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UNDERGRADUATE MAJOR AND LOCUS OF CONTROL

by
Nicole Napowanetz

A Thesis

Submitted to the
Department of Psychology
College of Science and Mathematics
In partial fulfillment of the requirement
For the degree of
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at
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Thesis Chair: Roberta Dihoff, Ph.D.

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Abstract

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Undergraduate Major and Locus of Control
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Master of Arts in School Psychology

The purposes of this investigation were to further examine whether there was a relationship between gender and a locus of control orientation, as well does a specified major, in this case being STEM-related majors, constitute a higher internal locus of control? A review of the present literature demonstrates a lack of research in regards to undergraduate major and locus of control orientation. The need for further understanding in regards to the gender gap within STEM-related majors is established. To investigate further, data was collected via undergraduate students' completion of Rotter's Locus of Control I-E scale and a brief demographics questionnaire, which was made available through the Rowan Subject Pool Online Survey Database. Two-way analysis of variance revealed no significant relationship between both gender and major in regards to a more dominant locus of control orientation. Interpretations of these findings as well as limitations of the present study and conclusions to be made are discussed.

Table of Contents

Abstract	iii
List of Tables	vi
Chapter 1: Introduction	1
Chapter 2: Literature Review	4
2.1 Locus of Control: Overview	4
2.2 Locus of Control and Mental Health	6
2.3 Locus of Control and Academic Achievement	7
2.4 External or Internal: Contributing Factors	8
2.5 Locus of Control: Gender Differences	10
2.6 Academic Major: Gender Disparity	12
Chapter 3: Methodology	18
3.1 Participants	18
3.2 Materials	18
3.3 Design	19
3.4 Procedure	19
Chapter 4: Results	21
Chapter 5: Discussion	23
5.1 Summary	23
5.2 Conclusions Regarding Student Population, Locus of Control, and Gender	23
5.3 Conclusions Regarding Locus of Control and STEM-Related Majors	24
5.4 Limitations of the Current Study	25
5.5 Implications for Future Research	25

List of Tables

Table	Page
Table 1 Mean Locus of Control Score and Gender	21
Table 2 Variance of Mean Locus of Control Score and Gender	21
Table 3 Mean Locus of Control and Academic Major	22
Table 4 Variance of Mean Locus of Control Score and Academic Major	22

Chapter 1

Introduction

As our modern society continues to develop and flourish, the demand for more individuals to occupy fields of science, technology, engineering and mathematics (STEM) remains an area of continued growth. The gender disparity within these fields is still a present issue and attention is continually placed on working to better understand the gap between male and female presence within these areas of study. Although women are continuing to become a larger presence within the STEM-related occupations, there is still a gap between male and female individuals within these areas of study. The choice of which major to focus on at an undergraduate level is a potential area that gender disparity can present itself before actual placement within the workforce takes place. The current study focused on what influences an individual to pursue a specific area of study and what can be viewed as a potential contributing factor to the so-called gender disparity within STEM majors?

It is commonly accepted that there are many contributing factors that influence an individual in regards to declaring an academic major. In regards to the gender gap within STEM majors this study examined locus of control among undergraduate students to see if there was a relationship between perceived personal control (or lack thereof), gender and declared area of study at an undergraduate level. The first hypothesis proposed that female subjects would present with a dominant external locus of control orientation. The second hypothesis of this present study proposed that subjects who reported studying a STEM major would score a higher internal locus of control orientation than their

counterparts. Through the use of the following operational definitions a greater understanding of the present study can be accomplished:

Locus of Control- Internal locus of control refers to a personal belief that reinforcements experienced result from their own behavior (Rotter, 1966)

External Locus of Control refers to individuals who believe that reinforcement is “controlled by external forces, particularly luck, chance, or experimental control...” (Rotter, 1966, 25)

Subjective Well-Being- An individual’s perception of their own happiness and satisfaction with their life. (Dave, Tripathi, Singh, & Udainiya, 2011)

STEM- Acronym for academic fields of Science, Technology, Engineering and Mathematics.

Academic Major- Designation of declared majors were separated as follows:

Business, Communication and Creative Arts, Education, Engineering, Humanities and Social Science, Medicine, Performing Arts, Science and Mathematics, and Undeclared.

For this present study it was assumed that all participants have designated an academic major, and if not they are willing to disclose their undeclared status. The integrity of this study operates under the assumption that all participants complete the locus of control scale (I-E scale) as honest and accurate as possible.

Limitations for this study included sample size, participant recruitment, and reliance on self-reported outcomes. Participants who were enrolled in fundamentals of psychology were required to complete a survey as a class requirement, which may have limited the number of students who declared a major in a predominately science or math

concentration. Another limitation was the reliance on self-reported outcomes through the I-E scale. Individual responses can potentially be influenced by a perceived belief of what is typically “right” vs. “wrong”, even if their anonymity is promised.

To summarize, the focus of this study was to investigate further into the gender gap within the STEM academic majors and to discover whether there is a relationship between locus of control orientation and different major concentrations. This study put attention on locus of control and explored the differences, if any, amongst gender and major concentrations.

First, a review of present literature will explore the in-depth definition of locus of control, what influences an individual to potentially become predominately internal or external, the implications locus of control can have on academic achievement and mental health, and the gender disparity that is presently understood within the literature in regards to locus of control and STEM fields of study. Next, the study design will be reviewed along with the research findings that were gathered. Finally, potential conclusions that can be inferred from the data collected will be examined and further study implications will be discussed.

Chapter 2

Literature Review

Review of the literature will begin with an overview of Locus of Control theory and the definition of external and internal orientation. A review of how an individual can become dominantly internal or external and potential gender differences will be examined. The influence locus of control has on an individual's mental health and academic achievement will be explained. Lastly, gender disparity within academic majors and limitations of current research available will be discussed.

Locus of Control: Overview

Locus of Control (Rotter, 1966) is a theory developed by Julian Rotter to better explain how individuals interpret events and their environmental influences. Social Learning Theory (Rotter; 1954, 1955, 1960) provided a background for the development of Locus of Control and its theoretical application. Social Learning Theory explains that “a reinforcement acts to strengthen an expectancy that a particular event will be followed by that reinforcement in the future” (Rotter, 1966, pg. 2). When expectancy is formulated from a specific situation it can be generalized and applied to a series of situations that are considered related or similar (Rotter, 1966). These situations can give way to the development of “attitude, belief, or expectancy regarding the nature of the causal relationship between one's own behavior and its consequences...” (Rotter, 1966, pg. 2).

Locus of Control theory depicts two ways in which individuals can interpret the relationship between an individual's behavior and the consequences that follow. Internal locus of control refers to a personal belief that reinforcements experienced result from

their own behavior (Rotter, 1966). If an individual experiences consistent rewards for their own efforts they are expected to develop an internal locus of control (Twenge, Zhang, & Im, 2004). These individuals believe that their success is derived from their own abilities and efforts (Tella, Tella, & Adeniyi, 2009). Individuals with a strong internal locus of control hold the belief that hard work and personal abilities will lead to positive outcomes (Carrim, Bason, & Coetzee, 2006).

External Locus of Control refers to individuals who believe that reinforcement is “controlled by external forces, particularly luck, chance, or experimental control...” (Rotter, 1966, pg. 25). If an individual demonstrates effort and does not succeed, this will, in turn, develop an external locus of control (Twenge et al., 2004). External individuals are less likely to make a change to behavior due to the belief that changing a behavior will not have an effect on the reinforcements experienced (Marks, 1998).

Hanna Levenson expanded on the Locus of Control theory and created a multidimensional model (Levenson; 1973, 1976). Levenson’s development of the multidimensional model was due to the belief that external locus of control definition was too broad. It was expected that external individuals would hold the belief that events were controlled by fate, chance, *or* powerful others (Levenson, 1973). Due to this broad definition the multidimensional model made the attempt to more precisely measure belief “in chance or fate expectancies as separate from a powerful others orientation” (Levenson, 1973). When examining behavior it was observed that individuals behaved and thought differently when it came to holding a belief that the world was “unordered (chance)” and those that viewed the world as ordered but that powerful others were in control (Levenson, 1973).

Locus of Control and Mental Health

It has been demonstrated that a higher external locus of control is correlated with a greater risk for mental health problems (Holder & Levi, 1988; Karayurt & Dicle, 2008). Internal locus of control has been linked to a lower occurrence of depression and presence of depressive symptoms (Burger, 1984; Presson & Benassi, 1996; Zawai & Hamaideh, 2009; Williams & Francis, 2010). Burger (1984) examined the correlation between desire for control and depression among college students. He concluded that “a general pattern that appears to be associated with depression is a perception that one has little internal control over the events in one's life...The perception that chance controls a great deal of one's life was an especially strong correlate with both initial and later levels of depression” (Burger, 1984, pg. 84). Presson & Benassi (1996) also found support for the hypothesis that higher levels of depressive symptoms is found to be associated with “higher degrees of belief in lack of internality, chance, and powerful others as controlling agents” (Presson & Benassi, 1996, pg. 208).

Another aspect of mental health that demonstrates a relationship with locus of control is subjective well-being. Subjective well-being refers to an individual's perception of their own happiness and personal satisfaction with life (Dave, Tripathi, Singh, & Udainiya, 2011). Individual well-being has been linked to locus of control (April, Dharani, & Peters, 2012; Dave et al., 2011). It has been demonstrated that internal locus of control is linked to a more positive well-being when compared to those who are external (Dave et al., 2011). Thus, when an individual presents with a higher level of external belief this in turn correlates with a lower level of well-being (April et al., 2012).

It can be assumed that an effort to make life better and positive thinking has a relationship to an internal locus of control (Dave et al., 2011). Zawawi et al. (2009) supported that locus of control has an important role in coping behavior with negative life events (low grades, financial problems, health problems). Adopting problem-solving strategies is found to be associated with internal locus of control, whereas externals tend to react emotionally (Zawawi et al., 2009). It has been found that there is a positive correlation between a severe level of stress and behavioral attributions to chance (de Carvalho, Gadzella, Henley, & Ball, 2009). When an individual enlists coping strategies for stress, there are two methods that one can use: problem-focused coping and emotion-focused coping (Arslan, Dilmac, & Hamarta, 2009). Problem-focused coping makes a change between the individual-environment relationship, which utilizes information that will eliminate the stress-inducing situation and create a plan of action (Arslan et al, 2009). Emotion-focused coping creates change by interpretation of the environment instead of by direct behaviors (Arslan et al, 2009). Thus, it can be inferred that in a stress-inducing situation locus of control has an effect on the way in which an individual will perceive the events in their surrounding environment (Arslan et al, 2009). Holding the belief that you control your own life can contribute to viewing oneself as strong and experiencing less levels of stress (Arslan et al 2009). External locus of control leads an individual to believe their life is out of their own control and can contribute to feeling weak and exposure to a greater degree of stress (Arslan et al., 2009).

Locus of Control and Academic Achievement

It has been verified that internal individuals demonstrating the belief that consequences are directly related to their own personal actions has a causal relationship

with acceptance of responsibility for what happens to them (NG et al., 2006). Individuals with an external disposition, however, tend to not accept responsibility for what happens to them due to “their belief structure... not... [including] a cause-and-effect relationship between the precedent behavior and the subsequent consequence” (NG et al., 2006, pg. 8). Wood, Saylor, & Cohen (2009) stated that possessing a “strong internal locus of control has been repeatedly associated with higher levels of personal satisfaction, motivation, and the achievement of positive personal outcomes, including academic success.” (pg. 291) Locus of Control has been shown to have an impact on academic achievement (Tella et al. 2009; Uguak, Elias, Uli, & Suandi, 2007; Shepard, Fitch, Owen, & Marshall, 2006) ethical decision making (Smith, Hume, & Zimmermann, 2007) student procrastination (Janssen & Carton, 2010) and work motivation (NG, Sorensen, & Eby, 2006). Amongst high school students it was noted that there was a correlation between higher academic achievement and locus of control scores, which demonstrated a more “internal control orientation” (Shepard et al., 2006. Pg.321). In regards to procrastination, it has been demonstrated that students who held internal “expectancies” for academic assignments took less time to complete and return the assignment than those who demonstrated external control “expectancies” (Janssen et. al., 2010, pg. 440).

External or Internal: Contributing Factors

Parenting style has an impact on the development of an external or internal locus of control orientation (Buriel, 1981; Lee, Daniels & Kissinger, 2006) Lee et. al (2006) identified parental practices that affected a “students’ self-concept, locus of control, and academic achievement” (Lee et al., 2006, pg. 253). Parents who present with an authoritative parenting style have a strong indication that their adolescent child will have

a more positive self-concept and internal locus of control (Lee et al., 2006). Authoritative parenting style is characterized by “moderate to high scores on scales assessing decision making (teen deciding after discussing with parents), expectations, and family rule, with high discussion and involvement scores” (Lee et al., 2006, pg. 255). This is reflective of parents who respond to their children’s needs but still implement standards of conduct (Baumrind, 1991). Parents who demonstrate less ability to provide structure, monitor their children’s behavior and are less engaging with their children in regards to decision-making positively correlates with children demonstrating lower positive self-concept and internal locus of control (Lee et al., 2006). Authoritarian parenting style, which is described as parents “who demand obedience but are not responsive to the needs of the child” (Lee et al., 2006, pg. 257) demonstrates a relationship to a child who has a lower self-concept and internal locus of control when compared to a child who is brought up in an authoritative parenting environment (Lee et al., 2006). What this demonstrates is that parental involvement in decision making and responsiveness to a child needs has a strong relationship to how a child develops their own self-concept and locus of control orientation.

Cultural differences present another link between a development of an internal or external locus of control ((Lifshitz, 1973; Trimble & Richardson, 1982; Paguio, Robinson, Skeen, & Deal, 1987). Paguio et al. (1987) looked at both child-rearing practices and social influence among children from Brazil, Philippines and the United States. This demonstrated that individuals who are brought up in a culture that is subjected to social change (Brazil and Philippines) present with a higher level of external locus of control than those who are brought up in a more stable social environment (the

United States) (Paguio et. al, 1987). Within Brazil and the Filipino culture it is common to place importance on “submission to authority” (Paguio et al., 1987, pg. 309) which can be reflective in a higher level of external orientation. Children within the United States tend to be brought up under less restrictive circumstances, which can lead to the demonstration of a lower internal locus of control (Paguio et al., 1987) What this portion of the study verifies is societal influence can most certainly correlate with the presence of an internal or external locus of control amongst children, which in turn can carry through to adulthood.

Along with parental style and cultural influence, age and maturity has shown to be an influential factor on locus of control (Lifshitz, 1973; Knoop, 1981; Chubb & Fertman, 1997). Lifshitz (1973) included children ranging from ages 9 to 14 and found that maturity was related to increasing ability to assume responsibility for successful outcomes and failures. When individuals get older their experiences shape their expectations, which in turn can change perceptions of control over their environment (Knoop, 1981). The longitudinal study conducted by Chubb et al. (1997) demonstrated that for both male and female students over the course of ninth and twelfth grade locus of control became less external each year (Chubb et al., 1997). Although this study in particular found no significant difference between locus of control and gender, there was a significant interaction between gender and grade; specifically that females became less external between ninth and tenth grade, whereas males became slightly more external (Chubb et al., 1997).

Locus of Control: Gender Differences

The interaction between gender and locus of control continues to be a topic that varies. It has been demonstrated through numerous studies that females tend to score higher in regards to external locus of control (Jemi-Alade, 2008; Mwamwenda, 1995; Wehmeyer, 1993; Zea & Forrest, 1994; Zaidi & Mohsin, 2013) whereas other studies have found no difference between genders (Adame, Johnson, & Cole, 1989; Fagbohunge & Jayeoba, 2012). In regards to a more dominant external locus of control amongst females, Zea et al. (1994) examined Colombian University students and concluded that women were more externally orientated than males. The study pointed out that gender socialization of Colombia is in fact consistent with these findings (Zea, et al., 1994). Colombian women aren't primarily main providers for families, or even themselves, which can create contribute to the gap between perceived control over external circumstances and gender (Zea et al., 1994). Although this can account for the external recognition amongst female students in Colombia, it proves to be a limitation in regards to general application. The difference in culture and values within these cultures can be deemed influential and inconsistent in regards to generalization for Locus of Control and gender attributions.

In regards to no significant difference between gender and locus of control, Fagbohunge & Jayeoba (2012) looked at locus of control in regards to gender and entrepreneurial abilities amongst undergraduate students who are enrolled in either social or management sciences at two Nigerian Universities of Western Nigeria. The study found that there was no significant interaction between gender and locus of control in regards to influence on entrepreneurial abilities (Fagbohunge & Jayeoba, 2012). Yet another limitation that can be expressed is that the academic major was controlled and

only included individuals from either social or management sciences. This shows the need for a greater understanding of locus of control in regards to a broader spectrum of majors.

Jemi-Alade (2008) examined whether there was a difference in locus of control amongst undergraduate and graduate students in Health Care Administration and Business Administration. It was found that both undergraduate and graduate college students generally had a similar internal locus of control orientation (Jemi-Alade, 2008). Gender did not demonstrate a significant relationship between majors, regardless of undergraduate or graduate level (Jemi-Alade, 2008). It is important to note that the student population was derived from Texas Woman's University and Texas Southern University, which can present a limitation of this study. Only 140 students were utilized for this study and one of the university's was an all female school, which can demonstrate an uneven distribution of gender. However, this study does examine two other academic majors and shows no difference between gender and locus of control. Considering the conflicting research between locus of control and gender, it is important to better understand the gender disparity amongst academic majors and further delineate whether gender and locus of control can be linked as a contributing factor.

Academic Major: Gender Disparity

It has been noted over the course of the years that fields of focus in regards to science, technology, engineering, and mathematics (STEM) are seemingly paramount in regards to stressed importance and status "in modern society due to their vital role in promoting and sustaining economic prosperity" (Riegle-Crumb, King, & Muller, 2012, pg. 1049). A reason such focus has been put on the assurance of further development and

participation in science and engineering is because it has been viewed as a way to make certain we as a nation continue to “prosper in the global marketplace of the 21st century” (National Academy of Sciences, 2007, pg. 40). According to the 2009 report put out by the National Center for Education Statistics, the percentage of high school graduates who earned credits in advanced mathematics courses was greater in 2009 than in 2005 (Nord et al., 2011, pg. 49). The percentage of graduates who earned credits in advanced science, engineering, engineering/science technologies and health science/ technology has proven to be larger in 2009 than in 1990 (Nord et al., 2011). The importance placed on STEM coursework sets the stage for needing to further understand the gender gap that exists within STEM academic majors.

When examining the differences between gender and STEM advanced science and engineering courses, STEM-related technical courses, and STEM advanced mathematics courses, the only areas where males earned a larger percentage of credits were: physics, engineering, and engineering/science technologies (Nord et al., 2011). A larger percentage of females than males earned credits in chemistry, advanced biology, health science/technology, algebra II and pre-calculus (Nord et al., 2011). High math achievers and female representation has increased greatly during the past few decades (Hill, Corbett, & St. Rose., 2010). Gender disparity in STEM coursework at a primary level is slowly becoming less prevalent, which emphasizes the fact that the gap between genders in the college setting and the workforce is not entirely contributed to underachievement at a lower educational level.

Gender bias is a factor that can have an impact on educational and career development. Ancis & Phillips (1996) looked to better understand the relationship

between academic gender bias and female students' agentic self-efficacy expectations. Agentic self-efficacy expectations can be defined as "an individual's beliefs about her ability to successfully engage in proactive educational and career facilitative behaviors" (Ancis & Phillips, 1996, pg. 131). The study found that the perception of a greater degree of gender bias at an undergraduate level related to a lower agentic self-efficacy expectation (Ancis & Phillips, 1996). Experiencing a biased environment may affect a woman's pursuance of valuable career-enhancing interactions and opportunities and can hinder the initiation and maintenance of proactive educational behavior (Ancis & Phillips, 1996). Having confidence in abilities related to STEM fields of study have been shown to develop during middle school and increases in high school, and girls have shown to report less confidence in math and science ability than boys (Pajares, 1996). A contributing factor to this can be negative stereotypes that are still of existence today. There are two stereotypes that still seem to be present within society: girls are not as good as boys in math, and scientific work is better suited for boys and men (Hill et al., 2010). The negative stereotypes that are still prevalent today can be a large contributing factor to the discrepancy between female performance and female presence in STEM disciplines. It can be inferred that females demonstrate a lack of interest in STEM disciplines due to "[an] attempt to reduce the likelihood that they will be judged through the lens of negative stereotypes by saying they are not interested and avoiding these fields" (Hill et al., 2010, pg. 38).

Having interest in a declared field of study is another contributing factor to academic major declaration. In regards to STEM fields, it was demonstrated that when high school seniors indicated their college major expectancy, "men are close to three

times as likely as women to expect a college major in the STEM...” (Ma, 2011, pg. 1186). A poll conducted by the American Society for Quality in 2009 found that 24 percent of boys and only 5 percent of girls reported interest in engineering careers (Hill et al., 2010). It is widely accepted that males and females exhibit dissimilar choices when declaring college majors (Zafar, B, 2009). Ceci, Williams, & Barnett (2009) reviewed more than 400 publications looking at factors that can be attributed to the underrepresentation of women in math-intensive fields and it was concluded that “...of all these factors, personal lifestyle choices, career preferences, and social pressures probably account for the largest portion of variance. This does not mean that math ability plays no role...but math ability does not appear to trump other factors in accounting for the underrepresentation of women in math-intensive fields.” (Cecil et al., 2009, pg. 250).

Zafar (2009) explained that “enjoying work at the jobs and learning more about things that interest them were the two most important reasons for choosing a major for both males and females” (pg.15). Even if a female demonstrates interest in a STEM field, the retention of the female population within the STEM fields has proven to be a bit problematic. Within academic science, for example, the gender gap is still prevalent and retention of females in science academia is still a persistent issue (Park, 2007; Fox, 2001; Xu, 2008).

In regards to majors that are more female dominated it is demonstrated that males are more inclined to be “encouraged by a mentor or role model to choose a major” than their female counterparts (Zafar, 2009, pg. 15). Females seemed to put less emphasis on “peer pressure, siblings making the same choice, and parents wanting them to make the choice” than males in this sample (Zafar, 2009, pg. 15). The limitation present within this

study is that the subjects were part of a sample of students that had majored in the College of Arts and Sciences (Zafar, 2009). This can imply that males felt more encouraged by others to choose a major than females because of majors in this college being “mostly dominated by females” (pg. 15) This demonstrates that although males do choose a female dominated major, the “desegregation of occupations has largely taken the form of women moving into male-dominate fields, rather than men moving into female-dominated fields” (England, 2010, pg. 154). The importance to note here is that outside influences are important when a male moves into a female-dominated area of study, which leaves the question as to what exactly influences a female to move into a male-dominated area of study? Does the difference in externality and internality have a part in the encouragement of moving into a more male-dominate area of study?

Zafar (2009) explained that males and females seem to possess similar preferences in regards to choices at college, but their differences lie in their “tastes regarding the workplace” (pg. 28) He described the differences in regards to pecuniary vs. non-pecuniary outcomes. Females seem to care more about non-pecuniary outcomes, which would be described as “gaining approval of parents and enjoying work at jobs” (pg. 28), while pecuniary outcomes (social status of jobs, likelihood of finding a job, and earning profiles at jobs) are deemed more important by males (Zafar, 2009). What this begins to touch upon is that a preconceived notion about the workplace can be a beneficial or hindering factor when choosing an area of study at an undergraduate or graduate level.

When looking to improve the gender disparity amongst STEM related majors and careers, it has been demonstrated through the literature that it is of great importance to

first understand why the disparity exists in the first place. Preconceived notions regarding the area of study, negative stereotypes and personal interest all have a major role in declaring an academic major. Research has shown that female students have equal ability within the classroom at an elementary age as male students, which has begun to remove the stigma that boys are better than girls when it comes to math and science.

If an individual places greater emphasis on chance and less belief within him or herself research has shown this can hinder potential for future advances. Much research has been done to examine the influence locus of control has on mental health and academic achievement, but there is a lack in research when it comes to understanding the influence locus of control orientation may have on making an academic major decision, if any at all.

Chapter 3

Methodology

Participants

The participants in this study were undergraduate students currently enrolled in the course Fundamentals of Psychology at Rowan University. Participants had to be at least 18 years of age and willing to disclose their gender and declared academic major. 100 undergraduate students completed both the demographics questionnaire and locus of control I-E scale; 43 of which were males and 57 were females. The sample size represented undergraduate academic majors as follows: business (n=15), communication & creative arts (n=16), education (n=7), humanities & social sciences (n=22), engineering (n=1), medicine (n=9), performing arts(n=1), science & mathematics (n=20), undeclared (n=9).

Materials

Participants were able to review an alternate consent form, which gave an overview of the purpose of the study and indicated reasoning for their participation. Participants were notified that there would be no risk to their physical or mental health by partaking in the study. The study materials that were used included a brief demographics questionnaire and Rotter's I-E scale.

The demographics survey required participants to include their age, their gender (male or female) and their undergraduate major. Participants were asked to choose their undergraduate major from the list that was provided. The participants could choose:

Business, Communication and Creative Arts, Education, Engineering, Humanities and Social Sciences, Medicine, Performing Arts, Science and Mathematics, or Undeclared.

Rotter's Locus of Control Scale was created in 1966 by Julian Rotter. The I-E scale is made up of 29 items with the intent to measure internal-external expectancies of individuals. It has been noted that this scale has an adequate test-retest correlation (range .49 to .78) and KR-20 estimates (range .65 to .79) (Rotter, 1966; Ferguson, 1993) Lange & Tiggemann (1981) found the test-retest reliability of the I-E scale to be .61, which demonstrates results are stable over a considerable period of time.

Design

To further understand the relationship between locus of control and declaration of undergraduate academic major, a brief demographics questionnaire was designed by the researcher. The demographics questionnaire required participants to disclose their age, gender and indicated academic major.

The locus of control I-E scale was developed by Julian Rotter and is used to determine the internal-external expectancies of individuals. The scale is made up of 29 items, with 23 scored items and 6 filler questions. Scoring for this particular scale is based on a low vs. high score, meaning that if an individual has a higher score they are deemed external whereas a low score is considered internal. Logically, the highest score an individual can receive is 23 and the lowest score an individual can receive is a 0.

Procedure

The subjects for this present study were undergraduate students currently enrolled at Rowan University. The participants were at least 18 years of age and were registered in the Fundamentals of Psychology course offered on campus. 100 students voluntarily

completed electronic surveys for participation credits in the Fundamentals of Psychology course, which allowed for voluntary participation and random assignment. The survey was uploaded to the Rowan subject pool website. The participants were given 15 minutes to complete both the demographics questionnaire and the locus of control I-E scale.

Once the enrollment for the study was complete, the researcher extracted the data from the online subject pool website and exported it to SPSS. Through SPSS the data was analyzed by means of One-Way Analysis of Variance to determine the relationship between locus of control score in both gender and academic major. Finally, interpretation of the data was made after the data was analyzed.

Chapter 4

Results

This chapter presents results related to the experimental examination of locus of control in relation to undergraduate academic major, gender, and the relationship between the variables. After data analysis was completed it was concluded that neither hypothesis was deemed significant.

In regard to hypothesis 1, the female population did not present with a more dominant internal orientation. As table 1 demonstrates, the mean locus of control score for males was 13.2, while the mean locus of control score for females was 13.1. The Analysis of Variance of between-subjects effects demonstrated that the relationship between locus of control orientation and gender presented no significant findings, $p=.291$, which is demonstrated in table 2.

Table 1
Mean Locus of Control Score and Gender

Gender	Mean	Std. Error
Male	13.21 ^a	.56
Female	13.13 ^a	.52

:Table 2
Variance of Mean Locus of Control Score and Gender

	df	Mean Square	F	p
Between Subjects	1	11.53	1.14	.29*

*Note: Finding is non-significant at $p>0.05$

In consideration of hypothesis 2, which was that STEM majors would present with a dominant external locus of control orientation, no significant findings were

established. For the purpose of data analysis, individuals who were of a declared major in medicine (n=9) and engineering (n=1) were grouped into science & mathematics to deter from outliers and the potential for skewed results. The participant who was performing arts declared major was grouped into communication & creative arts for the same purpose.

The mean scores for all represented majors are demonstrated in table 3. As the data analysis revealed, STEM majors vs. non-STEM majors did not demonstrate a significant difference in mean locus of control orientation score. Table 4 displays the results of an one-way Analysis of Variance, which showed no significant results non- (p=.461).

Table 3
Mean Locus of Control Score and Academic Major

Major	Mean	Std. Error
Business	12.82 ^a	.97
Communication & Creative Arts	12.33 ^a	.88
Education	14.75 ^a	1.25
Humanities & Social Sciences	13.48 ^a	.814
Science & Mathematics	12.32 ^a	.76
Undeclared	13.79 ^a	1.08

Table 4
Variance of Mean Locus of Control Score and Academic Major

	df	Mean Square	F	p.
Between Subjects	5	9.571	.943	.461*

*Note: Finding is non-significant at p>0.05

Chapter 5

Summary

The present study was aimed at identifying whether a dominant internal or external locus of control orientation had a significant relationship with both gender and a declared academic major at an undergraduate level. It was hypothesized that there would be a significant difference between male and female orientation; that being females would present with a more dominant external orientation. It was also hypothesized that individuals who declared a STEM-related major would be predominantly external in orientation. The findings presented within this current study did not yield significant results for either proposed hypothesis. Although the results were not significant, there are both important conclusions to be discussed as well as implications for future research.

Conclusions Regarding Student Population, Locus of Control, and Gender

In regards to a non-significant relationship between gender and locus of control, it is important to note that both genders tended to score within the “middle” range for locus of control orientation. What this can be interpreted as meaning is that both genders weren’t typically more external or internal, but rather they displayed a balance between both orientations.

Prior research has presented conflicting results in regards to gender and locus of control orientation. Although there were studies that found females presented with a higher score in regards to an external locus of control (Jemi-Alade, 2008; Mwamwenda, 1995; Wehmeyer, 1993; Zea & Forrest, 1994; Zaidi & Mohsin, 2013) this present study was consistent with other studies that found no difference between genders (Adame,

Johnson, & Cole, 1989; Fagbohunge & Jayeoba, 2012). Wehmeyer (1993) looked at gender differences in locus of control scores for students with learning disabilities. There was a gender difference found, which was females presented as more external than males. What is important to note, however, is that research has demonstrated an external locus of control is commonly found within the learning disabled population. This can reflect that an external orientation amongst females within this study is not to say it is commonly found within all populations, especially in regards to a typical functioning student enrolled at a college or university. For the current population being examined within this study it can be concluded that locus of control scores may not be indicative of gender disparities, but more commonplace amongst different populations.

Fagbohunge & Jayeoba (2012) found that both gender and locus of control did not have a significant influence on entrepreneurial abilities. Although a different focus in regards to gender and locus of control, this offers more support in relation to the concept that gender does not necessarily offer a correlational relationship between both locus of control orientation and personal ability. The importance of highlighting this is to further demonstrate that gender disparity amongst STEM-related majors may present as having a causal relationship with a locus of control orientation.

Conclusions Regarding Locus of Control and STEM-Related Majors

No significant differences were found between academic majors, specifically STEM-related majors, and a more dominant locus of control orientation. Given the lack of research on locus of control and academic majors, it was hypothesized that an internal locus of control would be related to STEM academic majors based on the belief that individuals who declared a STEM academic major would be more internally driven and

possessing the viewpoint that circumstances are of their own control. This line of thinking, however, was not supported by the present study. Although an internal locus of control score is associated with positive characteristics, such as: lower occurrence of depression (Burger, 1984; Williams & Francis, 2010), a more positive well-being (Dave et al., 2011), and personal satisfaction, motivation, and achievement (Wood, Saylor, & Cohen, 2009). It can be assumed that an effort to make life better and positive thinking has a relationship to an internal locus of control (Dave et al., 2011) this is not to say that one area of academic concentration denotes a stronger internal or external locus of control score.

Limitations of the Current Study

This study presented several limitations, including sample size, participant recruitment, and reliance on self-reported outcomes. Although the study used a relatively large sample size (n=100) the distribution of students was uneven amongst the prospective academic majors. Participants who were enrolled in fundamentals of psychology were required to complete a survey as a class requirement, which may have limited the number of students who declared a major in a predominately science or math concentration. Another limitation was the reliance on self-reported outcomes through the I-E scale. Although anonymity was promised to participants, individuals may feel they need to answer certain questions in a way that would be viewed as “acceptable” or “expected”.

Implications for Future Research

When taking into consideration the results that were presented within this present study, there are a few suggestions that can be made in regards to future research. The data

collected may produce significant results if the population included was from several universities and covered different geographical regions within the United States. A difference in culture as well as geographical regions may demonstrate a difference in locus of control scoring. If future studies focused on the difference between locus of control scores in regards to diverse cultures and regions within the United States it may shed some light onto the disparity that exists within STEM majors not based on gender alone, but also on cultural and geographical influence.

Another area of interest for future research in regards to locus of control may be to examine the differences amongst age groups. It would be of curious interest to see if there is a correlational relationship between age and a locus of control score. Are individuals prone to be more internal, external, or both at various points in their lives? If age is found to be a variant amongst locus of control scoring it may be important to know what occurs at different ages and why might this difference in scoring be presented?

Considering that locus of control score did not have a significant indication in regards to an academic major, specifically STEM-related, the disparity amongst STEM majors still needs to be examined further. It may be due to intrinsic beliefs or differences within individuals that are yet to be fully understood, but the area still needs further research. With the growing field and demand for individuals who are driven to fulfill a career path within these fields it is important to continue to bridge the gap and it is an area that needs greater focus put on it.

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