THE USE OF PERSONAL TESTIMONIALS TO ENHANCE GENDER BIAS LITERACY IN STEM

by

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To my parents and my wonderful puppy, Sadie

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ABSTRACT

Previous research has provided promising evidence for the effectiveness of video interventions to raise awareness of the gender bias that exists in science, technology, engineering, and math (STEM) fields. However, creating these beneficial video interventions can be costly and its possible that the success of these interventions may be hindered if a certain amount of resources are not invested into their creation (e.g., into high quality actors). Therefore, the current study expands on this research by investigating the use of personal testimonials of women's experiences with gender bias in STEM as gender bias interventions. More specifically, I examined whether certain characteristics (e.g., genuineness) of the testimonial's communicator would influence the relevant gender bias outcome (e.g., awareness of bias and sexism). I predicted that watching a woman genuinely talking about her experiences with bias, relative to a scripted re-telling of this story, would lead to better perceptions of the woman (e.g., more positive perceptions and perceptions of genuineness), greater feelings of empathy and connection with the woman, as well as less greater awareness of gender bias and less sexism from participants. To test this possibility, participants in the study were randomly assigned to interact with one of four story formats, a genuine telling of the woman's experiences with bias, a scripted re-telling of these experiences, a written version of the story, or a unrelated control video. After interacting with the story participants then completed measures related to perceptions of the woman and gender bias. The findings of the study were limited, possibly due to a lack of power, but were encouraging as they were in the expected direction. The implications of the findings as well as future research ideas to expand and improve on these findings are discussed.

CHAPTER 1: INTRODUCTION

A recent report published by the Economics and Statistics Administration in the US Department of Commerce using data from 2015 discovered that men still vastly outnumber women in Science, Technology, Engineering, and Math (STEM) fields, with women occupying less than a quarter of these positions (Noonan, 2017). Reports such as these raise the question of what may be hindering women from pursuing career paths in STEM. Although there are several possible reasons for this gender gap, previous research indicates that bias against women in STEM may be one source of this imbalance. Because of this, it is important to create and improve upon interventions that focus on mitigating gender bias. Recent research has examined the effects of using high quality video interventions to increase awareness of bias and reduce sexism in STEM fields (Pietri et al., 2017; Moss-Racusin et al., 2018a; Hennes et al., 2018). Although easy to implement (i.e., can be presented online without trained facilitators), professionally made videos can be costly to produce. To address this issue, the current study expands on this research by examining whether a woman's personal testimonial about her experiences with sexism in a STEM field can act as a tool to improve bias-related outcomes. More specifically, I investigated whether having a woman speak about her own personal experiences is better than having them re-told by someone with little acting skills or better than just reading about the experiences in a written format. Thus, the current study aimed to not only develop a new intervention but also test what makes this intervention effective.

Literature Review

Gender Stereotypes and STEM Fields

A potential factor perpetuating the gender disparity in STEM may be the traits and stereotypes that are often associated with men, women, and scientists. In particular, because men and women historically tended to fulfill different roles in society, with women taking on the caretaker role and men satisfying the breadwinner role, different stereotypes or general beliefs, about each gender emerged (Eagly, 1987; Shelton, 1992). That is, women tend to be seen as

communal (i.e., social, nurturing, warm) whereas men are viewed as agentic (i.e., dominant, competitive, competent; Eagly, 1987; Shelton, 1992). Beyond gender stereotypes, certain traits also are tied to specific occupations. Men make-up the majority of many STEM fields (Noonan, 2017), and thus, people tend to perceive scientists as possessing stereotypically masculine traits (Carli, Alawa, Lee, Zhao, & Kim, 2016). Indeed, Banchefsky, Westfall, Park, and Judd (2016) found that appearing feminine is in direct opposition to the typical image of a scientist. Specifically, the researchers used real photos of male and female scientists, with varying levels of femininity-masculinity (based on normed data), to explore whether scientist femininity influenced the likelihood that participants would indicate a person holds a career as a scientist or another unrelated career. The researchers found that the more feminine a scientist appeared, the less likely participants were to believe that person was a scientist, demonstrating a mismatch between being a woman and being a scientist (Banchefsky et al., 2016). Additionally, Nosek, Banaji, and Greenwald (2002) provided early support for the implicit relationship between STEM and men, finding that individuals are quicker to associate men with STEM than women with STEM.

Because STEM and scientists are often associated with agentic/masculine characteristics, even women who perform well in these fields may believe their goals do not align with STEM values. For example, Diekman, Brown, Johnston, and Clark (2010) provided evidence that having communal-related goals (e.g., wanting help others or society) plays a key role in dissuading women's interest in STEM careers. Specifically, the researchers found that the more women indicate having communal goals, the less interest they report in STEM careers, because they perceive STEM careers as not supporting communal goals (Diekman et al., 2010). Providing additional evidence for the importance of these goals, Diekman, Clark, Johnston, Brown, and Steinberg (2011) found that enhancing perceptions that STEM careers can fulfill communal goals increased female students' interest in STEM. Similarly, later research further demonstrated that when women perceive STEM fields as being more communal, they are more likely to explore these fields by taking more science-related classes during college (Stout, Grunberg, & Ito, 2016).

Given that women generally express having communal goals (Diekman et al., 2010), it is unsurprising that a meta-analysis from Su, Rounds, and Armstrong (2009) found that women tend to orient towards careers that involve working with people whereas men prefer careers that

consist of working with objects. Moreover, the researchers found that women were more interested in "Artistic, Social, and Conventional" careers and men indicated a higher interest in "Realistic and Investigative" careers (Su et al, 2009, p.871). Additionally, men were more interested in STEM fields than women, which the authors argue may be due to these differences in people versus objects interests between men and women (Su et al., 2009). Taken together, previous research suggests that the gender disparity in STEM is in part related to the attraction that men and women feel towards different types of jobs because of their communal versus agentic goals.

Gender Bias in STEM

In addition to influencing women's preferences for non-STEM fields, the tendency to associate men with STEM or scientist may lead to biases against women in these disciplines that manifest early. Hand, Rice, and Greenlee (2017) measured perceptions of people working in science and humanities fields in a sample of high school teachers and students, highlighting just how early these biases become relevant. Both teachers and students associated a scientist with masculine traits whereas feminine traits were paired with someone in a humanities field (Hand et al., 2017). In addition, these stereotypes influenced teachers' perceptions of their male and female students' performance, as teachers rated male students as better performers than female students in science fields (Hand et al., 2017). At the college level, Moss-Racusin, Dovidio, Brescoll, Graham, and Handelsman (2012) found that science faculty, regardless of gender, showed a greater preference for a male student over a female student with the same credentials for a lab manager position. In particular, relative to the male candidate, the scientists rated the female candidate as being less competent, less hirable, less worthy of mentorship, and deserving a lower starting salary (Moss-Racusin et al., 2012).

Recent work by Yang and Carroll (2018) highlights another way bias can manifest in STEM: in the form of microaggressions. Using a sample of female STEM professors, Yang and Carroll (2018) found that no matter their rank in terms of tenure vs nontenure, the majority of the female professors in their sample reported experiencing several different forms of microaggressions in the workplace, ranging from unequal treatment in relation to men and being belittled in decision making settings. Likewise, Kuchynka, Salomon, Basson, El-Hout, Kiebel,

Cooperman, and Toomey (2018) investigated the role of sexist behaviors in undergraduate STEM courses and how this sexism might influence women's decisions to choose a STEM major. Kuchynka et al. (2018) found that when women were low in STEM identification, experiencing high levels of experienced benevolent sexism in STEM classes (relative to low levels) predicted women not wanting to choose STEM as a degree. This unwelcoming climate for women may in turn dissuade them from entering STEM domains. Indeed, Moss-Racusin, Sanzari, Caluori and Rabasco (2018b) found that anticipating unfair treatment in STEM resulted in women expressing less interest in pursuing these fields. The above evidence leads to the obvious question: What can be done to both increase awareness of the issue of bias in STEM fields and limit its prevalence?

Workshops and Other Interventions

To help reduce harmful bias in STEM, interventions have been developed and tested in a variety of formats. For example, drawing from past empirical work on bias reduction, Carnes et al. (2012) created an interactive "Bias Literacy Workshop" for STEM faculty with the goal of heightening faculty awareness of gender bias in these fields (p.2). In order to validate this workshop and provide evidence of the workshop's effectiveness, Carnes et al. (2015) randomly assigned groups of STEMM (STEM and medicine) departments across a university to receive the workshop or be part of a weight list control condition (i.e., would receive the workshop at a later date). During the workshop, facilitators presented participants with information about sexism as well as strategies to combat gender bias in STEM. Participants actively discussed the research and tactics and applied them to various hypothetical situations involving unfair treatment (Carnes et al., 2015). Compared to the control faculty who had not yet attended the workshop, those who participated in the workshop reported higher levels of awareness of bias and confidence in their ability to increase equity for men and women (Carnes et al., 2015). Girod, Fassiotto, Grewal, Ku, Sriram, Nosek, and Valantine (2016) developed a shorter intervention than the workshop developed by Carnes et al. (2012) and explored how this new training impacted gender bias related to leadership in medical fields. This intervention was twenty-minutes and delivered facts and evidence demonstrating the existence of gender bias in STEM and leadership to medical and biology faculty (Girod et al., 2016). The authors found that after attending the workshop, faculty

showed decreased levels of implicit association between men and leadership compared to their scores from prior to the workshop (Girod et al., 2016).

Moss-Racusin, van der Toorn, Dovidio, Brescoll, Graham, and Handelsman (2016) adapted an intervention from Wood and Handelsman (2004) to target bias-related outcomes (i.e. reducing sexism) for instructors in science fields. Moss-Racusin et al. (2016) found that relative to the scores prior to the workshop, attending faculty showed heightened awareness of bias-related issues and lower sexism scores two weeks after the workshop. Outside of the traditional workshop format, Cundiff, Zawadzki, Danube, and Shields (2014) created a Workshop Activity for Gender Equity Simulation (WAGES) in which participants were split into teams during a game where one team experienced bias meant to imitate the biases women often face at work. Participants who played the game acknowledged the harmful nature of sexism more so than those who only received a list of facts about sexism (Cundiff et al., 2014). Taken together this previous research demonstrates that providing information about gender bias in STEM via a variety of formats are effective for reducing sexism and raising awareness of bias.

Video Interventions

Although these other types of gender bias interventions (i.e. workshops, interactive in-person games) have been effective, they also require a wealth of resources to create and implement (i.e., requiring in person participation and trained facilitators). To address this limitation, several studies have found that videos can be more time and cost-effective interventions to mitigate gender bias in STEM (Pietri et al., 2017; Hennes et al., 2018; Moss-Racusin et al., 2018a). For instance, researchers found with participants from the general population that, compared to those who watched control videos, participants who watched videos featuring either an expert discussing empirical evidence of gender bias in STEM or a story of someone experiencing gender bias reported increased awareness of gender bias in STEM, and were better able to notice subtle bias across new situations (Pietri et al., 2017). Moreover, research with male and female STEM faculty additionally found that relative to participants who watched control videos, the intervention videos increased awareness of bias, increased intentions to recruit and mentor women, and reduced sexist attitudes (Moss-Racusin et al., 2018a). Importantly, the positive effects associated with the intervention videos persisted for at least one

week after the intervention (Moss-Racusin et al., 2018). In a replication, also with STEM faculty, Hennes et al. (2018) demonstrated that when the intervention videos were paired with an informational slideshow on inclusive teaching strategies, participants reported greater confidence that gender bias can be changed and felt more self-efficacious at addressing gender bias in their classrooms.

Personal Testimonials

There is an accumulating body of research demonstrating that videos can function as successful interventions to reduce bias, which do not require in-person workshops and trained facilitators. However, video interventions, such as VIDS, still require an extensive amount of resources to create because they often rely on professional actors and script writers (e.g. Pietri et al., 2017). Thus, an important question remains -- is there a way to create a low-cost gender bias video intervention that maintains crucial bias reduction outcomes? Relying on a video that takes less technology to produce featuring a woman's personal testimonial about her experience with bias may be a successful but cost-effective intervention. Personal testimonials and their effects on attitudes have often been researched by those in health-related fields. For instance, de Wit, Das, and Ver (2008) used two different messages to relay the risk of hepatitis B virus, with one featuring a story of a man's experiences with hepatitis B and the other presenting various statistics about the virus. Compared to the statistical information condition, the personal story resulted in significantly higher levels of risk perception and higher levels of behavioral intention to get vaccinated (de Wit et al., 2008). In another example, Davis, Nonnemaker, Farelly, and Niederdeppe (2011) grouped together both personal stories from smokers and ads depicting damaged or harmed body parts into a category of "why-to-quit" ads and compared them to other forms of advertisements (e.g., ads that provide viewers with resources for "how-to-quit"; p.28). Compared to the other advertisements, smokers rated the "why-to-quit" ads as more believable and attention grabbing (Davis et al., 2011, p.28). Duke, Nonnemaker, Davis, Watson, and Farrelly (2014) expanded upon the findings by Davis et al. (2011) and found that the "why-to-quit" advertisements were more effective at changing attitudes towards smoking compared to other advertisements (e.g. resources on ways to quit; p.242).

Kemp and colleagues further explored the use of testimonials to encourage potential medical consumers to pursue certain hospitals or care options (Kemp, Min, & Joint, 2015). These researchers found that compared to rational messages alone (e.g., about the medical practices used at the facility), rational messages paired with testimonials (e.g., discussing positive experiences with their care team) increased ratings on measures of ad trust and intentions to pursue the care that was advertised (Kemp et al., 2015). Pruitt, Zoellner, Feeny, Caldwell, and Hanson (2012) also compared video rational appeals to personal testimonials at influencing reactions to various types of PSTD treatments. The personal testimonials consisted of the actual stories from PTSD patients that were delivered by actors. Relative to the rational appeals, the personal testimonial increased participants' likelihood of choosing PSTD treatments among participants who had not been exposed to any previous treatment (Pruitt et al., 2012).

Although much of the work on testimonials has been employed in the health literature, there has been some research employing testimonials to address biases. For instance, Case, Hensley, and Anderson (2014) used testimonials to help make privilege salient among participants. In their studies, Case et al. (2014) had participants participate in an intervention where they either watched a heterosexual person (Study 1) or a man (Study 2) discuss their lives living with privilege or they were told to read a handout from McIntosh (1988) outlining various ways being a male or heterosexual benefited them in society. Compared to participants' scores before the intervention, the privilege testimonial (but not the handout) was the only intervention that increased awareness of male or heterosexual privilege after the intervention (Case et al., 2014). Case and Rios (2017) also found that participants who watched video testimonials about White privilege reported higher awareness of White privilege relative to those who read facts about White privilege. These studies provide initial evidence that testimonials may be effective interventions for changing beliefs about bias (e.g., increasing awareness of gender bias in STEM).

Feelings of empathy and parasocial contact. One mechanism that may underlie the effectiveness of testimonials is feelings of empathy evoked by hearing a personal story. Indeed, testimonials from patients, paired with a writing activity, have been used to train dental students to feel empathy for their patients (Schwartz & Bohay, 2012). Additionally, work from Johnson, Cushman, Borden, and Mccune (2013) found that asking participants to actively visualize while reading a story about someone else's life evokes more empathy than if they were not asked to

visualize while reading. In turn, feeling more empathy after reading and visualizing the story was related to more prosocial behavior following the study (Johnson et al., 2013). Encouraging empathy is important because various studies have found that feeling empathy for a member of a group encourages positive attitudes towards that group (see Batson & Ahman, 2009; Dovidio, Johnson, Gaertner, Pearson, Saguy, & Ashburn-Nardo, 2010 for reviews). Early work from Batson et al. (1997a) provides evidence of this effect. In this work, participants listened to a member of a group that is often negatively evaluated by society (e.g. someone who is homeless) talk about their adversities and were asked to either put themselves in that person's shoes (i.e. be empathetic of their feelings) as they listened or to just focus on the facts (Batson et al., 1997a). The authors found that having participants focus on taking the person's perspective improved their overall beliefs (e.g. less likely to think the homeless person is just lazy), relative to those who were just asked to focus on the facts, and that this was explained by participant's feelings of empathy (Batson et al., 1997a). This is in line with the comprehensive model developed by Dovidio et al. (2010) in which the authors suggest that the positive bias outcomes that result from bias interventions can be explained through increases in empathy.

Feeling a sense of *parasocial contact* with the communicator in a video testimonial may also be an important factor leading to the success of video testimonials. Parasocial contact is feeling as though one has an emotional bond or social connection with fictional character or TV personality (Schiappa, Gregg, & Hewes, 2005). People can feel parasocial contact not only with reality TV and fictional TV stars (Schiappa et al., 2005) but also with, relevant to the current work, a person delivering a personal testimonial (Chu, Murrar, Pietri, & Rosen, 2017; Pietri, Johnson, Majid, & Chu, 2020). Moreover, similar to empathy, feeling a sense of parasocial contact with a member of stigmatized group (e.g. gay men or people with mental illness) on a television show encourages positive attitudes towards the group as a whole (Schiappa et al., 2005; Wong, Lookadoo, & Nisbett, 2017).

The Importance of Communicator Characteristics

Past work has found that both video and written testimonials are effective at persuading recipients of a message; however, there is some evidence that videos may be more effective than written testimonials. Specifically, Braverman (2008) examined the persuasiveness of personal

testimonials vs informational appeals on benefits of drinking water in both written and audio formatting and found personal testimonials (but not informational appeals) were more persuasive (i.e., resulted in more positive attitudes towards drinking water) in audio formatting compared to the written format. Forming bonds with and liking a person delivering a testimonial may help make videos more successful than identical written testimonials. That is, feeling a connection with a woman discussing her experiences with sexism may make the video more effective at reducing bias than simply reading about the woman's experience with sexism. Indeed, researchers have found that a message was more persuasive in video than written format because the likability of the communicator was more evident in the video than the written format (Chaiken & Eagly, 1983).

Another relevant experiment found that compared to reading about a Black male professor discussing experiences of racism, watching this person in a video resulted in more positive perceptions of the professor and higher feelings of parasocial contact with the professor. Moreover, feeling parasocial contact with the professor related to lower levels of racism (Chu et al., 2017). It is important to note that previous research has demonstrated that people are more likely to dislike and have negative perceptions of an individual when *reading* about a person's encounters with discrimination (Kaiser, Dryenforth, & Hagiwara, 2006). However, this previous research did not employ *videos* of a likable person recounting their experiences with unfair treatment, and the work by Chu et al. (2017) suggests that people will view others explaining personal past adversity more favorably in video versus written format.

It also is noteworthy that research employing videos as bias reduction interventions have relied on genuine accounts of experiences (e.g., Case & Rios, 2017; Chu et al., 2017) or utilized professional and highly skilled actors (e.g., Pietri et al., 2017).Thus, an important unanswered question is whether a video testimonial would still be more effective than a written testimonial when an unprofessional/unskilled actors recount experiences with bias that they have not personally experienced. That is, do the characteristics of the actor in a video testimonial make the video more or less effective or, is this irrelevant if the video just informs the viewers of the prevalence of bias? In particular, might low-quality acting appear insincere and harm the usefulness of a video testimonial? Consequently, looking at who specifically is communicating the message in videos testimonials is worth examining in depth.

Literature on persuasion and attitudes offer insights into what is and is not effective with regard to having an actor deliver a testimonial. For instance, more attractive communicators tend to be more persuasive (Mills & Aronson, 1965; Messner, Reinhard, & Sporer, 2008). Moreover, videos can be *less* persuasive than written messages when the source of the message is unlikeable (Chaiken & Eagly, 1983). That is, when the person delivering a persuasive message is unlikeable to viewers, this unlikableness is more evident in video than written format, which results in the video being less persuasive than the identical written message (Chaiken & Eagly, 1983). Work by Priester and Petty (1995) further demonstrates that when a strong message is delivered by a trustworthy and honest communicator, individuals are more likely to believe the message is accurate, leading to less critical interrogation of the message.

In related research, Moore, Mowen, and Reardon (1994) tested the influence of using paid testimonials by either indicating on the screen that the communicator was being paid for the message or that the communicator personally wanted to give the message (Moore et al., 1994). The results of this study showed that paid testimonials lead to more negative attitudes towards a product compared to unpaid testimonials (Moore et al., 1994). In related work, Howes and Sallot (2013) examined the effectiveness of using a paid spokesperson or a customer to relay an identical message endorsing a company. Relative to the message with the paid spokesperson, participants perceived the customer testimonial message as more credible and participants reported more positive attitudes towards the company when they watched the customer message. Likewise, Phua and Tinkham (2016) directly tested whether there is a difference between using an actor and using an actual person in a public service announcement related to obesity by manipulating a caption at the bottom of the video that indicated the person speaking was either an actor or a real person (Phua & Tinkham, 2016). The results demonstrated that the real person video condition was more effective than the actor video condition on outcomes related to losing weight (e.g. wanting to start a diet or to begin to exercise; Phua & Tinkham, 2016).

The literature on the perceptions of genuineness also highlights the importance of communicator characteristics for creating a persuasive message. Research done by Ilicic, Kulczynski, and Baxter (2018) found that compared to watching a celebrity with a genuine smile, seeing a celebrity with a forced smile while endorsing a product related to participants believing this celebrity was less genuine and indicating a lower likelihood of buying the product. Similarly, Namba, Kabir, Miyatani, and Nakao (2018) compared facial expressions that were

forced versus ones that were real to see which was better at accurately conveying emotions. The researchers discovered that when participants saw the image of a real facial expression, as opposed to one mimicking an expression, they were better able to correctly indicate whether the person was sincerely experiencing the emotion depicted and not just mimicking it. (Namba et al., 2018). Thus, using an unskilled actor to discuss someone else's experiences with bias may result in viewers being able to tell that the actor is not genuinely feeling the negative emotions associated with the recounting the unfair treatment. Moreover, perceptions that the unskilled actor is not genuinely upset or trustworthy, may then result in participants not believing the message (i.e., that sexism is an issue in STEM; Namba et al., 2018; Ilicic et al., 2018; Priester & Petty, 1995). Taking into account the previous research regarding the importance of communicator characteristics, it is possible that a video featuring a real woman discussing her experiences with sexism will be more effective at reducing bias related outcomes compared to a video using an unskilled actress conveying the same message because the real woman will be perceived as more genuine. In addition, relative to the unskilled actress, the real woman may also evoke more feeling of empathy and parasocial contact.

Current Study

Taken together, previous research demonstrates that video interventions result in many positive outcomes including increasing parasocial contact with a target of bias, reducing levels of bias, and increasing awareness of bias (Pietri et al., 2017 Schiappa, Gregg, & Hewes, 2005; Wong, Lookadoo, & Nisbett, 2017; Chu et al., 2017). Video interventions targeting gender bias in STEM, such as those by Pietri et al. (2017), have used trained professionals (e.g. actors, directors), and thus have been costly to create. Personal testimonials are successful at changing health attitudes, raising awareness of privilege, and have been used in empathy training (de Wit et al., 2008; Schwartz & Bohay, 2012; Case et al., 2014; Case & Rios, 2017). However, these personal testimonials are less effective when the people relaying the message appear to be paid or disingenuous (Moore et al., 1994; Howes & Sallot, 2013; Phua & Tinkham, 2016).

Thus, the current research aimed to address the following broad questions: Are video testimonials cost effective interventions for addressing biases in STEM, and, what characteristics of video testimonials make them most effective for this purpose? I explored whether a video of a

woman describing her personal experiences with bias in a STEM field was a useful intervention to help raise awareness of the pervasive sexism in STEM and ultimately reduce this bias. Additionally, I explored what qualities of this testimonial intervention contribute to its effectiveness. I specifically examined whether this personal account was more successful at increasing awareness of and reducing bias in video compared to written format. I also explored whether the video testimonial is only more effective than a written testimonial when the video features a woman genuinely recounting an experience with sexism as opposed to an unskilled actor (in this case, the same woman) conveying the experience. Thus, I aimed to answer the following specific questions:

> 1: Does watching a woman speak about her personal experiences with bias in STEM fields help raise awareness of gender bias in STEM and reduce sexism relative to a control video condition?
>
> 2: Is watching a video of a woman genuinely telling her own story on video more effective than watching someone (in this case, the same woman), with little-to-no acting skills, retell her account using a script?

<center>**Hypotheses**</center>

Given the evidence outlined by the previous research, I proposed the following:

Target Perception Hypotheses

1. The genuine video condition will be rated most positively followed by the written condition, and the disingenuous video condition, respectively. The control condition will be rated similarly to the genuine video on positive perceptions.
2. The genuine video condition will be perceived as most genuine followed by the written condition, the disingenuous video condition, respectively. The control condition will be rated similarly to the genuine video on genuineness.
3. Participants will feel the most empathy for the genuine video condition followed by the written condition, and then the disingenuous video condition, respectively. Predictions with regards to the control video were less clear. The genuine video and the written condition should result in more empathy than the control video as

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stories of people's experiences with bias often evoke greater feelings of empathy (Batson et al., 1997); the control condition lacks these type of stories. However, I did not have a clear prediction about whether the disingenuous video or control video would evoke more empathy.

4. Participants will feel the most parasocial contact with the genuine video condition followed by the written condition, disingenuous video condition, respectively. Participants will feel similar amounts of parasocial contact with control condition as they do the genuine condition.

Gender Bias Outcome Hypotheses

5. Participants will report the greatest awareness of gender bias in the genuine video condition followed by the written condition, the disingenuous video condition, and then the control video, respectively.
6. Participants will report the lowest levels of modern sexism in the genuine video condition followed by the written condition, the disingenuous video condition, and then the control video, respectively.

Mediation Hypotheses

Based on previous research, I also proposed the following hypotheses with regard to mediation models:

7. Relative to the written condition, participants will perceive the woman more positively and as more genuine in the genuine video condition and less positively and as less genuine in the disingenuous video condition, and these positive and genuine perceptions will be related higher feelings of empathy (Model 1a) and parasocial contact (Model 1b) (see Figure 1 for a combined theoretical model).
8. Relative to the written condition, participants will feel more empathy and parasocial contact with the woman the genuine video condition and less empathy and parasocial contact with the woman in the disingenuous video condition, and these feelings of empathy and parasocial contact will be related to higher

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awareness of bias (Model 2a) and lower modern sexism (Model 2b) (see Figure 2 for a combined theoretical model).

CHAPTER 2: METHOD

Participants

Five-hundred participants were recruited using Amazon's Mechanical Turk (MTurk). A power analysis calculated using G*Power (two independent sample t-test, α=.05, power= .80) indicated that 116 participants per condition would be sufficient to detect an effect of d=.37 (as found in Braverman, 2008) but 500 were recruited to account for potential loss due to failed attentions checks (Faul et al., 2007). A total of 501 participants completed the study.

A final sample of 364 participants were used for analyses. Data cleaning and reasons for exclusions are described in detail later in the Results section. The final sample was primarily White/Caucasian (78%), male (53%), and were, on average, 40 years of age. Participants indicated that they had completed some college (19%) or had earned a four-year degree (43%) and most had never held jobs in a STEM field (72%).

Procedure

I described the current study on Mturk as being about impressions and reactions to personal stories. The study was administered via an online Qualtrics survey link. Participants were first asked to read through the study information sheet and indicate if they would like to continue onto the study. After agreeing to participate, they were randomly assigned to interact with one of four format conditions:

1. **Genuine Video Conditions**: A real woman in STEM naturally telling their own personal experiences in video format.
2. **Disingenuous Video Conditions:** The same woman reading their personal experiences off of a script in video format (proxy for bad actor).
3. **Written Conditions**: Personal experiences of the woman in written format rather than video.
4. **Control Conditions**: The same woman discussing a topic unrelated to bias and STEM (e.g. her hobbies).

For each condition, I employed two women, to ensure any observed effects were not unique to a specific target. That is, I recruited two women to tell their genuine story about gender bias in STEM, to retell the story in a disingenuous manner, and to convey a story unrelated to gender bias. Thus, the current experiment is a 4 (genuine video, disingenuous video, written, control) by 2 (target) design.

After watching or reading the story they were assigned to, participants were asked to complete measures related to the story and the woman in the story, followed by measures of parasocial contact and empathy, outcome measures of gender bias and awareness of gender bias, and then a set of demographic questions.

Stimulus Creation

To create the stimulus materials (i.e., the video conditions and the written condition) for this study, I first obtained IRB approval to film and transcribe videos of women in STEM fields discussing their experiences. A total of four women were recruited via various STEM-related organization email listservs to participate in two sessions for the creation of these materials. They were each compensated with a total of $175 in Amazon gift cards for their time. Although four women participated in the creation of these materials, only the videos and written transcripts from two women were used in the current study. Specifically, the two women that were chosen for the current study provided enough content in the genuine and control videos to create to the ideal length for the videos and written transcripts. The two women were from STEM fields where women make up a small portion of the overall population and are more male-dominated (e.g., engineering fields, computer science-related fields, earth science fields) than other STEM fields such as biology or social science fields (National Science Board, National Science Foundation, 2019).

Stories about gender bias

Genuine video description of gender bias. The genuine videos feature the women discussing their experiences as a woman in their male dominated fields. The first session of two was used to create the genuine videos. In this session, the women were prompted with a set of questions surrounding their experiences in STEM (e.g., "Have you ever felt like you were treated

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differently in your field because you are a woman?", "How did these situations make you feel when they happened?"). Previous work from Lindsey, King, Cheung, Hebl, Lynch, and Mancini (2015a) employed a question similar to that of the first example question to gather stories of women's experiences with gender bias. The women were instructed that they could either answer each question during the video or, if they already had a story in mind, they were free to just tell that story. I filmed the women as they answered questions and told their stories. One woman's story described experiences of being questioned in her field about her overly feminine clothing and her work-life balance habits (i.e., having too much life balance). This video was 5 minutes and 13 seconds in length. The other woman's story focused on a variety of experiences that contributed to a feeling of not being welcomed or not belonging in her field. For instance, she discussed concerns over having her competence questioned regarding a topic related to her field and feeling as though she was not accepted by male peers. This video was five minutes and 11 seconds in length. Both of the videos had the women naturally telling their stories, not using a script, but in their most genuine form. The videos were later edited down and transcribed into a script in between the first and second sessions.

   Disingenuous video description of gender bias. The second session focused on the creation of the disingenuous videos and the control condition videos. For the disingenuous videos, the women retold the story from the genuine video using a script. As mentioned before, the script was transcribed from edited versions of the women's original (i.e., genuine) videos. The women were wearing the same clothing they wore in the genuine video in order to control for any difference in perceptions based off of clothing. To prevent the women from having to look down at a piece of paper to read off of this script, the script was displayed on a laptop screen (similar to that of a teleprompter) and the women used a wireless computer mouse to scroll down the script at their own pace while reading. The laptop was placed close to the camera and at a height similar to that of the camera in an attempt to have it look like the women were talking into the camera and not reading off a script. The women were told that it was okay if this re-telling of their story felt unnatural or disingenuous as this was supposed to be like an actor was telling their story. One video was four minutes and 53 seconds in length and the other was four minutes and 56 seconds in length. Note that these were shorter than the genuine videos because the scripts were read at a quicker pace than the original stories were told.

Written description of gender bias. In addition to having two different videos portraying the women's experiences (i.e., one genuine and disingenuous), there were also written conditions of each story. These were created using an almost exact transcription of an edited version of the original, genuine videos. With this condition, I was able to examine whether video formatting is always a more effective way to increase bias awareness/decrease bias or if it is only more effective given the genuineness of the person in the video.

Control story video. The control videos were created after the filming the disingenuous videos in the second session. These videos featured the same women from the genuine and the disingenuous videos. Again, the women were wearing the same clothing as they wore in the genuine video in order to control for any difference in perceptions based off of clothing. For these videos, the women were asked to discuss either their hobbies or their favorite TV show/movie, topics unrelated to gender bias and STEM. Both women chose to discuss their hobbies, one hobby was athletic in nature and the other was an artistic hobby. For these videos, they talked about different aspects of their hobbies such as how they got into the hobbies, why they enjoy them, and whether they do them with friends or family. One of the control videos was five minutes and six seconds in length while the other control video was four minutes and 55 seconds in length.

<div align="center">

Measures

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After either viewing or reading the story, participants completed questionnaires measuring the constructs of interest. To test the effectiveness of the interventions, I assessed gender bias and awareness of gender bias. Additionally, I examined perceptions of the women in the videos, including of positive perceptions and perceived genuineness of the woman, and feelings of parasocial contact and empathy for the woman. Various demographic measures for age, gender, race, etc. also were also included. Each measure and their respective items can be found in the Appendix.

Bias Outcomes

Gender Bias. I assessed gender bias using the 8-item Modern Sexism Scale developed by Swim, Aikin, Hall, and Hunter (1995). Participants rated their agreement with statements such as

"Society has reached the point where women and men have equal opportunities for achievement" using a scale of 1-*strongly disagree* to 5-*strongly agree* (Swim et al., 1995). In the original development of the scale, Swim et al. (1995) reported Cronbach alphas for reliabilities ranging from .75 and .84, while a more recent use of the measure by Moss-Racusin et al. (2018) reported reliabilities of .83 to .90 across studies and multiple time points. In the current study, the Modern Sexism Scale had a Cronbach's alpha of .92, indicating high reliability.

Awareness of Gender Bias in STEM. Pietri et al. (2017) created a measure to assess the level of participant's awareness of gender bias occurring in STEM fields, which I used for the same purpose in this study. This measure contains 8-items such as "'In my opinion, women in science fields often face negative reactions for being aggressive" and uses a 1- *strongly disagree* to 5-*strongly agree* scale (Pietri et al., 2017). Pietri and colleagues (2017) reported a Cronbach's alpha of .86 for the full measure. In the current study, the Awareness of Gender bias scale had a Cronbach's alpha of .90, indicating high reliability.

Mediators

Positive Perceptions of Story Subject. I used a scale from Kaiser and Miller (2001) to examine the extent that participants viewed the woman in the video or written story as having positive attributes. This scale included 15-items such as "The woman in the story is likeable" and "The woman in the story is honest" and was used to measure positive perceptions of the woman in the story (Kaiser & Miller, 2001). Participants indicated their level of agreement with each item on a 1-*strongly disagree* to 7-*strongly agree* scale. In the current study, the positive perceptions scale had a Cronbach's alpha of .96.

Perceptions of Genuineness. I measured participants' perceptions of the woman's genuineness using a 3-item Celebrity Authenticity measure from Moulard, Garrity, and Rice (2015). Using an adapted prompt which replaces celebrity as the subject of the rating, participants rated how much they agree with statements about the woman such as "Is genuine", "Seems real to me" and "Is authentic" using a 1-*strongly disagree* to 7-*strongly agree* scale (Moulard et al., 2015). Moulard et al. (2015) reported an original Cronbach's alpha of .87 when measuring perceptions of the authenticity of celebrity subjects. In the current study, the perceptions of genuineness measure had a Cronbach's alpha of .94, indicating high reliability.

Empathy. To measure participants' empathy following the woman's story, I used the 6-item empathy index from Batson, Early, & Salvarni (1997b). The prompt for this measure was similar to that used by Batson et al. (1997b) in which participants were asked how much they felt each of the items in the index while learning about the woman's story, using a scale of 1-*not at all to* 7-*extremely*. Example items from the index include "moved" and "compassionate" with Batson et al. (1997b) reporting a Cronbach's alpha of .85. In the current study, Batson et al.'s (1997b) empathy index had a Cronbach's alpha of .95, indicating high reliability.

Parasocial Contact. I used the Parasocial Interaction scale from Rubin, Perse, Powell (1985) to measure the extent in which participants felt a social connection with the person in the video. While the original measure consists of 20 items, the current study used a shortened version from Chu et al. (2017) which included the 8-items most relevant for the study's purposes and was amended to work for both written and video versions of the story. Additionally, I modified the items to make the primary subject of each item the woman in the video. Example items include "I would like to meet this woman in person" and "I see the woman in the video as a natural, down-to-earth person" and are measured on a scale of 1-*strongly disagree* to 5-*strongly agree* (Rubin et al., 1985). Chu et al. (2017) report Cronbach's alphas of .88 - .90 across four studies for this shortened scale. In the current study, the Parasocial Interaction scale had a Cronbach's alpha of .92, indicating high reliability.

CHAPTER 3: RESULTS

Data Cleaning

A total of 137 participants were excluded from analyses. Participants were first excluded for failing one or more of three attention check survey items. The first attention checks instructed participants to correctly answer a question related to the content of the story they interacted with (e.g., "Which option best describes something that was discussed in the previous story?" [correct answer depending on the content of the study]) (N=79). The second and third attention check item were embedded in the measures and told participants to, "Please select strongly agree for this item" (N=14). Finally, participants were excluded based off their response to an open-ended question in which they were asked to describe their impression of the woman in the story. Reasons for exclusion based on this question were as follows: providing non-sensical responses (e.g., "This is instance very nice") to this question (N=33), copying and pasting a line from the story they interacted with for this question (N=1), leaving this question blank or responding with an answer of such as "NA" or "none" (N=5), or for providing a response to this question that was too brief, too vague, and/or unrelated to impressions of the women (e.g., "I liked") (N=5).

A chi-square test of independence was used to test for any possible relationships between excluded participants and condition. No significant relationships were found between those who were excluded and their assigned condition, $\chi2$ (7, N = 501) = 1.998, p = .960. A total of 364 participants were included in the final sample.

Descriptive statistics (i.e., means and standard deviations) for each variable of interest for the whole sample and also across media conditions can be found in Table 1. Additionally, correlation analyses indicated significant relationships between all variables, with genuineness and positive perceptions having the strongest relationship at .80. Results of each correlation analysis can be found in Table 2.

Hypothesis Testing

In order to test hypotheses 1- 6, I ran between-subjects ANOVAs with media condition, target in the video, and the interaction between for parasocial contact, felt empathy, perceptions

of genuineness, perceptions of positive traits, gender bias and awareness of gender bias. Of note, the 4 (format) x 2 (target) ANOVAs first indicated that there were no significant interactions between the target of the video and media condition on any of the variables nor was there an effect of target only. Please see Table 3 for the full results of each ANOVA and Figures 3 - 8 for bar charts of the means and standard error bars for each format conditions. The following sections describe the effects for format condition in the ANOVA analyses. I employed Tukey's HSD post-hoc analyses to test for differences between media conditions.

Positive Perceptions

A main effect of format condition on positive perceptions of the woman in the video was found ($F(3,356) = 3.093$, $p = .027$). However, post-hoc analyses did not indicate any significant differences between media conditions. The only mean difference that was approaching significance was between the control video and the disingenuous video, with the control video being perceived as more positively than the disingenuous video, *Mean Difference* $= 0.38$ *p* $= .068$. Although the results of this analysis did directly not support Hypothesis 1, the average level of positive perceptions across groups were trending in the right direction, with the control video being perceived most positively, followed by the genuine video, the written condition, and the disingenuous video.

Genuineness

A main effect of format condition on perceived genuineness was found ($F(3,356) = 3.657$, $p = .013$). Post-hoc analyses indicated that the control video as perceived as significantly more genuine than the disingenuous video, *Mean Difference* $= 0.55$, $p = .010$. Further, the control video was perceived as most genuine, followed by the genuine video, written condition, and disingenuous video, respectively. Although this follows the expected pattern, there were no other significant differences between conditions.

Empathy

No significant main effect was found for format condition on felt empathy, thus Hypothesis 3 was not supported. The average levels of empathy by condition were trending in the general hypothesized direction with the most empathy felt for the genuine video, followed by the written condition, disingenuous video, and control video, respectively. However, there were no significant differences between conditions.

Parasocial Contact

No significant main effect was found for format condition on felt parasocial contact, thus Hypothesis 4 was not supported. Similar to the results for positive perceptions and genuineness, the control video elicited the highest level of parasocial contact followed by the genuine video and written condition. Conversely, participants indicated feeling the lowest levels of parasocial contact with the disingenuous video. However, these differences were not significantly different when compared to the other conditions.

Awareness of Gender Bias in STEM

No significant main effect was found for format condition on awareness of gender bias in STEM, thus Hypothesis 5 was not supported. Although no significant main effect was found, the results are still encouraging as the main effect was approaching significance (F (3,356) = 2.275, p =.080) and the average levels of gender bias awareness for each condition were in the hypothesized direction. Participants in the genuine video condition reported the highest awareness of gender bias followed by the written condition, then the disingenuous video, and finally, the control video. Post-hoc analyses indicated that the difference between the genuine video and control video were also approaching significance (*Mean Difference* = 0.36, p = .053).

Modern Sexism

No significant main effect was found for media condition on modern sexism. Participants in the disingenuous video condition did endorse the highest levels of modern sexism (i.e., the

most gender bias) whereas those in the genuine video condition endorsed the lowest levels. However, these results were not significant.

Parallel Mediation Models

The four parallel mediation models outlined previously were tested using Process Model #4 (Hayes, 2017). Initially, for the mediation models, the written condition was going to serve as a reference group, using dummy coding to compare the written condition to genuine and disingenuous condition. However, results from the previously described ANOVAs indicated that the written condition often fell in the middle of the four conditions each outcome and did not differ significantly from any other conditions on the outcome variables. As a result, I ran a set of exploratory mediation analyses comparing the disingenuous video (coded as 0) and the genuine video (coded as 1) directly. Moreover, in the above ANOVA analyses, I only found condition effects on genuineness and positive perceptions and not for parasocial contact and empathy. Consequently, mediation analyses with parasocial contact and empathy would not produce significant indirect effects because the effect of genuine vs. disingenuous video condition is not significant for these two potential mediators (i.e., the a-path would be insignificant). Thus, I ran two exploratory mediation analyses with genuine vs. disingenuous video condition as the predictor, genuineness and positive perceptions as the parallel mediators, and empathy (New Model 1a) and parasocial contact (New Model 1b) as the outcomes, respectively. The results of these mediation models are described below.

New Model 1a: Empathy. Hypothesis 7a proposed that the genuine video condition would be related to greater positive perceptions and perceptions of genuineness which in turn would relate to greater feelings of empathy for the woman in the video. In the new exploratory analysis, there was not a significant indirect effect for either mediator (i.e., positive perceptions and genuineness). Contrary to predictions, perceptions of genuineness did not share a relationship with empathy. However, positive perceptions were significantly related to feelings of empathy (See Figure 9 for the full mediation model).

New Model 1b: Parasocial Contact. Hypothesis 7b proposed that the genuine video condition would relate to greater positive perceptions and perceptions of genuineness and this in turn would predict greater feelings of parasocial contact with the woman in the video. In the new

exploratory analysis, there was a significant indirect effect of genuine vs. disingenuous video condition on parasocial contact via perceptions genuineness (0.06; 95% [.002, .15]) but not via positive perceptions. This finding indicates that going from the disingenuous video to genuine video increases how genuine the woman is perceived to be, and, in turn, these perceptions of genuineness relate to greater feelings of parasocial contact. While there was not a significant indirect effect of the genuine vs. disingenuous video on parasocial contact via positive perceptions, these perceptions were significantly related to more parasocial contact (See Figure 10 for the full mediation model). Thus, Hypothesis 7b was only partially supported through the exploratory analysis.

CHAPTER 4: DISCUSSION

The current study set out to investigate whether watching or reading a woman's story about her experiences with gender bias in STEM (i.e., her personal testimonial) could be used as way to increase awareness of gender bias in STEM and lower levels of sexism. Specifically, I tested whether the genuineness of the story (original telling vs. a re-telling using a script) and the format of the story (video vs. written) had influenced how the woman in the story was perceived and the effectiveness of the testimonial in terms of reducing gender bias and enhancing awareness of gender bias. Thus, the current study had four format conditions of the testimonial including a genuine video condition, a disingenuous video condition, a control video condition (with a story unrelated to gender bias), and a written condition.

Based on previous research regarding personal testimonials, empathy, target perceptions, parasocial contact, and video gender bias interventions, I hypothesized a number of main effects as well as four mediation models (e.g., Batson et al., 1997a; Howes & Sallot, 2013; Phua & Tinkman, 2016; Wong et al., 2017; Pietri et al., 2017). With regards to main effects, I hypothesized that the genuine and control videos would be perceived most positively, followed by the written transcript and the disingenuous video. In relation to these hypotheses, I only found evidence of format condition effects for positive perceptions of the woman in the story and genuineness of the woman. When exploring differences between condition for positive perceptions, no significant differences between conditions were found. For perceptions of genuineness, the only significant difference that emerged was the woman in control video being perceived as more genuine than the woman in disingenuous video. Although the results did not support my hypotheses, the average ratings across conditions are encouraging and are generally trending in the hypothesized direction. The control video had the highest positive and genuine ratings followed by the genuine video, the written condition and finally the disingenuous video.

Similarly, I hypothesized that the genuine video would elicit the most empathy and parasocial contact with the woman and that it would produce the highest levels of gender bias awareness and lowest levels of sexism, followed by the written condition and disingenuous video condition. With regard to the control video, I hypothesized that it would be produce similar levels of parasocial contact as the genuine video and less empathy than the genuine video.

Unfortunately, there were no significant format conditions effects for parasocial contact, empathy, awareness of gender bias or modern sexism. However, most of these results were trending in the expected direction. Participants felt the most parasocial contact with the woman in the control video, followed by the woman in the genuine video, then in the written transcript and the disingenuous video, respectively. Moreover, the genuine video produced the most empathy and awareness of gender bias as well as the lowest levels of modern sexism relative to the other three conditions. Although there were no significant differences between conditions on these outcomes, these results suggest that the genuine video was acting in the expected way. It is worth noting that fairly large portion of participants (27%) were excluded from analyses in the current study for various reasons. Therefore, the power to sufficiently detect any effects may have been harmed given the limited sample size. Given that some key main effects (e.g., greater awareness of gender bias in the genuine video condition relative to the control) were in the predicted direction, it is worth investigating these hypotheses in the future using a greater sample size.

I also proposed four parallel mediation models (Models 1a, 1b, 2a, 2b), in which the written condition was compared to the genuine and disingenuous videos, to help explain the mechanisms underscoring my predicted effects. Given that the written condition did not differ from the genuine or disingenuous conditions, I did not run all of the proposed mediation models. Rather, I tested new exploratory mediation analyses directly comparing the disingenuous video to the genuine video. Specifically, I tested whether relative to the disingenuous video, the genuine video resulted in more positive and genuine perceptions, which in turn related to higher feelings of empathy (New Model 1a) and parasocial contact (New Model 1b). I did not run these exploratory mediation analyses for Model 2a and Model 2b as there were no significant differences between conditions found for the mediators or the outcomes in these models.

I found partial support for New Model 1b, which examined parasocial contact as the outcome. Genuineness was found to mediate the relationship between the disingenuous versus genuine video condition and feelings of parasocial contact, in that the genuine video was perceived to be more genuine and perceptions of genuineness related to participants feeling more parasocial contact with the woman in the video. Although there was not a significant indirect effect of the disingenuous versus genuine video condition on parasocial contact through positive perceptions, positive perceptions were related to greater parasocial contact. As for participants'

felt empathy, there were no significant indirect effects of disingenuous vs. genuine video condition on participant's feelings of empathy for the woman in the video through greater perceptions of genuineness or positive perceptions (i.e., no support of New Model 1a). But positive perceptions were related to greater levels of empathy for the video target. Again, it seems that greater power is needed to parse out these results.

Implications

Given the lack of power in the current study, it is hard to draw meaningful conclusions as to whether personal testimonials, and which of their varying characteristics, can act as effective tools to better gender bias outcomes. What we do know from the current study is that the disingenuous video, in general, was rated lowest in genuineness and was perceived least positively across the four conditions, and that it was rated significantly lower on these dimensions than the control video. This indicates that characteristics of videos and how they are created (i.e., by genuinely telling a story or having someone retell a story using a script) do seem to influence how the videos and their subjects are perceived. Additionally, greater genuineness and positive perceptions were significantly related to greater awareness of bias and lower levels of modern sexism. Thus, there is initial evidence that diversity video interventions should be designed keeping in mind the importance of these perceptions. These findings also highlight the potentially critical role of pilot testing video diversity interventions and proactively investigating how the video targets are perceived. By doing so, researchers and organizations may be able to prevent any negative target perceptions from interfering with the message of the video and its ultimate outcomes (e.g., awareness of gender bias).

Limitations and Future Directions

As with any research, the current study and its results faced many limitations. First, as mentioned previously, the study was severely underpowered as many participants were excluded (27%) due to missing attentions checks. The power analysis using G*Power indicated that each condition would need 116 participants to reach a small to medium effect size (Faul et al., 2007) but after exclusions, each condition only had between 87-91participants. Thus, our lack of

significant effects may have been a result of the small sample size and future research should test our predicts with a larger sample.

Future research might also explore whether the acting of the woman in the video is more or less important for specific groups of participants. For instance, previous research on gender bias interventions suggests that the genuineness of personal testimonials may be more important for changing attitudes of men rather than women. Indeed, women generally are more aware of gender bias than men (Moss-Racusin et al., 2015), and a result, men may be more impacted by subtle differences in diversity interventions (i.e., the genuineness or quality of the actor). Supporting this possibility, Jackson, Hillard, and Schneider (2014) found that only men's (but not women's) implicit attitudes about women were improved after a bias literacy diversity training because had women already had positive attitudes prior to the diversity training.

To initially explore this possibility, I ran exploratory ANOVAs focusing only the responses of men (N=191) from the current sample. With this male-only sample, I found a significant main effect of format condition on both genuineness, F (3,183) = 4.451, p = .005, η_p^2 = .068 and positive perceptions, F (3,183) = 6.681, p < .001, η_p^2 = .099. Post-hoc analyses indicated that the disingenuous video was perceived as significantly less genuine than the genuine video, *Mean Difference* = 0.81, p = .012, and the control video, *Mean Difference* = 0.79, p = .015, and as significantly less positively than the genuine video, *Mean Difference* = 0.78, p = .003, and the control video, *Mean Difference* = 0.80, p = .002, among men. There was also a main effect of format condition for both empathy, F (3,183) = 8.419, p < .001, η_p^2 = .121, and parasocial contact, F (3,183) = 4.376, p = .005, η_p^2 = .067. Male participants felt significantly more empathy for the woman in the genuine video, *Mean Difference* = 1.13, p = .001 and in the written transcript, *Mean Difference* = 1.13, p < .001, compared to the disingenuous video. For parasocial contact, male participants felt significantly more socially connected to the woman in the control video, *Mean Difference* = 0.52, p = .031, and in the written condition, *Mean Difference* = 0.47, p = .044, when compared to the disingenuous video.

Lastly, there was a significant main effect of format condition, F (3,183) = 2.937, p = .035, η_p^2 = .046, on awareness of gender bias. While no significant differences between conditions were found for male participants, the average level of gender bias awareness was trending in the expected direct with the genuine video showing the greatest awareness and the control video showing the least awareness. These were purely exploratory analyses, and

therefore, future research should test the importance of target genuineness for raising awareness of gender bias among a larger sample of male participants. Please see Table 4 for male-only descriptive statistics for each variable across condition and Figures 11 - 16 for bar charts of the means and standard error bars for each format condition from the male-only sample.

Another limitation with the current sample is that I recruited participants from Mturk and did not test my research questions among participants specifically in STEM careers or with a STEM background. Indeed, only around 28% of participants in the current sample indicated that they had previously worked or are currently working in a STEM field. Previous research by Moss-Racusin and colleagues (2018) with VIDS (i.e., Video Interventions for Diversity in STEM) suggests that video interventions for raising awareness of gender bias in STEM are effective for both STEM and non-STEM participants, which suggests that I may find similar results among STEM-only participants. However, in a STEM-only sample, the authors did find evidence to suggest that the content of the video interventions has some bearing on important outcomes. In particular, among a STEM-only sample, relative to control videos, both the narrative and expert interviews raised awareness of bias and reduced modern sexism. However, compared to the narrative videos, the expert interviews, which explicitly described empirical evidence of gender bias, were more effective interventions (i.e., raised more awareness of gender bias in STEM and reduced modern sexism; Moss-Racusin et al., 2018a). These findings suggest testimonials may be most beneficial for a STEM sample, when they are accompanied by empirical evidence documenting sexism in STEM. Therefore, future research should specifically explore the effectiveness of personal testimonials for raising awareness of gender bias among a sample of STEM-only participants. Additionally, future research might examine the role of general awareness of bias in participants prior to the intervention as this might moderate the extent in which these personal testimonials are effective. As previously mentioned, having experience with or exposure to bias (e.g., as a woman; Jackson et al., 2014; Moss-Racusin et al., 2015) may hinder the testimonial's ability to further increase awareness of bias and decrease sexism. Thus, the testimonials may be most effective among participants with low initial awareness of gender bias in STEM.

A limitation of the intervention employed in the current work was the intervention consisted only of short stand-alone videos. Although it was the hope that using these short videos alone could effectively raise awareness of gender bias in STEM, this format may have limited

the videos effectiveness as previous research has highlighted the limitations of using brief interventions (Amber, 2017). Other work suggests that watching multiple video interventions (Moss-Racusin et al., 2018a) or pairing video interventions with other information about how to address gender bias (Hennes et al., 2018) may make video interventions more effective. Thus, future work might explore whether the testimonial videos function as more efficacious interventions when the videos are longer, when we combine multiple videos, or when we include additional information on how to address gender bias.

Relatedly, the current study found no significant differences between conditions for how much empathy participants felt for the woman in the video. The stand-alone format of the intervention also may have contributed to this lack of effect on empathy because previous work has found that stories are more successful at evoking empathy when participants are instructed to take the perspective of the target (i.e., see the story through the target's lens) while reading the story compared to not being told to take the target's perspective (Batson et al, 1997a; Vescio, Sechrist, & Paolucci, 2003). On the other hand, work from Amber (2017) suggests that pairing videos about a person's experience with bias with a perspective taking activity does always not guarantee positive outcomes. Given these mixed outcomes, future research should further explore whether these video testimonials about gender bias are more effective when participants are told to take the perspective of the woman in the testimonial. Additionally, previous work on diversity training (Lindsey, King, Hebl, & Levine, 2015b) indicates that participant's empathy at the trait level, rather than the state level as measured here, may influence the extent in which personal testimonials are effective. In particular, Lindsey and colleagues (2015b) found that a diversity intervention focused on encouraging perspective taking of marginalized groups was ineffective among participants high in trait empathy but did work to encourage positive attitudes towards marginalized groups for those whose with low trait empathy. This finding suggests that the testimonials may be most efficacious interventions among participants who are low in trait empathy.

The current study was further limited by the use of self-report measures rather than measuring participant's behavior after viewing or reading about the women's story. As participants may have felt compelled to respond in a way they deemed would be acceptable to others rather than what is reflective of their true attitudes (Paulhus, 2002), which may have been particularly relevant to the outcomes related to gender bias (e.g., awareness of bias and sexism).

Although possibility this may be less of a concern in the current study given that the variability between conditions was in the expected directions, it would be beneficial for future research to examine the effects of personal testimonials on actual behavioral outcomes or behavioral intention measures.

There are a number of ways in which future research could measure participant's behavior after watching or reading a testimonial about gender bias. For example, Pietri et al. (2017) assessed participants' behavioral intentions to confront perpetrators of sexism and found that participants had higher intentions to confront subtle bias across a variety of scenarios after watching the VIDS intervention videos compared to control videos. Participants also were more likely to comment on inappropriate sexist behavior in a short unrelated video, after watching the intervention videos relative to the control videos. Similarly, Moss-Racusin et al. (2018a) found that after watching the VIDS intervention videos participants had higher behavioral intentions to create more equitable environment for women in STEM relative to participants who watched the control videos.

Although the current study used two different stories about experiences with gender bias in STEM, there was not a concentrated effort to examine whether the type of gender bias experienced would make these interventions more or less effective. More specifically, the current study did not purposefully manipulate the overtness of the gender bias experiences. Previous research on both racial and gender discrimination suggests how ambiguous a biased remark or action is can influence how others interpret the behavior (i.e., interpret the act as being sexist/racist) and respond (e.g., emotionally and behaviorally) to sexist/racism behavior (Basford et al., 2014; Lindsey et al. 2015a; Jones, Arena, Nittrouer, Alonso, & Lindsey, 2017; Tao, Owen, & Drinane, 2017). For example, Basford et al. (2014) found that experiences with gender bias that were more obvious in nature resulted in participants being better able to judge them as examples of sexism. Participants also were less likely to perceive these discrimination experiences as harmful to the target when the encounters were ambiguous versus not ambiguous (Basford et al., 2014). Moreover, women are more hesitant to submit a complaint about sexism directed towards another person when that sexism was subtle relative to the when the sexism was more explicit (Lindsey et al., 2015a). Work on racial bias indicates that people feel more negative and less positive after reading about scenario with a microaggression that is clearly connected to a target's racial or ethnic identity compared to a scenario where the

microaggression or rude treatment it is not clearly connected to this identity (Tao et al., 2017). Thus, future research might investigate whether having the bias experience described in a personal testimonial be more explicit and clear results in stronger feelings of empathy and awareness gender bias relative to an ambiguous bias situation.

Conclusion

Given the negative experiences with sexism that women in STEM fields still face (Eaton, Saunders, Jacobson, & West, 2020), the current study investigated the use of personal testimonials, in which women discussed their own experiences with gender bias in their STEM fields, as potential gender bias interventions. Specifically, the current study tested whether originally telling a story about gender bias vs. retelling this story using script had any bearing on how participants perceived the target and whether these perceptions in turn influenced participants level of sexism and awareness of gender bias in STEM. Although I found some evidence suggesting that video format influenced perceptions of the target's genuineness, perceiving the target as genuine related to feeling a social connection to the target as well lower sexism and higher awareness of gender bias. However, the current study was underpowered making it difficult to draw meaningful conclusions from the results. These personal testimonials about experiences with gender bias might provide a more cost-effective intervention (i.e., it cost $175 to compensate each woman for her time) for organizations therefore, it would be valuable to continue researching their potential to influence gender bias outcomes. Follow-up studies using a larger sample and potentially a male-only sample are needed to further investigate the importance of genuineness for video testimonials' effectiveness. Moreover, future research should examine how the effectiveness of the personal testimonial changes when paired with other intervention pieces (i.e., additional videos, more information about gender bias, perspective taking manipulations).

TABLES

Table 1. Descriptive statistics by Format Condition

Measure	All Conditions N=364 Mean (SD)	Genuine Condition N=87 Mean (SD)	Disingenuous Condition N=98 Mean (SD)	Control Condition N=88 Mean (SD)	Written Condition N=91 Mean (SD)
Pos. Perceptions	5.43 (1.07)	5.58$_a$ (1.04)	5.25$_a$ (1.25)	5.63$_a$ (0.98)	5.30$_a$ (0.95)
Genuineness	5.78 (1.21)	5.89$_{ab}$ (1.24)	5.47$_a$ (1.49)	6.03$_b$ (0.97)	5.75$_{ab}$ (0.98)
Empathy	4.72 (1.61)	4.97$_a$ (1.45)	4.53$_a$ (1.87)	4.52$_a$ (1.53)	4.88$_a$ (1.49)
PS Contact	3.48 (0.96)	3.52$_a$ (0.94)	3.34$_a$ (1.04)	3.58$_a$ (0.85)	3.50$_a$ (0.98)
Awareness of GB	3.65 (0.94)	3.81$_a$ (0.78)	3.65$_a$ (0.96)	3.45$_a$ (1.04)	3.67$_a$ (0.93)
Modern Sexism	2.41 (1.03)	2.25$_a$ (0.82)	2.48$_a$ (1.06)	2.45$_a$ (1.14)	2.45$_a$ (1.05)

Notes. Shared subscripts between conditions indicate those conditions did not differ ($p < .05$) based on post-hoc Tukey HSD test. Pos. = Positive, PS = Parasocial GB = Gender bias

Table 2. Correlations

Variables	1	2	3	4	5	6
1. Pos. Perceptions	-					
2. Genuineness	.80***	-				
3. Empathy	.66***	.53***	-			
4. PS Contact	.76***	.63***	.76***	-		
5. Awareness of GB	.39***	.38***	.32***	.32***	-	
6. Modern Sexism	-.42***	-.40***	-.30***	-.29***	-.78***	-

Notes. ***$p < .001$, N=364, Pos. = Positive, PS= Parasocial, GB = Gender bias

Table 3. ANOVA results for Target Condition, Format Condition, Format x Target

Measure	Target Condition			Format Condition			Format x Target		
	F-value	p-value	η_p^2	F-value	p-value	η_p^2	F-value	p-value	η_p^2
Pos. Perceptions	0.010	.918	<.001	3.093[*]	.027	.025	2.385	.069	.020
Genuineness	0.092	.762	<.001	3.657[*]	.013	.030	0.643	.588	.005
Empathy	1.295	.256	.004	1.830	.141	.015	1.240	.295	.010
PS Contact	0.807	.370	.002	1.033	.378	.009	1.878	.133	.016
Awareness of GB	1.064	.303	.003	2.275	.080	.019	1.291	.277	.011
Modern Sexism	1.497	.222	.004	0.969	.407	.008	0.593	.620	.005

Notes. [*]$p < .05$, Pos. = Positive, PS = Parasocial, GB = Gender bias

Table 4. Male-only descriptive statistics by Format Condition

Measure	All Conditions N=191	Genuine Condition N=43	Disingenuous Condition N=49	Control Condition N=45	Written Condition N=54
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Pos. Perceptions	5.23 (1.09)	5.52$_a$ (1.05)	4.74$_b$ (1.31)	5.54$_a$ (0.92)	5.18$_{ab}$ (0.88)
Genuineness	5.60 (1.28)	5.90$_a$ (1.24)	5.09$_b$ (1.60)	5.87$_a$ (1.05)	5.60$_{ab}$ (1.04)
Empathy	4.56 (1.52)	4.96$_a$ (1.36)	3.83$_b$ (1.80)	4.52$_{ab}$ (1.35)	4.95$_a$ (1.26)
PS Contact	3.40 (0.95)	3.36$_{ab}$ (0.97)	3.08$_b$ (1.00)	3.60$_a$ (0.79)	3.55$_a$ (0.94)
Awareness of GB	3.38 (0.91)	3.63$_a$ (0.81)	3.24$_a$ (0.94)	3.18$_a$ (0.95)	3.48$_a$ (0.90)
Modern Sexism	2.66 (1.00)	2.33$_a$ (0.84)	2.83$_a$ (1.05)	2.72$_a$ (1.10)	2.73$_a$ (0.96)

Notes. Shared subscripts between conditions indicate those conditions did not differ ($p < .05$) based on post-hoc Tukey HSD test. Pos. = Positive, PS = Parasocial GB = Gender bias
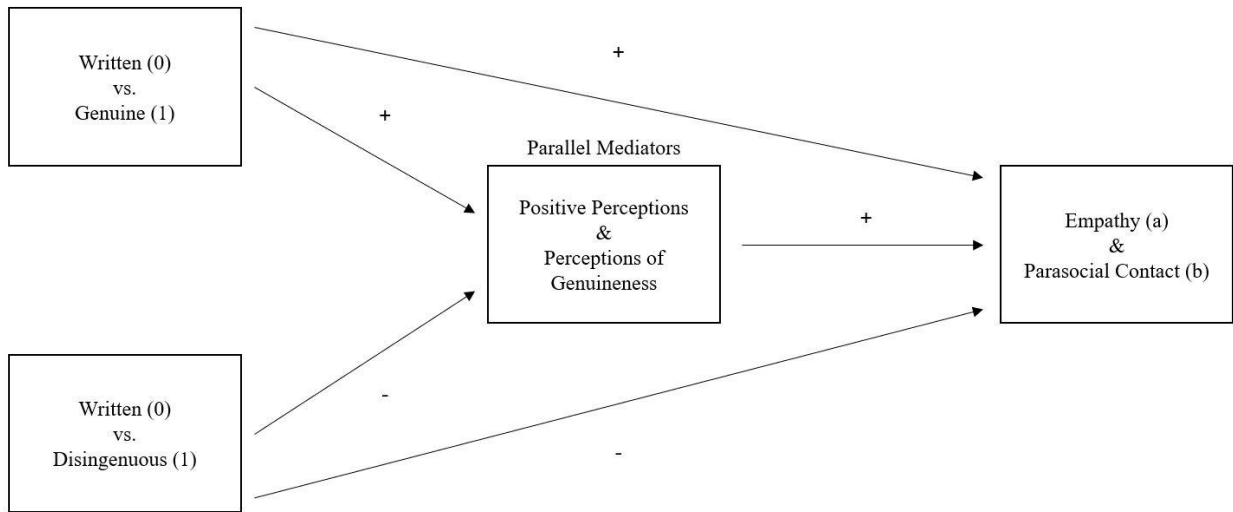
FIGURES

Figure 1. Hypothesized combined parallel mediation Model 1(a & b) comparing the written condition to the genuine video and disingenuous video. This model depicts the theoretical effects of format (written vs. genuine or disingenuous) condition on empathy and parasocial contact via positive perceptions and perceptions of genuineness.
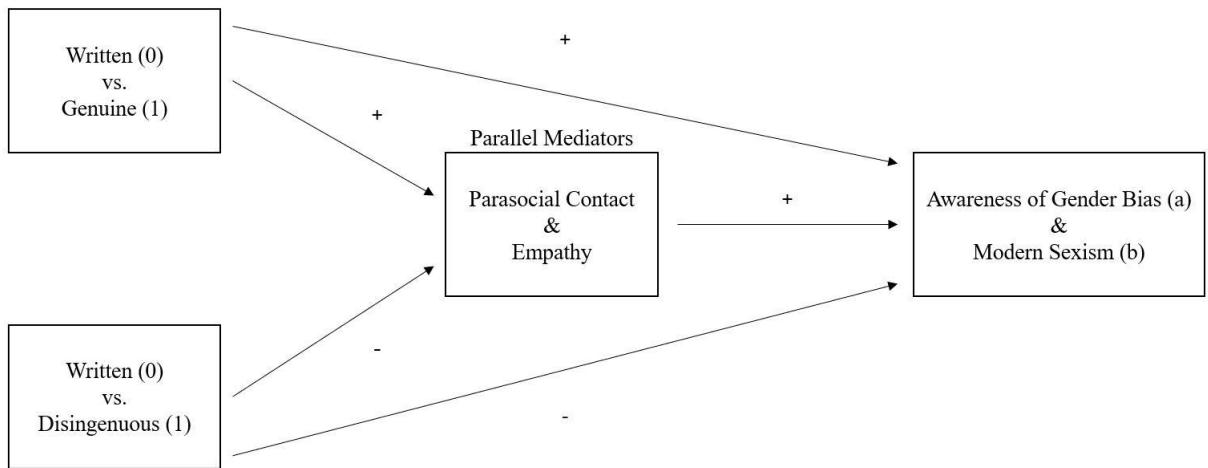

Figure 2. Hypothesized combined parallel mediation Model 2 (a & b) comparing the written condition to the genuine video and disingenuous video. This model depicts the theoretical effects of format (written vs. genuine or disingenuous) condition on gender bias outcomes via feelings of parasocial contact and empathy.

Figure 3. Bar chart of mean positive perceptions in each format condition with standard error bars.

Figure 4. Bar chart of mean perceptions of genuineness in each format condition with standard error bars.
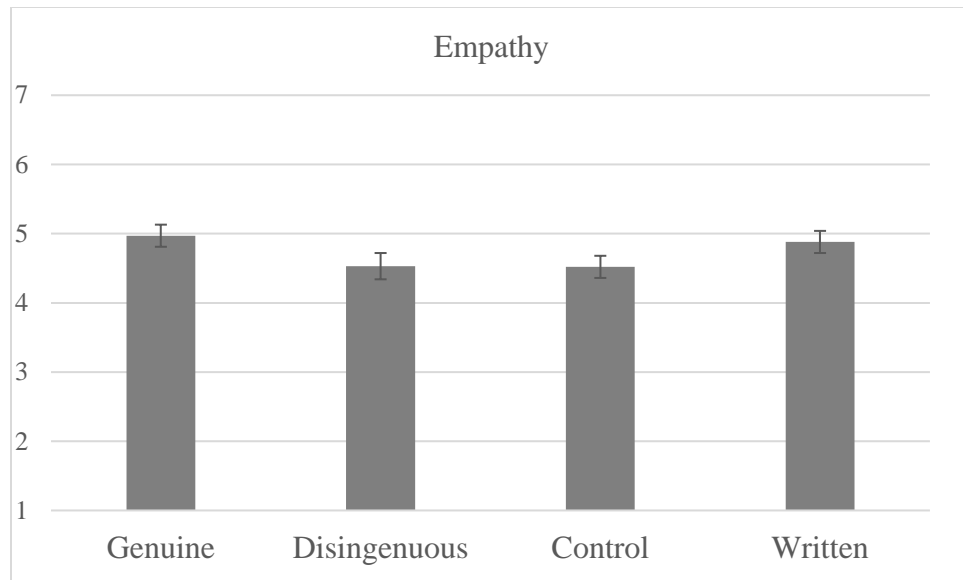
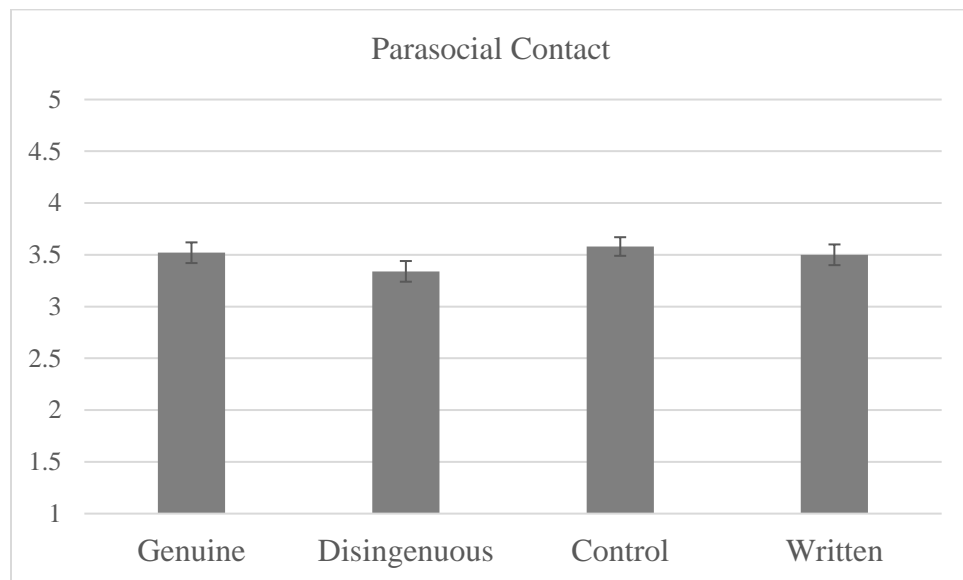Figure 5. Bar chart of mean empathy in each format condition with standard error bars.

Figure 6. Bar chart of mean parasocial contact in each format condition with standard error bars.
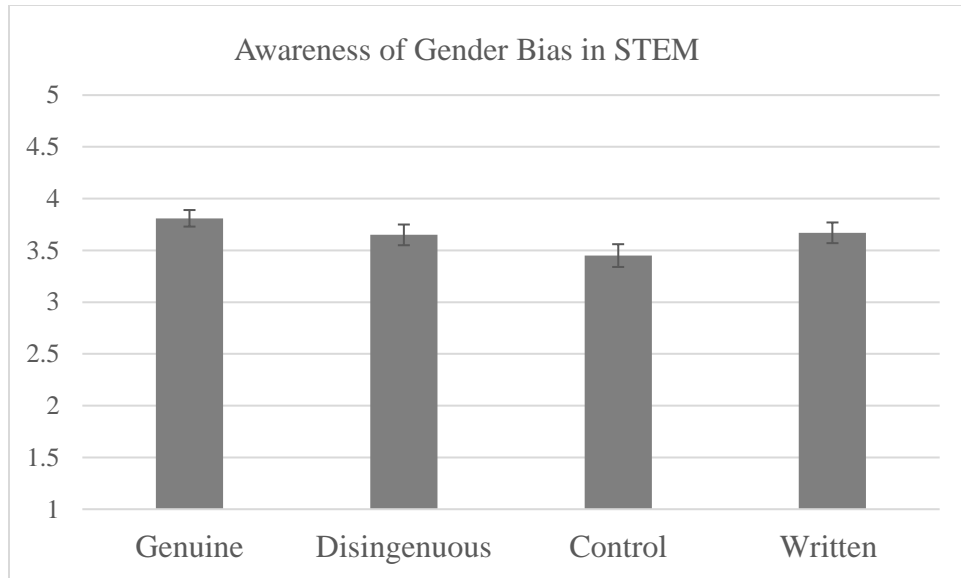
Figure 7. Bar chart of mean awareness of gender bias in each format condition with standard error bars.
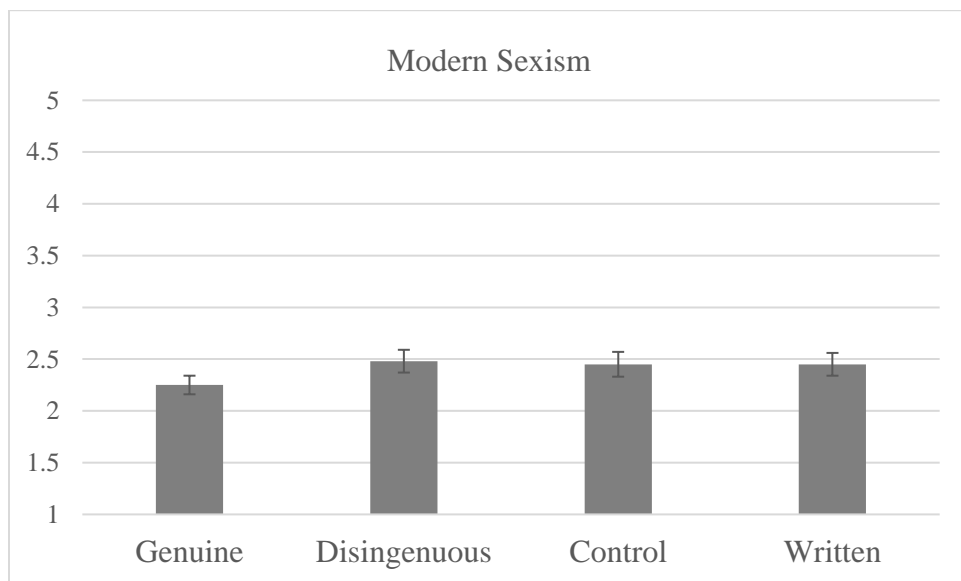

Figure 8. Bar chart of mean modern sexism in each format condition with standard error bars.
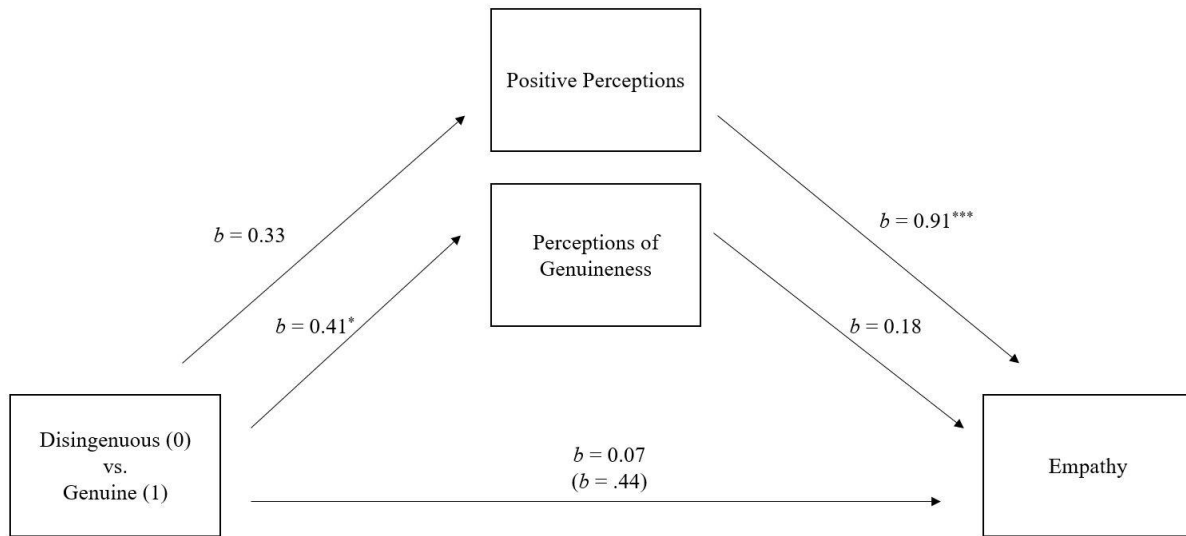
Figure 9. Results for exploratory parallel mediation New Model 1a comparing the disingenuous to the genuine video. The model depicts the results of video condition on empathy via positive perceptions and perceptions of genuineness.
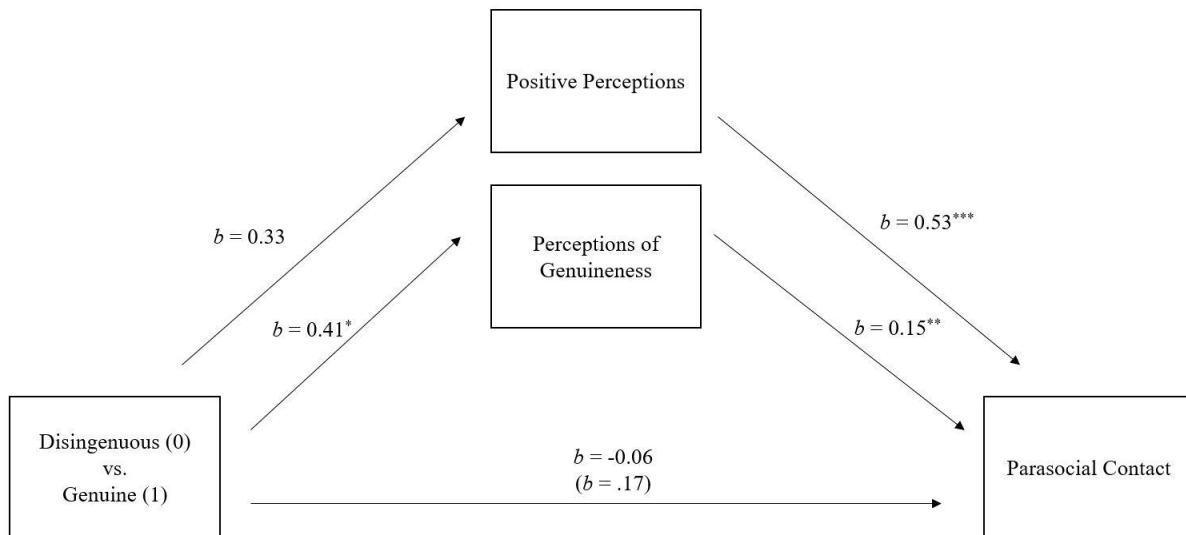

Figure 10. Results for exploratory parallel mediation New Model 1b comparing the disingenuous video to the genuine video. The model depicts the results of video condition on parasocial contact via positive perceptions and perceptions of genuineness.

Notes. The C-path on top is the direct effect of video condition while the C-path on the bottom (in parentheses) indicates the total effect of video condition.
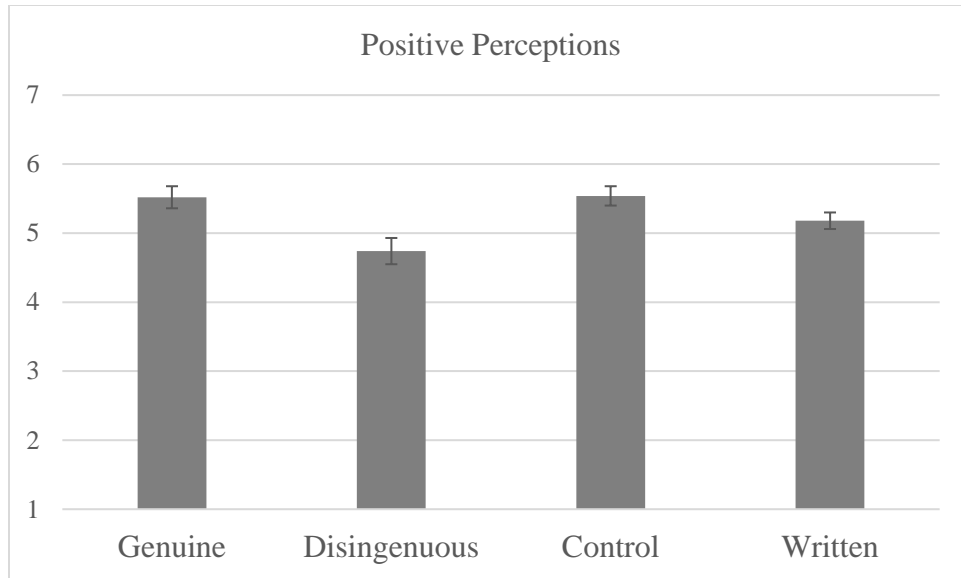$^{*} < .05,$ $^{**}p < .01,$ $^{***} < .001$

Figure 11. Bar chart of mean positive perceptions in each format condition with standard error bars for the male-only sample.
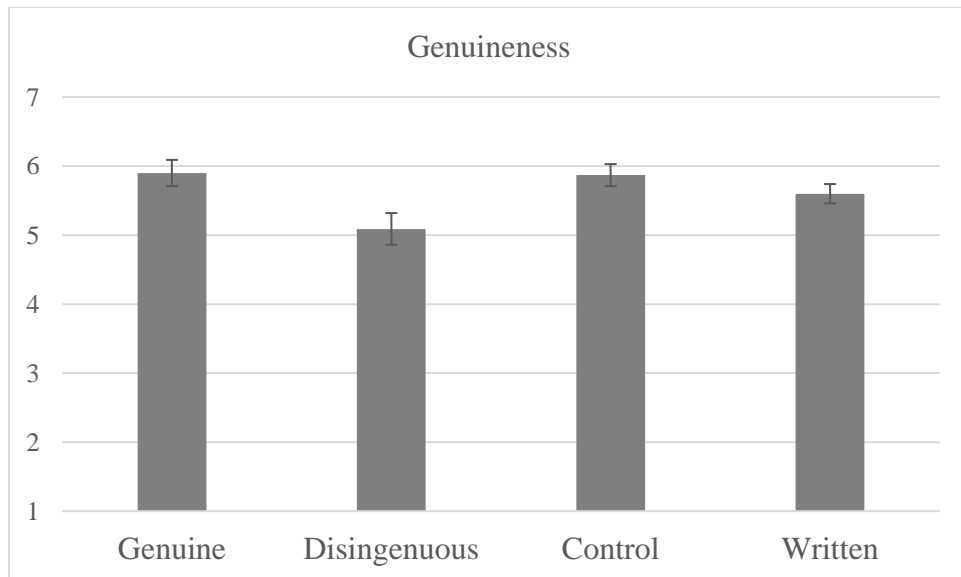

Figure 12. Bar chart of mean perceptions of genuineness in each format condition with standard error bars for the male-only sample.

Figure 13. Bar chart of mean empathy in each format condition with standard error bars for the male-only sample.

Figure 14. Bar chart of mean parasocial contact in each format condition with standard error bars for the male-only sample.

Figure 15. Bar chart of mean awareness of gender bias in each format condition with standard error bars for the male-only sample.
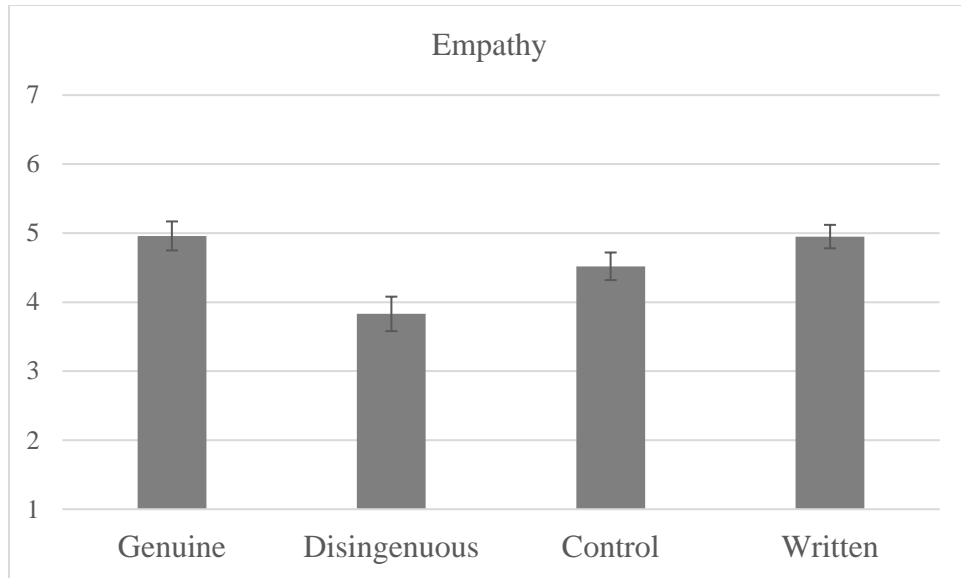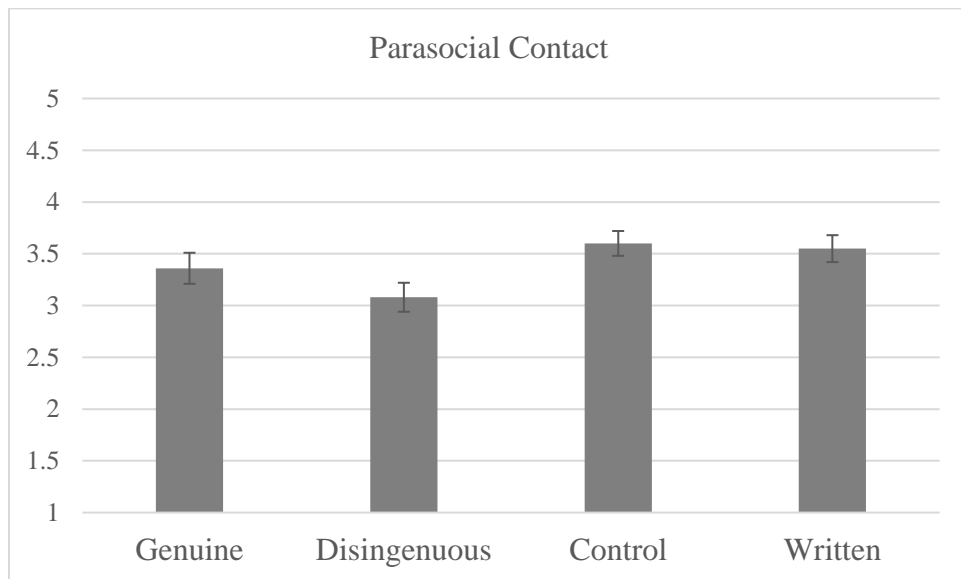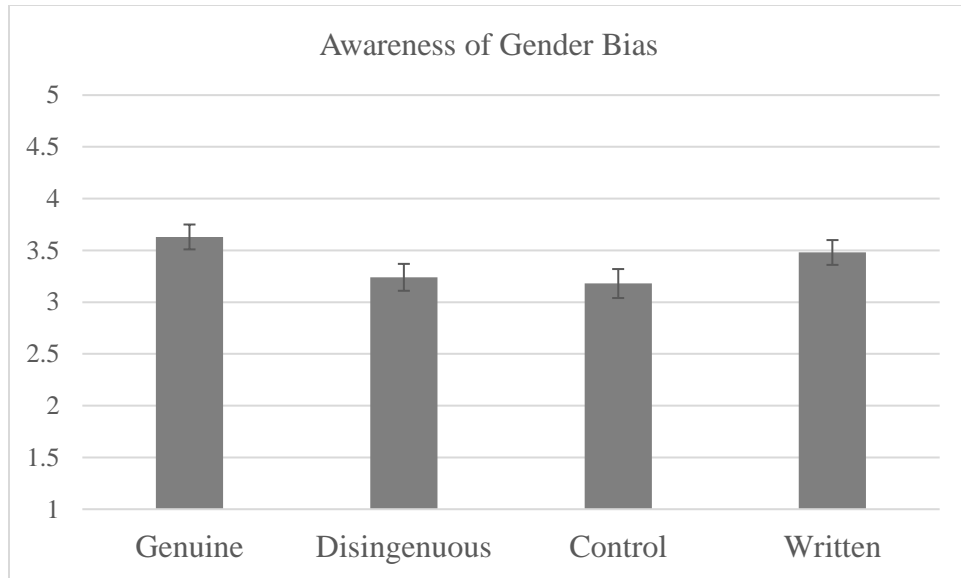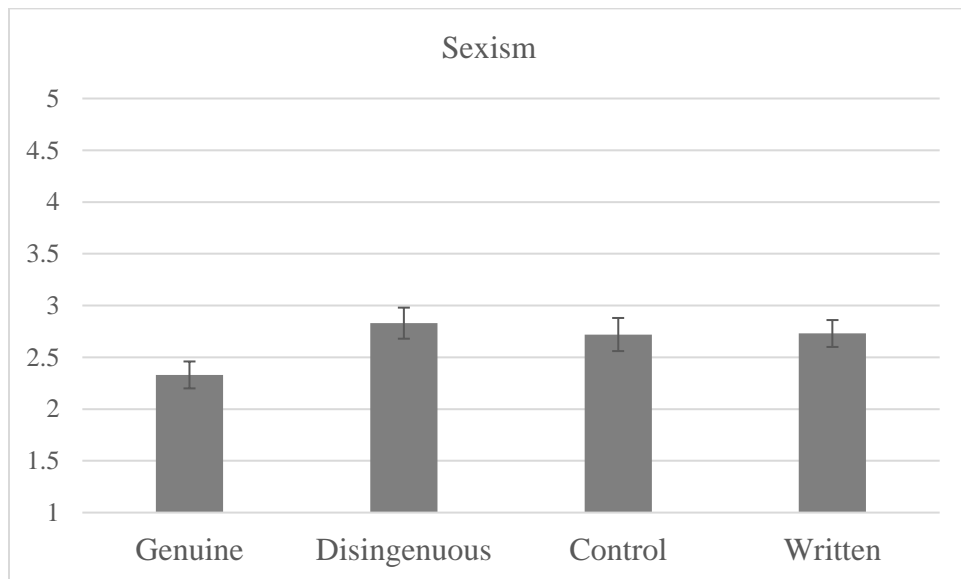

Figure 16. Bar chart of mean modern sexism in each format condition with standard error bars for the male-only sample.

APPENDIX: MEASURES

Modern Sexism Scale (8-items; Swim et al.,1995)

Please rate your level of agreement with each statement using the following scale: 1 (*strongly disagree*) to 5 (*strongly agree*)

1. Discrimination against women is no longer a problem in the United States.
2. Women often miss out on good jobs due to sexual discrimination. (R)
3. It is rare to see women treated in a sexist manner on television.
4. On average, people in our society treat husbands and wives equally.
5. Society has reached the point where women and men have equal opportunities for achievement.
6. It is easy to understand the anger of women's groups in America. (R)
7. It is easy to understand why women's groups are still concerned about societal limitations of women's opportunities. (R)
8. Over the past few years, the government and news media have been special favors for showing more concern about the treatment of women than is women warranted by women's actual experiences.

Awareness of Gender Bias in STEM (8-items; Pietri et al., 2017)

Please rate your level of agreement with each statement using the following scale: 1 (*strongly disagree*) to 5 (*strongly agree*)

1. In my opinion, women in science fields often do not face discrimination based on their gender. (R)
2. In my opinion, women in science fields often are not taken as seriously as their male colleagues.
3. In my opinion, women in science fields often don't have to work harder than their male colleagues to show they are equally as competent as the men (R).
4. In my opinion, women in science fields often face negative reactions for being aggressive.
5. In my opinion, women in science fields often face negative reactions for being assertive.
6. In my opinion, women in science fields often face negative reactions for being ambitious.
7. In my opinion, women in science fields often have trouble getting hired if they are pregnant.
8. In my opinion, people who work in science fields often do not want to hire women because they worry that the women might become pregnant and be unable to do their job adequately.

Positive Perceptions (15-items; Kaiser & Miller, 2001)

Please rate your level of agreement with each statement about the woman in the story using the

following scale: 1 (*strongly disagree)* to 7 (*strongly agree)*

1. The woman in the story is likable.
2. The woman in the story is friendly.
3. The woman in the story is honest.
4. The woman in the story is easy to get along with.
5. The woman in the story is intelligent.
6. The woman in the story is independent.
7. The woman in the story is responsible
8. The woman in the story is optimistic.
9. The woman in the story is respectable.
10. The woman in the story is considerate.
11. The woman in the story would be nice to converse with.
12. The woman in the story made a good impression.
13. The woman in the story would be a good friend
14. The woman in the story would be good coworker.
15. The woman in the story had a good personality.

Perceptions of Genuineness (3-items; Moulard et al., 2015)

Please rate your level of agreement with each statement about the woman in the story you just

interacted with using the following scale: 1 (*strongly disagree)* to 7 (*strongly agree)*

1. The woman in the story was genuine
2. The woman in the story seems real to me
3. The woman in the story was authentic

Empathy (Batson et al., 1997b; 6-items)

Please rate how much you felt the each of following emotions while learning about the woman's

story using the following scale: 1 (*not at all)* to 7 (*extremely so)*

1. Sympathetic
2. Softhearted
3. Warm
4. Compassionate
5. Tender
6. Moved

Parasocial Contact (Rubin et al., 1985; Chu et al., 2017)

Please rate your level of agreement with each statement about the woman in the story you just interacted with using the following scale: 1 (*strongly disagree*) to 5 (*strongly agree)*

1. This woman makes me feel comfortable, as if I am with a friend.
2. I see this woman as a natural, down-to-earth person.
3. I look forward to reading [watching] about this woman in another story.
4. If this woman appeared in another story [video], I would read [watch] it.
5. If there were a story about this woman in a newspaper or magazine, I would read it.
6. I would miss seeing this woman when she is on vacation.
7. I would like to meet this woman in person.
8. I find this woman to be attractive.

Demographics

Please provide us with some background information.

Which best describes your current employment status?

- I work full-time outside the home
- I work part-time outside the home
- I work full-time at home
- I work part-time at home
- I am a stay-at-home parent
- I work part-time at home and part-time outside the home
- I am not employed but am looking
- I am not employed and am not looking
- Other (please describe) _____

Do you currently work or have you worked in a STEM (science, technology, engineering, and mathematics) related field?
- Yes, I currently work in a STEM field
- Yes, I have worked in a STEM fields
- No, I have never worked in a STEM field

    If a "Yes" option was chosen:

    Please briefly describe your job in a STEM field (i.e., what was the position and area

    in STEM?)

What is your gender?

- Male
- Female

What is your age? _____

What is the highest level of education you have completed?

- Less than High School
- High School/ GED
- Some College
- 2-year college degree
- 4-year college degree
- Master's degree
- Doctorate degree
- Professional degree (JD,MD)

What is your race?

- White/Caucasian
- African American
- Hispanic
- East Asian
- South Asian
- Southeast Asian
- Middle Eastern
- Native American/Pacific Islander
- Multiracial
- Other

What is your country of residence?

- United States of America
- Other _____

What is your country of origin?

- United States of America
- Other _____

Do you speak English as a first language?

- Yes
- No

What is your political orientation on a scale from 1(extremely liberal) to 7(extremely conservative)?

 What state do you live in? _____

Approximately how many STEM (science, technology, engineering, and mathematics) classes have you taken in High School and College? _____

What do you think the purpose of this survey is? _____

Questions/comments: _____

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