

Article

Strategic Self-Presentation of Women in STEM

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Abstract: Despite a plethora of initiatives and a surge of research activity, women remain under-represented in science, technology, engineering, and mathematics (STEM) disciplines (National Science Foundation 2017). While much research has focused on ways to recruit women into these disciplines, less work has explored the strategies women use to navigate these contexts once they have entered. In a set of two experimental studies, we investigate women’s potential response strategies to the well-documented tension between female and STEM attributes in terms of individual self-presentation. In Study 1 ($N = 240$), we examine whether female STEM professionals have different impression goals when introducing themselves to professional peers versus a group of other women. In Study 2 ($N = 169$), we extend our inquiry to include self-presentation behavior as well as intentions. Across studies, we find that female STEM professionals hold different impression goals based on the audience with whom and context in which they expect to interact. These intentions align with actual self-introduction behavior, as observed in written self-introductions. Tuning one’s self-presentation, however, leads participants to feel less authentic. This work highlights one way women in male-dominated STEM contexts may navigate and strategically communicate their female and STEM identities to others, as well as the personal implications of doing so.

Keywords: STEM; gender; self-presentation; authenticity; identity integration

1. Introduction

“We are all just actors trying to control and manage our public image, we act based on how others might see us.”—Erving Goffman

People engage in self-presentation in order to convey a particular impression (Jones 1990) or to showcase a specific social identity to others (Barreto et al. 2003). For women in the workplace, managing the way that one is perceived can be especially challenging. Women must navigate both the feminine social norms for their gender and the frequently masculine norms of the professional environment, and achieving this balance is difficult (e.g., Rudman 1998). The burdens of negotiating these identities may be particularly heavy for women in male-dominated science, technology, engineering, and mathematics (STEM) domains, where tension between the identity components of “feminine” and “STEM professional” is well-documented. The current studies examine the impressions that women in STEM seek, experimentally investigate changes in self-presentation across personal and professional contexts, and explore the identity costs that self-presentational tuning may carry.

1.1. Women in STEM

Women in STEM fields may feel pressured to engage in impression management due to the mismatch between norms for their gender versus for their occupation. STEM fields are generally male-dominated, which is reflected in commonly held association of these disciplines with masculinity (National Science Foundation 2017; Nosek et al. 2009; Bodzin and Gehringer 2001). On top of these pervasive beliefs, STEM domains have been described as having a “chilly climate” that is unwelcoming

to women (Foster et al. 1994; Seymour and Hewitt 1997; Suresh 2006). It is perhaps not surprising, then, that women report a reduced sense of fit and lower overall job satisfaction compared to their male peers in these domains (Hill et al. 2010).

Over time, women who are constantly exposed to STEM environments and the associated tension between their female and STEM identities have been found to display identity bifurcation, disavowing certain feminine characteristics that are perceived to be in conflict with those traits most valued in STEM arenas (Pronin et al. 2004). Given that competence and agency are the most valued traits in STEM, perceptions of femininity as high in warmth but low in agency presents an inherent quandary for female STEM professionals. On the one hand, norms are powerful guides of behavior in general, and it is well-established that people prefer to work with similar others (Hogg and Terry 2014; Larimer and Neighbors 2003; Ben-Ner et al. 2009). This logic would advise women in STEM to present a version of themselves most similar to their male coworkers in order to increase the likelihood of their social acceptance and the productivity of their work relationships. If these relationships also increase social connections and perceived belonging in the workplace, such an outcome might attenuate the high rate of STEM attrition among women (Good et al. 2012). On the other hand, such an approach may come at a cost of feeling personally inauthentic if it is perceived to require suppressing important aspects of one's self, namely feminine traits. The current work explores how women in STEM navigate such situations, and the extent to which they use self-presentation as a strategic tool for impression management.

1.2. Impression Management and Underlying Identity Structure

People are willing to exert effort to manage the impressions that others form of them, a process known as impression management (Goffman 1959; Leary and Kowalski 1990). This process can play out via self-presentation at both the individual trait and broader social identity levels. In the case of women in STEM, impression management can be conceived to operate in relation to female and STEM identity components and their prescribed traits.

In general, impression management behaviors are particularly likely when we believe people may hold an impression that is different from the one we want them to (Barreto et al. 2003). Efforts in this realm are especially common among individuals with lower power, token minorities, and those who anticipate being a target of stigma (Kaiser and Miller 2001; Saenz 1994). The most common motivation for impression management is simply to achieve a positive evaluation from others, though the degree of motivation may be raised in high-stakes situations, such as when pursuing an important goal (Baumeister 1982; Leary 2010; Leary and Kowalski 1990; Pandey and Rastogi 1979; Schlenker 1980). For women in male-dominated STEM contexts, many of these situational factors are likely to apply.

Impression management, however, is not without its consequences. Several potential costs have been documented, including decreased feelings of authenticity, increased fatigue, cognitive depletion, decreased social ease, worse health outcomes, increased social withdrawal, and increased negative affect, including both guilt and shame (Barreto and Ellemers 2015; Critcher and Ferguson 2014; Duffy 2014; Pachankis 2007; Quinn and Chaudoir 2009; Shelton et al. 2005; Vohs et al. 2005). The current work examines the potential well-being consequences of impression management when people strategically self-present in an initial introduction, as well the power of one's self-concept structure to buffer against these potential costs.

In particular, people vary in the degree to which they perceive multiple identity components to be compatible with each other. This phenomenon, conceptualized as identity integration, refers to a combination of the subjective distance and conflict between two identity components (Benet-Martínez and Haritatos 2005). Previous work has shown that identity integration plays a moderating role as an individual switches between identity components, such that individuals with different levels of identity integration may respond differently to identity-related primes and those with higher levels of integration seem to find the switching process significantly less taxing (Benet-Martínez et al. 2002; Kamat 2011).

While identity integration was originally investigated in terms of bicultural identities, the current research considers identity integration between female and STEM identities. Because strategically altering one's self-presentation according to the immediate context requires a certain amount of effort (Vohs et al. 2005), it is predicted that those women in STEM with higher levels of identity integration will be provided some amount of protective benefit against fatigue.

The current work considers not only the impact that a pre-existing identity structure might have on the experience of strategic self-presentation, but also the potential impact that self-presentation behavior might have on one's subsequent identity structure. Previous work has shown that publicly performed behaviors, such as those involved in strategic self-presentation to others, can feed back into one's self-concept and alter its content through internalization (Tice 1992; Festinger and Carlsmith 1959). This can impact both later self-ratings as well as future behavior (Gonzales and Hancock 2008; Tice 1992; Schienker et al. 1994). These findings suggest that not only might an individual's initial identity structure impact self-presentation behaviors, but these same behaviors may also hold the power to change an individual's underlying self-concept. It is possible that women in STEM who engage in strategic self-presentation that downplays their feminine characteristics may internalize a less feminine identity. Alternatively, women in STEM may become well-practiced at tuning their self-presentation to meet the expectations of different audiences, leaving their underlying self-representations intact. With both the presence of important goals (i.e., career success) and the potential expectation of being the target of stigma as a member of an under-represented group, women in STEM comprise an ideal population in which to study identity navigation and impression management behaviors.

1.3. Overview of Present Studies

In a set of two experiments, the current work examines the dynamics of impression management and identity communication that an individual who is both a member of the female and STEM groups might use to navigate situational contexts where a single one of these categories is shared with a potential audience. In both studies, our participants were comprised of adult women currently working in STEM professions. First, we investigate whether explicit impression goals differ based on the situation (here manipulated via composition of the audience with which a participant expects to interact; Study 1). Second, we examine whether different audience expectations influence actual self-presentations of women currently employed in STEM domains (Study 2). Study 2 also explores whether interaction context and induced alterations of participants' self-presentation influence their self-concepts and subjective experiences of individual well-being.

We hypothesize that (1) participants will display and emphasize attributes congruent with the shared identity of their expected audience (STEM or female) as compared to a control condition; (2) tuned self-presentation will feed back into participants' self-concepts; and (3) tuning one's self-presentation will be effortful, though less depleting for those participants with high levels of identity integration.

2. Study 1: Impression Goals

2.1. Methods

2.1.1. Participants

Participants were 240 women recruited through Amazon's Mechanical Turk platform. All participants were at least 24 years of age, reported being employed in a science, technology, engineering or mathematics (STEM) discipline at least 20 h per week, and were citizens of the United States. The most common age range selected was 24–29 years and the sample's median age range was 30–39 years. Because our hypotheses focused on female STEM professionals in predominantly male

domains, we attempted to exclude respondents who worked in female-dominated STEM areas (e.g., veterinary, dental, nursing professionals; math and science teachers, etc.).¹

2.1.2. Procedure

After agreeing to participate in an online study about impression goals, participants began by completing a short series of screening questions to determine their eligibility as women currently employed in STEM disciplines. Participants who qualified for the study were then asked about the specific impressions they would want to create when introducing themselves to a particular audience. Based on a participant's randomly assigned condition, this audience was described either as a group of other STEM professionals (STEM condition) or as a group of other women (female condition). Specifically, as a free response measure participants were asked:

When introducing yourself to a group of other [professionals in your field/women], what impression are you generally trying to make?

They were provided a text entry box for their responses. Following this free response measure, participants were asked to select a set of specific adjectives that best represented the important qualities they would want to communicate about themselves to the audience in question. Participants selected three adjectives out of a set of fourteen options, each of which could be categorized as more stereotypically professional or more stereotypically feminine. Lastly, participants completed an adapted measure of identity integration relating to their female and professional identities. Participants were then debriefed and thanked for their participation.

2.1.3. Measures

Desired impression free response. Two independent coders analyzed participants' text-based descriptions of their desired impressions and categorized warmth-related items (e.g., "friendly"), competence-related items (e.g., "capable"), feminine non-warmth items (e.g., "stylish"), professional non-competence items (e.g., "passionate about my field"), and other/ambiguous items. Coders were blind to study hypotheses and participant condition. Following independent coding, disagreements were resolved through conversation between coders. Frequencies for each type of item were recorded for each participant's response and then converted into proportions of the total items mentioned to control for variation in response length between participants.

Desired impression adjective selection. The fourteen provided adjectives included a combination of feminine, warm, and communal attributes (cheerful, sincere, warm, communal, agreeable, fashionable, family-oriented) as well as professional, competence-related, and agentic attributes (intelligent, ambitious, competent, independent, efficient, assertive, confident). The feminine, warm, and communal items were collectively categorized as more stereotypically feminine, while the professional, competence-related, and agentic items were collectively categorized as more stereotypically professional. All participants selected exactly three items ($M_{\text{Professional}} = 1.96$, $SD_{\text{Professional}} = 0.86$; $M_{\text{Feminine}} = 1.05$, $SD_{\text{Feminine}} = 0.85$).

Identity integration. We adapted the bicultural identity integration scale (adapted from (Benet-Martínez and Haritatos 2005)) to assess integration between participants' female and STEM identities. Participants indicated their agreement on a scale from 1-Strongly Disagree to 7-Strongly Agree with each of eight statements assessing subjectively experienced distance and conflict between these two identity components (e.g., "I am simply a woman who works in STEM"; "I feel like someone moving between two mindsets"; $\alpha = 0.63$, $M = 5.74$, $SD = 1.09$).

¹ Originally, 305 responses were collected. After filtering out invalid responses and those whose job titles did not qualify them as STEM employees, 240 responses remained and were the basis for all analyses.

3. Results

First, participant free responses about what kind of impression they would want to make when interacting with a group of other professionals in their field (STEM condition) or a group of other women (female condition) were coded by categorizing each item mentioned as either warmth-related (e.g., “friendly”), competence-related (e.g., “capable”), feminine non-warmth-related (e.g., “stylish”), professional non-competence-related (e.g., “passionate about my field”), or other/ambiguous.

In line with a priori hypotheses, proportions of warmth and competence content were entered into a repeated measures ANOVA with condition (i.e., expected audience) as a between subjects factor. Results indicated a significant main effect of the warmth versus competence item types, such that participants overall included more competence than warmth-related goals ($F(1, 238) = 7.26, p = 0.01$, partial $\eta^2 = 0.03$).² As predicted, a significant interaction of item type with participant condition also emerged ($F(1, 238) = 56.43, p < 0.001$, partial $\eta^2 = 0.19$). Planned contrasts revealed that participants included significantly more competence-related goal content ($F(1, 238) = 39.32, p < 0.001$, partial $\eta^2 = 0.14$) as well as significantly less warmth-related goal content ($F(1, 238) = 53.64, p < 0.001$, partial $\eta^2 = 0.18$) when introducing themselves to other professionals in their field (STEM condition) versus to other women (female condition; see Figure 1).

Figure 1

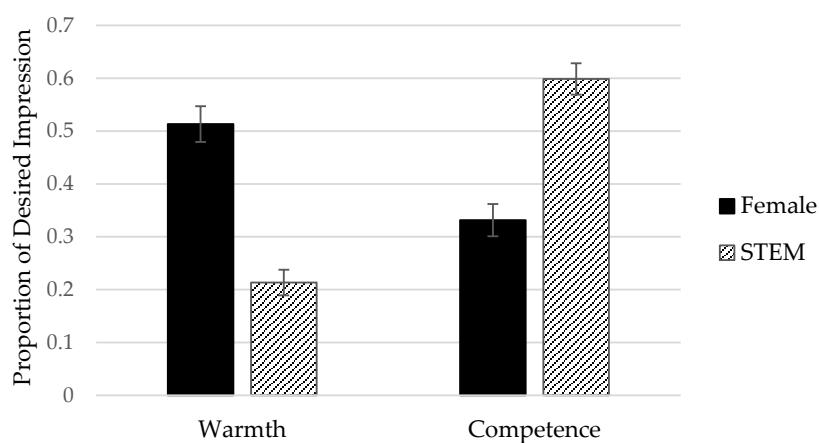


Figure 1. Proportions of Desired Impressions Coded as Warmth and Competence. Error bars represent standard errors.

A repeated measures ANOVA was also conducted including the expanded set of warmth-related (e.g., friendly), competence-related (e.g., intelligent), feminine non-warmth (e.g., stylish) and professional non-competence (e.g., passionate about my field) item types for differences based on participant condition. Mirroring the pattern found with warmth and competence, a main effect of item type was found ($F(1.81, 430.62) = 139.51, p < 0.001$, partial $\eta^2 = 0.37$). A significant interaction of item type and participant condition was also revealed ($F(1.81, 430.62) = 41.51, p < 0.001$, partial $\eta^2 = 0.15$). In addition to the differences between conditions in warmth and competence-related goal content mentioned above, planned contrasts showed a significant difference in non-competence professional goal content between conditions ($M_{STEM} = 0.13, M_{Female} = 0.03; F(1, 238) = 13.66, p < 0.001$, partial $\eta^2 = 0.05$). Participants in the STEM condition included more goal content of this type relative to their counterparts in the female condition. Participants in the STEM condition also included marginally

² This and all future analyses with within-subjects repeated measures reported in this manuscript are statistical results with a Greenhouse-Geisser correction.

less feminine non-warmth content than participants in the female condition ($M_{STEM} = 0.004$, $M_{Female} = 0.02$; $F(1, 238) = 3.40$, $p = 0.07$, partial $\eta^2 = 0.01$).

The predicted pattern that women in STEM hold more professional impression goals when introducing themselves to a STEM relative to a female audience was also supported by a second constrained-choice adjective selection measure of impression goals. Participants in the STEM condition selected significantly more professional adjectives as describing their desired impressions relative to their counterparts in the female condition ($M_{STEM} = 2.24$, $M_{Female} = 1.63$; $F(1, 237) = 35.33$, $p < 0.001$, partial $\eta^2 = 0.13$).

We also examined whether the extent to which participants wanted to make a different context-tailored impression was related to identity integration. In a simultaneous regression of condition, identity integration, and their interaction predicting the number of professional adjectives selected as one's impression goal, only participant condition was a significant predictor ($\beta = 0.30$, $p < 0.001$). Similar patterns emerge for all other desired impression outcome variables, including coded free response measures. These results imply that identity integration does not appear to impact the impression management goals that women in STEM hold when imagining presenting themselves to different audiences.

Overall, these results suggest that professional women working in STEM disciplines do hold different impression goals based on the audience with whom they are interacting. In both free response and forced-choice measures, women who considered introducing themselves to an audience of other STEM professionals reported significantly different impression goals than women who considered introducing themselves to an audience of other women. These differences followed the predicted pattern of emphasizing traits congruent with the shared identity component of the group, as participants reported significantly more professional impression goals in the STEM relative to the female condition. These goal differences were not found to be related to identity integration, suggesting that integration may be most important when individuals are actually engaging in self-presentation strategies rather than simply considering the goals that they might have when doing so. We examine this possibility in Study 2.

4. Study 2: Self-Introductions

4.1. Methods

4.1.1. Participants

169 female participants were recruited online using Amazon's Mechanical Turk. Similarly to Study 1, participants were all at least 24 years of age, reported being currently employed in a STEM domain at least 20 h per week, and were citizens of the United States. Participants ranged in age from 24 to 62 years ($M = 33.88$; $SD = 8.82$).³

4.1.2. Procedure

Participants in this study believed that the researchers were interested in how people would communicate in a new type of online network. Depending on the condition to which participants were randomly assigned, the network in question was either described as a professional network similar to LinkedIn, as a social network similar to Facebook, or simply as an online network with no further information.

³ Initially, 223 responses were collected. After filtering out invalid written responses, those who self-reported not being careful in their completion of the study, and those whose job titles did not qualify them as STEM employees, 169 responses remained for analysis. Based on the effect size of condition on impression goal adjective selection found in Study 1, calculations using G*Power (Faul et al. 2009) reveal that a sample size of at least 98 people ($1 - \beta = 0.95$) would be sufficient to detect an effect.

Participants were presented with information about four other people with whom they were told they would later interact with in a chat room as part of this online network. For participants who were told they were interacting in a professional network, these four people included three men and one woman who were all currently employed in STEM disciplines (STEM/Male-dominated audience condition).⁴ For participants who were told that they were interacting in a social network, these four people included four women who were not employed in STEM disciplines (Social/Female-dominated audience condition). For participants who knew only that they were interacting online, no specific profile information was provided beyond that participants had been placed into a group with four other people (Control condition; for details, see Appendix A). In both conditions where detailed information was provided, interaction partners were depicted as being within 4 years of age of the participant viewing their information.

After viewing these short profiles, participants were asked to write an introduction to share with the group before their interaction. After writing their introduction, participants were asked to respond to a few survey questions before the chat room interaction. Participants provided self-ratings of warmth and competence, responded to items assessing the authenticity of their self-introductions, and indicated the levels of fatigue and social ease they experienced while writing their self-introduction.

Participants were then informed that they would not be interacting with other people, but were asked to select a set of three adjectives from a set of listed options that best described the qualities that they would have most wanted to communicate about themselves if they had. Participants then completed survey measures of self-efficacy in STEM, identity integration, self-esteem, and current mood.

Finally, participants provided their job titles and employment duration before being debriefed and thanked for their time.

4.1.3. Measures

Unless otherwise noted, measures were collected on a 7-point scale from 1-Strongly Disagree to 7-Strongly Agree.

Self-Introduction. Participants typed their self-introductions as free-form text responses. These introductions were coded by two independent raters for self-oriented as opposed to other-oriented content (i.e., statements disclosing information about one's self versus statements or questions relating to the rest of the group). Within each of these orientation categories, free response items were further coded as primarily relating to work, family, social, or other/ambiguous concerns. Disagreements related to category classifications were resolved through discussion.

Introductions were also rated for overall warmth and competence on a scale of 1 to 4, where higher ratings indicated greater levels of each attribute. For each of these ratings, the results of three independent coders were averaged for a final result. Finally, a separate set of two coders rated introductions for masculinity-femininity of responses along a single continuum rating from 1- Highly Masculine to 4- Highly Feminine. Their two ratings were averaged for a final result. All coders were blind to study hypotheses and participant condition.

Warmth. Warmth was assessed using a combination of two items taken from work by Fiske et al. (2002). Participants rated the degree to which they agreed with the statements "In general, I am a friendly person" and "In general, I am a sincere person" ($r = 0.58$, $M = 6.12$, $SD = 0.81$).

Competence. Similarly to warmth, competence was assessed using a combination of two items (Fiske et al. 2002). Participants indicated their agreement with the statements "In general, I am a capable person" and "In general, I am a competent person" ($r = 0.71$, $M = 6.45$, $SD = 0.62$).

⁴ This ratio was selected to most closely reflect the gender ratio in STEM employment.

Authenticity. Self-presentational authenticity was assessed using a 10-item scale (“It felt hard to give the other participants an accurate sense of who I am in my introduction”; “I felt like I could really be myself in my introduction”; $\alpha = 0.86$, $M = 4.35$, $SD = 0.93$; novel items and adaptation of (Rusbult et al. 2009; Duffy 2014).

Fatigue. Fatigue was calculated from agreement with the two items “I feel emotionally depleted right now” and “I have good self-control” ($\alpha = 0.47$, $M = 2.60$, $SD = 1.15$; Duffy 2014).

Social ease. Social ease was measured by reverse-scoring a 4-item measure of high maintenance interaction (“Writing my introduction required a lot of energy”; “For some reason, writing my introduction seemed to be more complicated than it should have been”; $\alpha = 0.87$, $M = 4.39$, $SD = 1.42$; adapted from).

Impression goals adjective selection. Participants selected three adjectives describing the qualities they would have most wanted to convey about themselves from the same set of fourteen options used in Study 1 ($M_{\text{Professional}} = 1.75$; $SD_{\text{Professional}} = 0.91$; $M_{\text{Feminine}} = 1.25$, $SD_{\text{Feminine}} = 0.91$).

STEM efficacy. Self-efficacy in STEM was measured using a twelve-item scale adapted from Baldwin et al. (1999) to refer specifically to self-efficacy within the STEM domain (e.g., “I am confident I can do well in STEM”, “I believe that if I exert enough effort, I will be successful in STEM”; $\alpha = 0.84$, $M = 5.92$, $SD = 0.79$).

Identity integration. Identity integration was measured using the same eight-item scale from Study 1 ($\alpha = 0.58$, $M = 5.19$, $SD = 0.82$).

Self-esteem. Self-esteem was measured using the single item global self-esteem measure (Robins et al. 2001). Participants indicated how true of them the statement “I have high self-esteem” was on a scale from 1-Not True of Me to 7-Very True of Me ($M = 5.05$; $SD = 1.56$).

Mood. Mood was measured with a single item reading “Overall, my current mood is:” to which participants responded on a scale from 1- Extremely Unpleasant to 10- Extremely Pleasant ($M = 7.32$, $SD = 1.78$).

5. Results

Replicating Study 1, interaction contexts were found to influence participants’ impression goals in Study 2 (see Appendix B). Analysis of the adjective selection impression goals measure revealed a significant effect of participant condition ($F(2,168) = 5.05$, $p = 0.01$, partial $\eta^2 = 0.06$), such that the number of professional adjectives selected was highest in the STEM/male-dominated audience condition ($M_{\text{STEM/Male-DominatedAudience}} = 2.02$), followed by the control condition, ($M_{\text{Control}} = 1.78$), and then the social/female-dominated audience condition ($M_{\text{Social/Female-DominatedAudience}} = 1.49$). We predicted that these differences would adhere to a linear trend, with participants in the STEM/male-dominated audience condition (coded 1) selecting the highest number of professional attributes, participants in the control condition (coded 0) selecting the second most, and participants in the social/female-dominated audience condition (coded -1) selecting the fewest. Results conformed to the predicted linear trend ($F(1,166) = 10.04$, $p = 0.002$), while the quadratic test was not significant.

To examine whether these self-reported goals aligned with actual self-presentation, we turned to the coding of participants’ self-introductions. Given their reported self-presentation goals, we expected participants in the STEM/male-dominated audience condition to express relatively higher competence, lower warmth, and more masculinity overall in their introductions, while those in the social/female-dominated audience condition were expected to express relatively higher warmth, lower competence and more overall femininity. Participants in the control condition were expected to fall somewhere in between. To examine whether condition moderated differences in coded competence versus warmth of introductions, we conducted a repeated measures ANOVA with condition as a between subjects factor. Results revealed not only a main effect towards greater competence than warmth ratings overall ($F(1,165) = 14.95$, $p < 0.001$, partial $\eta^2 = 0.08$) but also the predicted significant interaction with participant condition ($F(2,165) = 11.75$, $p < 0.001$, partial $\eta^2 = 0.13$).

In order to determine what was driving this conditional variation, we analyzed levels of warmth and competence separately. Beginning with the level of competence participants expressed in their

introductions, a one-way ANOVA with linear and quadratic trends tests revealed a significant omnibus test ($F(2,167) = 7.05, p = 0.001$, partial $\eta^2 = 0.08$), and the predicted simple linear trend of expressed competence between conditions ($M_{STEM/Male-DominatedAudience} = 2.83, M_{Control} = 2.44, M_{Social/Female-DominatedAudience} = 2.42; F(1, 165) = 10.75, p = 0.001$). The quadratic trend for competence emerged as marginal ($F(1, 165) = 3.36, p = 0.07$). Analyses of expressed warmth also showed significant differences across conditions in the omnibus test ($F(2,167) = 5.63, p = 0.001$, partial $\eta^2 = 0.06$), and results again confirmed the predicted linear trend ($M_{STEM/Male-DominatedAudience} = 2.0, M_{Control} = 2.42, M_{Social/Female-DominatedAudience} = 2.38; F(1, 165) = 7.08, p = 0.01$). Unexpectedly, the quadratic trend for warmth also emerged as significant ($F(1, 165) = 4.19, p = 0.04$), reflecting a greater discrepancy between the STEM/male-dominated audience and control conditions than between the control and social/female-dominated audience conditions.

Finally, introduction coding along the spectrum of masculinity-femininity also showed significant differences between conditions ($F(2, 168) = 8.71, p < 0.001$, partial $\eta^2 = 0.10$). Confirming predictions, a significant simple linear trend emerged such that introductions written by participants in the STEM/male-dominated audience condition were perceived to be the least feminine and most masculine ($M_{STEM/Male-DominatedAudience} = 2.33$), followed by those from participants in the control condition ($M_{Control} = 2.76$) and those from participants in the female condition ($M_{Social/Female-DominatedAudience} = 2.96; F(1, 166) = 16.61, p < 0.001$). No quadratic trend was found.

Examining specific introduction content, we found that the proportions of other-oriented content were all quite low ($M_{Work} = 0.002, M_{Family} = 0.01, M_{Social} = 0.0002$), leaving too few items for between condition analyses. Within the self-orientated items, we were able to examine differences by category (work, family, social) between conditions. A significant effect of item type emerged ($F(1.7, 282.95) = 97.34, p < 0.001$, partial $\eta^2 = 0.37$) such that participants overall tended to mention more work-related than social or family items ($M_{Work} = 3.82, M_{Family} = 1.71, M_{Social} = 0.95$). Item type was also found to interact significantly with condition ($F(10.46, 282.95) = 10.46, p < 0.001$, partial $\eta^2 = 0.11$). As predicted, participants in the STEM/male-dominated audience condition mentioned the most work-related items ($M_{STEM/Male-DominatedAudience} = 5.45, M_{Control} = 3.11, M_{Social/Female-DominatedAudience} = 3.21$) and the fewest family ($M_{STEM/Male-DominatedAudience} = 1.42, M_{Control} = 1.64, M_{Social/Female-DominatedAudience} = 2.02$) and social items ($M_{STEM/Male-DominatedAudience} = 0.66, M_{Control} = 1.18, M_{Social/Female-DominatedAudience} = 0.95$).

The observed differences in self-presentation did not seem to affect participants' explicit self-concepts as measured by self-rated warmth and competence collected immediately after completing their introductions. Entering self-ratings of warmth and competence into a repeated measures ANOVA with condition as a between-subjects factor, no significant interaction with condition emerged ($F(2, 166) = 1.59, p = 0.21$, partial $\eta^2 = 0.02$). There was, however, a condition-independent overall trend towards higher self-ratings of competence than warmth ($F(1, 166) = 24.61, p < 0.001$, partial $\eta^2 = 0.13$), perhaps reflecting that our sample consisted of professionals who chose and were currently immersed in male-dominated STEM contexts.

In terms of participants' subjective self-presentation experiences, we examined measures of felt authenticity, fatigue, and social ease. We predicted that specific audience expectations of one group or another may elicit the emphasis of certain personal traits and the suppression of others, leading to a feeling of lower authenticity for participants engaging in self-presentational tuning to either audience than for those who were in the control condition. A planned contrast to this effect, comparing the tuned (STEM/male-dominated audience and social/female-dominated audience) conditions to the control condition, revealed a significant difference in terms of felt authenticity ($F(1, 168) = 3.92, p = 0.05$, partial $\eta^2 = 0.02$) such that participants in the control condition felt more authentic than those who engaged in self-presentational tuning ($M_{STEM/Male-DominatedAudience} = 4.19, M_{Control} = 4.54, M_{Social/Female-DominatedAudience} = 4.29$). Analysis of social ease revealed a similar but only marginally significant effect ($M_{STEM/Male-DominatedAudience} = 3.14, M_{Control} = 3.63, M_{Social/Female-DominatedAudience} = 3.14$).

3.36; $F(1, 168) = 2.62, p = 0.11$, partial $\eta^2 = 0.02$). Fatigue ratings did not show any significant difference based on participant tuning or condition.

Interestingly, while participant ratings of fatigue did not vary by condition, identity integration between participants' female and STEM identity components was negatively correlated with fatigue in both the social/female-dominated audience ($r_{\text{Social/Female-DominatedAudience}} = -0.38, p = 0.002$) and STEM/male-dominated audience conditions ($r_{\text{STEM/Male-DominatedAudience}} = -0.32, p = 0.03$) at significant levels, while remaining unrelated to fatigue in the control condition ($r_{\text{Control}} = -0.12, p = 0.34$).⁵⁶ This finding suggests that, as predicted, identity integration may hold some protective benefits against depletion in the face of self-presentation tuning. This benefit may only come into play in scenarios where some form of tuning is required, however.

Mood, self-esteem, and self-efficacy in STEM did not vary significantly by condition.

Study 2 replicated and extended the results from Study 1. Participants who were informed that they were introducing themselves to a male-dominated STEM audience or to a female-dominated social audience reported impression goals that emphasized attributes congruent with their shared identity. Additionally, these intentions were reflected in actual self-introduction behaviors. Participants wrote self-introductions emphasizing feminine and warm attributes when communicating with other women in a social context while emphasizing professional and competent attributes when communicating with a male-dominated group of other professionals in their field.

Beyond self-introduction behavior, Study 2 also examined participants' subjective experiences of engaging in self-presentational tuning, and found that participants who tuned their self-presentation reported feeling less authentic and experienced marginally less social ease compared to those who did not. Identity integration was negatively associated with experienced fatigue in both tuning conditions, but was not associated with fatigue in the control condition. These findings suggest that not only are women in male-dominated spaces tuning their self-presentation based on context and audience composition, but that identity integration may help to buffer against at least one potential negative effect of doing so.

6. Discussion

This research represents a first step towards examining the self-presentational consequences of women in male-dominated STEM contexts. Across two studies, we examined the effects of interaction context and audience expectations on the impression goals of professional women currently employed in STEM disciplines. In Study 1, we found that women hold explicitly different impression goals based on whether they expect to interact with a group of other women or a group of other STEM professionals. These varying intentions emerged both in free response descriptions of participants' desired impressions as well as in a constrained-choice adjective selection measure. In Study 2, we directly replicated these discrepant impression goals using the same forced-choice adjective selection task and with the addition of an audience-unspecified control condition.

In addition to reporting different impression goals, participants in Study 2 showed that professional women in STEM do, in fact, present themselves differently in different contexts. Actual self-introductions differed not only in degree of overall perceived masculinity-femininity, but also in perceived embodiment of warmth and competence. Even the amount of information dedicated to certain topics varied by condition in line with hypotheses, as women who expected to interact with a STEM/male-dominated audience included more information about work and less information

⁵ Due to the low reliability observed between the two fatigue items, we also conducted all reported fatigue analyses with only the first fatigue item ("I feel emotionally depleted right now") which seemed most accurate for the concept we intended to measure. Analyses reveal similar patterns using only the first fatigue measure.

⁶ A simultaneous regression analysis of condition, identity integration, and their interaction predicting fatigue reveals a marginal interaction effect ($\beta = -0.11, p = 0.16$).

about family and social items relative to participants in the social/female-dominated audience and control conditions.

Within the population of professional working women, the observed differences in self-presentation behavior were not found to feed back into participants' self-ratings of personal warmth or competence. We did find, however, a trend towards higher self-ratings of competence compared to warmth and a general emphasis of competence-related items in impression goals overall, such that this population might already have experienced a shift in their self-concepts towards a stable working model of competence. It would be worth investigating whether women who are newly exposed to male-dominated contexts might show more self-concept movement, or whether sustained exposure might lead to self-concept stability through continuous tuning such that single instances of self-presentational shifts are less impactful.

We also found evidence that women who were engaged in self-presentational tuning may suffer costs in terms of feeling less authentic and experiencing marginally less social ease compared to those who did not alter their self-presentations. These findings raise the possibility that women may face a bind in male-dominated professional spaces: Either tune one's self-presentation to create the desired impression with one's colleagues and feel less authentic in the workplace, or fail to tune one's self-presentation and retain personal authenticity at the cost of potential belonging and the positive regard of one's peers. Whereas fatigue did not differ by conditions overall, identity integration was associated with reduced fatigue in both tuning contexts but not in the control condition, signaling a potential protective function that should be explored more thoroughly in future investigations.

The current work is not without its limitations. For example, while Study 1 simply manipulates audience composition expectations (other women vs. other professionals from a participant's field), Study 2 does not disentangle social contexts from female audience members in the social/female-dominated audience condition or majority-male audiences from professional contexts in the STEM/male-dominated audience condition. While the male to female ratio in the STEM condition was chosen to most closely reflect realistic STEM workforce representation, the disentangling of professional versus social contexts from the impact of audience gender composition should be explored in future work. It may be the case that individuals naturally present themselves more professionally in any professional (as compared to social) context, but that these shifts are particularly exaggerated among women in male-dominated work contexts. For this initial investigation, we opted to use the strongest manipulation as a starting point, from which follow-up studies can provide nuance and refinement.

This work also used a relatively impoverished social interaction context. Participants did not actually interact with others face to face, and the self-introductions written by our participants were brief compared to ongoing interactions in an actual workplace setting. While this design afforded a high level of experimental control, it does not necessarily capture all of the simultaneous features of real-world contexts. Future designs might expand to capture the influences of factors like body language or other self-presentational aspects such as attire that play a role in initial encounters.

It is, however, a strength of this work that we were able to recruit and examine actual professional women who are already part of the STEM workforce. Given that the vast majority of social psychological research related to women in STEM is conducted with female undergraduate STEM majors, this work provides an extension into the experiences and behaviors of women who have already joined the STEM workforce. Surely understanding the most relevant population of working professionals will provide important insight into the issues of workplace navigation, retention, and creating more inclusive environments. However, some self-presentational and identity navigation processes may differ for undergraduate STEM majors, and as such comparative work should be conducted with this population as well.

Within the population of female STEM professionals, we attempted to narrow our focus to women employed in male-dominated domains. It is, however, unlikely given the nature of job titles provided that we successfully excluded all participants whose STEM workplaces are gender-balanced or female-dominated. While future work will be useful in determining how self-presentational

dynamics might differ based on the gender composition of a particular industry or office environment, the current inclusion of these participants provides an even stronger test of our initial hypotheses.

The fact that these experiments reveal significant effects after such a quick and minimal self-introduction suggests that self-presentational dynamics in the real world have the potential for much stronger effects. Not only were the described audiences in our study not actual coworkers or authority figures with the power to influence our participants' career outcomes, but these introductions were a short, single occurrence rather than repeated communication with ongoing cultural pressure in a male-dominated environment. Given that impression management is exaggerated under higher-stakes conditions, that continuous self-presentational tuning is likely to require greater ongoing effort than a single instance, and that repeated behaviors may be more likely to feed back into a person's self-concept than a single act, our initial results suggest that navigating these challenges may hold powerful implications for women in male-dominated professional contexts. Furthermore, once participants were added to the described audience in the STEM/male-dominated audience condition, the resulting group included 2 women and 3 men—which is likely a more gender-balanced ratio than that observed in many actual STEM workplaces. If anything, this is likely to underestimate the extent and influence of male-dominance in such domains.

It is our aim that the work presented here provides a groundwork for further investigation of the dynamics of self-presentation and authenticity in the STEM workforce and beyond. While the studies presented here are focused on women in STEM, the dynamics explored are likely to also hold implications for other minority-group members who must navigate multiple contexts and identity components.

We hope future investigations will move forward with investigation of questions such as how self-presentational tuning impacts the impressions of interactions partners across contexts. One might predict that women in STEM who emphasize competence and downplay attributes associated with their female identities would be perceived as more congruent with their professional surroundings and thus evaluated more favorably, but this is an empirical question. Even if others' perceptions generally align with the desired impressions women are trying to make, does tuning behavior actually improve professional outcomes? On the one hand, being perceived as similar to one's coworkers may facilitate respect and positive peer relationships, which could in turn increase felt belonging and retention over time. On the other hand, sustained tuning may decrease belonging by causing women to continually feel less authentic in working environments. In order to avoid the latter, are there ways that we might allow people to feel authentic and avoid fatigue despite tuning the way that they present themselves? It may be that if women can create an integrated sense of self as it relates to these two identities, tuning one's self-presentation may become more viable as a sustained strategy. Or, if the stereotype content of STEM fields develops towards gender equity and therefore reduces the gendered identity threat of professional spaces, might these dynamics change or become unnecessary? Presumably, an ideal outcome is one in which women in STEM feel that they can bring their entire selves to relevant tasks without fear of devaluation.

Although past work has established that women in male-dominated contexts can distance themselves from their female versus STEM identity components (e.g., [Pronin et al. 2004](#)), the work presented here showcases the ways in which women working in STEM fields dynamically tune their self-presentation to emphasize each of these identity components to different audiences. This research represents a first foray into identifying the strategies that women use to navigate their identities in male-dominated contexts. Understanding these strategies, we hope, will illuminate both the potential challenges women face in environments in which they are underrepresented as well as potentially successful strategies for coping with these challenges.

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Appendix A

Audience Manipulations: Study 2

Participants were informed that, in order to protect confidentiality, they had been assigned the pseudonym Person B. Others with whom they expected to chat were referred to as Person A, Person C, Person D, and Person E. In the information below, $\langle\text{age}\rangle$ represents the age of the participant viewing this information. Participants were presented with the gender, age, and employment industry of each interaction partner.

STEM Condition

<u>Person A</u>	<u>Person C</u>	<u>Person D</u>	<u>Person E</u>
Male	Male	Female	Male
$\langle\text{age}\rangle+3$	$\langle\text{age}\rangle-2$	$\langle\text{age}\rangle+1$	$\langle\text{age}\rangle-1$
Engineering/ Technology	Math/ Science	Engineering/ Technology	Math/ Science

Female Condition

<u>Person A</u>	<u>Person C</u>	<u>Person D</u>	<u>Person E</u>
Female	Female	Female	Female
$\langle\text{age}\rangle+3$	$\langle\text{age}\rangle-2$	$\langle\text{age}\rangle+1$	$\langle\text{age}\rangle-1$
Legal	Service	Retail	Education

Control Condition

No specific information provided.

Appendix B

Study 1: Pairwise Comparisons of Dependent Variables between Conditions

	STEM vs. Female Conditions
Coded Competence	F(1, 238) = 39.32, $p < 0.001$
Coded Warmth	F(1, 238) = 53.64, $p < 0.001$
Coded Feminine (Non-Warmth)	F(1, 238) = 3.40, $p = 0.07$
Coded Professional (Non-Competence)	F(1, 238) = 13.66, $p < 0.001$
Coded Other	F(1, 238) = 2.64, $p = 0.11$
Professional Adjectives Selected	F(1, 237) = 35.33, $p < 0.001$
Identity Integration	F(1, 238) = 0.44, $p = 0.51$

Study 2: Pairwise Comparisons of Dependent Variables between Conditions

	STEM/Male-Dominated Audience vs. Social/Female-Dominated Audience	STEM/Male-Dominated Audience vs. Control Condition	Social/Female-Dominated Audience vs. Control Condition
Professional Adjectives Selected	F(1, 107) = 8.68, $p = 0.004$	F(1, 107) = 2.22, $p = 0.14$	F(1, 118) = 3.50, $p = 0.06$
Coded Competence	F(1, 107) = 11.10, $p = 0.001$	F(1, 106) = 9.89, $p = 0.002$	F(1, 117) = 0.03, $p = 0.87$
Coded Warmth	F(1, 107) = 8.50, $p = 0.004$	F(1, 106) = 8.89, $p = 0.004$	F(1, 117) = 0.12, $p = 0.73$
Coded Masculinity-Femininity	F(1, 107) = 16.75, $p < 0.001$	F(1, 107) = 7.91, $p = 0.006$	F(1, 118) = 1.93, $p = 0.17$
Coded Work-Related Items	F(1, 107) = 27.29, $p < 0.001$	F(1, 107) = 29.06, $p < 0.001$	F(1, 118) = 0.24, $p = 0.62$

	STEM/Male-Dominated Audience vs. Social/Female-Dominated Audience	STEM/Male-Dominated Audience vs. Control Condition	Social/Female-Dominated Audience vs. Control Condition
Coded Family-Related Items	F(1, 107) = 3.38, $p = 0.07$	F(1, 107) = 0.01, $p = 0.93$	F(1, 118) = 3.76, $p = 0.06$
Coded Social-Related Items	F(1, 107) = 3.36, $p = 0.07$	F(1, 107) = 0.475, $p = 0.03$	F(1, 118) = 0.33, $p = 0.57$
Coded Other Items	F(1, 107) = 16.55, $p < 0.001$	F(1, 107) = 21.46, $p < 0.001$	F(1, 118) = 3.49, $p = 0.06$
Self-Rated Competence	F(1, 107) = 7.63, $p = 0.007$	F(1, 107) = 2.58, $p = 0.11$	F(1, 118) = 1.86, $p = 0.18$
Self-Rated Warmth	F(1, 107) = 0.49, $p = 0.48$	F(1, 107) = 2.22, $p = 0.14$	F(1, 118) = 0.74, $p = 0.39$
Authenticity	F(1, 107) = 0.27, $p = 0.60$	F(1, 107) = 3.94, $p = 0.05$	F(1, 118) = 2.21, $p = 0.14$
Fatigue	F(1, 107) = 1.99, $p = 0.16$	F(1, 107) = 2.09, $p = 0.15$	F(1, 118) = 0.00, $p = 1.00$
Social Ease	F(1, 107) = 0.61, $p = 0.44$	F(1, 107) = 3.38, $p = 0.07$	F(1, 118) = 1.07, $p = 0.30$
Identity Integration	F(1, 107) = 1.00, $p = 0.76$	F(1, 107) = 0.01, $p = 0.92$	F(1, 118) = 0.05, $p = 0.82$
STEM Efficacy	F(1, 107) = 0.25, $p = 0.62$	F(1, 107) = 0.63, $p = 0.43$	F(1, 118) = 0.10, $p = 0.75$
Mood	F(1, 107) = 0.03, $p = 0.87$	F(1, 107) = 0.30, $p = 0.58$	F(1, 118) = 0.18, $p = 0.68$
Self Esteem	F(1, 107) = 1.12, $p = 0.30$	F(1, 107) = 0.09, $p = 0.76$	F(1, 118) = 0.82, $p = 0.37$

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