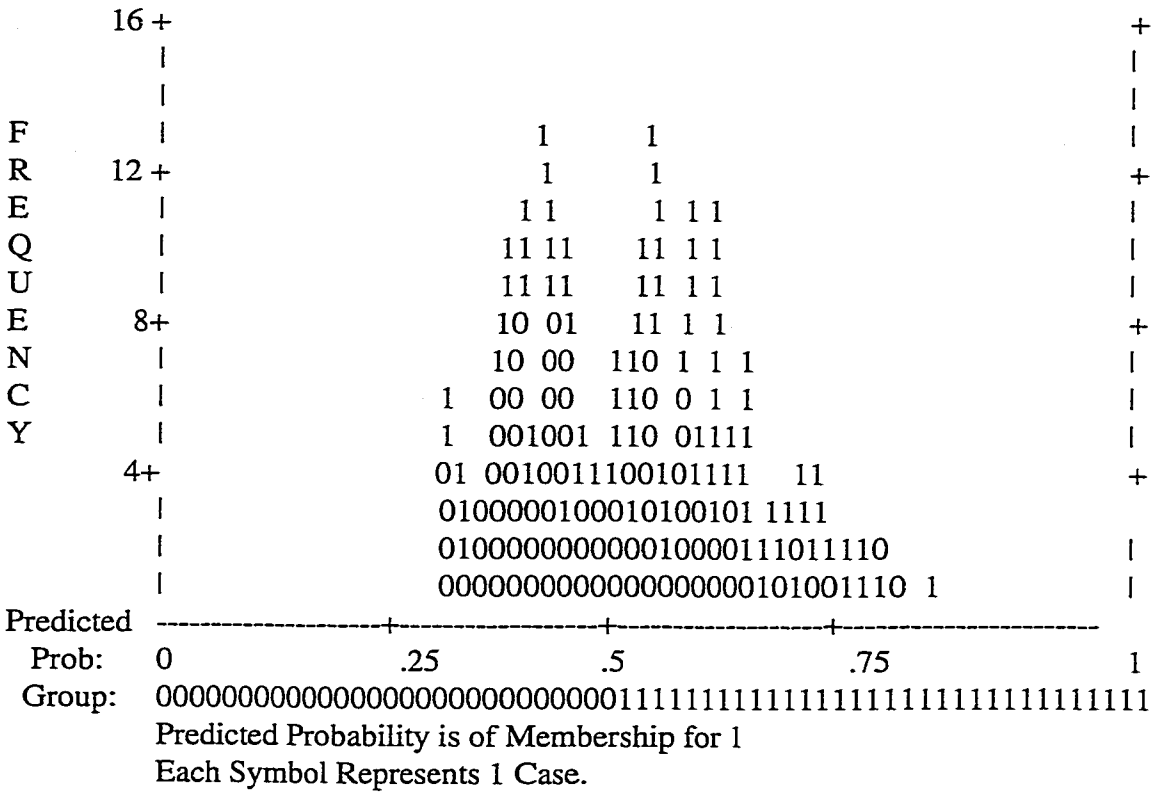
Table 8

Exploratory Model Building: LRA results for female sample (n=177)

Variable	B	SE	Wald's Stat	df	R	odds ratio	-2 log likelihood	df	Model χ^2 (Δ -2LL)	Δ df	Improvement χ^2	df
Best Fit of All Combinations												
Constant	.46	.60	.59	1	--	--	245.32	176	--	--	--	--
EXPLORATORY LRA MODEL							**234.29**	174	**11.04****	2	**11.05****	2
GUIDE	-.26	.13	4.03*	1	-.09	.77		175		1		1
SP.ICS	.06	.02.	6.04**	1	.13	1.06		174		2		1

Note. *p<.05 non-significant, **p<.01 non-significant, ***p<.001 statistically significant.
For LRA definitions and an interpretation guide see Appendix S.

Figure 6. Histogram of Exploratory LRA for the **female** sample.



Male Sample

Exploratory Model Building.

Exploratory LRA for the **male** sample has been conducted as follows (see tables 9 and figure 7).

Exploratory LRA: Direct entry of measures constituting the best model identified for its predictive value of the student entrance into NTS vs. TS.

Exploratory LRA

Analyses select the best model for prediction of NTS entrance of selected variable combinations. Direct Entry of Exploratory LRA items produce significant improvement in model building. For the **male** sample, the best combination of variables included: Choice, ISEI mom and dad, SP.ICS, SP.NPO, SP.PPO, SP.RPS. There is a noteworthy departure in regards to the importance of these variables when analyses with the **male** sample are compared to those of the **female** sample. The Wald Statistic for ISEI mom and dad, SP.NPO, SP.PPO, and SP.RPS all attain statistical significance ($p<.001$). The Wald Statistic for Choice and SP.ICS attain a p-value of ($p<.01$). There is a mix of both negative and positive R values indicative of both increases and decreases of the likelihood of student entrance into NTS, with variable increases accordingly. Correct classifications equal 81% for this model with 84% correctly classified as TS and 77% correctly classified as NTS. In total, 30 out of 185 subjects were misclassified equaling 16%. These figures suggest a considerable improvement in classification ability over previous models. Histogram depiction shows a good clustering of correctly classified cases close to appropriate ends of 0 and 1. Both Model χ^2 and Improvement results reach statistical significance ($p<.001$). This analysis is reflective of a good fit and predictive value of entrance into NTS vs. TS for the **male** sample (see table 9, figure 7).

Table 9

Exploratory Model Building results for **male** sample (n=185)

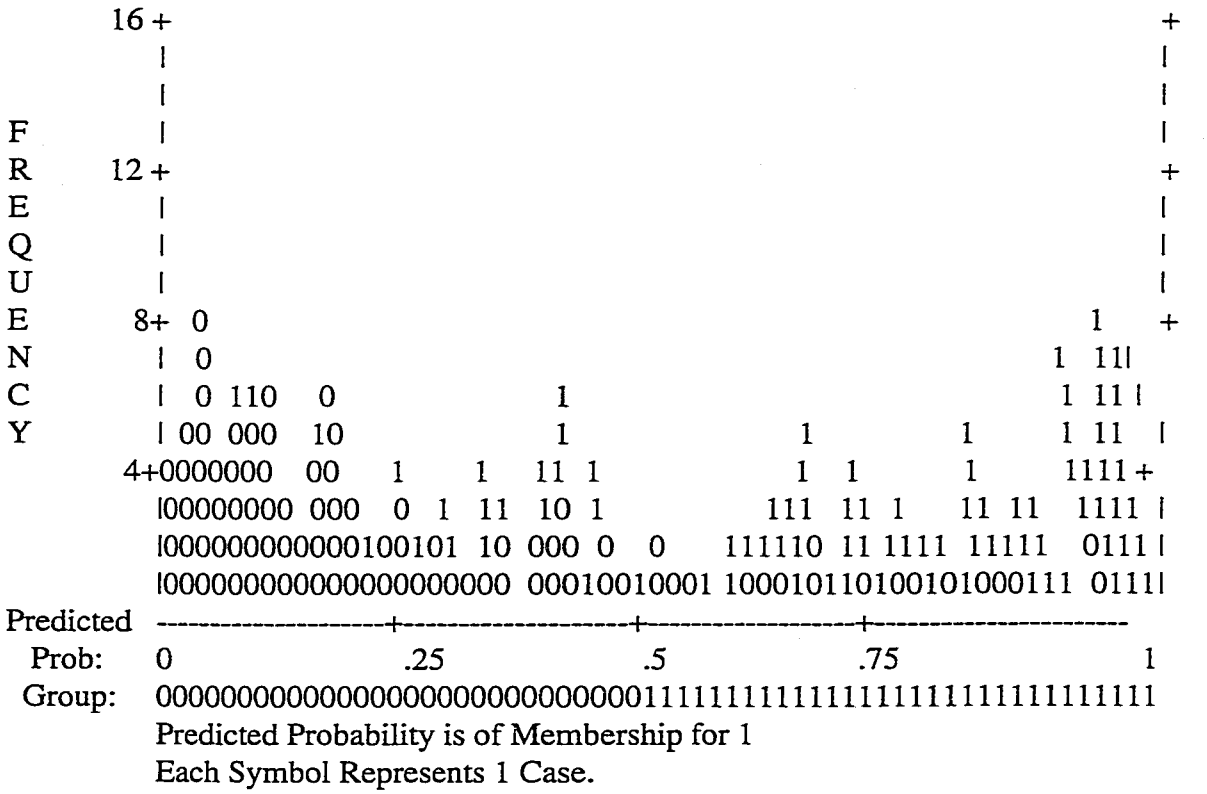
Table 9

Exploratory Model Building: LRA results for male sample (n=185)

Variable	B	SE	Wald's Stat	df	R	odds ratio	-2 log likelihood	df	Model χ^2 (Δ -2LL)	Δ df	Improvement χ^2	df
Best Fit of All Combinations												
Constant	1.35	1.41	.92	1	--	--	255.34	184	--	--	--	--
EXPLORATORY LRA MODEL							158.34	177	97.47***	7	97.47***	7
CHOICE	-.39	.15	6.73**	1	-.14	.68		183		1		1
ISEI dad	-.07	.02	19.5***	1	-.26	.93		182		2		1
ISEI mom	.06	.01	19.7***	1	.27	1.06		181		3		1
SP.ICS	-.10	.04	6.32**	1	-.13	.91		180		4		1
SP.NPO	.12	.04	10.8***	1	.19	1.13		179		5		1
SP.PPO	.36	.09	17.3***	1	.24	1.45		178		6		1
SP.RPS	-.09	.02	15.4***	1	-.23	.91		177		7		1

Note *p< 05 non-significant, **p<.01 non-significant, ***p<.001 statistically significant.
For LRA definitions and an interpretation guide see Appendix S.

Figure 7. Histogram of Exploratory LRA for the **male** sample.



Model Predictive Ability

When making predictions one must choose the best model. Once a model is chosen it is possible to make a prediction based on measure results for any given student. For the **male** sample the best model for predictive purposes of entrance into NTS vs. TS is found in the exploratory analysis. An individual's scores on Choice, ISEI dad, ISEI mom, SP.ICS, SP.NPO, SP.PPO, SP.RPS are utilized to determine the probability of a given individual's entrance into NTS vs. TS based on the values listed for the logistic coefficients in this model. These coefficient values contribute to the model enabling us to calculate the probability that a given student would be enrolled in NTS or TS.

For example, if a **male** student has the following values on the measures listed, Choice = 2, ISEI dad = 50, ISEI mom = 70, SP.ICS = 1, SP.NPO = 3, SP.PPO = 4, SP.RPS = 15 we can predict domain entrance. The following equation will result in a value for the probability of NTS vs. TS entrance (see Appendix R).

Where,

$$\text{Prob(NTS)} = \frac{e^z}{1 + e^z}$$

$$z = 1.35 - .3888(2) - .0701(45) + .0600(70) - .0999(1) + .1209(3) + .3616(4) - .0912(15)$$

$$z = 1.959$$

$$\text{Prob(NTS)} = \frac{e^z}{1+(2.718)^{1.959}} = 0.876$$

With probabilities of greater than 0.5, enrollment in NTS vs. TS is predicted. If probability is less than 0.5 TS is predicted. The probability of this **male** student entering NTS is .876. This is greater than the 0.5 cut-off and suggests that this student is quite likely to enter into NTS vs. traditional studies, given these measure scores for a **male** student.

Once a good model is identified (i.e., exploratory LRA for the **male** sample) this equation can be utilized with any student's measure results to determine probability of domain entrance. The utility of this is two-fold. One, it enables the researcher to make predictions based on the model[13] (noting that the predictions are only as good as the model -- 81% correct classification of the exploratory LRA for the **male** sample can be expected). Two, it highlights the factors most influential in course choice for undergraduate students entering traditional and non-traditional streams of study. The second point of model utility is key, as identification of factors that influence career choice is the goal of this study.

Summary of Findings

In summary, a priori analyses of hypotheses 1 through 4 (individual LRA) were not supported for either the **male** or **female** sample groups. The best combination of all primary predictors for the **female** sample included CAVE failure and SRES. These findings were significant ($p<.01$) but close inspection of classification accuracy revealed an inadequate fit that failed to support our stated $\mathbf{H_o1}$ and $\mathbf{H_o4}$. The best combination of all primary predictors for the **male** sample included SPSI-R and SRES. These findings were significant ($p<.01$). However, once again close inspection revealed only weak predictive ability and overall failed to support our stated hypotheses, $\mathbf{H_o1}$ and $\mathbf{H_o3}$.

The exploratory LRA are more meaningful for the **male** sample but not for the **female** sample. Exploratory LRA identified the best models for classification purposes utilizing additional variables gathered during data collection. For the **male** sample, exploratory LRA (Direct Entry of variables) resulted in the best fit and statistical significance ($p<.001$). For the **male** sample, variables included CHOICE, ISEI mom and dad, SP.ICS, SP.NPO, SP.PPO and

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[13]Model fit will always prove best for cases drawn from the original sample than for any other sample or individual cases as the model was fit to the sample set (Hosmer & Lemeshow, 1989).

SP.RPS. Accurate classification achieved 81% for exploratory LRA with the **male** sample. For the **female** sample, exploratory LRA of the best fit failed to achieve significance with the variables GUIDE and SP.ICS. Classification rate achieved only 60% for this analysis.

CHAPTER V

Discussion

Choosing a career based on interest, ability, and fit is critical in the interest of vocational harmony, job motivation, efficacy, and satisfaction. This ensures that personal resources are congruent with job demands (Chartrand, Strong & Weitzman, 1995). The primary goal of this study is linked to the existing sex segregation in the workforce that continues to plague specific occupational fields. The point of inquiry motivating this study hinged on a specific set of factors which could theoretically influence career choice, as per the theoretical infrastructure developed in chapter II. Were students choosing traditional careers because they were unduly influenced by social cognitive factors such as sex-role stereotypes, or possibly other psychological factors like lack of ability confidence, maladaptive attribution style or limited problem solving skills?

Should these factors be predominant in the career choices made for a lifetime it would appear logical that students would be later encumbered by a sense of post-decisional regret. In contrast, Holland's Theory (1992) of vocational choice suggests that, students who make career choices congruent with interest, ability, and person by environment fit would be well suited, satisfied and content. Whatever the outcome, we remain concerned over the extant gender imbalance and must question the ongoing discordance in education and career selection. We are particularly concerned if the imbalance results from over weighting of social and psychological factors in such decisions.

Summary of Findings: Female Sample

In the case of our **female** sample, hypotheses 1 through 4 were not supported. Sex-role egalitarianism, impostor feelings, attribution style, and social problem solving skills did not account significantly for the **women's** educational choices made for NTS vs. TS

domain entrance. This is true for factors considered individually and as a whole. While we had developed a plausible, empirically supported theoretical rationale in chapter II, the responses provided by these **women** did not support our hypotheses. This is an important finding, suggesting several possibilities: (1) These social or psychological factors were insufficient motivators or predictors of educational choice behaviors for the **female** sample (we may be observing a vocational evolution in career choice where **women** feel freer from the impact of such factors when making these important decisions); (2) The self-report measures selected were not adequately sensitive or specific enough to capture the constructs we were hoping to measure; and (3) Past behavior or behavioral intentions were not adequately addressed as potential choice factors. In retrospect, it is likely that the freedom of opportunity **women** have experienced in past years has opened doors leading to the mastery of a broad range of interests, while enhancing one's personal sense of grasp and competency within many varied realms.

Regardless of the reason, a continued demographic career imbalance across gender remains and thus a need for further exploration exists.

Female Sample: Exploratory Analysis

To fully investigate the information available in our dataset, we developed an exploratory Logistic Regression Analysis which included potential predictors of women's career choice not previously analyzed. This exploratory analysis offered only a slightly improved model in the identification of factors influential in **female** student's educational domain choices. Two factors were identified as most important in predicting student entrance into NTS vs. TS. These variables included GUIDE, and SP.ICS. Unfortunately, this model remains modest as an adequate and accurate predictor of NTS vs. TS domain entrance and fails to improve prediction and classification over previous analyses.

Not only were the primary measures unable to contribute to a good predictive model of NTS vs. TS entrance for the **female** students, neither were additional variables gathered during the data collection. It is possible that the lack of significant findings is due, in part, to insufficient attention to issues of behavioral intention, personal attitudes and social pressures specifically related to educational choice. One potential direction to consider is that accounted for in the Theory of Reasoned Action (TRA) which states that behavioral intentions are the guiding force behind behaviors (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). The TRA also asserts that these intentions are driven by two forces (1) individual perceptions of behaviorally related social pressures or norms; and (2) personal attitudes toward the behavior in question.

Not only does TRA provide a fruitful direction in which to account for the NTS imbalance it also provides a potential explanation for the lack of significant findings in this study. Simply stated, our project may have overlooked or insufficiently addressed personal and societal attitudes, pressures, and norms in the formation of intentionally driven behaviors. If this is the case then, the TRA may pave the way to the identification of areas where attitudinal laden intentions potentially block ability and interest from directing educational pursuits.

One example of how the incorporation of the TRA may prove useful in explaining our non-significant results is related to the Impostor Phenomenon/Ability Confidence measure. The link between this measure and self-efficacy was made earlier in this document (pages 24-26) and plays an important explanatory role of the utility of the TRA for our purposes. Hackett and Watkins (1995) insist that current research shows that "self-efficacy must be assessed with reference to some specific set of behaviors or tasks. Self-efficacy is *not*, conceptually, a stable personality trait" (p. 202). Since our respondents were not instructed to

refer to their educational or occupational choices when completing this component of our questionnaire we lost the benefit of an attitude to behavior link recommended by the TRA.

A measure like the Occupational Self-Efficacy Scale (OSES) does a superior job of assessing ability confidence than the IP in relation to specific vocational choices including non-traditional and traditional occupations (Betz & Hackett, 1993). The OSES has been identified as an effective indicator of self-referenced sex role restrictions in vocational selection. Hence, that measure meets two of our identified research limitations: (1) The measure appears to be more specific and sensitive, and; (2) It more closely adheres to the attitude to behavior chain recommended by the TRA.

The SRES also failed to provide adequate specificity when items were reviewed individually. Only 10 out of the 25 SRES questions were related specifically to career training or occupations. Over half the scale (15 items) related to realms of personal and home life attitudes and behaviors. Certainly, it is not out of the question for an individual to have different attitudes regarding different life spheres. Thus, it is possible that these additional superfluous questions may have further confounded results and led to non-significant findings. The SPSI-R and CAVE were also hindered by problems similar to those found in the IP and SRES measures.

Based on the examples above, it appears possible that by following the logic of the TRA and addressing identified research limitations of lack of measure specificity and sensitivity we may be able build a more robust study to address our research questions.

Summary of Findings: Male Sample

Hypotheses 1 through 4 were not supported for the **male** sample. Sex-role egalitarianism, impostor feelings, attribution style, or social problem solving skills did not account for the **male** student's educational choices made for NTS or TS domain entrance.

This is true for factors considered individually and as a whole. Although our hypotheses were established on a good theoretical base and the statistical power for proposed analyses was satisfactory our results did not support our hypotheses. Despite the lack of a priori statistical significance, a gender imbalance remains in specific educational domains. This implies that other factors not yet analyzed for predictive ability have a greater impact on educational choice for this group of **males.**

Male Sample: Exploratory Analysis

In order to develop a thorough investigation of our dataset, an exploratory Logistic Regression Analysis was conducted. This exploratory LRA provides superior model building and classification results conducive to identifying factors critical in predicting educational domain choice when compared to both the hypotheses testing for the **male** sample and for the **female** sample hypotheses testing and exploratory analysis. As discussed earlier, **Male** students entering NTS have a very different set of criteria from which to base their decisions (see Male Participants: Factors Influencing Choice, p. 40). Specifically, males must weigh a unique set of costs and benefits related to their choices. For **males** entering NTS, the costs include loss of prestige, wages, societal pressures and discrimination versus the potential benefits of improved person-environment fit, time flexibility, job stability, plus reduced occupational demands and risks. Therefore, it is not surprising that the identified factors influencing these choices are very different than those in the **female** sample. The enhanced predictive ability may be accounted for by differences in perception and the specific costs and benefits assumed on the part of **males** entering NTS than for **females** entering NTS.

The exploratory analysis for the **male** sample resulted in a marked improvement in predictive ability in this final LRA over previous LRA's and when compared with the analyses of the **female** data set. The following variables for NTS vs. TS prediction included:

CHOICE, ISEI mom and dad, SP.ICS, SP.NPO, SP.PPO, and SP.RPS. The unique set of costs and benefits for the **male** sample selecting NTS vs. TS appear to play an important role on the predictor variables identified for this sample. Specifically, **male** vs. **female** sample perceptual differences of education/occupation choice may account for the differences in predictive ability of variables for the two sample sets. Also, measure items appear to be more relevant to the **male** than **female** sample. Identified cost/benefit issues (loss of prestige, wages, societal pressures, discrimination, improved person-environment fit, time flexibility, job stability, and reduced occupational demands or risks) appear to be more important for **males** than **females** when making education/career decisions and are seemingly more closely tied to the important predictor variables (CHOICE, ISEI mom and dad, SP.ICS, SP.NPO, SP.PPO, and SP.RPS). The implication of career choice costs and benefits on identified predictors will be discussed in the following paragraphs.

With the variable CHOICE, higher scores indicate a desire to retain the same career choice while lower scores indicate a desire to change, if one had the opportunity to switch. A desire to change careers was a predictor of NTS vs. TS career choice. This implies that the **male** students choosing NTS experience ambivalence or dissatisfaction with their choices. This response might be more reflective of societal pressures and the devaluation of **female** dominated careers rather than personal interest and ability. It is also possible that the **male** students arrive at the conclusion that the benefits of NTS are not worth the psychosocial and monetary costs. One study of occupational desirability characteristics (N=2000) showed that "income was more important for men, whereas relationships with people was more important for women" when selecting a career (Gati, Givon & Osipow, 1995, p. 207). Therefore, these perceived preferences and costs may result in **male** student's ambivalence and desire to join more male dominated domains.

The identification of ISEI mom and dad suggests that socio-economic status of both parents play an important role in career choice for **male** students. These two variables rank the highest as predictors of NTS vs. TS entrance. Higher socioeconomic status for mother's and lower SES for father's is the predictive pattern for these variables. Higher SES is generally linked to power and power has influence. Thus, it is likely that the mother with higher SES leads the family and plays a greater role in influencing the son's career decisions. Decisions that may take a decidedly expressive orientation in families where this SES pattern is evident.

SP.PPO, SP.RPS, SP.NPO, and SP.ICS are all subscale scores derived from the SPSI-R. SP.ICS represents inattention and is scored negatively such that a careful attention to detail is predictive of NTS vs. TS entrance. This finding is in accordance with Maydeu-Olivares and D'Zurilla's (1995) conception of the SPSI-R subscales. The other subscale variables identified as predictors are explained as follows: SP.RPS is characterized by the skillful application of appropriate problem-solving techniques aimed at dealing systematically and purposefully addressing problems and then monitoring their effectiveness; SP.PPO is a positive and persistent attitude towards problems as opportunities for success signaled by direct action; SP.NPO is a measure of problem-solving dysfunction where one believes that problems are risky occasions often leading to negative outcomes.

Our findings show that, concerns about possible negative outcomes is a predictor of NTS vs. TS as represented by SP.NPO for the **male** students. Following this last finding, we recognize an apparent problem solving ambivalence characterized by a combination of both negative (SP.NPO) and positive (SP.PPO) orientations among **male** students selecting NTS vs. TS. Finally, a less systematic approach (SP.RPS) to solving problems is predictive of NTS vs. TS. These findings appear, at times, to be somewhat contradictory and unsupportive

of the SPSI-R scale or our anticipated hypotheses. At the same time, it is possible to interpret the results above as reflecting ambivalence, such that a relatively positive belief in one's ability to solve problems is coupled with a desire to avoid problem solving much of the time. A phenomenon that may fit well within an expressive model characterized by tact, dependence, and passivity (Broverman, Vogel, Broverman, Clarkson, & Rosenkrantz, 1972; Williams & Best, 1982). One can also recall the costs and benefits listed earlier that reinforces the notion of career selection ambivalence among our **male** sample.

Given these exploratory results, we have greater insight toward the planning of future research for a **male** sample. This is particularly true in light of the significant ISEI results which suggest that parental career behavior and socio-economic status play a role in **male** student's choice of NTS over TS. Clearly, career choice post-decisional instability is another factor that seems to point toward NTS vs. TS decisions (Osipow, Carney, & Barak, 1976). Finally, social problem solving skills further contribute to educational choice but in a manner that, once again, suggests decision making ambivalence.

This decision-making element was not directly measured in our study and may prove to be another avenue that could be useful in future research. Numerous studies on measures of career decideness linked to self-efficacy theory have been conducted (Gati, Krausz, & Osipow, 1996; Luzzo, 1996; Luzzo, James, & Luna, 1996; Stead, Watson, & Foxcroft, 1993). The main focus of that work is to identify the individual's degree of difficulty in attaining career decidedness. Imbedded in the Educational-Vocational Undecidedness Scale are four factors (need for structure, perceived external barriers, positive choice conflict and personal conflict) that may be particularly useful in research with **male** samples where career ambivalence and indecision appears to be a salient element (Osipow, Carney, & Barak, 1976).

Conclusions

Notwithstanding the exploratory findings described above, it has become clear over the course of this study that predicting factors that influence educational choices were not readily captured by the selected measures and may require a shift in thinking in order to identify a more elegant explanation of educational imbalances. To recapitulate, our focus needs to be redirected in order to identify factors at the hypotheses testing stage that offer potentially parsimonious solutions to our line of inquiry. This requires a reconceptualization of the importance of past behaviors and educational choice related intentions that up-to-date have not been given adequate attention in this research field (Ajzen & Fishbein, 1980).

Furthermore, the interrelatedness of situations, attitudes, and cognitions is much more complex than was anticipated. The complexity of the interconnectedness of subsystems may further explain our lack of significant findings. Greeno (1998), makes a strong case for this in his suggestion that:

> "Because we have not yet understood the relations between subsystems, we depend on a factoring assumption -- that the properties of the subsystems we are investigating do not depend significantly on the ways in which the other subsystems behave in the specific conditions that we have chosen. Without analyzing the larger systems thoroughly we risk arriving at conclusions that depend on specific features of activities that occur in the special circumstances that we arrange, and that these specific features will prevent generalization to the domains of activity that we hope to understand" (Greeno, 1998, p. 7).

The theoretical foundation upon which we developed this study continues to inform us about the outcome of this research project. The selected primary measures (CAVE, IP/AC, SPSI-R, SRES) laid the groundwork for hypotheses 1 through 4. We have learned something

about each of these measures and how they relate to our sample groups.

Contrary to our expectations the attribution measure failed to show predictive strength despite being developed explicitly to tap real life experiences of study participants. According to Weiner (1992), motivation is explained through Attribution Theory and linked to perceptions of past conditions or experiences. The CAVE measure utilized in this study attempted to capture the motivational link to past experience by asking the following open-ended questions "I was successful/unsuccessful when..." and "I believe this success/failure was due to...". Questioning should more precisely address current educational experiences in order to more closely maintain a past to current behavior chain (Ajzen & Fishbein, 1980; Weiner, 1992). Succinctly directing questions to educationally related attributions of success and failure may improve the predictive value of this measure. This is a refinement of a measure that may still offer utility in future research.

As Beggs and Doolittle (1993) reported, perception of non-traditional career appropriateness was not enough to lead to noteworthy increases in numbers of women entering non-traditional courses. Our study was also unable to support egalitarian views toward NTS as a reliable predictor of domain entrance possibly due to costs outweighing benefits. However, earlier studies did find more elevated egalitarianism among women in non-traditional than those in traditional fields (Brabeck & Weisgerber, 1989; King & King, 1985). The critical point here, is that the sampling pool in those studies were women already employed. Our sample was contained within a university setting and did not include individuals currently employed in a broad spectrum of non-traditional and traditional occupations. Once a committment to a field has been established through training and employment, giving real world reinforcement contingencies a chance to generate tangible benefits and costs, a different prediction pattern may emerge.

Mazen and Lemkau (1990) reported a measure of masculinity-feminity to be the strongest factor in differentiating non-traditional vs. traditional studies among women. NTS and TS are respectively linked to instrumentality and expressiveness for women (Williams & Best, 1982; Spence & Helmreich, 1978). It is possible that SRES, being more of an attitudinal measure, simply failed to adequately capture this connection and thus failed as a predictor of NTS vs. TS entrance. Based on Greeno's (1998) theoretical assumptions of interconnecting subsystems, SRES scores were further complicated as they are comprised of six life attitude factors and this may have confounded the few questions pertaining directly to attitudes relating to education and employment. There was no precedent for extracting employment and education attitudinal subscores and hence this technique was not used in our data collection. However, we recommend future studies consider the utilization of factor extraction or integration of a more precise measure of these attitudes where prediction of NTS vs. TS remains the goal.

Although Impostor Phenomenon/Ability Confidence did not function as an effective predictor in our analyses, these results do point to a potentially positive outcome -- where students forge ahead in the hope of achieving their goals based on previous positive experiences despite Impostor feelings. Since Clance and Imes (1978) began their investigations into the IP they were always able to find individuals who had shown great successes in a variety of fields despite their Impostor feelings. In this case, non-significant findings are laced with a sense of hopefulness, particularly in light of research suggesting that up to 49% of successful female students have impostor feelings (Baranowsky & Collins, 1997). Baranowsky and Collins (1997), also found that continued evidence of success did not result in lower Impostor scores among these female students. The good news is that these Impostor feelings may not turn out to be a major block to goal pursuit or achievement.

The five factor Social Problem Solving Inventory (Maydeu-Olivares & D'Zurilla, 1995) did not operate as a good predictor of NTS vs. TS at the hypotheses testing stage. In exploratory analysis problem solving factors were identified in a model for predicting NTS entrance for **male** students. The fact that specific SPSI-R, subscale scores surfaced as significant predictors in exploratory LRA suggests that the global measure (a combination of the five factors) was not a sensitive measure of problem solving. Thus, it failed as a predictor until exploratory analysis revealed the more sensitive subscale items. Hence, specific social problem solving factors continue to hold some promise for future work in this area with the recognition that subtest items are more likely to produce predictive results than the global measure.

We also found a discrepancy in predictive value of these problem solving items between the **male** and **female** subgroups at the exploratory stage. Prior to this point we had already identified the **male** and **female** groups as distinct and separated them for analyses. There were both empirical and theoretical bases for viewing these subgroups as separate. Our findings appear to offer additional verification of this distinction.

As in past studies, sex continues to be the best single predictor of entrance into NTS and TS by definition and based on the literature (Anderson, 1994; Lefevre, Kulak & Heyman, 1992; Singer & Stake, 1986). In fact, Steinkamp and Maehr (1984) reported that female students had greater egalitarian attitudes toward science courses but these attitudes were not sufficient to increase course enrollment in these disciplines. Interestingly, lack of enrollment in NTS for women does not mean poor past performance or lack of interest in these areas. Once again, these studies point us in the direction of using the Theory of Reasoned Action model (Ajzen & Fishbein, 1980) while attending closely to behaviorally linked attitudes and intentions to guide further investigations in this field.

Study Strengths and Limitations

To an extent, the psychosocial and cognitive factors that influence NTS vs. TS choices remain uncertain and therefore a clear direction to address current career imbalance eludes our grasp. As illustrated earlier, it seems possible that a behaviorally based measure of career intention linked to NTS vs. TS choice could have improved predictive ability of our models (Fishbein & Ajzen, 1980).

Further, a measure of expressive vs. instrumental participant gender-role orientation may have enhanced the theoretical strength of the study questionnaire and possibly explained more of the variance than the selected study measures. Such a measure may have helped to clarify the differences in findings among the female and male sample sets. What we do know and have discussed earlier in this document is that gender-role orientation tends to be a motivator in the selection of careers (Broverman, et. al., 1972; Spence & Helmreich, 1980). We had hoped to capture these constructs in the SRES measure but in retrospect it is possible that this measure was not specific enough to adequately assess instrumental vs. expressive career orientation.

Finally, a broader Socioeconomic and job range (i.e., truck drivers, mechanics, electricians, secretaries, nurses aids, factory workers) might have resulted in a very different outcome for scale means. This is based on the notion that university students are for the most part higher in SES, more sophisticated test takers, and likely to be more liberal as a whole than those with a lower socioeconomic and educational backgrounds. Social desirability may have also played a role among this select group of students studying in NT and TS.

Despite the study limitations noted above, this project continues to rest upon a good research and theoretical base that point toward the likelihood of the stated hypotheses. Power analyses were conducted to provide adequately for analyses conducted with ample sample

size. Power was set at .80 and alpha = .05 (see Appendix O). A full sampling of both the **male** and **female** participants allowed us to analyze different groups on the same measures. It also provided further research on an infrequently studied group -- **male** students entering NTS. Utilization of Logistic Regression Analyses enabled us to build models in a search of factors that would best predict NTS study choice. Although these analyses were not as informative as we had hoped they did assist us in: (1) ruling out variables that had not proven to be good predictors of NTS vs. TS; (2) a reconceptualization of the problem, and subsequently; (3) the identification of new avenues of research.

Contributions

The key contributions made in this study include:

(1) Primary measures (ie., IP/AC) have been ruled-out in the search for a model best suited to predict non-traditional vs. traditional study choice.

(2) The male and female samples have been identified as distinct in two ways. First, there was a significant Sex * SRES interaction, and second, the LRA resulted in very different findings for these sample groups.

(3) The study identifies a reconceptualization and new direction in which to take future research of a similar nature (i.e., toward behaviorally linked intentional measures of NTS vs. TS, Theory of Reasoned Action).

(4) Exploratory analyses with the male sample gave greater clarity in model building for the prediction of NTS.

(5) Superior model building capabilities based on study measures for the male sample point out noteworthy perceptual differences among males entering NTS than for females. The variability in our sample sets presents another excellent line of inquiry for future research.

(6) Statistical power of this study was set at a respectable level and would have found effects 80% of the time had effects been present. Thus, suggesting that our non-significant findings remain noteworthy.

Future Directions

Although we continue to see a shortage of women and men in specific career fields this does not appear to be influenced by the psychosocial and cognitive factors identified in this study. This is a positive finding at best, suggesting that the motivation behind career choices are not hindered by limiting beliefs about one's ability, deficits in social problem solving, maladaptive attributions, or restrictive sex-role views. It is a hopeful scenario where students feel empowered to make choices that are well-suited to their interests, abilities, and needs and career related post-decisional regret will not surface later in life. A less hopeful picture would identify not yet specified psychosocial and cognitive factors that play a role in career choice that put students at risk of making choices that will not provide the best long-term out-come either for individuals or society as a whole.

As discussed earlier, the Theory of Reasoned Action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) appears to provide a potential future direction for understanding the imbalance in non-traditional study choice particularly for female students but also for the male students. This model continues to receive attention by researchers and has been found to have predictive utility in two recent studies (Hedeker, Flay & Petraitis, 1996; Yang, Blunt & Butler, 1994). This points us to the utilization of a behaviorally driven intentional measure linked to choice of NTS vs. TS choice that may prove to be a crucial as yet unresearched mediating link.

A more decisive measure of instrumentality and expressive orientation may also highlight the strength of that construct as a predictor of educational choice. ISEI has some

promising features and would be useful in a future study with a similar goal. Choice factors related to career decision ambivalence, more precise measures of problem solving, and a measure of vocational self-efficacy may all enhance predictive ability in future research of a similar nature. Finally, in order to further our knowledge of the factors influencing career choice we must consider the impact of interest and ability as they relate to the past and present behavior change (TRA).

In conclusion, we must recall the research goal of identifying factors that link existing workforce sex segregation with prior non-traditional vs. traditional study choice and the reasons behind this disparity. The imbalance continues and discordance in opportunities and career contributions still require attention. Concentrating on the new directions identified in this study and the recognition of low yield constructs that have been ruled out is a good place to start on the journey toward occupational balance and harmony.

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Appendix A
Career Choice Study
SRES form BB

Below are statements about men and women. Read each statement and decide how much you agree or disagree. We are not interested in what society says. We are interested in your personal opinions. For each statement, choose the number that describe(s) your opinion. Please do not omit any statements. Remember to choose only one of the five number choices for each statement. Place the appropriate number in the parentheses ( ) next to the appropriate number on the questionnaire, then transcribe this onto the computer sheet provided.

1 = Strongly Agree
2 = Agree
3 = Neutral or undecided or no opinion
4 = Disagree
5 = Strongly disagree

1. ( ) Home economics courses should be as acceptable for male students as for female students.

2. ( ) Women have as much ability as men to make major business decisions.

3. ( ) High school counselors should encourage qualified women to enter technical fields like engineering.

4. ( ) Cleaning up the dishes should be the shared responsibility of husbands and wives.

5. ( ) A husband should leave the care of young babies to his wife.

6. ( ) The family home will run better if the father, rather than the mother, sets the rules for the children.

7. ( ) It should be the mother's responsibility, not the father's, to plan the young child's birthday party.

8. ( ) When a child awakens at night, the mother should take care of the child's needs.

9. ( ) Men and women should be given an equal chance for professional training.

10. ( )It is worse for a woman to get drunk than for a man.

11. ( )When it comes to planning a party, women are better judges of which people to invite.

12. ( )The entry of women into traditionally male jobs should be discouraged.

Appendix A

13. ( )Expensive job training should be given mostly to men.

14. ( )The husband should be the head of the family.

15. ( )It is wrong for a man to enter a traditionally female career.

16. ( )Important career-related decisions should be left to the husband.

17. ( )A woman should be careful not to appear smarter than the man she is dating.

18. ( )Women are more likely than men to gossip about people they know.

19. ( )A husband should not meddle with the domestic affairs of the household.

20. ( )It is more appropriate for a mother, rather than a father, to change their baby's diapers.

21. ( )When two people are dating, it is best if they base their social life around the man's friends.

22. ( )Women are just as capable as men to run a business.

23. ( )When a couple is invited to a party, the wife, not the husband, should accept or decline the invitation.

24. ( )Men and women should be treated the same when applying for student loans.

25. ( )Equal opportunity for all jobs regardless of sex is an ideal we should all support.

IP Questionnaire

Circle the appropriate number on the questions that follow. Fill in the corresponding number on your computer op-scan sheet with answer of your choice. Give the first response that enters your mind rather than dwelling on each statement and thinking about it over and over.

26. I have often succeeded on a test or task even though I was afraid that I would not do well before I undertook the task.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

27. I can give the impression that I'm more competent than I really am.

1	2	3	4	5

28. I avoid evaluations if possible and have a dread of others evaluating me.

1	2	3	4	5

Appendix A

29. When people praise me for something I've accomplished, I'm afraid I won't be able to live up to their expectations of me in the future.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

30. I sometimes think I obtained my present position or gained my present success because I happened to be in the right place at the right time or knew the right people.

1 2 3 4 5

31. I'm afraid people important to me may find out that I'm not as capable as they think I am.

1 2 3 4 5

32. I tend to remember the incidents in which I have not done my best more than those times I have done my best.

1 2 3 4 5

33. I rarely do a project or task as well as I'd like to do it.

1 2 3 4 5

34. Sometimes I feel or believe that my success in my life or in my job has been the result of some kind of error.

1 2 3 4 5

35. It's hard for me to accept compliments or praise about my intelligence or accomplishments.

1 2 3 4 5

36. At times, I feel my success has been due to some kind of luck.

1 2 3 4 5

37. I'm disappointed at times in my present accomplishments and think I should have accomplished much more.

1 2 3 4 5

38. Sometimes I'm afraid others will discover how much knowledge or ability I really lack.

1 2 3 4 5

39. I'm often afraid that I may fail at a new assignment or undertaking even though I generally do well at what I attempt.

1 2 3 4 5

40. When I've succeeded at something and received recognition for my accomplishments, I have doubts that I can keep repeating that success.

1 2 3 4 5

Appendix A

41. If I receive a great deal of praise and recognition for something I've accomplished, I tend to discount the important of what I have done.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

42. I often compare my ability to those around me and think they may be more intelligent than I am.

1 2 3 4 5

43. I often worry about not succeeding with a project or on an examination, even though others around me have considerable confidence that I will do well.

1 2 3 4 5

44. If I'm going to receive a promotion or gain recognition of some kind, I hesitate to tell others until it is an accomplished fact.

1 2 3 4 5

45. I feel bad and discouraged if I'm not "the best" or at least "very special" in situations that involve achievement.

1 2 3 4 5

SPSI-R Questions

Below are a series of statements that might describe the way some people might think, feel and behave when they are faced with problems in everyday living. We are talking about important problems that could have a significant effect on your well-being or the well-being of your loved ones, such as health-related problems, a dispute with a family member, or a problem with your performance at work or in school. Please read each statement and carefully select one of the numbers below which indicates the extent to which the statement is true for you. Consider yourself as you typically think, feel, and behave when you are faced with problems in living these days and place the appropriate number in the parentheses ( ) next to the appropriate number on the questionnaire, then transcribe this onto the computer sheet provided.

0 = Not at all true of me
1 = Slightly true of me
2 = Moderately true of me
3 = Very true of me
4 = Extremely true of me

46. ( )I spend too much time worrying about my problems instead of trying to solve them.

47. ( )I usually feel threatened and afraid when I have an important problem to solve.

Appendix A

0 = Not at all true of me
1 = Slightly true of me
2 = Moderately true of me
3 = Very true of me
4 = Extremely true of me

48. ( )When making decisions, I do not usually evaluate and compare the different alternatives carefully enough.

49. ( )When I am attempting to decide what is the best solution to a problem, I often fail to take into account the effect that each alternative is likely to have on the well-being of other people.

50. ( )When I am trying to find a solution to a problem, I often think of a number of possible solutions and then try to combine different solutions to make a better solution.

51. ( )I usually feel nervous and unsure of myself when I have an important decision to make.

52. ( )When my first efforts to solve a problem fail, I usually think that if I persist and do not give up too easily, I will be able to find a good solution eventually.

53. ( )When I am attempting to solve a problem, I usually act on the first idea that comes to mind.

54. ( )When I have a problem I usually believe that there is a solution for it.

55. ( )I usually wait to see if a problem will resolve itself first, before trying to solve it myself.

56. ( )When I have a problem to solve, one of the things I do is analyze the situation and try to identify what obstacles are keeping me from getting what I want.

57. ( )When my first efforts to solve a problem fail, I get very angry and frustrated.

58. ( )When I am faced with a difficult problem, I often doubt that I will be able to solve it on my own no matter how hard I try.

59. ( )When a problem occurs in my life, I usually put off trying to solve it for as long as possible.

60. ( )After carrying out a solution to a problem, I do not usually take the time to evaluate all of the results carefully.

61. ( )I usually go out of my way to avoid having to deal with problems in my life.

Appendix A

0 = Not at all true of me
1 = Slightly true of me
2 = Moderately true of me
3 = Very true of me
4 = Extremely true of me

62. ( )Difficult problems make me very upset.

63. ( )When I am attempting to decide what is the best solution to a problem, I try to predict the overall outcome of carrying out each alternative course of action.

64. ( )I usually confront my problems "head on," instead of trying to avoid them.

65. ( )When I am attempting to solve a problem, I often try to be creative and think of original or unconventional solutions.

66. ( )When I am attempting to solve a problem, I usually go with the first good idea that comes to mind.

67. ( )When I attempt to think of possible solutions to a problem, I cannot usually come up with many alternatives.

68. ( ) I usually prefer to avoid problems instead of confronting them and being forced to deal with them.

69. ( )When making decisions, I usually consider not only the immediate consequences of each alternative course of action, but also the long-term consequences.

70. ( )After carrying out a solution to a problem, I usually try to analyze what went right and what went wrong.

71. ( )After carrying out a solution to a problem, I usually examine my feelings and evaluate how much they have changed for the better.

72. ( )Before carrying out a solution to a problem in the actual problematic situation, I often practice or rehearse the solution in order to increase my chances of success.

73. ( )When I am faced with a difficult problem, I usually believe that I will be able to solve the problem on my own if I try hard enough.

74. ( )When I have a problem to solve, one of the first things I do is get as many facts about the problem as possible.

75. ( )I often put off solving problems until it is too late to do anything about them.

76. ( )I think that I spend more time avoiding my problems than solving them.

Appendix A

0 = Not at all true of me
1 = Slightly true of me
2 = Moderately true of me
3 = Very true of me
4 = Extremely true of me

77. ( )When I am attempting to solve a problem, I often get so upset that I cannot think clearly.

78. ( )Before I try to think of a solution to a problem, I usually set a specific goal that makes clear exactly what I want to accomplish.

79. ( )When I am attempting to decide what is the best solution to a problem, I do not usually take the time to consider the pros and cons of each solution alternative.

80. ( )When the outcome of my solution to a problem is not satisfactory, I usually try to find out what went wrong and then I try again.

81. ( )I hate having to solve the problems that occur in my life.

82. ( )After carrying out a solution to a problem, I usually try to evaluate as carefully as possible how much the situation has changed for the better.

83. ( )When I have a problem I usually try to see it as a challenge, or opportunity to benefit in some positive way from having the problem.

84. ( )When I am attempting to solve a problem, I usually think of as many alternative solutions as possible until I cannot come up with any more ideas.

85. ( )When I am attempting to decide what is the best solution to a problem, I usually try to weigh the consequences of each solution alternative and compare them against each other.

86. ( )I often become depressed and immobilized when I have an important problem to solve.

87. ( )When I am faced with a difficult problem, I usually try to avoid the problem or I go to someone else for help in solving it.

88. ( )When I am attempting to decide what is the best solution to a problem, I usually consider the effect that each alternative course of action is likely to have on my personal feelings.

89. ( )When I have a problem to solve, one of the things I do is examine what sort of external circumstances in my environment might be contributing to the problem.

Appendix A

0 = Not at all true of me
1 = Slightly true of me
2 = Moderately true of me
3 = Very true of me
4 = Extremely true of me

90. ( )When making decisions, I usually go with my "gut feeling" without thinking too much about the consequences of each alternative.

91. ( )When making decisions, I generally use a systematic method for judging and comparing alternatives.

92. ( )When I am attempting to find a solution to a problem, I try to keep in mind what my goal is at all times.

93. ( )When I am attempting to find a solution to a problem, I try to approach the problem from as many different angles as possible.

94. ( )When I am having trouble understanding a problem, I usually try to get more specific and concrete information about the problem to help clarify it.

95. ( )When my first efforts to solve a problem fail, I tend to get discouraged and depressed.

96. ( )When a solution that I have carried out does not solve my problem satisfactorily, I do not usually take the time to examine carefully why it did not work.

97. ( )I think that I am too impulsive when it comes to making decisions.

General Questions

Continue using the computer op-scan sheet for answers to numbered questions only. Answer questions A through P directly on this questionnaire.

A. Date of Birth: (month/day/year) Age _____

B. First and Last initials: Male ❑ Female ❑

C. Major: _____
(e.g., Nursing, English, Engineering, Computer Science, etc.)

98. University Year: (number of university years completed)
_____

D. Circle Approximate Current GPA: (if you do not know your exact GPA give an estimate)
A+=10; A=9; A-=8; B+=7; B=6; C+=5; C=4; D+=3; D=2; E=1; F=0.

E. Marital Status: Married ❑ Single ❑ Divorced ❑ Separated ❑

Appendix A

F. Language fluency: English ❑ French ❑ Both ❑

G. Mother's work (Please be specific): _____

H. Mother's highest level of education (Please be specific): _____

I. Father's work (Please be specific): _____

J. Father's highest level of education (Please be specific): _____

K. Mentors/Role models: [Fill in the blank space below with the person who fits the description of a mentor or a role model best in your life. Please indicate whether this person is/was male or female. For example, high school biology teacher, female].

_____

99. Circle the number below that most closely reflects how supportive your mother was concerning your choice of academic major?

Extremely supportive 1 2 3 4 5 Not supportive at all

100. How supportive was your father concerning your choice of academic major?

Extremely supportive 1 2 3 4 5 Not supportive at all

101. Circle the number below that most closely reflects how much of a role a guidance counselor(s) played in your educational choice?

Extremely Influential 1 2 3 4 5 Not influential at all

102. If you had a chance to make your career choice over again would you choose differently?

Most definitely 1 2 3 4 5 Definitely not

L. If you would choose a different field and you know what it would be, name that field below. _____

103. How many hours per week on average do you spend on volunteer activities? _____

104. How many brothers and sisters do you have? _____

105. Where are you in the birth order (e.g., 1st = oldest) _____

Appendix A

CAVE Section

You have almost made it to the end of this questionnaire. In this last section we are interested in how you view your own accomplishments and the times where the outcome was not as satisfactory as you would have hoped. Please think back over experiences you have had in the last few years, and determine one instance in which you accomplished something important to you and another time when you failed to do so. This may have occurred in any situation you feel is important to you and there is no one right answer. Briefly describe the situation and the reasons you believe things turned out as they did.

M. I was successful when:

_____

_____

_____

N. I believe this success was due to:

_____

_____

_____

O. I was unsuccessful when:

_____

_____

_____

P. I believe this failure was due to:

_____

_____

_____

Thank you for participating in this research project your effort is highly valued.

Appendix B
Recruitment Letter to Classes

Dear Student,

I am a Doctoral student in the Psychology Department at the University of Ottawa. I am currently working on my dissertation research which is being supervised by Dr. Michael McCarrey. I am asking for your volunteer participation in my research project.

If you decide to participate in this study, you will be given a questionnaire that will ask questions regarding decision making tendencies, your reactions to task outcome, feelings of confidence and competence, and statements regarding male and female roles. This will be followed by a number of demographic type questions regarding career aspirations, grade point average, time spent at volunteer work, etc. There is no right or wrong answer to any of these questions. Please use the OP-Scan computer sheet provided for questions numbered 1 through 105. Answer the lettered questions A through P directly on the questionnaire. Keep the Op-Scan sheet tucked into the questionnaire once you are completed so these sheets are not separated.

The questionnaire will take approximately 40 minutes to complete. Any information you share will be kept strictly confidential, as your name will not appear on the questionnaire, and all completed forms will be coded and kept in a secure locked room. Furthermore, the information you provide on your questionnaire will be anonymously analyzed on a group basis only. Please be aware that you can decide to withdraw from participating at any point in time, without any penalty whatsoever. We do ask you to keep the contents of this questionnaire confidential as we will be recruiting volunteers from other classes and this will help to maintain the integrity of this research project.

After completing the questionnaire you will be given a letter of debriefing that explains more fully the research questions being asked. I will return to your classroom in one week's time to pick-up completed questionnaires and distribute letters of debriefing. If you have any concerns or comments, or you wish to know the results of this study you may contact me, Anna B. Baranowsky at the Department of Psychology, University of Ottawa, Montpetit room 418, Ottawa, Ontario, K1N 6N5, or my supervisor, Dr. McCarrey, at 562-5800, ext. 4307. Your consent to participate in the study is assumed when you complete and return your questionnaire, after reading this letter. Your participation is highly valued and we appreciate your time and interest. Thank you for your cooperation and attention.

Sincerely,

Anna B. Baranowsky

Appendix C
Letter of Debriefing

Dear Participant,

Thank you for your time and effort in contributing to this study. The goal of this project is to gain some knowledge of the predictors of entrance into studies currently deemed non-traditional or traditional (those greater than 70% male or female dominated based on current statistics). As a means of gaining this knowledge we have chosen to use the Sex Role Egalitarianism Scale (which tells us about attitudes towards the equality of women and men), the Social Problem Solving Inventory Revised (which measures individual problem solving abilities), the Impostor Phenomenon Scale (which informs us on how confident of your abilities you are), a series of open ended attribution questions -- CAVE section (the tendency to see our successes or failures as being due to internal reliable abilities or external factors out of our own control), and some personal demographic information. The purpose of this study is to clarify the tools needed to choose one's course of study based on true desire, ability, and knowledge, rather than on any unsubstantiated perceived limitation on the part of the student.

If you would like to know the results of this study you can leave your name, phone number, and the name of the project researcher (Anna Baranowsky) with Dr. Michael McCarrey at 562-5800 ext.4307. I can be contacted at the following address: Anna B. Baranowsky, Department of Psychology, University of Ottawa, Montpetit room 418, Ottawa, Ontario, K1N 6N5. Please feel free to contact either of us if you have any questions regarding this project. A summary of findings will be made available, once the study is complete, for those who are interested.

We will be recruiting other students from this university and would appreciate your effort to keep the details of this questionnaire secure, as this ensures that the research remains uncompromised.

Thank you once again for your valuable contribution to this research project.

Sincerely,

Anna B. Baranowsky

Appendix D

Recruitment Script to Classes

Hello, my name is Anna Baranowsky and I am a Doctoral student in the Department of Psychology at the University of Ottawa. I am currently working on my dissertation research conducted under the supervision of Dr. Michael McCarrey. Your Professor has given me permission to address you so I may ask for your participation in a research project. This is on a completely volunteer basis and will not have any bearing on your course marks.

Choosing your career will be one of the most important life decisions you make. Making the wrong decision can lead to considerable distress, while choosing the career most suited to you will lead to satisfaction on many levels. The information you provide will help us to understand the factors that influence career choice and help us aid students in making the best choices for themselves in the future.

If you choose to participate, you will be given a questionnaire to fill out. You will then be asked to answer statements regarding male and female roles, feelings of competence, decision making skills, and reactions to task outcomes. This will be followed by a number of demographic type questions regarding career aspirations, grade point average, time spent at volunteer work, etc.

The questionnaire will take approximately 40 minutes to complete. Any information you share will be kept strictly confidential, as your name will not appear on the questionnaire, and all completed forms will be coded and kept in a secure locked room. Please be aware that you can decide to withdraw from participating at any point in time, without any penalty whatsoever.

After completing the questionnaire you will receive a letter of debriefing that explains more fully the research questions being asked and where to contact the researcher if you have any further questions regarding this project. I will return to your classroom in one week's time to pick-up completed questionnaires and distribute letters of debriefing. If you would like to know the results of this study you can leave your name, phone number, and the name of this project researcher (Anna Baranowsky) with Dr. Michael McCarrey at 562-5800 ext.4307.

Your consent to participate in the study is assumed when you complete and return your questionnaire. Your participation is highly valued and we appreciate your time and interest. Thank you for your cooperation and attention.

Appendix E

Letter of Informed Consent (Carleton Psychology)

Dear Student,

I am a Doctoral student in the Psychology Department at the University of Ottawa. I am currently working on my dissertation research (Titled: Career Choices) which is being supervised by Dr. Michael McCarrey. I am asking for your volunteer participation in my research project. The purpose of this study is to examine factors that influence career choices and the tools needed to aid students in making the best career choice for themselves.

If you decide to participate in this study, you will be given a questionnaire (Titled: Predictors questionnaire) that will ask questions regarding decision making tendencies, your reactions to task outcome, feelings of confidence and competence, and statements regarding male and female roles. This will be followed by a number of demographic type questions regarding career aspirations, grade point average, time spent at volunteer work, etc. There is no right or wrong answer to any of these questions. Please use the OP-Scan sheets provided for questions numbered 1 through 105.

The questionnaire will take approximately 30 minutes to complete. Any information you share will be kept strictly confidential, as your name will not appear on the questionnaire, and all completed forms will be coded and kept in a secure locked room. Furthermore, the information you provide on your questionnaire will be anonymously analyzed on a group basis only. Please be aware that you can decide to withdraw from participating at any point in time, without any penalty whatsoever. There are no potential physical or psychological risks in this experiment. However, the questions may lead you to feel a need to further investigate your career choice or speak with someone regarding the responses you made on the questionnaire. Carleton University offers both career and personal counseling at Counseling and Student Life Services (tel. # 520-6600).

After completing the questionnaire you will be given a letter of debriefing that explains more fully the research questions being asked. If you have any concerns about how this project has been conducted or the contents of the questionnaire, you may contact your Ethics Chair Dr. Lise Paquet at 520-2600 ext. 2692 or Dr. Bill Jones, Department Chair at 520-2600 ext. 2648. If you have any questions or comments, or wish to know the results of this study you may contact myself, Anna B. Baranowsky at the Department of Psychology, University of Ottawa, Montpetit room 418, Ottawa, Ontario, K1N 6N5, or my supervisor, Dr. McCarrey, at 562-5800, ext. 4307. If you decide to participate in this study please sign this letter of informed consent prior to handing in your completed questionnaire. Your participation is highly valued and we appreciate your time and interest. Thank you for your cooperation and attention.

I have read the above description of the Career Choices study and understand the conditions of my participation. My signature indicates that I agree to participate in the experiment.

Participants Name: _____

Participants Signature: _____

Research Name: _____

Research Signature:_____

Date: _____

Appendix F
Letter of Debriefing (Carleton Psychology)

Dear Participant,

Thank you for your time and effort in contributing to this study. The goal of this project is to gain some knowledge of the predictors of entrance into studies currently deemed non-traditional or traditional (those greater than 70% male or female dominated based on current statistics). As a means of gaining this knowledge we have chosen to use the Sex Role Egalitarianism Scale (which tells us about attitudes towards the equality of women and men), the Social Problem Solving Inventory Revised (which measures individual problem solving abilities), the Impostor Phenomenon Scale (which informs us on how confident of your abilities you are), series of open ended attribution questions-CAVE section (the tendency to see our successes or failures as being due to internal reliable abilities or external factors out of our own control), and some personal demographic information. The purpose of this study is to clarify the tools needed to choose one's course of study based on true desire, ability, and knowledge, rather than on any unsubstantiated perceived limitation on the part of the student.

If you would like to know the results of this study you can leave your name, phone number, and the name of this project (see front page of questionnaire) with Dr. Michael McCarrey at 562-5800 ext.4307. I can be contacted at the following address: Anna B. Baranowsky, Department of Psychology, University of Ottawa, Montpetit room 418, Ottawa, Ontario, K1N 6N5. Please feel free to contact us in regards to any questions you may have about this project. A summary of findings will be made available, once the study is complete, for those who are interested. If you have any ethical concerns about how this project has been conducted or the contents of the questionnaire, you may contact your Ethics Chair Dr. Lise Paquet at 520-2600 ext. 2692 or Dr. Bill Jones, Department Chair at 520-2600 ext. 2648.

There are no potential physical or psychological risks in this experiment. However, the questions may lead you to feel a need to further investigate your career choice or speak with someone regarding the responses you made on the questionnaire. Carleton University offers both career and personal counseling at Counseling and Student Life Services (tel. # 520-6600).

We will be recruiting other students from this university and would appreciate your effort to keep the details of this questionnaire secure, as this ensures that the research remains uncompromised.

Thank you once again for your valuable contribution to this research project.

Sincerely,

Anna B. Baranowsky

Appendix G

Announcement for Recruiting

Recruitment Script to Classes (Carleton Psychology)

Hello, my name is Anna Baranowsky and I am a Doctoral student in the Department of Psychology at the University of Ottawa. I am currently working on my dissertation research conducted under the supervision of Dr. Michael McCarrey. Your Professor has given me permission to speak with you so I may ask for your participation in a research project. This is on a completely volunteer basis and will not have any bearing on your course marks.

Choosing your career will be one of the most important life decisions you make. Making the wrong decision can lead to considerable distress, while choosing the career most suited to you will lead to satisfaction on many levels. The information you provide will help us to understand the factors that influence career choice and help us aid students in making the best choices for themselves in the future.

If you choose to participate, you will be given a questionnaire to fill out. You will then be asked to answer statements regarding male and female roles, feelings of competence, decision making skills, and reactions to task outcomes. This will be followed by a number of demographic type questions regarding career aspirations, grade point average, time spent at volunteer work, etc.

The questionnaire will take approximately 30 minutes to complete at home. I will return the following week to collect completed forms. Any information you share will be kept strictly confidential, as your name will not appear on the questionnaire, and all completed forms will be coded and kept in a secure locked room. Please be aware that you can decide to withdraw from participating at any point in time, without any penalty whatsoever.

On the first page of your questionnaire you will find a letter of informed consent that explains the research in brief and your role in it. There will be a place to sign your name if you decide to participate once reading this letter. After completing the questionnaire you will be given a letter of debrief which will more fully explain the research questions being asked and where to contact the researcher, your ethics chair, and department chair, if you have any further questions regarding this project. If you would like to know the results of this study you can leave your name, phone number, and the name of this project (see front page of questionnaire) with Dr. Michael McCarrey at 562-5800 ext.4307.

Your participation is highly valued and we appreciate your time and interest. Thank you for your cooperation and attention.

Appendix H

Letter to Deans & Chairs Requesting Permission To Address Classes

Carleton University or University of Ottawa
Faculty of _____
Dean/chair _____

Re: Access to Students in the Faculty of _____ for a
Study of Students' Education and Career Choices _____.

December 6, 1995

Dear Dr. _____,

I am writing to gain your support for approaching teachers in your Faculty of _____' Department of _____, with a view to gaining access to the students taking their courses. I would like to secure 5 minutes of class time at the beginning of class to introduce our study and invite student's participation on a voluntary basis. Students would be requested to take materials home and return them completed to us at the next class. Students participate on an anonymous and volunteer basis.

This study is important as it will help us to understand the reasons behind the continued under representation of women and men students in certain disciplines. We are studying factors related to educational and career choices, as well as the impact of significant role models on current course studies.

This issue is significant because many university students with high ability show poor performance and motivation; quite possibly based on the absence, or the ill defined nature of their career and educational goals. As well, many with an aptitude for a domain, do not choose it due to outdated gender stereotypes.

Let me thank you for your consideration of this request, which if positive, will allow us to approach individual professors in your Faculty who teach the courses with the largest number of students majoring in this discipline. Any additional assistance you might be able to provide by way of endorsement of our study, or with suggestions of names of professors who we might contact would help us considerably. We would like to approach students in mid-January, 1996 and so look forward to following up this letter by contacting you during the week of December 18-22nd.

Yours Sincerely,

Michael McCarrey, Ph.D.
Professor, Industrial/Organizational Psychology

Anna B. Baranowsky
Doctoral Candidate

Appendix I

SRES form population norms (King & King, 1993).

Form		Mean			Standard Deviation			N		
SRES BB	Total	105.61			13.42			467		
		Total Sample			Male			Female		
SRES KK	Score	Mean	SD	N	M	SD	N	M	SD	N
Sample 1	Total	108.06	14.02	98	100.41	14.87	32	113.82	9.32	49
Sample 2	Total	104.08	14.88	193	96.72	14.78	78	109.07	11.67	115

Note. Sample 1 and 2 were cited secondarily from King and King, 1993.

Sample 1: College Faculty staff, and students, Central Michigan University (Billingham & King, 1991).

Sample 2: College students, University of North Carolina at Chapel Hill (Rosenfeld & Jarrard, 1985 & 1986).

Appendix J

Raw Data Input Coding System

Numbers	Item
1 through 25	Sex Role Egalitarianism Scale Form BB
26 through 45	Impostor Phenomenon Questionnaire
46 through 97	Social Problem Solving Inventory - Revised
98	Number of University Years Completed
99	Degree of Career Choice Support from Mother
100	Degree of Career Choice Support from Father
101	Degree of Influence for Career Choice from Guidance Counselor
102	Desire for Different Career Choice
103	Hours per week on Volunteer Activities
104	Number of Siblings
105	Respondent's Birth Order
106	Grade Point Average
107	Male or Female
108	University of Ottawa or Carleton University
109	Female Dominated Studies or Male Dominated Studies
110 through 111	Unique number in Data Cell
112 through 113	Age
114 through 116	CAVE - Group #1 Success: Internality/Externality, Stability/Instability, Globality/Specificity
117 through 119	CAVE - Group #1 Failure: Internality/Externality, Stability/Instability, Globality/Specificity
120 through 122	CAVE - Group #2 Success: Internality/Externality, Stability/Instability, Globality/Specificity
123 through 125	CAVE - Group #2 Failure: Internality/Externality, Stability/Instability, Globality/Specificity
126 through 128	CAVE - Group #3 Success: Internality/Externality, Stability/Instability, Globality/Specificity
129 through 131	CAVE - Group #3 Failure: Internality/Externality, Stability/Instability, Globality/Specificity
132 through 134	CAVE - Group #4 Success: Internality/Externality, Stability/Instability, Globality/Specificity
135 through 137	CAVE - Group #4 Failure: Internality/Externality, Stability/Instability, Globality/Specificity

Appendix K

University Enrollment Statistics

The following represents demographics of women in traditional and non-traditional studies at the University of Ottawa and Carleton University. Of the programmes targeted the following statistics apply for the year of 1994 based on current statistics produced by the Department referred to below.

University of Ottawa
Institute of Research and Planning
2nd Floor Tabaret Hall, Rm 239
Paul Mercier 562-5800 ext. 1442

Program	Women	Men	Total # Women	Total # Men
TS				
Nursing	95%	5%	981	53
Education	77%	23%	1,158	341
NTS				
Computer Science	23%	77%	77	255
Engineering	20%	80%	263	1,062
Physics	23%	77%	13	44

The most recent Statistics available for Carleton University were sourced from Anderson (1994).

Carleton University
Planning & Analysis
788-3617

Program	% Women	Total # Students
NTS		
Architecture	25.4%	63
Computer Science	25%	52
Engineering	8.3%	169
Industrial	14.3%	21
Music	16.7%	6

Appendix L
Content Analysis of Verbatim Explanations (CAVE Technique)

CAVE Technique Delineated: Rater Training Document (4-5 hours training for raters)

Peterson (1990) described in detail the technique that has been utilized in this study for measuring attribution of positive and negative events (success and failure). The two step technique developed by Peterson, is entitled the CAVE procedure (Content Analysis of Verbatim Explanations) and is used for measuring explanatory style (Peterson, Seligman, & Vaillant, 1988). The first step, requires the researcher to read participant's verbatim written responses to extract information regarding negative events and the causal explanation for the event. The second step, is to copy the causal explanation onto index cards that are identified by code number and thus, ready for blind ratings. Up to four blind raters, evaluate the event and rate it according to the 7-point scale system that corresponds to level of stability-instability, globality-specificity, and internality-externality.

For the purposes of this study, the use of both negative (failure) and positive (success) events has been incorporated. Each of the event potentials are cued for the participant with directed open-ended questions that illicit related responses. This makes identifying failure and success experiences very straightforward for the rater, who looks up the event category required under the CAVE section of the questionnaire.

Peterson, Seligman, & Vaillant (1988), provide an excellent explanation of the scale items:

> A stable cause invokes a long-lasting factor ("it's never going to go away"), whereas an unstable cause is transient ("it was a one-time thing"). A global cause is one that affects a wide domain of activities ("it's going to ruin everything I do"), whereas a specific cause is circumscribed ("it has no bearing on my life"). Finally, an internal cause points to something about the self ("it's me"), whereas an external cause points to other people or circumstances ("it's the heat in this place") (p. 23).

The learned helplessness model informs us of the variability of individual reactions to uncontrollable negative experiences. Emerging from a reformulation of this model is a system of assessing this variability called explanatory style (Abramson, Seligman, & Teasdale, 1978).
Peterson, Seligman, & Vaillant (1988) state that when a person explains negative events

> with stable, global, and internal causes [they show] ... more severe helplessness deficits than a person who explains them with unstable, specific, and external causes.

Along these lines, we also expect a person who explains positive events with unstable, specific, and external causes to portray greater feelings of helplessness as they are not able to internalize their successes. This leaves the individual without a sense of on-going control over their successes or positive life events. The opposite response to both positive and negative events would likely represent a healthier management over feelings of helplessness. The healthier response would be stable, global, and internal causes for successes; and unstable, specific, and external causes for failures.

Appendix L

Both steps of the CAVE procedure have been found to be reliable. Peterson (1990) reports on two earlier studies which support the procedure.

> Independent researchers agree 90% of the time about the presence or absence of a particular causal attribution (e.g., Peterson, Bettes, & Seligman, 1985). And with four raters, the reliability of rating each dimension approaches .90, as estimated by coefficient alpha (e.g., Peterson, Seligman, & Vaillant, 1988) (p. 58).

An example of how ratings are made based on the 7-point scale is provided below from Peterson (1990) based on Peterson, Seligman, and Vaillant's work.

> 'I cannot seem to decide firmly on a career ... (because) ... this may be an unwillingness to face reality' (1986, p. 25). The attributed cause of the bad event would be given a score of 7-5-5 (along the dimensions of internality, stability, and globality, respectively).

This example leads directly into the training technique followed when teaching and subsequently rating each of the questionnaires.

CAVE PROCEDURE RATING TECHNIQUE

(1) Turn to the CAVE portion of the questionnaire
   (a) Write your initials under the CAVE portion (there should be no more than four initials, so if the questionnaire you pick already has four, then it is complete and needs to be filed).
   (b) If there are other initials look for the index card in use for this questionnaire.
   (c) The code identifies the index card and the questionnaire.
   (d) Make sure the index card has all ratings, your initials, and a code (take this from the questionnaire you are working on) -- or put the code on a new card if you are starting one from scratch.

(2) There will be 2 questionnaire piles
   (i) Circulating Questionnaires
   (ii) Re-file questionnaires (those with 4 initials under the CAVE section are put in the Re-file pile).

(3) Look at the CAVE example card. All elements on this card should be written on your card.

EXAMPLE CARD: Front

12345 [sample code]
Success
Internality rating: 5
Stability rating: 4
Globality rating: 1

A.B. [initial]
Failure
Internality rating: 3
Stability rating: 1
Globality rating: 6

Appendix L

EXAMPLE CARD: Back

12345 [sample code] B.J. [initial]

Success

Internality rating: 5
Stability rating: 3
Globality rating: 2

Failure

Internality rating: 2
Stability rating: 1
Globality rating: 6

(a) Read M and N on your CAVE section. Locate the successful event and the causal explanation.

(b) Rate each causal explanation using the 7-point scale corresponding to its internality-externality, stability-instability, and globality-specificity. (see the board or this reference sheet for the scale).

[about me] Internality - 1 2 3 4 5 6 7 - Externality [other people/situation]

[long-lasting] Stability - 1 2 3 4 5 6 7 - Instability [transient-one time thing]

[everything] Globality - 1 2 3 4 5 6 7 - Specificity [circumscribed]

(c) Repeat steps (a) and (b) for O and P in the CAVE section.

(d) Place the questionnaire in the re-file or circulate pile.

(e) Place index card in the re-file or circulate pile

(f) Staple cards together if you have started a new one with the same code as an existing one.

Appendix M

Ethics Approval: Granted by the University of Ottawa

Université d'Ottawa • University of Ottawa

École de psychologie School of Psychology

January 23, 1996

Ms. Anna B. Baranowsky
School of Psychology
University of Ottawa
Montpetit Hall
INTRA

Dear Ms. Baranowsky,

RE: Research Project: "Predictors of entrance into traditional vs. non-traditional studies among female university students"

Following a review of your project by the Human Research Ethics Committee of the School of Psychology, at a meeting held on January 22, 1996, I am pleased to inform you that your project has received full approval (Category I.A.). Such approval is valid for one year.

We wish you the best in your project.

Sincerely,

Claude Lamontagne, Ph.D.
Chair of the Ethics Committee

CL/jc

145, rue Jean-Jacques Lussier, C.P. 450, Succ. A
Ottawa (Ontario) K1N 6N5 Canada

145 Jean-Jacques Lussier St., P.O. Box 450, Stn. A
Ottawa, Ontario K1N 6N5 Canada

(613) 562-5799 • Télec. Fax (613) 562-5147

Appendix N
Missing Data: Itemized

IP30	287
IP38	262
SP48	263
SP87	80
Yrs	44, 92, 137, 203, 294
Dad	151
Vol	44, 152
Age	83
Cave Failure	15, 19, 35, 98, 104, 131, 155, 156, 165, 179, 220, 238, 273, 285, 299, 300, 301, 302, 311, 319, 320, 328, 338, 362
Cave Success	71, 83, 104, 131, 155, 156, 165, 179, 220, 238, 273, 285, 299, 300, 301, 302, 311, 319, 320, 328, 338, 362
ISEI Mom	5, 8, 14, 32, 41, 43, 44, 48, 49, 53, 76, 84, 97, 107, 115, 118, 129, 139, 142, 148, 186, 204, 207, 211, 217, 241, 253, 270, 295, 300, 304, 306, 311, 313, 324, 333, 341, 345, 362
ISEI Dad	5, 7, 14, 27, 48, 51, 71, 110, 143, 151, 166, 184, 186, 217, 219, 222, 251, 270, 301, 304, 311, 316, 335, 337, 362

Appendix O
Sample Size Calculation: Power Analysis

The sample size for this study was initially calculated based on a "short rule-of-thumb" (Cohen, 1992, p. 156) power analysis treatment. The relationship between sample size (N), population effect size (ES), statistical power, and significance criterion (a), interact to guide the power analysis for this study. Logistic regression analysis is the main statistical tool and significance level for power analyses was set at $a = .05$. According to Cohen (1992) a medium ES is approximated (for LRA) based on the F test for regression, or $f2 = .15$. Four variables (SRES, SPSI-R, IP, & CAVE) were used as the basis for determining the requisite N. Given the information above, 84 participants are required to fill each of the two female and male groups (traditional and non-traditional) in order to ensure adequate power ($\underline{N} = 84$), when the University of Ottawa and Carleton cells are collapsed.

Subsequently, the sample size was calculated based on a more in-depth treatment approximated through a t-test formula (Howell, 1985). Power analyses based on t-test formulations are likely to result in greater N requirements than those for Regression models (Cohen, 1992). The two calculations were compared and the final result corresponded with Cohen's rule-of-thumb ($\underline{N} = 84$). In all cases the larger possible N of the two methods was always chosen thus assuring an N well within the acceptable range for power. The following paragraphs illustrate Howell's power analysis for each of the variables, where possible.

The estimate of ES for the Sex Role Egalitarianism Scale was based on data cited in the SRES Manual (King and King, 1993). The mean SRES score for women equals 109.07 and for men equals 96.72, and the SD = 14.78 based on SRES KK scores from college students at the University of North Carolina.

$$y = \frac{u1 - u0}{\sigma}$$

$$y = \frac{109.07 - 96.72}{14.78} = .84$$

Population means for women and men are used as in the current study samples are male and females in traditional and non-traditional studies. An assumption is being made that the SRES scores for the previous sample will be similar to that of the current population. The next calculation answers the question of how many subjects are required in order for power to equal .80 at alpha = .05 (Howell, 1985, p. A20).

$$\delta^2 = y\sqrt{\frac{N}{2}} \qquad \text{Then,} \qquad \delta^2 = \frac{y^2 N}{2} \qquad \text{Then,} \qquad N = \frac{2\delta^2}{y^2}$$

$$= \frac{2.(2.8)^2}{.84^2} = 22$$

Appendix O

Therefore, 22 subjects are needed in each of the four cells to find a significant difference with power set at .80.

The estimate of ES for the Impostor Phenomenon Questionnaire was based on data cited in Baranowsky and Collins (1997). The mean IP score for women equals 61.32 and for men equals 55.85, and the SD = 12.47 based on IP scores from university students at the University of Victoria.

$$y = \frac{u1 - uo}{\sigma}$$

$$y = \frac{61.32 - 55.85}{12.47} = .44$$

Population means for women and men are used as in the current study samples are male and females in traditional and non-traditional studies. An assumption is being made that the IP scores for the previous sample will be similar to that of the current population. The next calculation answers the question of how many subjects are required in order for power to equal .80 at alpha = .05 (Howell, 1985, p. A20).

$$\delta^2 = y\sqrt{\frac{N}{2}} \quad \text{Then,} \quad \delta^2 = \frac{y^2 N}{2} \quad \text{Then,} \quad N = \frac{2\delta^2}{y^2}$$

$$= \frac{2.(2.8)^2}{.44^2} = 80.99$$

Therefore, 81 subjects are needed in each of the four cells to find a significant difference with power set at .80.

It is not possible to make an estimate of ES (Howell's method) based on previous SPSI-R research. For this variable I will make a calculation based on Personal assessment of what difference is important (Howell, 1985, p. 170). The reason for this approach is the lack of studies reporting SPSI-R global scores (which will be the primary score analyzed in this study). Subsequently, there is no available data on these means and standard deviations from which to derive an estimate. With the current sample (N=194) SPSI-R global score mean = 9.2; maximum = 12.56; minimum = 3.29 and SD = 1.777. A meaningful difference would entail a difference of 3 points between U1 and Uo. σ must be estimated from other data. The only data available stems from the current set where SD = 1.777.

$$y = \frac{u1 - uo}{\sigma}$$

$$y = \frac{3}{1.777} = 1.69$$

Appendix O

The next calculation answers the question of how many subjects are required in order for power to equal .80 at alpha = .05 (Howell, 1985, p. A20).

$$N = \frac{2\delta^2}{y^2}$$

$$= \frac{2.(2.8)^2}{1.69^2} = 5.49$$

Therefore, 6 subjects are needed in each of the four cells to find a significant difference with power set at .80.

There is no available data from which to derive an estimate of N for the Attribution measure.

Considering both the rule-of-thumb and Howell's more in-depth analysis, a sample of N= 84 for each of the four cells provides a conservative conclusion to the power analysis.

Appendix P-I

Data Screening: Significance testing for missing data

Significance testing for missing data. Independent t-tests comparing missing data with complete data groups for ISEI and CAVE findings over SPSI-R, SRES, and IP scores

T-tests for independent samples of CAVE failure on SPSI-R, SRES, and IP scores. Set with missing data = 0; set with complete data = 1.

Variable	N	M	SD	SE of Mean	F	p.
SPSI-R						
MS fail 0	24	12.57	2.21	.452	3.07	.081
MS fail 1	338	12.91	2.70	.147		
SRES						
MS fail 0	24	80.63	11.42	2.332	2.101	.148
MS fail 1	338	82.04	8.44	.459		
IP						
MS fail 0	24	47.88	11.63	2.37	.012	.913
MS fail 1	338	56.53	12.06	.656		

T-tests for independent samples of CAVE success on SPSI-R, SRES, and IP scores. Set with missing data = 0; set with complete data = 1.

Variable	N	M	SD	SE of Mean	F	p.
SPSI-R						
MS success 0	22	12.17	2.38	.508	2.558	.111
MS success 1	340	12.93	2.69	.146		
SRES						
MS success 0	22	79.50	11.48	2.447	1.415	.235
MS success 1	340	82.10	8.44	.457		
IP						
MS success 0	22	58.64	11.89	2.528	.007	.934
MS success 1	340	56.49	12.04	.653		

Appendix P-I

Data Screening: Significance testing for missing data

T-tests for independent samples of ISEI mother on SPSI-R, SRES, and IP scores. Set with missing data = 0; set with complete data = 1.

Variable	N	M	SD	SE of Mean	F	p.
SPSI-R						
ISEI Mom 0	38	13.40	2.74	.444	.125	.724
ISEI Mom 1	324	12.83	2.66	.148		
SRES						
ISEI Mom 0	38	81.76	8.91	1.445	.429	.513
ISEI Mom 1	324	81.96	8.64	.480		
IP						
ISEI Mom 0	38	57.95	12.83	2.08	.085	.770
ISEI Mom 1	324	56.46	11.93	.663		

T-tests for independent samples of ISEI father on SPSI-R, SRES, and IP scores. Set with missing data = 0; set with complete data = 1.

Variable	N	M	SD	SE of Mean	F	p.
SPSI-R						
ISEI Dad 0	24	13.47	3.19	.652	.806	.370
ISEI Dad 1	336	12.84	2.65	.144		
SRES						
ISEI Dad 0	24	82.88	7.79	1.591	.601	.439
ISEI Dad 1	336	81.85	8.73	.476		
IP						
ISEI Dad 0	24	54.33	12.15	2.48	.138	.710
ISEI Dad 1	336	56.84	12.02	.656		

Appendix P-II
Data Screening: Test for Outliers

Total number of cases: 362 (Unweighted)
Number rejected because of missing data: 0

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
SRES	0	0.01	0.45	1	0.49	0	1.01
SP.GLB	-0.12	0.05	6.21	1	0.01	-0.09	0.88
SUCCFL_1	-0.09	0.04	5.1	1	0.02	-0.07	0.91
FAILFL_1	0.09	0.04	4.56	1	0.03	0.07	1.1
IPSCORE	0	0.01	0.19	1	0.65	0	1
ISEIMO_1	0.02	0	12.01	1	0	0.14	1.02
ISEIDA_1	-0.02	0	11.3	1	0	-0.13	0.97
Constant	0.57	1.64	0.12	1	0.72		

Appendix P-III
Check for Skewness and Kurtosis
Check for Plausible Means and Standard Deviations

Variable	M	SD	Kurtosis	SE Kurt	Skew	SE Skew	Min	Max	N
Failure	12.53	2.74	0.41	0.26	-0.08	0.13	3.25	20	362
Success	9.58	2.81	0.78	0.26	0.67	0.13	3	20	362
SRES	81.94	8.65	1.01	0.26	-0.84	0.13	45	101	362
SPSI-R	12.89	2.67	0.39	0.26	-0.53	0.13	2.6	19.46	362
IP	56.62	12.02	0.56	0.26	0.59	0.13	30	100	362
ISEI Mom	48.37	18.52	-0.48	0.26	-0.26	0.13	16	88	362
ISEI Dad	53.38	16.15	0.11	0.26	-0.37	0.13	16	90	362

Number of valid observations (listwise) N = 362.00
*Missing Observations = 0
* Missing items identified and replaced with group mean as recommended by Tabachnick and Fidell.

Tabachnick and Fidell (1989) recommend evaluating the significance of skewness using the following formula: z = Skewness divided by SE Skew
They also recommend utilizing a similar formula for determining the significance of kurtosis: z = Kurtosis divided by SE Kurtosis.
Outcomes that are far from normality are questioned and may require transformations.

CAVE Success
Skewness z = .672 / .28 = 5.25
Kurtosis z = .784 / .256 = 3.06

CAVE Failure
Skewness z = -.088 / .128 = .6875
Kurtosis z = .416 / .256 == 1.625

Social Problem Solving Inventory - R
Skewness z = -.525 / .128 = -4.10
Kurtosis z = .388 / .256 = 1.52

ISEI - Mom
Skewness z = -.262 / .128 = -2.05
Kurtosis z = -.482 / .256 = -1.88

ISEI - DAD
Skewness z = -.373 / .128 = -2.91
Kurtosis z = .105 / .256 = .410

IP SCORE
Skewness z = .548 / .128 = 4.28
Kurtosis z = .563 / .256 = 2.20

SRES
Skewness z = -.837 / .128 = -6.54
Kurtosis z = 1.013 / .256 = 3.95

*Plausibility of the means, SD, appear to be plausible and skewness, kurtosis, of each of the variables listed above all appear to be within reasonable levels.

Appendix P-IV

Check for Multicollinearity and Singularity

These problems occur when the correlation matrix results in extreme correlations that attain .90 or greater for multicollinearity and a perfect correlation of one for singularity (Tabachnick & Fidell, 1989).

Multicollinearity and Singularity are not a consideration for this sample as all correlations are within the acceptable range.

Correlation Coefficient Matrix

Variable	Fail	Success	SRES	SPSI-R	IPSCORE	ISEI-Mom	ISEI-Dad
Fail	1 p=.	0.196 p=.000	0.0667 p=.205	0.1643 p=.002	-0.1551 p=.003	.0072 p=.892	.0302 p=.567
Success	0.1996 p=000	1 p=.	-.0467 p=.376	-.0962 p=.068	.0856 p=.104	-.0527 p=.317	.0015 p.977
SRES	.0667 p=.205	-.0467 p=.376	1 p=.	0.1866 p=.000	-0.1423 p=.007	.0808 p=.317	.0057 p.=913
SPSI-R	.1643 p=.002	-.0962 p=.068	.1866 p=.000	1 p=.	-.5108 p=.000	.0227 p.667	.0143 p.=787
Ipscore	-.1551 p=.003	0.0856 p=.104	-.1423 p=.007	-.5108 p.000	1 p=.	.0002 p=.998	-.0338 p=.521
ISEI-M	.0072 p=.892	-.0527 p=.317	.0808 p=.125	.0227 p=.667	.0002 p=.998	1 p=.	.1402 p=.008
ISEI-D	.0302 p=.567	.0015 p=.977	.0057 p=.913	.0143 p=.787	-.0338 p=.521	.1402 p=.008	1 p=.

(Coefficient / (Cases) / 2-tailed Significance)

Appendix Q

Domain and Measure Results for Sample Groups

Data set for the study of Factors influencing educational choice. Variables include Domain, SRES, IPrank, SPSI-R, CAVE fail & success, ISEI mom & dad for female subjects[14].

No.	Dom	SRES	IP	Fail	Succ	ISEIM	ISEID
1	0	73.00	2.00	12.25	17.25	16.00	56.00
2	0	77.00	2.00	12.75	13.25	45.00	54.00
3	0	87.00	2.00	11.25	15.25	55.00	50.00
4	0	84.00	1.00	12.50	15.50	55.00	68.00
5	0	70.00	1.00	14.00	13.75	46.85	54.21
6	0	90.00	2.00	10.25	16.50	43.00	65.00
7	0	91.00	2.00	13.00	15.00	65.00	54.21
8	0	90.00	1.00	9.75	16.25	46.85	43.00
9	0	89.00	2.00	14.75	15.25	25.00	38.00
10	0	91.00	2.00	14.50	16.25	43.00	69.00
11	0	90.00	2.00	14.50	13.50	66.00	52.00
12	0	83.00	2.00	15.00	16.50	53.00	69.00
13	0	90.00	1.00	10.00	13.00	46.00	54.00
14	0	93.00	2.00	12.50	16.75	46.85	54.21
15	0	88.00	2.00	12.07	18.25	51.00	24.00
16	0	90.00	2.00	9.00	12.25	66.00	51.00
17	0	86.00	1.00	11.25	15.75	43.00	88.00
18	0	85.00	1.00	11.75	17.75	66.00	67.00
19	0	88.00	2.00	12.07	16.50	43.00	56.00
20	0	92.00	1.00	10.00	16.75	67.00	69.00
21	0	93.00	2.00	13.25	14.75	59.00	59.00
22	0	91.00	2.00	18.25	16.25	16.00	58.00
23	0	87.00	1.00	11.75	15.50	43.00	68.00
24	0	89.00	2.00	13.25	18.75	65.00	65.00
25	0	84.00	2.00	13.50	15.75	53.00	51.00
26	0	90.00	1.00	9.25	16.50	66.00	54.00
27	0	91.00	1.00	12.00	16.50	59.00	54.21
28	0	87.00	2.00	15.50	12.00	39.00	46.00
29	0	87.00	2.00	12.00	13.00	25.00	51.00
30	0	85.00	2.00	12.00	17.25	38.00	23.00
31	0	93.00	2.00	10.25	15.00	16.00	23.00
32	0	84.00	2.00	11.50	13.25	46.85	51.00
33	0	79.00	2.00	13.75	9.25	16.00	51.00
34	0	87.00	2.00	17.25	17.50	65.00	66.00
35	0	89.00	1.00	12.07	17.00	16.00	67.00
36	0	83.00	1.00	17.00	12.75	34.00	68.00
37	0	89.00	1.00	12.50	13.75	59.00	59.00

[14]Data collection undertaken January 1996 through December 1996 at the University of Ottawa and Carleton University.

Appendix Q

Data set for the study of Factors influencing educational choice. Variables include Domain, SRES, IPrank, SPSI-R, CAVE fail & success, ISEI mom & dad for female subjects.

No.	Dom	SRES	IP	Fail	Succ	ISEIM	ISEID
38	0	82.00	2.00	8.25	15.50	53.00	40.00
39	0	85.00	2.00	11.50	14.25	66.00	71.00
40	0	89.00	2.00	10.75	16.25	51.00	59.00
41	0	84.00	2.00	17.50	16.25	46.85	51.00
42	0	93.00	1.00	12.75	8.25	45.00	40.00
43	0	91.00	2.00	16.25	14.00	46.85	69.00
44	0	76.00	2.00	11.75	13.75	46.85	67.00
45	0	86.00	2.00	14.50	14.25	39.00	51.00
46	0	88.00	1.00	7.75	17.25	56.00	65.00
47	0	85.00	2.00	13.50	14.25	55.00	74.00
48	0	89.00	2.00	11.75	14.00	46.85	54.21
49	0	70.00	1.00	8.50	12.25	46.85	56.00
50	0	94.00	2.00	13.25	8.25	69.00	85.00
51	0	95.00	2.00	13.00	15.25	45.00	54.21
52	0	91.00	2.00	11.25	15.50	16.00	44.00
53	0	84.00	1.00	9.25	16.50	46.85	53.00
54	0	93.00	2.00	10.75	13.75	58.00	50.00
55	0	67.00	1.00	8.75	15.00	16.00	51.00
56	0	92.00	2.00	12.75	15.50	54.00	51.00
57	0	93.00	2.00	9.75	7.00	51.00	24.00
58	0	62.00	2.00	9.50	14.00	24.00	32.00
59	0	81.00	1.00	12.00	7.25	47.00	50.00
60	0	75.00	2.00	10.25	17.25	43.00	51.00
61	0	75.00	1.00	16.50	9.75	56.00	56.00
62	0	79.00	1.00	10.00	17.75	16.00	31.00
63	0	93.00	1.00	13.00	15.75	88.00	55.00
64	0	92.00	2.00	15.25	12.00	51.00	51.00
65	0	83.00	1.00	14.50	8.50	43.00	66.00
66	0	92.00	1.00	15.00	16.75	55.00	46.00
67	0	93.00	2.00	8.75	16.25	38.00	51.00
68	0	87.00	1.00	11.50	13.00	45.00	42.00
69	0	95.00	2.00	8.50	14.75	43.00	51.00
70	0	75.00	1.00	9.50	16.50	16.00	68.00
71	0	83.00	1.00	8.50	15.25	66.00	54.21
72	0	78.00	1.00	7.25	15.75	38.00	23.00
73	0	65.00	2.00	8.25	12.50	51.00	39.00
74	0	81.00	2.00	11.75	13.25	56.00	56.00
75	0	84.00	2.00	10.25	17.75	66.00	32.00
76	0	93.00	2.00	17.00	16.00	46.85	30.00
77	0	89.00	2.00	10.25	16.25	66.00	69.00

Appendix Q

Data set for the study of Factors influencing educational choice. Variables include Domain, SRES, IPrank, SPSI-R, CAVE fail & success, ISEI mom & dad for female subjects.

No.	Dom	SRES	IP	Fail	Succ	ISEIM	ISEID
78	0	75.00	2.00	11.25	17.75	51.00	51.00
79	0	90.00	2.00	10.25	15.50	69.00	77.00
80	0	93.00	2.00	14.75	14.75	16.00	60.00
81	0	87.00	2.00	13.75	16.25	16.00	56.00
82	0	90.00	2.00	17.50	15.00	66.00	68.00
83	0	83.00	1.00	10.00	15.25	51.00	44.00
84	0	77.00	2.00	15.00	16.50	46.85	44.00
85	0	89.00	2.00	8.25	16.25	50.00	66.00
86	0	93.00	2.00	9.75	17.25	53.00	50.00
87	0	85.00	2.00	10.75	13.50	43.00	88.00
88	1	79.00	2.00	14.75	7.50	66.00	67.00
89	1	92.00	2.00	11.75	14.00	85.00	88.00
90	1	90.00	2.00	10.50	16.00	66.00	56.00
91	1	71.00	1.00	12.75	18.50	16.00	29.00
92	1	73.00	1.00	13.00	13.50	45.00	16.00
93	1	92.00	2.00	15.75	17.25	66.00	44.00
94	1	91.00	1.00	9.75	13.75	44.00	33.00
95	1	88.00	2.00	14.00	18.00	66.00	66.00
96	1	90.00	2.00	13.25	18.75	51.00	88.00
97	1	87.00	1.00	13.00	17.00	45.33	50.00
98	1	87.00	2.00	12.87	14.75	51.00	46.00
99	1	88.00	2.00	12.75	17.00	69.00	88.00
100	1	85.00	2.00	13.50	12.75	66.00	51.00
101	1	74.00	1.00	12.75	8.75	66.00	65.00
102	1	71.00	1.00	14.25	13.25	51.00	66.00
103	1	89.00	2.00	13.25	15.25	16.00	66.00
104	1	90.00	2.00	12.87	15.50	51.00	30.00
105	1	89.00	2.00	14.50	18.00	16.00	51.00
106	1	73.00	2.00	13.00	15.50	45.00	69.00
107	1	83.00	1.00	16.00	14.25	45.33	56.00
108	1	73.00	2.00	8.75	17.25	38.00	51.00
109	1	92.00	2.00	14.50	16.00	38.00	51.00
110	1	83.00	1.00	13.25	12.75	16.00	56.67
111	1	88.00	2.00	16.00	17.25	69.00	69.00
112	1	93.00	1.00	17.50	5.00	16.00	65.00
113	1	76.00	1.00	8.50	19.25	52.00	52.00
114	1	57.00	2.00	12.75	16.25	51.00	88.00
115	1	86.00	2.00	16.25	18.25	45.33	66.00
116	1	87.00	1.00	12.00	9.75	66.00	71.00

Appendix Q

Data set for the study of Factors influencing educational choice. Variables include Domain, SRES, IPrank, SPSI-R, CAVE fail & success, ISEI mom & dad for female subjects.

No.	Dom	SRES	IP	Fail	Succ	ISEIM	ISEID
117	1	84.00	2.00	12.75	16.75	51.00	67.00
118	1	82.00	2.00	7.75	16.50	45.33	88.00
119	1	78.00	2.00	19.50	18.25	50.00	29.00
120	1	79.00	1.00	14.00	6.75	71.00	67.00
121	1	74.00	2.00	9.75	16.00	88.00	85.00
122	1	84.00	1.00	10.75	14.50	71.00	56.00
123	1	78.00	2.00	12.75	14.50	16.00	54.00
124	1	79.00	2.00	14.25	17.75	16.00	65.00
125	1	85.00	2.00	13.75	14.25	88.00	74.00
126	1	65.00	2.00	13.00	18.50	16.00	43.00
127	1	91.00	2.00	10.00	18.27	59.00	85.00
128	1	80.00	2.00	8.75	18.50	50.00	65.00
129	1	89.00	2.00	16.00	14.50	45.33	42.00
130	1	84.00	2.00	10.50	15.00	30.00	44.00
131	1	89.00	1.00	12.87	15.50	51.00	30.00
132	1	84.00	2.00	13.00	2.00	24.00	77.00
133	1	78.00	2.00	7.00	13.50	16.00	71.00
134	1	79.00	2.00	14.75	5.25	16.00	51.00
135	1	88.00	1.00	14.25	8.00	66.00	69.00
136	1	101.00	2.00	14.50	16.50	44.00	44.00
137	1	79.00	1.00	15.50	14.00	39.00	67.00
138	1	83.00	1.00	19.75	13.25	16.00	30.00
139	1	91.00	2.00	14.00	9.00	45.33	77.00
140	1	79.00	1.00	13.50	8.75	71.00	55.00
141	1	87.00	2.00	17.50	8.75	66.00	69.00
142	1	87.00	1.00	12.25	15.75	45.33	68.00
143	1	83.00	1.00	13.25	14.50	66.00	69.00
144	1	81.00	1.00	11.75	15.50	55.00	69.00
145	1	78.00	1.00	11.25	18.75	16.00	51.00
146	1	92.00	2.00	4.50	17.75	29.00	78.00
147	1	85.00	1.00	7.50	9.25	16.00	51.00
148	1	76.00	1.00	10.75	21.00	45.33	56.67
149	1	91.00	2.00	12.50	9.50	43.00	88.00
150	1	71.00	2.00	11.25	18.75	66.00	50.00
151	1	79.00	1.00	15.50	15.00	45.00	56.67
152	1	61.00	2.00	14.25	9.25	16.00	68.00
153	1	84.00	2.00	12.50	18.00	55.00	51.00
154	1	80.00	2.00	12.50	6.00	51.00	68.00
155	1	93.00	1.00	12.87	15.50	55.00	33.00

Appendix Q

Data set for the study of Factors influencing educational choice. Variables include Domain, SRES, IPrank, SPSI-R, CAVE fail & success, ISEI mom & dad for female subjects.

No.	Dom	SRES	IP	Fail	Succ	ISEIM	ISEID
156	1	92.00	2.00	12.87	15.50	16.00	34.00
157	1	88.00	2.00	12.75	14.75	16.00	50.00
158	1	93.00	1.00	13.75	19.00	38.00	56.00
159	1	84.00	2.00	14.50	21.75	16.00	66.00
160	1	91.00	2.00	11.00	17.00	66.00	77.00
161	1	90.00	2.00	15.00	17.75	51.00	51.00
162	1	72.00	2.00	15.50	17.00	66.00	65.00
163	1	90.00	2.00	11.00	13.00	51.00	38.00
164	1	84.00	1.00	5.00	21.50	66.00	56.00
165	1	87.00	1.00	12.87	15.50	66.00	38.00
166	1	85.00	2.00	14.00	15.15	16.00	56.67
167	1	77.00	1.00	18.25	18.50	16.00	34.00
168	1	89.00	2.00	3.25	18.00	16.00	24.00
169	1	90.00	2.00	11.25	15.75	39.00	38.00
170	1	86.00	2.00	14.00	19.25	52.00	46.00
171	1	85.00	1.00	14.25	13.00	51.00	68.00
172	1	80.00	1.00	11.00	12.25	59.00	43.00
173	1	92.00	2.00	11.50	16.75	16.00	38.00
174	1	80.00	1.00	12.50	17.75	51.00	51.00
175	1	91.00	2.00	17.25	12.00	51.00	30.00
176	1	68.00	1.00	13.75	18.00	54.00	51.00
177	1	80.00	1.00	16.75	17.25	34.00	34.00

Appendix Q

Data set for the study of Factors influencing educational choice. Variables include Domain, SRES, IPrank, SPSI-R, CAVE fail & success, ISEI mom & dad for male subjects[15].

No.	Dom	SRES	IP	Fail	Succ	ISEIM	ISEID
1	1	82.00	2.00	18.50	13.25	34.00	67.00
2	1	57.00	1.00	12.53	13.85	36.00	16.00
3	1	80.00	2.00	11.50	17.50	30.00	38.00
4	1	79.00	2.00	17.25	13.25	71.00	16.00
5	1	83.00	2.00	8.00	18.00	60.00	43.00
6	1	88.00	2.00	9.00	17.50	70.00	55.00
7	1	89.00	1.00	11.00	18.25	57.80	16.00
8	1	65.00	2.00	11.25	17.00	88.00	88.00
9	1	90.00	2.00	11.50	18.00	57.80	44.98
10	1	77.00	1.00	15.25	20.00	51.00	38.00
11	1	79.00	2.00	5.75	19.50	40.00	43.00
12	1	63.00	2.00	13.00	13.25	51.00	51.00
13	1	84.00	1.00	14.25	15.75	30.00	43.00
14	1	89.00	2.00	8.25	13.50	33.00	44.00
15	1	73.00	2.00	5.75	16.00	38.00	53.00
16	1	74.00	2.00	16.75	17.75	88.00	43.00
17	1	88.00	2.00	20.00	17.00	66.00	66.00
18	1	75.00	2.00	14.75	16.75	67.00	16.00
19	1	77.00	2.00	10.50	18.50	69.00	51.00
20	1	46.00	1.00	12.75	16.00	50.00	50.00
21	1	86.00	2.00	13.75	16.00	51.00	51.00
22	1	70.00	2.00	14.50	17.75	69.00	54.00
23	1	82.00	2.00	13.25	12.00	51.00	16.00
24	1	79.00	2.00	12.75	19.75	30.00	65.00
25	1	82.00	2.00	18.75	18.25	88.00	43.00
26	1	75.00	2.00	10.50	17.00	56.00	55.00
27	1	91.00	2.00	19.00	16.50	29.00	44.98
28	1	98.00	1.00	13.50	7.00	66.00	66.00
29	1	70.00	1.00	11.75	13.00	30.00	16.00
30	1	68.00	2.00	11.00	13.25	69.00	44.98
31	1	74.00	1.00	10.25	20.50	69.00	69.00
32	1	77.00	2.00	15.50	8.00	40.00	51.00
33	1	69.00	2.00	13.25	5.25	50.00	49.00
34	1	89.00	1.00	5.50	21.25	45.00	44.98
35	1	82.00	2.00	13.50	18.50	88.00	43.00
36	1	91.00	2.00	12.75	15.50	51.00	51.00
37	1	77.00	2.00	12.50	15.00	43.00	51.00

[15]Data collection undertaken October 1995 through November 1996 at the University of Ottawa and Carleton University.

Appendix Q

Data set for the study of Factors influencing educational choice. Variables include Domain, SRES, IPrank, SPSI-R, CAVE fail & success, ISEI mom & dad for male subjects.

No.	Dom	SRES	IP	Fail	Succ	ISEIM	ISEID
38	1	78.00	1.00	15.75	13.00	33.00	54.00
39	1	84.00	2.00	6.50	19.75	50.00	16.00
40	1	81.00	2.00	8.00	19.50	57.80	44.98
41	1	91.00	2.00	14.50	17.00	71.00	53.00
42	1	89.00	2.00	13.50	13.00	57.80	16.00
43	1	78.00	1.00	12.53	15.85	66.00	29.00
44	1	81.00	1.00	10.50	17.75	40.00	55.00
45	1	94.00	2.00	14.25	18.75	57.80	43.00
46	1	82.00	2.00	12.50	12.50	58.00	43.00
47	1	92.00	1.00	12.25	17.50	23.00	43.00
48	1	81.00	1.00	13.00	17.75	65.00	74.00
49	1	95.00	2.00	15.00	12.25	68.00	51.00
50	1	85.00	1.00	10.75	12.50	69.00	66.00
51	1	75.00	2.00	13.25	15.25	85.00	59.00
52	1	90.00	1.00	9.75	14.50	66.00	43.00
53	1	93.00	1.00	9.25	6.75	67.00	16.00
54	1	93.00	1.00	15.25	17.00	33.00	30.00
55	1	81.00	2.00	15.00	12.25	51.00	69.00
56	1	87.00	2.00	10.00	18.50	71.00	69.00
57	1	70.00	1.00	12.00	14.50	36.00	16.00
58	1	81.00	2.00	15.25	6.75	51.00	43.00
59	1	78.00	2.00	13.00	12.50	37.00	16.00
60	1	74.00	2.00	10.50	3.75	51.00	51.00
61	1	76.00	2.00	12.53	15.85	44.00	56.00
62	1	94.00	1.00	9.50	13.00	61.00	16.00
63	1	87.00	2.00	12.25	16.75	29.00	16.00
64	1	82.00	2.00	12.00	9.00	85.00	44.98
65	1	93.00	1.00	14.50	9.25	74.00	16.00
66	1	80.00	1.00	11.50	17.00	59.00	51.00
67	1	92.00	2.00	11.25	17.50	77.00	16.00
68	1	76.00	2.00	16.25	16.50	65.00	66.00
69	1	76.00	1.00	13.50	12.25	88.00	66.00
70	1	73.00	1.00	15.50	15.75	71.00	54.00
71	1	75.00	2.00	12.75	14.75	54.00	52.00
72	1	92.00	2.00	15.75	15.00	51.00	16.00
73	1	86.00	2.00	14.00	16.50	69.00	43.00
74	1	90.00	2.00	13.50	14.25	57.80	55.00
75	1	88.00	2.00	16.75	18.50	74.00	56.00
76	1	78.00	2.00	13.00	19.25	77.00	44.98
77	1	84.00	2.00	15.00	14.75	43.00	16.00

Appendix Q

Data set for the study of Factors influencing educational choice. Variables include Domain, SRES, IPrank, SPSI-R, CAVE fail & success, ISEI mom & dad for male subjects.

No.	Dom	SRES	IP	Fail	Succ	ISEIM	ISEID
78	1	90.00	2.00	11.25	18.25	69.00	51.00
79	1	83.00	1.00	15.75	17.50	56.00	59.00
80	1	84.00	2.00	13.50	14.25	70.00	66.00
81	1	69.00	2.00	9.25	13.00	66.00	66.00
82	1	84.00	1.00	11.00	17.00	66.00	66.00
83	1	68.00	1.00	9.00	20.00	66.00	16.00
84	1	70.00	2.00	11.25	15.50	77.00	51.00
85	1	93.00	1.00	8.50	15.50	71.00	39.00
86	1	83.00	2.00	9.00	18.50	65.00	74.00
87	1	74.00	1.00	10.00	16.00	67.00	43.00
88	0	75.00	2.00	8.75	16.25	55.00	37.00
89	0	69.00	2.00	6.75	16.25	65.00	65.00
90	0	82.00	1.00	10.50	16.00	16.00	70.00
91	0	82.00	2.00	10.50	14.75	16.00	51.00
92	0	81.00	1.00	13.50	17.25	16.00	43.00
93	0	91.00	2.00	10.50	18.50	44.14	57.08
94	0	69.00	2.00	18.25	5.50	16.00	51.00
95	0	87.00	2.00	12.00	15.25	43.00	43.00
96	0	79.00	2.00	12.64	15.15	45.00	43.00
97	0	83.00	2.00	12.00	12.25	43.00	67.00
98	0	79.00	2.00	13.25	16.50	66.00	66.00
99	0	79.00	1.00	16.50	8.25	43.00	54.00
100	0	80.00	1.00	16.00	15.25	43.00	68.00
101	0	70.00	2.00	11.50	9.00	43.00	29.00
102	0	82.00	2.00	14.50	13.25	55.00	51.00
103	0	71.00	2.00	13.50	12.00	55.00	69.00
104	0	89.00	2.00	15.75	9.00	69.00	56.00
105	0	90.00	2.00	12.25	13.25	43.00	67.00
106	0	77.00	2.00	17.50	14.75	77.00	67.00
107	0	75.00	2.00	13.50	12.25	16.00	51.00
108	0	76.00	2.00	12.64	15.15	56.00	71.00
109	0	72.00	1.00	14.25	14.00	55.00	56.00
110	0	74.00	2.00	11.75	16.00	16.00	45.00
111	0	80.00	2.00	13.50	12.25	66.00	69.00
112	0	72.00	2.00	15.00	16.00	43.00	33.00
113	0	77.00	1.00	11.50	16.50	43.00	66.00
114	0	59.00	1.00	16.00	12.50	16.00	56.00
115	0	73.00	2.00	13.75	13.50	43.00	50.00
116	0	88.00	2.00	15.50	15.50	69.00	66.00
117	0	73.00	2.00	11.50	12.75	51.00	51.00

Appendix Q

Data set for the study of Factors influencing educational choice. Variables include Domain, SRES, IPrank, SPSI-R, CAVE fail & success, ISEI mom & dad for male subjects.

No.	Dom	SRES	IP	Fail	Succ	ISEIM	ISEID
118	0	68.00	2.00	7.75	8.50	44.14	51.00
119	0	76.00	2.00	11.00	16.25	16.00	67.00
120	0	80.00	1.00	11.50	15.25	16.00	69.00
121	0	76.00	2.00	14.75	13.00	16.00	31.00
122	0	75.00	2.00	12.64	15.15	66.00	65.00
123	0	68.00	2.00	12.64	15.15	44.14	69.00
124	0	88.00	2.00	12.64	15.15	66.00	57.08
125	0	45.00	1.00	12.64	15.15	55.00	69.00
126	0	75.00	2.00	13.25	16.75	16.00	71.00
127	0	77.00	2.00	11.75	8.50	44.14	57.08
128	0	76.00	2.00	13.75	14.00	43.00	66.00
129	0	71.00	1.00	12.75	16.50	44.14	43.00
130	0	80.00	2.00	10.75	14.25	45.00	60.00
131	0	85.00	2.00	12.50	13.75	52.00	60.00
132	0	66.00	2.00	14.00	13.75	16.00	36.00
133	0	77.00	1.00	11.00	8.75	16.00	56.00
134	0	84.00	2.00	12.64	15.15	44.14	57.08
135	0	87.00	2.00	9.00	17.00	16.00	69.00
136	0	83.00	2.00	17.25	5.50	44.14	69.00
137	0	82.00	2.00	14.50	14.75	74.00	74.00
138	0	77.00	2.00	7.50	17.00	16.00	51.00
139	0	67.00	2.00	8.50	17.00	55.00	57.08
140	0	78.00	2.00	15.00	18.50	23.00	51.00
141	0	90.00	2.00	18.50	16.00	77.00	71.00
142	0	88.00	2.00	12.64	15.15	43.00	43.00
143	0	83.00	1.00	12.64	15.15	88.00	66.00
144	0	72.00	2.00	15.75	17.25	51.00	71.00
145	0	89.00	2.00	15.75	8.00	39.00	29.00
146	0	91.00	2.00	13.25	14.75	16.00	69.00
147	0	73.00	2.00	11.25	16.25	44.14	51.00
148	0	91.00	2.00	11.25	15.00	66.00	66.00
149	0	78.00	1.00	11.00	15.00	55.00	51.00
150	0	78.00	2.00	12.25	15.75	51.00	56.00
151	0	71.00	1.00	12.64	15.15	25.00	43.00
152	0	69.00	2.00	12.50	14.75	69.00	42.00
153	0	86.00	1.00	10.75	15.25	29.00	54.00
154	0	74.00	1.00	14.25	14.25	16.00	51.00
155	0	70.00	2.00	12.50	19.50	52.00	85.00
156	0	64.00	2.00	11.00	14.75	44.14	44.00

Appendix Q

Data set for the study of Factors influencing educational choice. Variables include Domain, SRES, IPrank, SPSI-R, CAVE fail & success, ISEI mom & dad for male subjects.

No.	Dom	SRES	IP	Fail	Succ	ISEIM	ISEID
157	0	72.00	2.00	13.50	13.25	51.00	66.00
158	0	78.00	2.00	10.50	14.75	56.00	57.08
159	0	85.00	1.00	11.00	15.00	51.00	66.00
160	0	81.00	2.00	11.75	16.50	16.00	57.08
161	0	84.00	2.00	12.64	15.15	55.00	54.00
162	0	85.00	1.00	9.75	15.25	66.00	77.00
163	0	82.00	2.00	12.50	14.75	45.00	69.00
164	0	63.00	1.00	13.25	14.75	44.14	43.00
165	0	88.00	2.00	14.25	19.00	67.00	90.00
166	0	71.00	2.00	14.75	19.50	69.00	69.00
167	0	84.00	2.00	11.00	20.75	54.00	50.00
168	0	70.00	1.00	12.50	12.25	44.14	23.00
169	0	88.00	2.00	10.25	18.00	66.00	65.00
170	0	93.00	2.00	19.00	7.50	59.00	46.00
171	0	79.00	2.00	10.50	16.00	16.00	68.00
172	0	68.00	1.00	10.50	14.50	52.00	71.00
173	0	70.00	2.00	15.25	15.00	53.00	46.00
174	0	93.00	2.00	12.25	17.25	16.00	38.00
175	0	88.00	2.00	8.75	19.50	51.00	51.00
176	0	80.00	2.00	16.00	15.50	16.00	69.00
177	0	90.00	2.00	11.25	19.50	51.00	51.00
178	0	92.00	2.00	17.75	17.25	16.00	66.00
179	0	58.00	2.00	7.25	13.50	43.00	43.00
180	0	82.00	1.00	13.00	14.50	43.00	52.00
181	0	68.00	1.00	7.50	18.75	43.00	71.00
182	0	79.00	2.00	15.00	16.50	43.00	67.00
183	0	71.00	2.00	9.50	17.50	66.00	30.00
184	0	87.00	2.00	12.00	13.50	65.00	66.00
185	0	80.00	2.00	12.64	15.15	44.14	57.08

Appendix R
Logistic Regression Analyses Interpretation Guide

This interpretation guide has been developed to aid the reader in disciphering Logistic Regression Analyses findings reported in the results section. It is not a primer on LRA but instead gives the reader all the necessary tools to interpret results. In order to learn more about LRA and to perform analyses refer to the texts cited in this document.

The interpretation methods outlined here closely follow those recommended in Chapter 1 by Norusis (1994).

Step 1:
Look at the Wald Statistic, in cases where there is a large sample and the regression coefficient is small. Otherwise, the Wald Statistic is counterindicated as it may result in a failure to correctly reject the null hypothesis.

$$\text{Wald Statistic} = \quad (\text{Bcoef./SE})^2$$

The Wald Statistic is used for hypothesis testing. Note in the LRA result tables, that the significance level follows the Wald Statistic. P-values are reported with a * for $p<.05$, ** for $p<.01$, and *** for $p<.001$ as required. The $p<.05$ level is recognized as non-significant for LRA (marginally significant for other analyses such as t-test). When results show significance, we are informed that the variable is significantly different from 0 or in this case traditional studies.

Step 2:
We evaluate the R statistic to establish the contribution of the variable to the model. Small partial contributions result in small values; whereas large values mean large contributions. R ranges from -1 to +1 in value, where "a positive value indicates that as the variables increases in value, so does the likelihood of the event occurring. If R is negative, the opposite is true" (Norusis, p. 5, 1994).

The following is the R statistic equation

$$R = + \sqrt{\left(\frac{\text{Wald Statistic} - 2K}{2LL(o)}\right)}$$

Step 3:
It is important to assess the fit of the model to the data set. Various methods have been established to achieve this including the use of the Histogram, Classification Table, and the resulting Likelihood or Goodness of Fit.

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Step 3a:

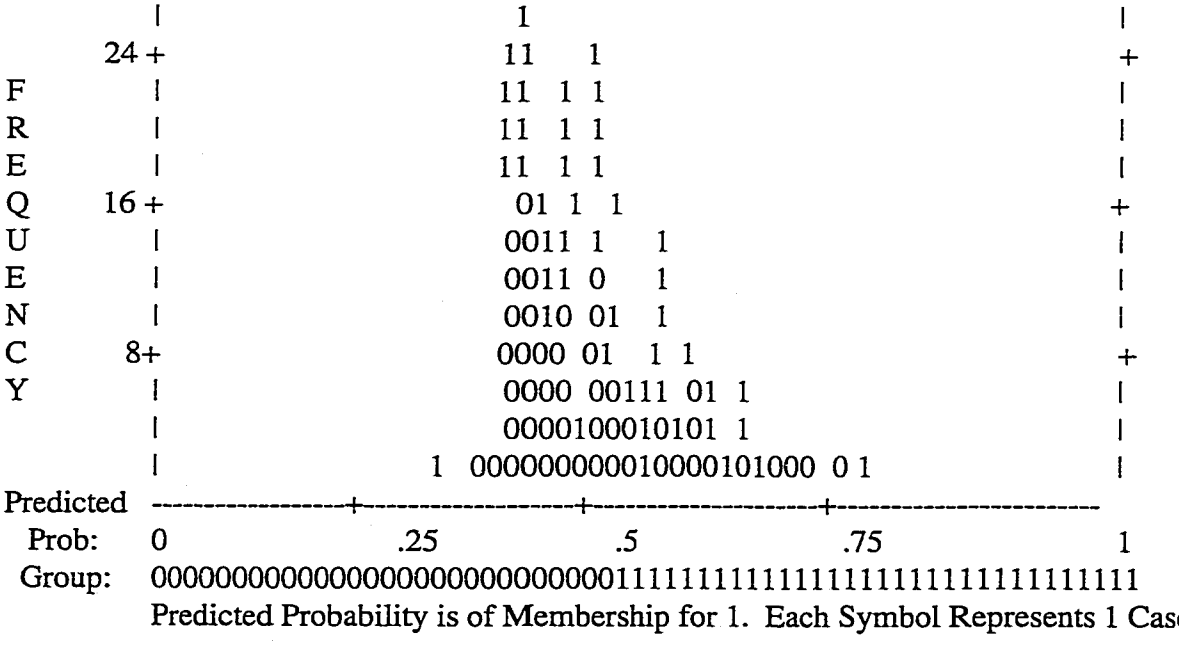
The Classification Table readily provides information regarding the % of cases correctly and incorrectly classified by the model to fit the data. Diagonal entries always show numbers of subjects correctly classified. In the female sample LRA for SRES, only 52 (59.77%) were correctly classified as TS and 50 (55.56%) were correctly classified as NTS. Overall, 57.63% were classified correctly. Off-diagonal entries signify incorrect classifications. In total, 75 out of 177 subjects were misclassified amounting to 42.37%. Not an overly optimistic or reliable result for classification purposes.

Step 3B:

The Histogram provides a more thorough understanding of the classification table. A Histogram of estimated probabilities provides information on the size or estimated probabilities for a given outcome (Norusis, 1994). Thus, we learn about the specifics of estimated probabilities for respondents enrolled in NTS and TS that were classed correctly and misclassified. The classification table informs us of whether a subject's results exceeded or failed to exceed 0.5. Those exceeding 0.5 are classed as NTS those below 0.5 are classed as TS. Large estimated probabilities for those in NTS and small estimated probabilities for those in TS are preferable if the model is to do a good job of correctly classing subjects.

A good model for classifying course enrollment (NTS or TS) should show the majority of identified non-traditional students clustered in the above 0.5 region and the balance of traditional students clustered in the below 0.5 region. The example for the female sample and SRES, is less than impressive with most of the clustering being a mix of NTS and TS hovering around 0.5 as opposed to the more desirable correct clustering close to 0 or 1. A new prediction rule for this mix of correctly classified and misclassified cases would not help us arrive at a more accurate classification solution given these results. This is due to the large number of misclassifications.

Histogram for female sample LRA results of SRES.



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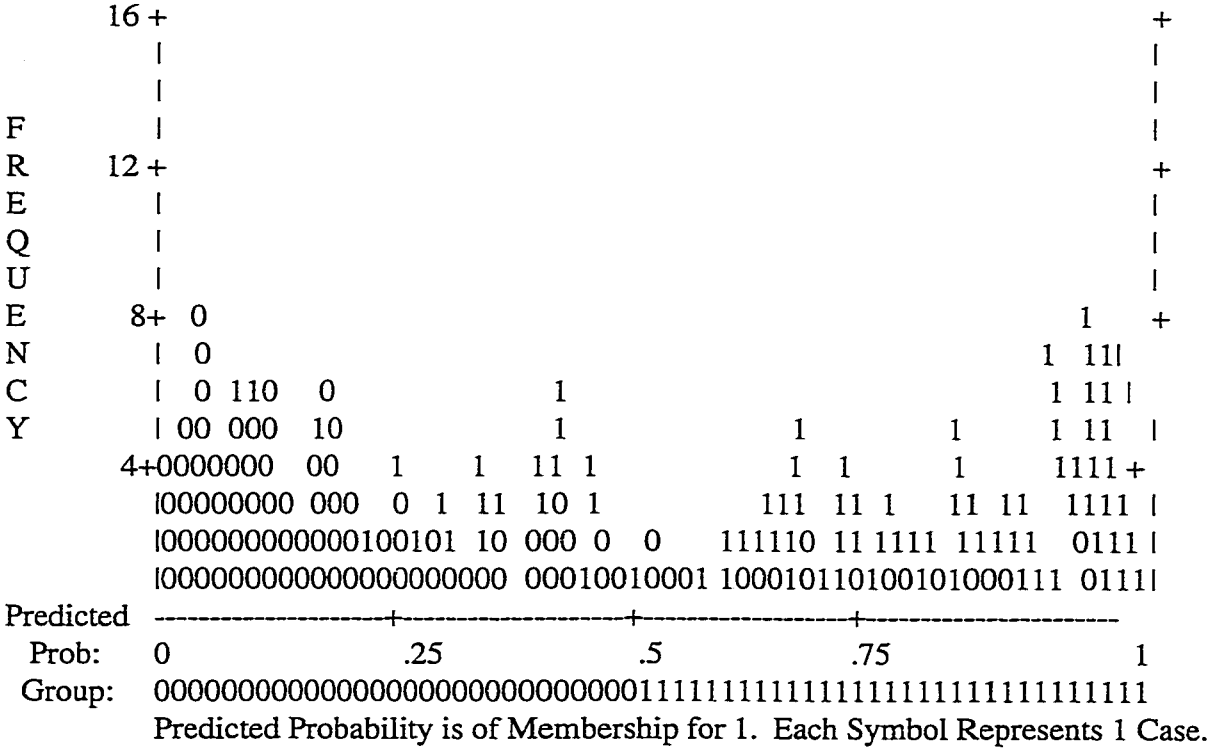
The histogram provides a visual depiction of results revealing a profile for classification based on the IV. These results make it difficult to adequately assign a useful cut-off for classification as misclassifications are scattered throughout the correctly classified respondents. The histogram is a strong indicator of performance of the logistic model. In this case the fit can only be considered to be minimal and so the performance of this model is not to be considered to be adequate for prediction.

Below is an example of a good fitting model, visually depicted by the histogram.

Histogram for exploratory LRA for the male sample with the variables Choice, ISEI dad, ISEI mom, SP.ICS, SP.NPO, SP.PPO, and SP. RPS.

Observed Groups and Predicted Probabilities



Step 3c:

Assessing Goodness of Fit is also accomplished through an examination of the "Likelihood" of sample results based on parameter estimates. Likelihood is the probability of a given result based on parameter estimates. The log of the likelihood is multiplied by -2 (-2LL) as likelihood itself is a number smaller than 1 and this multiplication acts to increase its size. When we achieve a high likelihood of observed results, this is determined to be the sign of a good model. The smaller the -2LL value the better the fit up to 0 for -2LL and 1 of likelihood, both indicating perfect fit.

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The following example will be based on the LRA for female sample with SRES.

i) Look at the -2LL for the constant only.

-2LL = 245.323

Note the large number which is not reflective of a good model fit with the constant only in the model.

ii) Check the Goodness-of-Fit statistic which relates to the present model. When this is smaller than the -2LL for the constant, this is a sign of improved fit. This means the model is a better fit with the IV than without.

-2LL = 177.237

iii) Model Chi-Square is arrived at by subtracting -2LL of the model tested from the -2LL of the constant only model.

245.323	Model with constant only
-240.791	Current model
4.532	Model Chi-Square

This is a test of the null hypothesis. Note a non-significant level of $p=.033$ or $p<.05$.

iv) Improvement reflects model building step changes in -2LL. This is another test of the null hypothesis. When there are multiple steps (as in stepwise sequential techniques), Improvement Model Chi-Square values will differ. Otherwise, Model Chi-Square and Improvement values remain the same. In our example for the female sample LRA with SRES only, there is a non-significant finding at the $p<.05$ level. Hence, improvement can be said to be non-significant in this case.

Step 4:
When interpreting coefficient results it is useful to understand the meaning and use of the term odds. Odds are defined as

> the ratio of the probability that it [an event] will occur to the probability that it will not... the odds of getting a diamond on a single draw from a card deck are 0.25/0.75 = 1/3 (Norusis, p. 6, 1994).

$$\text{odds} = \frac{\text{Prob (event)}}{\text{Prob (no event)}}$$

Log odds is the number value recorded (as the B coefficient) when the IV has a one unit change (ie., 0 to 1) and the other IV values remain constant. In LRA results for the female sample and CAVE-failure, a one unit change from 0 to 1 in CAVE, is reflected by a log odds increase of 0.11 for student enrollment in NTS. In this case, the log odds of the student

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being enrolled in NTS increases by 0.11. With our variables the logistic coefficient will tend to be small as there are, in most cases, many increments in each measure.

If we observe the results of the LRA for the female sample with SRES only the coefficient equals -.0438. This signifies a -.0438 change in the log odds, when SRES changes by 1 unit and the other IVs remain constant. Thus the log odds of NTS occurring with a one unit increase in SRES are decreased by -.0438. The negative sign reflects a decrease in the event occurring. If the sign were positive there would be a .0438 increase in the log odds of NTS occurring given the same scenario.

Making Predictions

Where there is a good model fit, we can determine the probability of a given individual's entrance into traditional vs. non-traditional studies based on the values listed in the logistic coefficient for the model. Although the exploratory LRA model built for the female sample failed to produce a good predictive fit we can still use these results to explain the use of model prediction. The coefficient values for Guide and SP.ICS each contribute to the exploratory LRA model and enable us to arrive at a value that informs us of the probability that a given student would be enrolled in NTS or TS.

Based on LRA results for forced entry of Guide and SP.ICS of the female sample we can attempt to make a prediction of domain entrance.

For example, if a student has the following values on the measures listed GUIDE = 6, and SP.ICS = 4 we can attempt prediction of domain entrance.

The following equation will result in a value for the probability of NTS vs. TS entrance.

$$\text{Prob(NTS)} = \frac{e^z}{1 + e^z} \qquad \text{where, Prob (TS)} = 1 - \text{Prob (NTS)}$$

where z = constant + or - Bcoeff(actual result) + or - ...

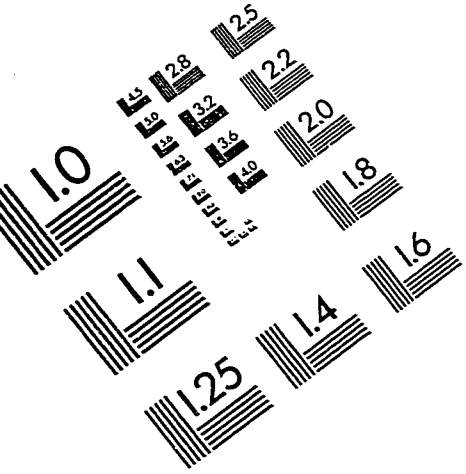
and e = "the base of the natural logarithms, approximately 2.718" (Norusus, p. 2, 1994).

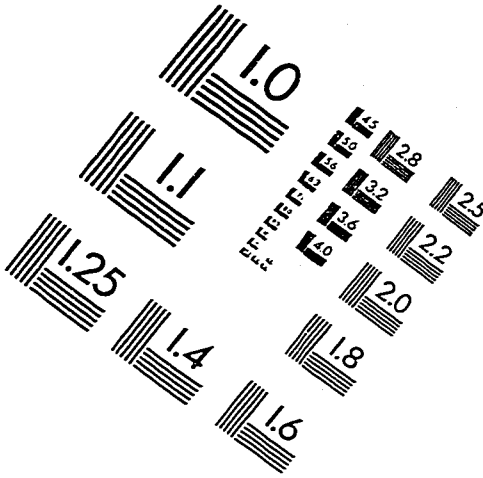
$z = .4497 - .2573(6) + .0558(4) = -0.8709$

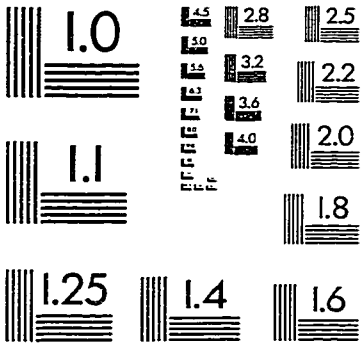
$$\text{Prob(NTS)} = \frac{e^z}{1+(2.718)^{-.8709}} = 0.295$$

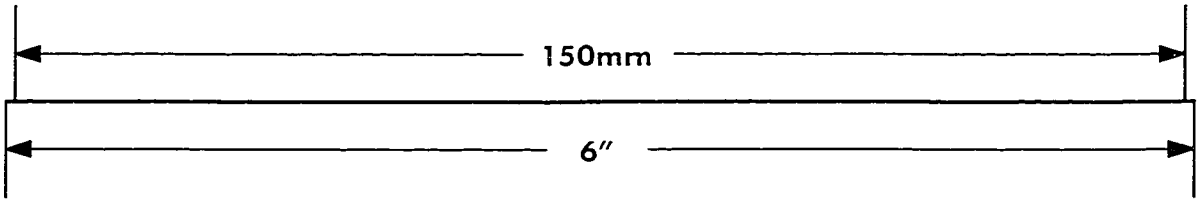
With probabilties of greater than 0.5, enrollment in NTS is predicted. If probability is less than 0.5 TS is predicted. In the eventuality of an exact 0.5 outcome either NTS or TS is equally probable (Norusis, 1994). For this example, the probability of the student entering NTS is .295. This is less than the 0.5 cut-off and suggests that this student is unlikely to enter into NTS studies, given these measure scores for a female student.

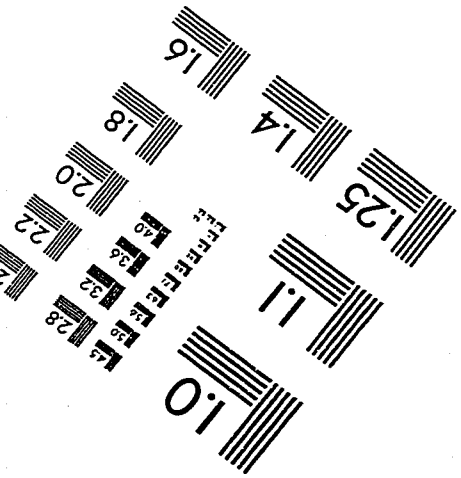
IMAGE EVALUATION
TEST TARGET (QA-3)

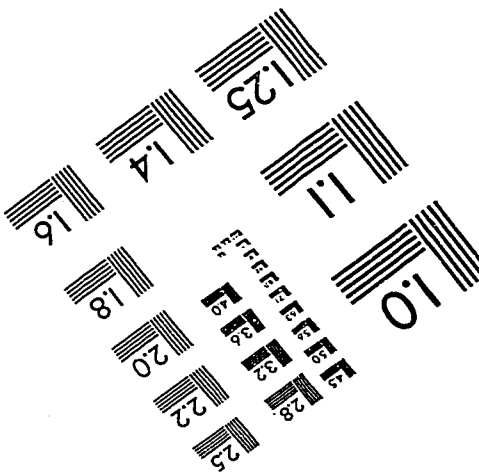












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