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Who Deserves to be in STEM? How Threat and Confirmation of the Gender Hierarchy Impact Helping Behavior Towards Prospective STEM Majors

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WHO DESERVES TO BE IN STEM? HOW THREAT AND CONFIRMATION OF THE
GENDER HIERARCHY IMPACT HELPING BEHAVIOR TOWARDS PROSPECTIVE
STEM MAJORS

by

SAMANTHA GNALL

(Under the Direction of Amy A. Hackney)

ABSTRACT

Current events that either threaten or confirm the current gender hierarchy may impact people differently. This can depend upon one's group membership and their attitudes towards a fair and just society. When people are asked to help others while facing uncertainty of the hierarchy, they may choose to help or lash out in an effort to re-establish the hierarchy or dismantle the hierarchy. STEM faculty were presented with information that either did not threaten the gender hierarchy (i.e., maintaining gender inequality) or that threatened the current gender hierarchy (i.e., reaching gender equality). Participants were then given an opportunity to offer help either to a prospective male or female STEM student with a scholarship essay and then they completed the Social Dominance Orientation Scale (Ho et al., 2017). The primary hypothesis was that participants would award more money to an essay writer of the same gender, however the amount awarded would differ based on information regarding the gender hierarchy. With the limited number of participants we were able to recruit, there is not sufficient statistical power for confirmatory hypothesis testing. An exploratory analysis of the data trends suggested that the hypotheses may not be supported in this sample. Data regarding Social Dominance Orientation is not reported at this time and will be analyzed as part of an ongoing study. This research has the ability to increase awareness and willingness to help women entering STEM majors.

INDEX WORDS: Helping, social hierarchy, Science technology engineering math, Ingroup, Outgroup, Scholarship essay, News media, Gender, STEM

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CHAPTER 1

INTRODUCTION

Historically, media has been used to further disseminate stereotypes on a range of issues and topics. It plays a role in the perpetuation of sexist stereotypes and a social system where women are viewed as less than men (Martin, 2002; Montiel, 2015). Within the past decade there has been more current events in the news and other forms of social media that may either threaten or endorse the current gender hierarchy (Halabi et al., 2008; Wilkins et al., 2018). For example, the #MeToo movement, which has resulted in several women replacing men who had been in powerful positions (Cooney, 2017), threatens the structure of the gender hierarchy, while the recent confirmation of Judge Kavanaugh to a powerful position (Stolberg, 2018) further perpetuates the structure of the gender hierarchy. How people react to such information can be related to their social identity or their social dominance orientation.

Social Identity Theory

Social identity theory was first discussed by Tajfel and Turner (1979). This theory posits that the social groups in which people belong are an important part of their sense of self. People have varying social identities that can include aspects such as social class, gender, sports teams, family, nationality, and hobbies. This leads to the categorization of an in-group and an out-group, as well as an us vs. them mentality (Tajfel & Turner, 1979). The in-group consists of individuals with the same or similar identities to oneself while the out-group consists of those with whom an individual does not identify.

In-group/Out-group Effects. Social categorization of groups leads to an in-group bias, where the in-group is evaluated favorably relative to the out-group. This bias may be influenced by both groups competing towards a goal, for example political parties campaigning for their

nominee. However, the presence or recognition of an out-group can also result in bias (Tajfel & Turner, 1986). Previous studies have examined a minimal group paradigm to test the idea of an in-group and out-group. Participants were divided into random, non-overlapping groups and told to decide how much money to award to other participants. They were assigned to either group X or Y, then told which group the participant receiving the money belonged to. Those in the X gave more money to participants in the X group than those in the Y group. Y group members gave more money to fellow Y group members than those in the X group. This demonstrates that in-group favoritism and out-group discrimination persisted with such cognitive groupings (Islam, 2014; Tajfel, 1970; Tajfel & Turner, 1986).

Social identity and social categorization are also aspects of the creation of social groups (Stets & Burke, 2000; Tajfel, 1982). Social identity means that individuals and others are recognizing themselves to belong to a certain category collectively. Individuals want their social group to be perceived positively as it is relative to how the individual perceives themselves (Turner & Oakes, 1986). There is then a need to differentiate one's group from the out-group through social comparison processes (Hogg et al., 2017; Tajfel, 1982; Tajfel & Turner, 1979).

One's identification can be dependent upon social situations as a different social identity may become more salient (Stets & Burke, 2000). Imagine an individual whom goes off to college and joins the drama club. If they attend an away football game, they may see themselves as a member of their respective university. Yet, if there is a club day event, the individual may see themselves as a member of the drama club.

Overall, when an in-group and out-group are formed, there is a tendency to view the in-group positively and the out-group negatively. Positive views of the in-group result in increased helping towards one's group, more willingness to share resources, and exaggerated perceptions of

the outside group (Islam, 2014). The person often defines themselves by the group, which accounts for the positive self-relevant view.

Social Dominance Orientation

People may respond differently to current events (i.e., public apologies, elections, and protests; Halabi et al., 2008) due to their group membership or levels of Social Dominance Orientation (SDO; Ho et al., 2017), which measures how much a person endorses group dominance and their beliefs about a fair society for all (Ho et al., 2017). For example, a person high in SDO would believe that society should be structured in hierarchies and not all people should have the same opportunities. Conversely, someone low in SDO would believe in equality regardless of group membership. The combination of one's group membership and SDO serve as a deciding factor when an individual is evaluating whether or not to help another person in need (Halabi et al., 2008). Those who strongly endorse group dominance seek out roles and methods to further perpetuate inequality, while those who strongly disagree with group dominance may seek to attenuate or reduce the inequality (Sidanius & Pratto, 1999). Such role seeking behaviors have been observed in college students when deciding on a major and in the various aspects related to the workplace (Georgeac & Rattan, 2019; Pratto et al.,1997). It was demonstrated that people whom endorsed higher levels of SDO intended to work in careers that would perpetuate inequality (i.e., law enforcement and politics), while those with lower levels of SDO intended to work in hierarchy attenuating positions (i.e., social work and counseling). When examining gender of the participants, it was found that men had significantly higher SDO scores than women (Pratto et al., 1994).

Gender Hierarchy

Hierarchy Establishment. There is a prevalence of hierarchies in species across the planet (Mazur, 1985). Seen in both humans and animals, they are organized into social groups and hierarchies to assist in social learning (Henrich & McElreath, 2003) and resource allocation (Sapolsky, 2005). Judgments and behaviors are used to assign social ranks to others so that roles and structure within society are defined (Halevy et al., 2011; Zitek & Tiedens, 2012), which is an important social skill (Koski et al., 2015). For example, body size is correlated with higher status, and men are on average taller and have a larger mass than women, leading to a more dominant perception (Buunk et al., 2008; Mueller & Mazur, 2001). Additionally, the strength of a person's facial features serves a cue for their dominance, such that the stronger the features (ex/ jawline) – the higher status or more power they are perceived as having (Mueller & Mazur, 1996). This hierarchy establishment can lead to the creation of stereotypes. Social role theory explains stereotypes by the way people are placed into different social roles by society (Eagly & Steffen, 1984). The different roles or categories help to ascribe characteristics to a person or group (Eagly & Steffen, 1984), which people then use to make judgements and infer behaviors (Koenig & Eagly, 2014).

Gender Stereotypes. Stereotypes are sets of beliefs or ideas about a group of people. These beliefs are used as a source of knowledge (Dovidio & John, 2013) to make inferences about groups and their member's behaviors and qualities (Moss-Racusin et al., 2010). These ideas are socialized at a young age (Wilbourn & Keen, 2010) and remain steady for the duration of a person's life (Fiske et al., 2002).

Stereotypes of men and women have been seen cross-culturally (Williams & Best, 1990).

Women on average are perceived as more likable (Eagly et al., 1991; Haddock & Zanna, 1994) and are associated with more communal adjectives (Williams & Best, 1982) such as, submissive, superstitious, and sentimental. Conversely, men are rated less likeable (Eagly et al., 1991; Haddock & Zanna, 1994) and tend to be associated with agentic terms (Williams & Best, 1982) such as forceful, independent, and adventurous (Williams & Best, 1990).

Gender roles have consistently led to discrimination and perpetuation of the patriarchy within society (hooks, 2000). When visiting a doctor, men are more likely to have their medical concerns taken seriously (e.g., being referred to a specialist for a surgical procedure or given a diagnosis; Chapman et al., 2013) than are women. Gender predicts a lender's loan decisions, such that men are more likely to be approved for a loan than women (Harkness, 2016), and men are more likely to receive a response when they apply for an apartment (Oblom & Antfolk, 2017). Gender roles also predict decisions in voting such that women candidates with the same qualifications as men are taken less seriously and receive less votes (Sanbonmatsu, 2002).

Hierarchy Stability and Backlash. For some, learning the gender hierarchy is in question can result in moral conflict and feelings of disgust, as respecting the hierarchy is a moral value (Brescoll et al., 2018; Haidt, 2003). Backlash or helping is then used as a tool to re-establish the hierarchy (Brescoll et al., 2018). Take a person whom is successful in a gender atypical position, such as a woman leader. They often are associated with typical male characteristics such as agentic or confident, which is ascribed with high status. This can be perceived as a hierarchy violation, leading fellow colleagues to engage in sabotage or reduced help towards the individual (Rudman, et al., 2012). Women in STEM careers have a low retention rate (Heybach & Pickup, 2017) and are often perceived as less deserving and qualified for positions, higher salaries, and mentorship

(Moss-Racusin et al., 2012). Additionally, men who deviate from hierarchy perpetuating behaviors often suffer from social and economic consequences (Moss-Racusin et al., 2010).

Dependency Oriented and Autonomy Oriented Helping. While people are trying to reach their goals, they may need help and reach out to another person or a person might become aware of another's struggle. The interaction is dependent upon each person's group membership and their position within the hierarchy. Helping may be used one of two ways, with either dependency oriented or autonomy oriented actions (Nadler, 2002). Autonomy oriented help involves teaching the person being helped and explaining what to do, so in the future the work can be done on their own. Dependency oriented help does not allow the person being helped to learn; in fact, it often involves the other person doing the task for them with no explanation of what was done. The high status group will often offer dependency oriented help to low status members to establish their dominance, while offering in-group high status members autonomy oriented help (Nadler, 2002).

Representation of Women in STEM

Women in STEM careers earn 33% more on average than their non-STEM counterparts yet hold disproportionately fewer undergraduate degrees in STEM fields than men (Beede et al., 2011). Women are half of the modern workforce overall, but less than 25% of STEM jobs (Fayer et al., 2017). Ideas as to why this gap exists include parenting and gender socialization, or differential reinforcement, as well as media influence.

Parenting and Gender Socialization. Starting before birth, parents often begin the process of gender socialization. This is achieved through painting the nursery blue for boys and pink for girls as well as the types of toys and clothing purchased (Pomerleau et al., 1990; Smith, 2015). Boys are consistently encouraged to play with toys such as trucks, science sets, and

machines. Girls are encouraged to play with doll houses, kitchen sets, and baby dolls. These toys influence certain skills and generally strengthen gender roles in children (Smith, 2015). Toys for boys encourage building new things, scientific skills, and agency. Toys for girls often encourage homemaker and caregiver roles (Cheryan et al., 2017; Martinez et al., 2013). Looking at how the products are advertised; male characters or actors appear more than females. Additionally, in television advertisements that show both boys and girls, the male voice was more likely to be used in the voice over (Martinez et al., 2013).

Young women in high school who want to pursue a degree in STEM report less peer support than those in college or graduate school currently pursuing their degree. Regardless of current educational level (i.e., high school, college, or graduate school), the majority of women report experiencing gender bias within a year period (Leaper & Starr, 2018; Robnett, 2016). Gender bias is associated with a lower STEM self-concept; however, the effect was lessened for those who had supportive peers. This lower self-concept may hurt performance or make girls less likely to engage in STEM activities and education (Robnett, 2016) and view STEM less positively (Moss-Racusin et al., 2018).

Although previous research has demonstrated a link between threats to the hierarchy and helping or backlash behaviors, this primarily focused on the workplace (Rudman et al., 2012). Data indicate that there is a deficiency of women's representation in STEM fields (Beede et al., 2011; Fayer et al., 2017). There has been research conducted regarding individual feelings of belongingness in STEM at various educational levels (Leaper & Starr, 2018; Moss-Racusin et al., 2018; Robnett, 2016). However, there is a lack of research examining faculty members and their reactions towards prospective college students in STEM majors.

Previous research has shown that when men are presented with anti-male bias and endorse Status Legitimizing Beliefs (SLBs), they evaluate female targets more negatively and are less willing to help them (Wilkins et al., 2018). SLB's are comprised of beliefs that social status can be improved as long as you work hard (Wilkins & Kaiser, 2013). The help that was analyzed in Wilkins and colleagues (2018) was regarding resume help. However, we wanted to further examine helping behavior regarding the awarding of scholarship money, which is novel in this context. Expenses for college are continuously on the rise and scholarships play an important role in what school a person attends, if at all (Powell & Kerr, 2019). A pilot study was conducted (Gnall & Hackney, 2019) utilizing a question in which college participants were asked to indicate how much scholarship money they felt the applicant deserved. There were two significant interactions observed from the data. First, women awarded more scholarship money to a female essay writer than a male essay writer, while men awarded more scholarship money to a male essay writer than a female essay writer. Second, those who read about a threat to the gender hierarchy awarded more scholarship money to a male essay writer than a female essay writer, while those in the no gender hierarchy threat condition awarded female essay writers more money than male essay writers. Additionally, while our analysis was underpowered, we observed a non-significant three-way interaction trend between participant gender, essay writer gender, and hierarchy threat. When men perceived gender hierarchy threat, they awarded more money to a male essay writer than to a female essay writer. Men that did not perceive gender hierarchy threat awarded similar amounts of money to male and female essay writers. When women perceived gender hierarchy threat, they awarded similar amounts of money to male and female essay writers. Yet, when women did not perceive gender hierarchy threat, they awarded more money to female essay writers than to male essay writers.

As previously mentioned, status legitimizing beliefs were measured in previous literature. SLBs are attitudes that a person may hold that justify the current hierarchy; specifically, they are a set of beliefs declaring that any person can improve their social status if they work hard enough (Wilkins et al., 2018). Social Dominance Orientation (SDO, Ho et al., 2017) could also moderate the relationship between anti-male bias and helping behaviors/target evaluation. Social Dominance Orientation is a measure of a person's preference for a hierarchy through systems of oppression and social ideologies (Ho et al., 2017). Given that SDO is a measure consisting of personality traits and anti-egalitarianism (Ho et al., 2017), it is possible that it better accounts for reactions to gender hierarchy threat. The present study sought to examine this hypothesis by using the SDO7 measurement (Ho et al., 2017). Based on research that suggests those who perpetuate traditional gender roles will react differently to the perception of anti-male bias (Shnabel et al., 2016) and how group identity threat can impact helping (Nadler et al., 2009), it was predicted that if people are high in SDO they would exhibit less helping behavior and have a more negative evaluation than those who do not endorse SDO. Specifically, the goal of the current research was to experimentally test the effects of confirming/threatening gender hierarchy information on helping behaviors. We anticipated that those high in SDO would feel threatened by news of women's progress, resulting in lowered helping behavior toward a female target and increased helping towards a male target.

Activating Gender Hierarchy and Helping. The gender hierarchy condition was manipulated by presenting participants with a news article that had one of the following levels: gender hierarchy threat or no gender hierarchy threat. The no gender hierarchy threat condition ended by stating, "by 2024, sex will still be a marker of social status in the United States. The gender hierarchy threat condition ended by stating, "by 2024, sex will no longer be a marker of

social status in the United States". The helping condition had the levels of male target or female target (i.e., essay writer gender). This was manipulated by presenting the participants with a scholarship essay written by either a young man or woman, then asking them to give feedback about the essay and to recommend a scholarship amount.

      Hypotheses. Social identity theory predicts that members of a group will discriminate against the out-group to enhance one's image; therefore my hypotheses were:

1. Participants will award more scholarship money to an essay writer of the same gender, regardless of gender hierarchy condition. This will manifest in a 2 (participant gender) x 2 (essay writer gender) interaction.

2. Participants will award more scholarship money to men in the gender hierarchy threat condition than women, while more scholarship money will be awarded to women than men in the no gender hierarchy threat condition. This will manifest in a 2 (essay writer gender) x 2 (gender hierarchy threat) interaction.

3. Based off of the pilot study results - there is anticipation of a three-way interaction: when men perceive the gender hierarchy as threatened, they will award more money to men than women. Yet when there is no gender hierarchy threat, men will award similar amounts of money to men and women. Conversely, when women perceive the gender hierarchy as threatened, they will award similar amounts of money to men and women. Yet when the gender hierarchy is not threatened, they will award more money to women than men. This will manifest in a 2 (participant gender) x 2 (gender hierarchy threat) x 2 (essay writer gender) interaction.

4. If our sample has a large enough variability in SDO, then SDO will be analyzed as a moderating variable that changes the effects of the manipulation. For those who are in

the gender hierarchy threat and female essay writer condition, higher SDO scores will be associated with less helping behavior. For those who are in the no gender hierarchy threat and male essay writer condition, higher SDO scores will be associated with more helping.

CHAPTER 2

METHODOLOGY

Participants

We were able to recruit 34 participants through email. They were 75% male with an age range of 33-76 years ($M = 48.63$). Participants received a monetary incentive of a $2.50 Amazon gift card. A G-Power analysis, with an effect size of .25, was conducted and recommended approximately 400 participants for the current research design (Faul et al., 2007). After the exclusionary criteria was run, there was a total of 22 participants. The remaining sample used in the data analysis was 77% male and 23% female. Participants had an average age of 48.43 ($SD = 12.8$) that ranged from 34-74 years. Eighty-six percent identified as White/Caucasian and 36% were faculty from a chemistry department.

Participants were recruited from across the United States from very high research, public and private, universities as deemed by the Carnegie Classification website from. A list was generated from the Carnegie Classification site, in which two private and two public universities were selected at random from each region of the united states. The regions were Northeast, Southeast, Southwest, Midwest, and West. Universities were selected and faculty emails were obtained through their respective university's department listings. All individuals were tenure track or tenured faculty in either the engineering, physics, biology, or chemistry department. There were no race/ethnicity or gender restrictions. Participants were contacted via email, where they were given the Qualtrics link to the survey and told they would receive a monetary incentive of $2.50 via Amazon gift card should they choose to participate.

Materials

All measures that were in this study are described below.

Informed Consent. The informed consent was read by participants. This described the general purpose, participant risks and benefits, study confidentiality, participant rights, and the contact information of the primary investigator and faculty mentor. They were then given the option to voluntarily consent to continue to the study or to not continue to the study.

Article Stimuli. The news articles that were used were modified from Wilkins and Kaiser (2013). The articles served as the stimuli for gender hierarchy threat (gender equality) and no gender hierarchy threat (gender inequality). The article for gender hierarchy threat described the rates at which women are achieving positions of power in various aspects of society (i.e., becoming CEO's) to depict the decline in gender based inequality (i.e., "Social analysts suggest that if recent trends continue, by 2024, sex will no longer be a marker of social status in the United States."). In order to create a similar condition for no gender hierarchy threat, the article described that despite women achieving positions of power, men still have a higher position of privilege (i.e., "Social analysts suggest that if recent trends continue, by 2024, sex will still be a marker of social status in the United States.").

Article Evaluation Questionnaire. Participants responded to three statements, modified from Roy and colleagues (2007), on a 6-point Likert scale (1 = strongly disagree to 6 = strongly agree). This was used in line with the cover-story to establish the quality of the article and argument. A sample item is "This article is clear and well written."

Scholarship Essay Stimuli. Participants read a brief scholarship essay modified from Ducote (2015). This source described where a student's interest in STEM came from and their

experience being in a STEM field. The essay presented was either the account of a woman or a man hoping to major in a STEM field at the university.

Scholarship Essay Evaluation. The assessment of the STEM scholarship essay that we used was created for this study. It was used in line with the cover story as well as to establish willingness to help the applicant. It consisted of 6 questions; the first question asked participants to indicate on a 7-point Likert-type scale, (0 = *very low quality* to 6 = *very high quality*), "How would you rate the overall quality of this essay?" The second question asked participants to indicate on a 7-point Likert-type scale, (0 = *not at all likely* to 6 = *very likely*), "If this person asked you for help with their essay, how likely would you be to help them?" The third question asked participants to indicate on a 7-point Likert-type scale, (0 = *very undeserving* to 6 = *very deserving*), "How much does this person deserve to be a STEM major?" The fourth question asked participants to indicate from $0 to $5,000, "How much scholarship money do you feel they should receive to help pay for their tuition and fees per semester?". The final question asked participants "Are you willing to go back and review the applicant's essay to provide feedback?". If they chose no, they then continued to the next section of the survey. If the participant selected yes, they were directed back to an image of the essay that utilized 'hotspot'. This allowed participants to indicate by paragraph which sections they liked or did not like. They could then leave comments for each paragraph if they desired.

Social Dominance Orientation (SDO). The most recent measure of Social Dominance Orientation, the SDO_7, was used to measure each participants' belief in social dominance. Using a 7-point Likert-type scale (1 = *strongly oppose* to 7 = *strongly favor*) participants indicated their agreement with sixteen statements. Sample items include "Some groups of people must be kept in their place" and "No one group should dominate in society".

The SDO$_7$ scale consists of two sub-dimensions, dominance (SDO-D) and egalitarianism (SDO-E). The first eight questions are those of the dominance dimension, while the following eight are for the egalitarianism dimension. Each of those dimensions is split into four con-trait items and four pro-trait items. SDO-D measures the extent to which a person actively participates in suppressing subordinate groups. SDO-E measures a person's support for politics/policies that maintain inequality between groups. These can be analyzed separately or together for an overall score, for the purpose of this study the scores were combined for an overall SDO score.

Attention to Manipulation. Participants answered a series of questions pertaining to what they had just completed. This served as an attention check and allowed participant responses to be analyzed for random responding. A sample question includes "What was the main part of the news article?"

The last question of this section is from Aust (2013), which asks participants "It would be very helpful if you could tell us at this point whether you have taken part seriously, so that we can use your answers for our scientific analysis, or whether you were just clicking through to take a look at the survey?" They then indicated whether their data should be used or should not be used. This aided in removing participants who did not take the study serious or that responded randomly.

Demographics. Participants completed a 4-item self-report questionnaire to evaluate their age, gender, race/ethnic identity, and departmental affiliation at the university.

Procedure

With the approval of the university's Institutional Review Board, the primary researcher activated the study on the Qualtrics website. Participants were contacted via email with the link to the Qualtrics survey. Once contacted they were able to complete the study at that time on their computer. When the participant followed the study link to Qualtrics, they were automatically

randomly assigned to one of four conditions ("gender hierarchy threat with female scholarship essay", "gender hierarchy threat with male scholarship essay", "no gender hierarchy threat with female scholarship essay" or "no gender hierarchy threat with male scholarship essay") using the block randomization function. The blocks were to be presented an even amount of times to ensure that participants were evenly distributed across conditions.

To continue to the study, participants had to first read and agree to freely participate in the study. The informed consent listed the purpose, risks and benefits, confidentiality protocol, participant rights, and the primary researcher's contact information for the current study. If the participant did not wish to participate after reading the informed consent, they would close out of the Qualtrics window on their computer screen.

Participants who chose to participate completed the study using the online data survey program, Qualtrics, for the administration of materials and recording of answers. Online data collection reduces the potential for human data entry errors and potential experimenter biases. However, with the questions created, it was possible that they may have introduced experimenter bias (Schwarz, 1999). For example, the questions could be interpreted as leading to some participants to answers they think the researcher is looking for. Additionally, no identifying information was collected from the participants other than an email address in a separate survey, which will allow the participant to receive payment for completing the study. This was to ensure that the participant's privacy was maintained in addition to minimizing potential biases and demand characteristics. All data were downloaded from Qualtrics and stored on a password protected computer. Only researchers approved by the university's IRB had access to the study data.

After they agreed to participate, they followed the instructions associated with each of the presented materials. They started with the randomly assigned news article then proceeded to the article evaluation. Next, they read the randomly assigned scholarship essay and completed the evaluation. The SDO_7 questionnaire was then presented in a randomized order, utilizing the randomization function in Qualtrics. That was followed by the manipulation check, random responding check, and demographic questionnaire. Debriefing is being delayed as data collection will continue. This is to ensure that the purpose and procedures of the study are confidential and to decrease the likelihood that potential participants will learn of the true nature of the study.
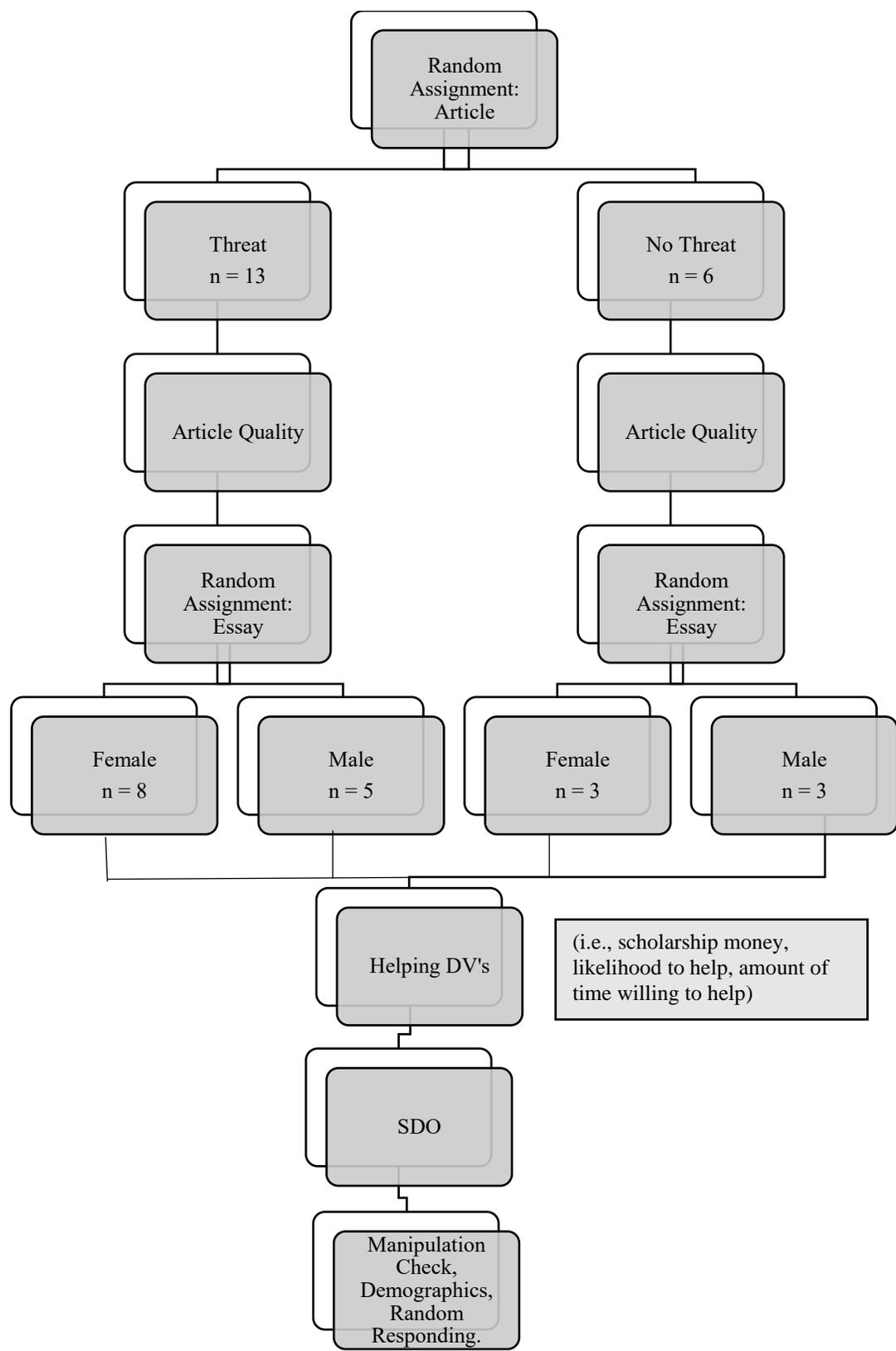
Figure 1. Summary of the Procedure.

CHAPTER 3

RESULTS

Exclusionary Criteria. In total there were 34 respondents. Before data analysis, there were a number of filters run to exclude participants who did not take the study seriously and/or failed manipulation checks. For a manipulation check, participants had to successfully recall the topic of the news article they read and the gender of the essay writer. Those who did not select the correct response to either were removed from the data. This led to 8% (n = 3) of the participants being removed.

At the end of the survey participants were then asked if they completed the survey seriously or had just clicked through. Participants who indicated they clicked through, or did not respond to the question, were removed from the data. This led to 26% (n = 9) of the participants being excluded from the analysis.

Once participants were filtered utilizing the exclusionary criteria, 64.7% (N = 22) of participants were retained.

Data Analysis. Each result is written in the order of the hypotheses presented.

Hypothesis 1. It was predicted that participants would award more scholarship money to an essay writer of the same gender, regardless of gender hierarchy condition. To test this, a 2 x 2 (Participant Gender x Essay Writer Gender) factorial ANOVA was conducted.

There was a significant main effect of essay writer gender $F(1,15) = 10.05$, $p = .006$, partial $\eta^2 = .401$, such that more scholarship money was awarded to female essay writers ($M = 3,182$, $SEM = 539$, 95% CI [2033, 4331]) than to male essay writers ($M = 844$, $SEM = 503$, 95% CI [-229, 1917]). There was no main effect for participant gender $F(1,15) = 2.26$, $p = .153$,

partial η^2 = .131. There was not a significant interaction between participant gender and essay writer gender $F(1,15)$ = .120, p = .734, partial η^2 = .008.

The results are illustrated in the graph below.
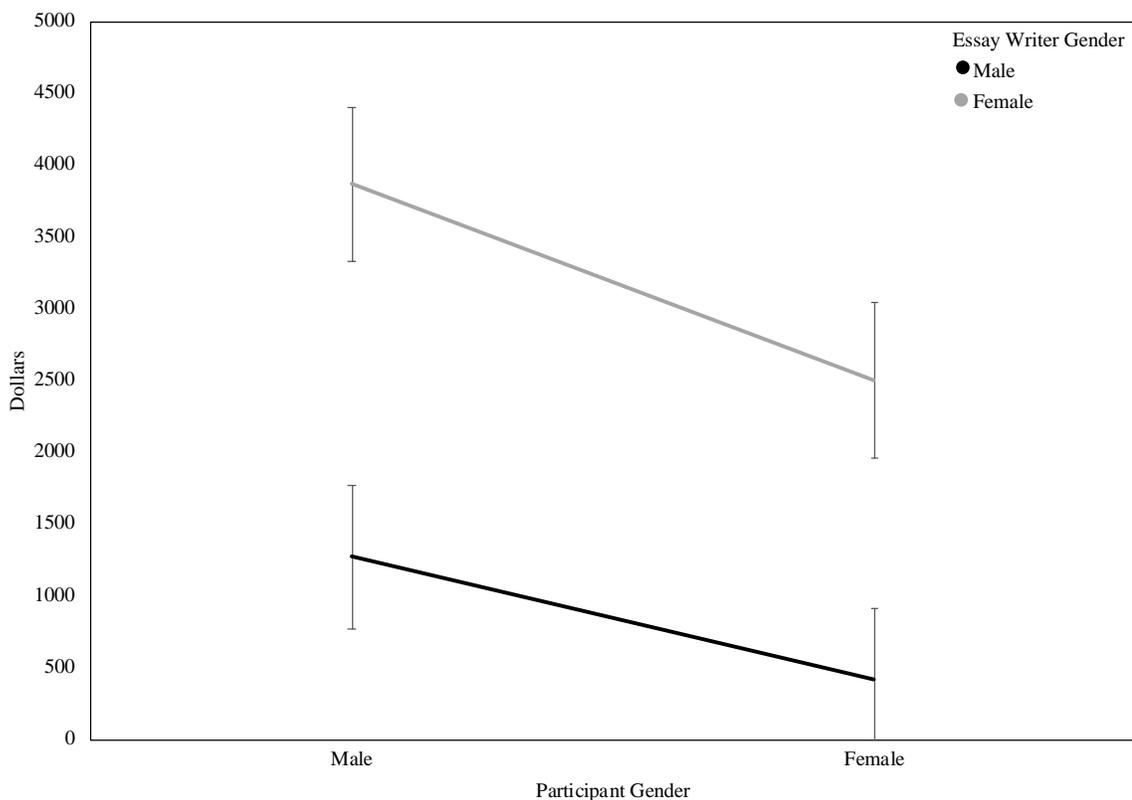
Figure 2. Nonsignificant Interaction Between Participant Gender and Essay Writer Gender.

Hypothesis 2. It was predicted participants would award more scholarship money to men in the gender hierarchy threat condition than women, while more scholarship money would be awarded to women than men in the no gender hierarchy threat condition. To test this a 2 x 2 (Gender Hierarchy Threat x Essay Writer Gender) factorial ANOVA was conducted.

There was a significant main effect of essay writer gender $F(1,15)$ = 18.83, p = .001, partial η^2 = 557, such that more scholarship money was awarded to female essay writers (M = 3925, SEM = 469, 95% CI [2924, 4926]) than male essay writers (M = 927, SEM = 506, 95% CI [-152, 2007]). There was no main effect for gender hierarchy threat $F(1,15)$ = .714,

$p = .411$, partial $\eta^2 = .045$. There was not a significant interaction between gender hierarchy threat and essay writer gender $F(1,15) = 1.25$, $p = .281$, partial $\eta^2 = .077$.

The results are illustrated in the graph below.
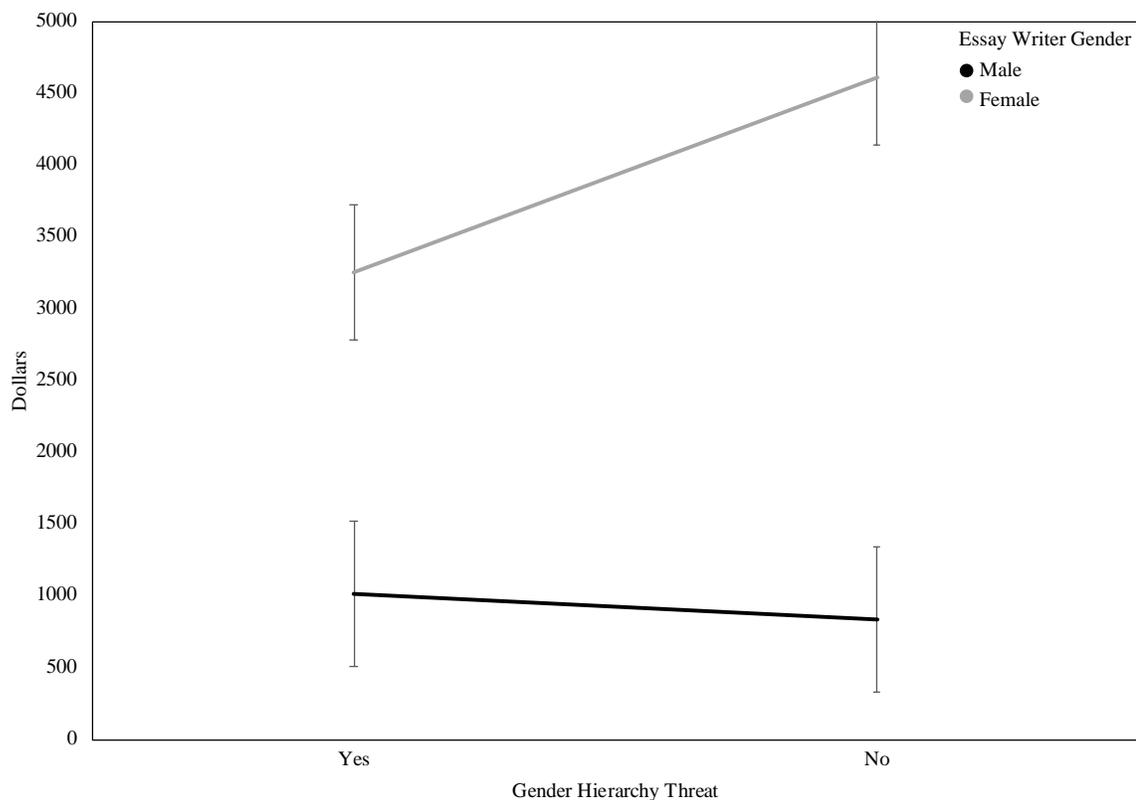
Figure 3. Nonsignificant Interaction Between Gender Hierarchy Threat and Essay Writer Gender.

Hypothesis 3. There was anticipation of a three-way interaction: when men perceive the current gender hierarchy as threatened, they will award more money to men than women, yet when the hierarchy is endorsed, they will award similar amounts of money to men and women. As for women, when they perceive the current gender hierarchy as threatened, they will award a similar amount of money to men and women, yet when the gender hierarchy is not threatened, they will award more money to women than men. To test this a 2 x 2 x 2 (Participant Gender x Essay Writer Gender x Gender Hierarchy Threat) factorial ANOVA was conducted.

There was a significant main effect of essay writer gender $F(1,11) = 14.6$, $p = .003$, partial $\eta^2 = .570$. Participants awarded more scholarship money to female essay writers ($M = 3,279$, *SEM* = 475, 95% CI [2233, 4324]) than to male essay writers (M = 790, *SEM* = 446, 95% CI [-192, 1772]). No main effect was found for participant gender $F(1,11) = 3.72$, $p = .080$, partial $\eta^2 = .253$. There was also no main effect for gender hierarchy threat $F(1,11) = 3.73$, $p = .080$, partial $\eta^2 = .253$. There was a significant interaction between gender hierarchy threat and essay writer gender $F(1,11) = 5.94$, $p = .033$, partial $\eta^2 = .351$. Participants in the gender hierarchy threat condition awarded female essay writers more scholarship money ($M = 1,855$, *SEM* $= 624$, 95% CI [480, 3230]) than male essay writers ($M = 955$, SEM = 533, 95% CI [-218, 2129]). For participants in the no gender hierarchy threat condition, they awarded female essay writers more scholarship money ($M = 4,702$, *SEM* $= 715$, 95% CI [3127, 6277]) than male essay writers ($M = 625$, *SEM* $= 715$, 95% CI [-950, 2200]). There was no significant interaction between gender hierarchy threat and participant gender $F(1,11) = 2.03$, $p = .182$, partial $\eta^2 = .156$. There was also no significant interaction between participant gender and essay writer gender $F(1,11) = .214$, $p = .653$, partial $\eta^2 = .019$. Lastly, there was no significant three way interaction between participant gender, essay writer gender, and gender hierarchy threat $F(1,11) = 3.526$, p = .087, partial $\eta^2 = .243$.

The results are illustrated in the graph below.
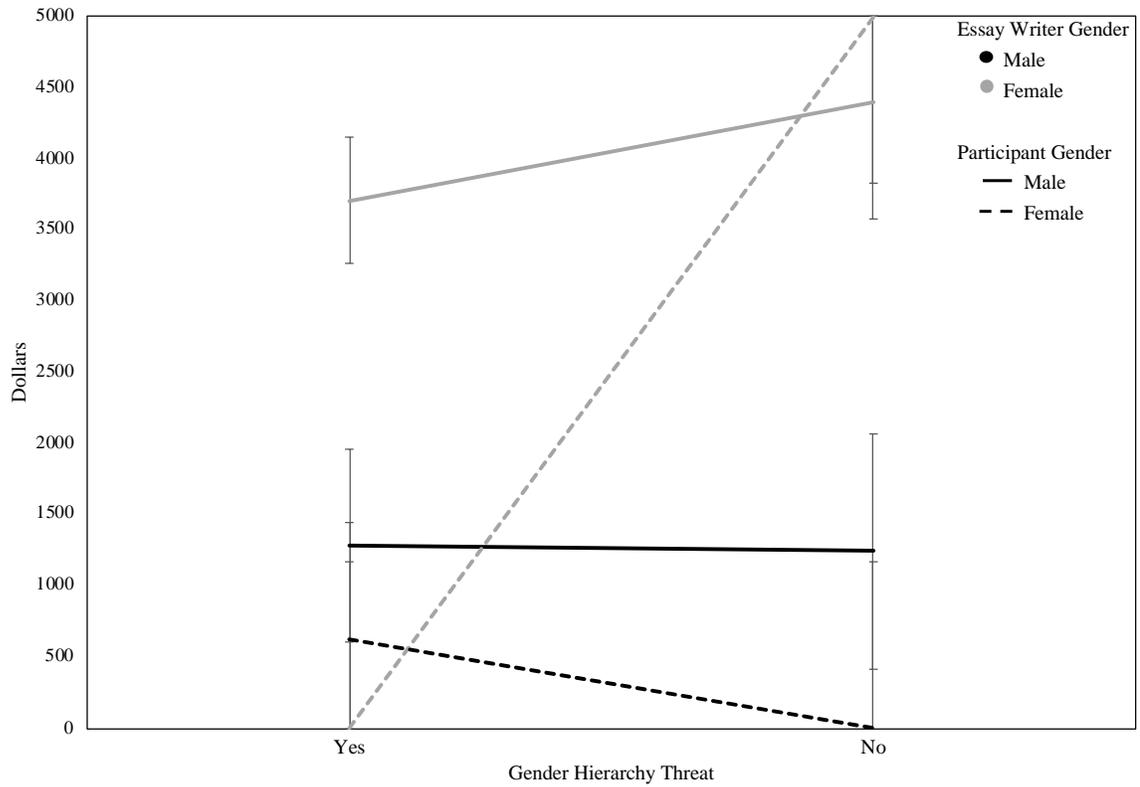
Figure 4. Nonsignificant Three-way Interaction Between Gender Hierarchy Threat, Participant Gender, and Essay Writer Gender.

Hypothesis 4. The data regarding SDO was collected as part of a larger study and will be analyzed when there is sufficient participant data.

CHAPTER 4

DISCUSSION

The purpose of the current study was to examine how threat or endorsement of the current gender hierarchy impacts helping towards prospective STEM majors. Specifically, participants in this study rated how much scholarship money they felt an applicant deserved after being randomly assigned to read about the lack of change in the current gender hierarchy or change in the current gender hierarchy, then reading a scholarship essay written by either a male or female applicant. Based on the results of the analyses, all of the proposed hypotheses were not supported. It was not supported that female participants would award more scholarship money to female essay writers and that male participants would award more scholarship money to male essay writers. It was also not supported that participants in the gender hierarchy threat condition would award more scholarship money to men than women, while those in the no gender hierarchy threat condition would award more scholarship money to women than men. Lastly, the hypothesis regarding the three-way interaction was not supported. When male participants perceived gender hierarchy threat, they did not award more money to men than women; furthermore, when there was not gender hierarchy threat, they did not award similar amounts to men and women. When female participants perceived gender hierarchy threat, they did not award similar amounts of money to men and women, yet they did award more to women than men in the no gender hierarchy threat condition. The limitations of the sample will be discussed next.

Limitations

The ability to draw accurate conclusions is extremely limited by the small sample size. Small sample sizes are notoriously known for having low power, which lessens the chance of

observing true effects (Button et al., 2013). The G*power analysis suggested a sample of 400

participants, making our sample of 22 participants very underpowered. This can lead to the

creation of both type 1 and type 2 errors. The analyses that did show up as significant, may be

type 1 errors as the sample may be different by chance. The analyses that were not significant,

might be significant, yet it will not be known until there are more participants. Increasing the

sample size will afford for better population estimates (Lieber, 1990). In sum, the current sample

size gives us insufficient statistical power for confirmatory hypothesis testing.

　　　Although just over 2,000 STEM faculty members were contacted to complete the survey,

only 34 people responded (see Figure 5, depicting participant recruitment and retention).

Reasons for the low response rate may be due to compensation amount and available time. While

participants were compensated $2.50 via an Amazon gift card for their time, it may have been

too little given the survey took on average 15 minutes to complete. Although this would equate

to the federal minimum wage as recommended by Berinsky and colleagues (2012), it may have

been perceived as underpayment for a tenured or tenure track professor. Additionally, professors

report working an average of 61 hours a week (Ziker et al., 2013). They have many

responsibilities outside of teaching, for example advising, research, service, and professional

development (Ziker et al., 2013). This may make it difficult to find time to complete a survey of

this length, or they may have overlooked the survey invitation in their email inbox.

　　　Another limitation to this study is participant response bias. Of the 2,000+ recruitment

emails sent, only 34 STEM faculty members responded to the survey. It is possible that only

faculty interested in mentoring students or those who wanted the monetary incentive took part in

the survey. Those that may have taken the survey for mentorship purposes may have taken more

time when answering questions and provided more detailed feedback relative to those who solely

wanted the incentive. Overall, this trend can be speculated when observing the number of

participants who submitted for their gift cards. Of those 34 participants, only 15 of them (44%)

provided information to receive payment. This information provides some context to the current

results. It seems likely that the majority of STEM faculty who took the time to read their email,

agreed to participate in the study, and spent fifteen minutes providing help to a prospective

STEM student, did so for internally motivated reasons. Whether these participants were

motivated to help prospective STEM students, motivated by intellectual curiosity, or motivated

by some other factor is worth pursuing to aid future STEM faculty recruitment.

Future Directions

The top priority for my line of research is to increase the sample size to obtain enough

statistical power. This will allow us to more accurately gauge the impact perceptions of the

gender hierarchy can have on helping behavior regarding prospective STEM majors. Monetary

and time adjustments could aid in participant recruitment; specifically, it may help to increase

payment and/or decrease the length of the survey.

As previously mentioned, the current survey took approximately 15 minutes to complete

and participants were compensated $2.50. While there is not a set wage amount for online

participation, the general rule of thumb is that payment equates to the federal minimum wage;

this is known as the wage-payment model (Brown et al., 2019; Dickert & Grady, 1999).

However, Brown and colleagues (2019) examined the rate of payment for participants broken

down by various categories, such as time commitment, IRB review type, population type, etc.

Looking solely at time commitment, the mean pay for participants completing a study 30

minutes or less was $4.67. When analyzed by type of study, those who participated in an online

study received $3.95. Regarding pay based on population type, nonstudent adults were paid an average of $15.29.

Our population is STEM faculty from very high research institutions, and it is discussed that researchers should consider the value of their participants' wage potential (Brown et al., 2019; Dickert & Grady, 1999). This would suggest that paying participants $5 for the 15 minutes may help, which would closely follow the reimbursement model of participant payment (Dickert & Grady, 1999). If we are unable to secure enough funding to increase payment, another option would be to decrease the survey time. This could be achieved by using the short form of the SDO scale and removing some of the exploratory variables. The short form of SDO utilizes 8 items instead of 16. Additionally, there were 3 other helping/exploratory variables trying to measure different aspects of helping that were measured. If those were removed, it could potentially bring the average survey time down to 10 minutes.

The information that we were able to gather from the 22 participants could also be used to inform future research decisions. Examining the first and second hypotheses, the significant findings would suggest that people are interested in helping prospective women pursue STEM majors. Hypothesis 3 would also support this as females were awarded more money than males (see Table 1 and Table 2 describing frequencies and measures of central tendency, respectively). When looking at the interaction between essay writer gender and hierarchy threat, the means would suggest that in the no threat condition people are more willing to help. This may be due to the perception that equality will never happen, so participants are not feeling threatened. The sample is 77% male so this observed interaction would follow what was observed in the pilot study. Differences in the results would not be completely surprising as the population for the pilot study is completely different from that of the thesis study. For example, the pilot study

population consisted of college students from a public university in Southeast Georgia, which completed the study as part of a requirement for their introductory psychology course. The current study population consisted of STEM faculty that were tenured or tenure track professors at very high research universities across the United States. Additionally, the faculty members were recruited via email as opposed to the pilot sample, in which students had the ability to pick from various studies listed on SONA systems. It is possible that professors would seek to help people they think would be successful in their field compared to a college student that has comparatively little identity connection to STEM. However, social identity and previous research would suggest that they should follow similar patterns. Yet, given the small sample size, these results are nonconclusive.

Conclusions

Overall, with such a small sample, no conclusions can be drawn from the current data. Yet this research is an important addition to the literature on women's representation in STEM and barriers to women in STEM. It attempts to address how perceptions of the current gender hierarchy may impact women entering such fields. In a society that has been historically male dominated (hooks, 2000), this may tell us how possibility of change can motivate women to pursue these fields as well as motivate others to help. My research aims to see if people are willing to help women who seek to enter the STEM field when given the opportunity and what role the gender hierarchy and perceptions of it may have. Additionally, the research seeks to examine the role played by gender through out-group discrimination. If it is found that gender hierarchy, participant gender, and essay writer gender affect the way in which people help those trying to enter male dominated fields, research can seek to address ways to increase awareness and change reactions towards those seeking help.
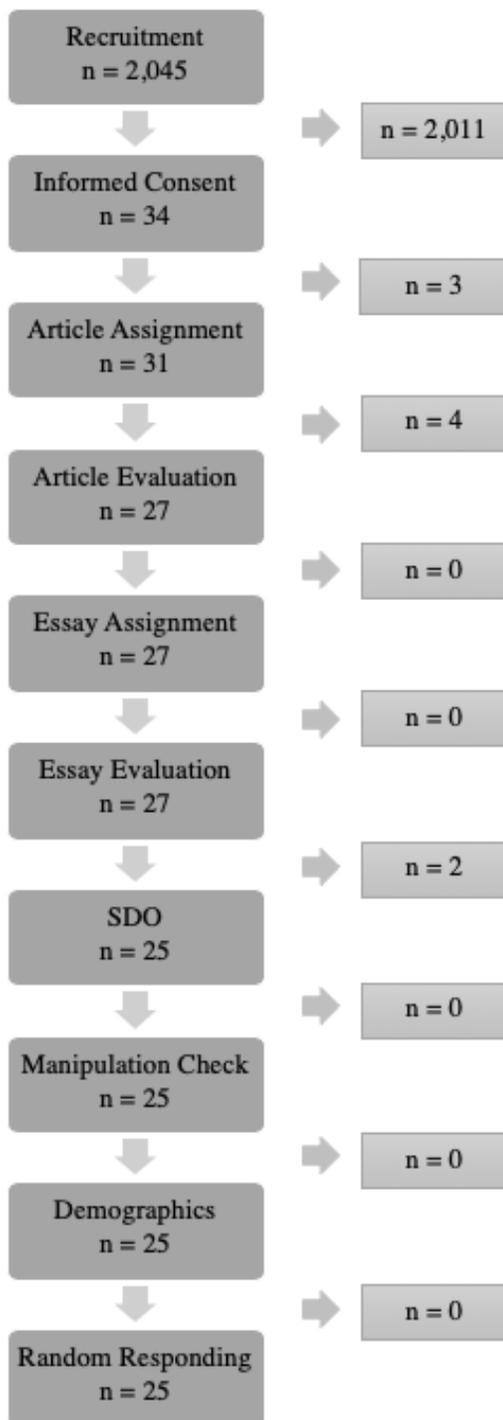
Figure 5. Participant Recruitment and Retention Throughout the Survey.

Table 1
Frequencies of Dollars Awarded for Scholarship

Dollars	*f*	Rel *f*	c*f*	Percentile
5000	4	0.21	19	100.00
4000	2	0.11	15	78.95
3810	1	0.05	13	68.42
2980	1	0.05	12	63.16
2857	1	0.05	11	57.89
2500	3	0.16	10	52.63
1000	1	0.05	7	36.84
750	1	0.05	6	31.58
500	1	0.05	5	26.32
0	4	0.21	4	21.05

Note. ℱ is the frequency. Rel *f* is the proportion of times a score occurs. C*f* is the frequency of scores at and below a particular score. Percentile is the percent of all scores that are at or below a particular score.

Table 2

Scholarship Money Awarded by Essay Writer Gender

Essay Writer	Min.	Max.	*M*	*SEM*	Median	Mode
Female (n = 11)	0.00	500.00	3617.27	475	4000.00	5000.00
Male (n = 8)	0.00	2857.00	950.88	446	625.00	0.00

Note. Min. = minimum, Max. = Maximum, *M* = mean, and SEM = standard error mean.

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