**Superstars Within Reach: The Role of Perceived Attainability & Role Congruity**

**in Media Role Models on Women’s Social Comparisons**

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Abstract

Based on social comparison and role congruity theory, this study examined the effect of perceived attainability and role congruity in media female role models on women’s social comparison and career interest. A 2x2 experiment was conducted in which participants read a high or low attainability message, then portrayals of role models in a counter-stereotypical career with a family (high congruity to the female gender role) or without a family (low congruity to the female gender role). Results showed that the high attainability message lead to self-inspiration and higher career interest, but only when the portrayals were in a less self-relevant domain. Implications for the use of role models to address the issue of female underrepresentation in STEM fields were discussed.

*Keywords*: social comparison, role congruity theory, role models, women in STEM, stereotype, perceived attainability, upward comparison threat

Female underrepresentation in STEM (science, technology, engineering, and mathematic) fields has long been a persistent and intractable problem (National Science Foundation [NSF], 2015). Worldwide, only 29% of researchers are women (UNESCO Institute for Statistics, 2018). In North America and Western Europe, that number is only slightly better at 32%, a significant drop-off from the 48% of women enrolled in doctoral programs – a phenomenon known as the leaky pipeline problem. Clearly, encouraging women to study STEM majors may not be enough if those who graduate do not choose to enter research-focused careers. Thus, research into the types of messages that can help bridge this gap is of societal importance if women’s potentials are to be fully realized and STEM disciplines are to benefit from these talents.

Female role models, or portrayals of successful and high-achieving women, are among the most commonly used messages to inspire women’s interest and encourage their participation in male-dominated domains such as leadership roles and STEM fields (Hoyt, 2013; Ramsey, Betz, & Sekaquaptewa, 2013). These role models can be real or mediated, and media role models have been shown to have powerful impact on individuals’ self-perceptions and life aspirations (Knobloch-Westerwick, Robinson, Willis, & Luong, 2016). Within the context of women in STEM, role congruity theory (Eagly & Karau, 2002) has guided the development of a specific type of role models, termed the *feminine role models*. Extant studies showed that the perceived incongruity between the female gender role and the STEM career role is ingrained and widespread: The prototypical scientist or engineer is thought to possess counter-stereotypical characteristics such as being geeky, unfriendly, or not nurturing; and younger female students tend to perceive themselves as being different from this stereotype and thus feel like they do not belong in these domains (Archer et al., 2013; Banchefsky, Westfall, Park, & Judd, 2016; Master, Cheryan, & Meltzoff, 2016). Feminine role models, which portray female scientists with stereotypically feminine traits, were thus used to reduce this perceived incongruity but to varying results (Betz & Sekaquaptewa, 2012; Ziegler & Stoeger, 2008). Upward social comparison process and the perceived attainability of the role models have been suggested to account these inconsistencies (Lockwood & Kunda, 1997; Park-Stamms, Heilman & Hearns, 2008).

There is, however, less research on the population of female STEM students who are making decisions about pursuing or discontinuing research-oriented career paths. In 2015, among scientists and engineers who are not working, 28% of women reported family responsibilities for their unemployment status, compared to 6.25% of men. Similarly, 49.21% of women chose to work part-time for this reason, compared to 19% of men (NSF, 2015). Clearly, the incongruity between the female gender role and the STEM career role does perpetuate to this level, contributing to the leaky pipeline problem, but one that can be addressed by female role model messages (Drury, Siy, & Cheryan, 2011).

Against this backdrop, the current study has several aims. First, we want to examine whether the use of feminine role models, as proposed by *role congruity theory*, can effectively reconcile the gap between the career role and the family role and reduce the attrition between the STEM education and the career levels. To this end, we use a sample of female professional students studying veterinary medicine whose career options include becoming a clinician (a female-typed career path in this field) or a researcher (a male-typed career path), and present them with portrayals of female researchers with or without a family. Second, we use *social comparison theory* (Festinger, 1954) and *role salience* (Luchetta, 1995) to contextualize the inconsistent findings in previous works and, as well as proposed a new message strategy. To this end, we introduce and test a new type of attainability message that can potentially increase the effectiveness of media role models, and examine the moderating effect of role salience. Taken together, the findings of this study can help shed light on the nuanced psychological process in response to exposure to media role models, and thus delineate the message designs that are most conducive for these portrayals to produce positive impact.

# Role Congruity Theory & Female Role Models

 Role congruity theory (Eagly & Karau, 2002) posits that there exists a perceived incongruity between the female gender role and the leadership role. As a social role, a gender role is a set of beliefs and expectations for behaviors, activities, or tasks deemed appropriate for people of said gender (Eagly, 1987). For example, men are expected to engage in behaviors to fulfill the breadwinner role, and women the homemaker role. From this behavioral role expectation, people then infer traits and characteristics appropriate for each gender; that is, because women are expected to fulfill a caregiver role, they are also assumed and expected to be caring and nurturing (Eagly & Wood, 1999). Thus, a gender role consists of both *role* and *trait* expectations of what people *do* and how people *are* based on their gender.

 Further, a gender role includes include both the *descriptive* norm, or belief about how people of a given gender *are* and what they *do* (similar to a stereotype); and *injunctive* norm, or belief about how they *should be* and what they *should do*. For the female gender role, women are *assumed* (descriptive) and *expected* (injunctive) to carry out *communal* roles (such as a caregiver or homemaker) and embody *communal* traits (such as being caring, helpful, and gentle) (Eagly, 1987). This association between the female gender role and communal traits remains salient even for women who are occupying non-communal roles, and thus creates a perceived incongruity.

More specifically, role congruity theory focuses on the perceived incongruity between the female gender role and the leadership role, which is thought to required predominantly *agentic* qualities (such as competence, such as being strong, forceful, competitive, and dominant) instead of *communal* qualities. This perceived incongruity led to two prejudices against women in leadership role. First, women are more likely to be judged as being less suited to be leaders than men (because of the *descriptive* norm – people who *are* inherently communal are not suited for an agentic role); and second, when women exhibit leadership qualities, they are evaluated more negatively than men (because of the *injunctive* norm – people who *should* be communal are disliked when they act in an agentic role and exhibit agentic qualities) (Eagly & Karau, 2002).

 Subsequent research extended the framework to look at the perceived incongruity between the female gender role and other non-communal roles, such as stereotypically male occupations (Davison & Burke, 2000). This perceived incongruity has further been shown to be internalized by women, prompting them to think that they are not suited for stereotypically male careers (Evans & Diekman, 2009). Similarly, studies have consistently shown this perceived role incongruity in STEM domains: Both men and women judged women with feminine appearance as being less likely to be a scientist (Banchefsky et al., 2016), and young female students’ conception of a scientist was contradictory to their self-described characteristics (Archer et al., 2013). As a consequence, female students exhibited less interest in computer science after exposure to a role model embodying the STEM stereotype of being geeky, obsessed with technology, and not nurturing (Master et al., 2016). In terms of the mass media, extant portrayals of female role models in STEM fields were either lacking (Kitzinger, Haran, Chimba, & Boyce, 2008), or depicted with the same incongruity: Although female scientists and researchers in popular movies were depicted as professional and confident, they were shown to be childless or having difficulty balancing their jobs and family (Steinke, 2005).While it remains ambiguous whether this effect was due to the stereotype itself or the inference that a stereotypical scientist likely enjoys activities that women would not enjoy, the empirical evidence points to a negative impact of exposure to STEM stereotypes on women’s STEM interests.

 To address this issue, some researchers have examined the use of female role models who embody both a stereotypical role and a counter-stereotypical role, specifically the STEM career role (Betz & Sekaquaptewa, 2012; Parks-Stamm et al., 2008; Ziegler & Stoeger, 2008). From the role congruity perspective, a female role model who is successful in a stereotypically male career while simultaneously displaying communal *traits* or embody communal *roles* demonstrates that the female gender role and the counter-stereotypical role are not incompatible and can co-exist. Perceived similarity to the role models was also posited to be an important determinant of message effectiveness (Drury et al., 2011). Thus, this type of role model, termed the *feminine role model*, should be better at fostering women’s interest and participation in these fields by helping them envision themselves in these career roles. However, this strategy has not always produced the desired outcomes for women (reviewed below). A common theme emerged from these studies: Feminine role models tend to be most counter-productive to women who have low interest in or who do not identify with STEM fields (Betz & Sekaquaptewa, 2012; Ziegler & Stoeger, 2008). Clearly, making the STEM role models more congruent to the female gender roles and more similar to the female audience was not as effective as previous research suggested. Social comparison theory and the upward comparison threat can potentially provide an explanation to account for this pattern of results.

# Social Comparison Theory & Upward Comparison Threat to Female Role Models

 Social comparison theory (Festinger, 1954) posits that humans have a tendency to compare themselves to others to evaluate their own abilities and performances on a particular domain. The more similar the target of comparison is to the individual, and the less objective the standard for the domain is, the stronger the drive for the individual to socially compare that target. Future works expanded upon the original framework to include directions of comparison: downward (target of comparison is perceived to be worse than the individual on the given domain), and upward (target of comparison is perceived to be better than the individual on the given domain), as well as the outcomes of comparison (Taylor & Lobel, 1989; Wills, 1981).

Downward comparison is commonly thought to enhance the individual’s self-view and lead to positive self-related affect, whereas upward comparison can either lead to positive or negative outcomes (Taylor & Lobel, 1989; Wills, 1981). Lockwood and Kunda (1997) showed that if the upward comparison target’s achievement is perceived as attainable to the individual, he or she will feel *inspired*, leading to positive outcome; but if the target’s achievement is perceived as unattainable, he or she will feel *deflated*, leading to negative outcome. *Self-inspiration* is characterized by individuals’ bolstered self-view, positive evaluation of the target, as well increased interest and motivation in the given domain; whereas *self-deflation* is characterized by individuals’ deflated self-view, negative evaluation of the target, as well as decreased interest and motivation in the given domain (Lockwood & Kunda, 1997; Hoyt, 2013). This latter outcome is usually termed *upward comparison threat* (Rudman & Phelan, 2010). In short, perceived attainability is one of the key moderators of the impact of upward comparison on people’s self-perceptions (Lockwood & Kunda, 1997; Mussweiler, 2001).

 Subsequent studies have applied the social comparison theory to look at women’s responses to female role models in counter-stereotypical domains. Women high in self-perceived agency, which leads to higher perceived attainability, viewed successful women in a masculine occupation more positively than women low in self-perceived agency (Lawson & Lips, 2014). Luong & Knobloch-Westerick (2017) found that after viewing magazine articles featuring successful women in counter-stereotypical fields, female participants who felt similar to the role models performed better at a math test, whereas those who felt different from the role models performed worse at the same test. In Parks-Stamm et al. (2008)’s study 1, women’s self-evaluation and perception of the role models after exposure to feminine vs. neutral role models in a stereotypically male job were examined. The neutral role model allowed female participants to engage in self-bolstering cognition and perceive the role negatively in the communal domain (i.e. being cold and unlikable). This negative evaluation occurred despite the neutral role model being depicted with positive albeit gender-neutral characteristics. However, the feminine role model presented an increased upward comparison threat, which led to a more negative self-view and lowered perceived self-competence.

 The same phenomenon was observed for female role models designed specifically to increase women’s STEM interests. Ziegler and Stoeger (2008) found that for girls with high prior interest in STEM fields, watching a movie with a feminine role model led to higher self-confidence and academic interest compared to a movie featuring a woman who is either feminine or good at science; but this effect is reversed for girls with low prior interest. Similarly, Betz and Sekaquaptewa (2012) found that exposure to a feminine scientist reduced middle school girls’ current math interest, self-rated ability, and success expectations in STEM fields compared to a neutral role model, and this effect was driven by STEM-disidentified students perceiving the role model as unattainable. In studies that included male participants (Parks-Stamm et al., 2008; Ziegler & Stoeger, 2008), this pattern of result did not occur for them. Clearly, although feminine role models may help to lower the perceived congruity between the female gender role and a STEM career role, they are more likely to be perceived as unattainable, especially by women with low prior interest or self-perceived ability in STEM. Thus, exposure to this type of role models may induce a greater upward comparison threat to women, prompting them to hold more negative self-view as well as less interest in the stereotypically male domain.

# Perceived Attainability & Feminine Role Models

If low perceived attainability of the role models prompts more negative self-view and reduced interest, increasing role models’ perceived attainability should be an effective strategy to help buffer women against the upward comparison threat, protecting their self-view and increasing their interest in the stereotypically male domains. Several studies attest to this notion: Lawson and Lips (2014) found that women with higher agentic qualities perceived the masculine job (in which a female role model was portrayed) to be more attainable, and job attainability mediated the relationship between agentic qualities and positive evaluation of the role model. Parks-Stamm et al. (2008)’s study 2 showed that, when women were given an attainability induction in the form of positive feedback, they held more positive perceptions of both the role model and themselves. Thus, increasing perceived attainability can steer upward social comparison effect towards self-inspiration instead of self-deflation, safeguarding the positive impact of exposure to role models on women’s self-concepts and STEM career interest.

 However, perceived attainability in these studies was either measured instead of manipulated (Lawson & Lips, 2004), or the manipulation was only feasible in a lab experiment and not in real-life environment (Parks-Stamm et al., 2008). Additionally, in both studies, perceived attainability was shown to be effective against upward comparison threat to female role models portrayed solely in a counter-stereotypical domain, or unfeminine role models. Lastly, female participants in both studies were expressing interest in and evaluating hypothetical jobs instead of making real career decisions. The current study aims to address all three issues: First, we created an attainability induction in the form of a message, which can be easily disseminated as part of a campaign or an intervention. Second, we tested the effect of this attainability message against the upward comparison threat induced by female role models portrayed solely in a counter-stereotypical domain and in both a stereotypical and a counter-stereotypical domain. And third, we conducted the study with a sample of female professional students who are making their own career decisions. As the attrition of women between higher education and entry-level research career in STEM fields is significant (UNESCO Institute for Statistics, 2018), this population deserves more research interest and attention.

 Additionally, the role incongruity between the female gender role and the research career role perceived by this particular population may be different[[1]](#endnote-1). The discrepancy may not lie not between the stereotypically male career role and feminine appearance or *communal qualities* (i.e. being warm, caring, cooperative, etc.) as the *trait* component of the female gender role. It may instead lie between the stereotypically male career role and the family role (i.e. being a wife and mother) – a *communal role* as the *role* component of the female gender role. Because these female STEM students have already chosen a STEM major and are about to make their career decisions, they may be less concerned about how stereotypically feminine a researcher is and more concerned how little time a researcher may have for her family. Due to the fact that research- and science-oriented careers are usually perceived as being conflicting with having a family or raising children (Settles, 2004), significantly more women than men cited family responsibilities as the reason for them not working or working part-time in STEM careers (NSF, 2015). As such, a feminine role model for this population was operationalized as someone who successfully balance having a research career and having a family, termed a *family role model*. Portrayals of role models in the career role only would be termed a *non-family role model*.

Taken together, the high attainability message is expected to help reduce the upward comparison threat overall, leading to self-inspiration instead of self-deflation. Whether this effect differs depending on exposure to family or non-family role models, however, is uncertain. Thus, the first hypothesis and research question are proposed:

 *H1*: Exposure to a high attainability message significantly increases women’s self-inspiration in response to female role models, compared to exposure to a low attainability career message.

 *RQ1*: Does the effect of the high attainability message differ depending on portrayals of the role models (family vs. non-family)?

# Family Role Salience as the Moderator for Role Models’ Role Congruity

 Because the operationalization of feminine role models here focuses on the perceived incongruity between the family role and the research career role, how important the family role is to the audience can be an influential factor in how they perceive and socially compare to the role models. Thus, role salience, which refers to the personal importance an individual attaches to a role, as well as the level of commitment and effort the individual intends to devote to said role (Amatea, Cross, Clark, & Bobby, 1986; Luchetta, 1995), can be an important moderator of the effect of role models’ role congruity on women’s self-inspiration and career interest.

 In particular, for women who consider the family role to be personally important (high family role salience), family role models (portrayed in both the career role and the family role) should be perceived as more inspiring, whereas for women who consider the family role to be personally unimportant (low family role salience), non-family role models (portrayed in the career role only) should be perceived as more inspiring, provided that perceived attainability was successfully induced. Thus, the following hypothesis is proposed:

 *H2*: Exposure to a high attainability message interacts with exposure to female role models and women’s family life role salience to produce differential effect on women’s self-inspiration in response to the role models: (a) For women with high family life role salience, exposure to family role models leads to higher self-inspiration than exposure non-family role models; (b) for women with low family life role salience, exposure to non-family role models leads to higher self-inspiration than exposure family role models.

 Finally, consistent with the upward social comparison literature, higher self-inspiration in response to the female role models should increase interest in the research career, and self-inspiration should mediate the relationship between exposure and career interest (see Figure 1).

*H3*: Self-inspiration in response to the role models fosters women’s interest in the research career.

*H4*: The interaction effect between perceived attainability, role models’ level of role congruity, and women’s family role salience on women’ interest in the research career (suggested in H2) is mediated by their self-inspiration in response to the role models.

# Method

## Sample

A total of 206 female professional students studying veterinary medicine in a large Midwestern university participated in the study, 185 of whom completed part 1 (pretest), and 181 of whom completed part 2 (exposure & posttest). Participants who completed part 1 received $5 gift cards as compensation, and those who completed both parts received $20 gift cards. Twenty-one participants whose exposure time to either the attainability message or the role model messages was less than 15 seconds or more than 900 seconds were excluded from analyses. The resulting sample (*N =* 160) had a mean age of *M* = 24.49 years (*SD* = 2.13), with 123 (78.3%) self-identifying as White, 5 (3.2%) as Black/African American, 21 (13.4%) as Hispanic/Latino, 11 (7%) as Asian/Pacific Islanders, 1 (0.6%) as Native American, and 4 (2.5%) as “Other.”

## Experimental Design and Procedure

The study employed a 2 (attainability message: high vs. low) x 2 (role models: family vs. non-family) online experimental design. The study was purportedly about evaluation of career information materials, including career magazines and fact sheets about research career in veterinary medicine, the relevant counter-stereotypical career path for participants. The field of veterinary medicine, as well as the program participants are in, is predominantly female (approximately 80%; Smith, 2006). Graduates can become clinicians and practice veterinary medicine, or pursue post-graduate studies and research-track careers focusing on their clinical specialty (pathology, immunology, epidemiology, etc.), conducting studies to test new drugs and treatments. According to a report by the American Veterinary Medical Association (AVMA, 2017), about 22.5% of veterinarians in the U.S. worked in research-related professions in academia, industry, or government sectors. Reports by the National Research Council (2013) emphasized the need for and the shortage of researchers with a veterinary medicine background, and more schools are providing programs with a research focus (Chiu, 2010). Although women made up the vast majority of veterinary medicine students and clinicians, less than 43% of researchers are women (AVMA, 2017). Thus, the clinical path is the stereotypically female career for this population, the research path the relevant stereotypically male career, and the need for more researchers is well acknowledged within the field.

Of note, the work-life conflict (conflict between the family role and the career role) is not isolated to the research path in veterinary medicine. Mastenbroek, Jaarsma, Scherpbier, van Beukelen, and Demerouti (2014) documented such conflict among clinical veterinarians, and Mastenbroek et al. (2014) showed that this conflict is more pronounced among young female veterinarians. However, this line of research focuses on the impact of experienced work-life conflict on job performance and well-being for practicing veterinarians as opposed to the impact of anticipated work-life conflict on career decisions of veterinary medicine students. It is not known how the levels of experienced work-life conflict among clinicians compare to that among researchers. For female veterinarian students who are comparing and deciding between the two career paths, however, mentions of anticipated work-life conflict were repeatedly and explicitly brought up as a potential barrier of them entering a research career, indicating that this concern for the research path is more salient and more strongly considered compared to the clinical path.1

 In part 1, participants first completed an online pretest in which they reported their baseline levels of interest in the research career, family life role salience, current GPA, as well as their demographic information. Four to six days later, they were sent the link to part 2, which included message exposure and a posttest questionnaire. First, participants were randomly assigned to read either the high (*N* = 76) or the low-attainability message (*N* = 84), which was presented as a career fact sheet. Then, they were again randomly assigned to read career magazine articles featuring role models with either high (*N* = 80) or low role congruity (*N* = 80). In the high-congruity condition, participants read three articles featuring three different role models, all of whom were portrayed in both career and family roles. Similarly, in the low congruity condition, participants read three articles with three different role models portrayed in the career role only. After reading the articles, participants were asked to evaluate the fact sheets and the magazine articles to enforce the cover story. They then answered a posttest questionnaire, in which they indicated their level of self-inspiration and their posttest level of research career interest. Finally, they were thanked and debriefed.

## Stimuli

**Career attainability manipulation.** The manipulation of the low vs. high career attainability message built on approaches used by Harrison, Taylor, and Marske (2006), Mussweiler (2001), Lockwood and Kunda (1997), and Veldhuis, Konijn, & Knobloch-Westerwick (2017). The high attainability version (1) used future instead of present tense to increase the perceived amount of time participants have to achieve the same level of success as the target, (2) used first-person instead of third-person pronoun to prime similarity, and (3) included specific instruction as to how participants can obtain the achievement (see the online appendix for the full text of the stimuli). Given the present context of women’s participation and interest in a counter-stereotypical career, the attainability message took the form of a fact sheet about the career, which could be easily adopted in a communication intervention.

 The attainability message manipulation was pretested with a sample (*N* = 47) of undergraduate students. Participants were randomly assigned to read one of the two messages, and were then asked to indicate how enjoyable, interesting, informative, helpful, and realistic the fact sheet was, as well as their level of agreement or disagreement to the following statement ‘A typical student will be able to pursue a research career in veterinary medicine’ on a scale of 1-7. Results showed no significant differences between the two fact sheets in how enjoyable, interesting, informative, helpful, and realistic they were. The high attainability message (*M* = 5.04, *SD* = 1.46) was evaluated to portray the research career to be significantly more attainable than the low attainability message (*M* = 3.91, *SD* = 1.31), *F*(1, 46) = 7.76, *p* = .008, *η2* =.022.

 During the main study, participants spent an average of *M* = 116.52s (*SD* = 73.42) on the high attainability message, and *M* = 99.06s (*SD* = 95.7) on the low attainability message.

 **Role models manipulation.** Three magazine articles featuring three different female role models were created, each of which had a family version and a non-family version, resulting in a total of 6 articles. Each article contains a title, a byline, a photo of the role model with caption, and two pull-out quotes. The name, age, as well as education and career details of each role model were kept consistent across versions, as were the faces in the photos using Photoshop.

 Family role models were portrayed in both career and family roles. Several paragraphs in the body of text mentions of the role model’s marriage, her husband, and her children or plan to have children in the future. In the non-family role model version, the body of text instead included details of her personal life, such as friends and hobbies, and the lack of family life was explicitly mentioned. The non-family role models were portrayed as having an active, happy social life to ensure the difference between versions is the presence or absence of the family role and not the perceived time requirement of the career or the desirableness of the role model’s life. The photo in the family version showed the role model in a family setting – in a kitchen or living room with her husband or children, while the photo in the non-family version showed the role model in a professional setting – in a lab or office, alone or with colleagues. The caption served to describe the photo and underline the difference between the two versions (see the online appendix for a pair of stimuli articles).

 The articles were pretested with a sample (*N* = 135) of undergraduate students. This sample is separate from the sample used to pretest the attainability messages. Due to a limited number of participants in the target population to which we have access, both stimuli pretests were conducted using samples of undergraduate students not in veterinary medicine. Participants were randomly assigned read one of the two versions of one article, asked to evaluate it, and were then randomly assigned to one of the two versions of the next article. They did this for all three role models. Participants were then asked to indicate how enjoyable, interesting, informative, and realistic the article was, as well as the extent to which the role model’s family life was mentioned in the article on a scale of 1-7. For all three role models, results from three MANOVA tests showed no significant differences between the two articles in each pair in how enjoyable, interesting, informative, and realistic they were. Mention of the role model’s family life was clearly distinguished between the high and low congruity versions for each pair of articles (see Table 1 for means and standard deviations for all three pairs of articles).

 During the main study, participants spent an average of *M* = 144.64s (*SD* = 84.59) on a family role model article, and *M* = 180.60s (*SD* = 140.49) a non-family role model article.

## Measures

 **Interest in the counter-stereotypical career.** Interest in the counter-stereotypical career was measured with two items, how *interested* participants were in pursuing and how *likely* they were to pursue a research career in the field of veterinary medicine (both on a slider scale from 1-Not at all to 100-Extremely). The scores were averaged across these two items. Interest in the counter-stereotypical career was measured at both pretest (part 1) and posttest (part 2) of the study. Participants reported an average *M* = 32.78 (*SD* = 23.87, Spearman’s *r* = .88) at pretest, and *M* = 35.52 (*SD* = 31.29, Spearman’s *r* = .92) at posttest. Pretest interest in the counter-stereotypical career was included as a covariate in all analyses.

 **Self-inspiration.** To capture self-inspiration, items from the overall role model perception ratings were selected.Participants rated statements such as “I feel *connected* to [role model]” to capture perceptions of the role models, on a scale of 1-Strong disagree to 7-Strongly agree. The specific items assessed how *connected to*, *similar* *to*, and *different* *from* the role models the participants felt, as well as how *likable*, *competent*, and *desirable* the role models were perceived to be. The three values for each item across the three articles were averaged to create the overall scores respectively for each participant. A principal component analysis, wherein factors were allowed to be correlated, was run on these overall scores (scores for *different* were reverse-coded), which yielded two factors that explained 51.02% and 22.54% of the variance, respectively. Two items that loaded 0.7 or higher on the first factor and 0.4 or lower on the second factor in absolute value were selected for the measure (see Table 2 for the factor loadings for all items). Thus, two items, ‘I feel *connected* to [role model]’ and ‘[Role model] was *inspiring*,’ were averaged to create the self-inspiration score. On average, participants reported a mean *M* = 4.81 (*SD* = .95, Spearman’s *r* = .70).

 **Family role salience.** Family role salience was measured with the modified 15-item Life Role Salience scale (Amatea, Cross, Clark, & Bobby, 1986; Knobloch-Westerick et al., 2016) on a scale of 1-100. The scale measured the personal importance of and expected commitment to three main life domains: romantic partner, family/parent, and career. On average, participants reported a mean *M* = 50.89 (*SD* = 31.19, Cronbach’s *α* = .94) for their level of family role salience. See Table 3 for the bivariate correlation coefficients of all the variables measured.

 **GPA**. Participants were asked to self-report their GPA at time 1 to be included as a covariate. On average, participants reported a mean *M* = 3.55 (*SD* = .3te6).

# Results

Hypothesis 1 proposed that exposure to the high attainability message will significantly increase women’s self-inspiration in response to the female role models (both family and non-family) compared to exposure to the low attainability message; and RQ1 asked if the high attainability message affects participants differently depending on whether they read articles featuring family or non-family role models. To test H1 and answer RQ1, an Analysis of Covariance (ANCOVA) was conducted, with the two experimental manipulations as the main factors, participants’ age, GPA, and pretest interest in research career as the covariates, and self-inspiration as the dependent variable. The model was not significant, *F*(6, 142) = 1.03, *p* = n.s., *R2* = .05. There was no significant difference in the level of self-inspiration between the high attainability message (*M* = 4.90, *SD* = .92) and the low attainability message (*M* = 4.69, *SD* = 1.01), *F*(1, 142) = 1.62, *p* = n.s., *η2* = .012. Neither the main effect from role model portrayal (*F*(1, 142) = .11, *p* = n.s., *η2* = 0) and the interaction effect was significant (*F*(1, 142) = .004, *p* = n.s., *η2* = 0). Thus, H1 was not supported, and there is no differential effect of the high attainability message depending on portrayals of role models.

 Hypothesis 2 predicted a three-way interaction between perceived attainability, portrayals of role models, and family role salience on women’s self-inspiration in response to the role models. Specifically, for women with high family life role salience, after reading the high attainability message, exposure to family role models will lead to higher self-inspiration than exposure non-family role models. Vice versa, for women with low family life role salience, exposure to non-family role models will lead to higher self-inspiration than exposure family role models. A Model 3 moderation analysis was conducted using the PROCESS macro (Hayes, 2013) to test this hypothesis, with the two experimental manipulations and family life role salience as the predictors, participants’ age, GPA, and pretest interest in research career as the covariates, and self-inspiration as the outcome variable.

 Overall, the model was significant, *F*(10, 138) = 2.06, *p* = .03, *R2* = .15. None of the three independent variables reached statistical significance, but the three-way interaction emerged as a significant predictor, *β* = -.03, *SE* = .01, *t* = -2.64, *p* = .01, Δ*R2* = .05. However, the direction of the interaction was different than expected. As seen in Figure 2, the attainability message did not consistently affect self-inspiration for both types of role models. For participants with *low family life role salience*, reading the high attainability message increased their self-inspiration to the role models compared to reading the low attainability message, but only for *family role models*. For participants with *high family life role salience*, we observed the reverse pattern: Reading the high attainability message increased their self-inspiration to the role models compared to reading the low attainability message, but only for *non-family role models*. Thus, H2 was rejected.

 Hypothesis 3 predicted that self-inspiration in response to the role models will increase women’s interest in the research career. To test this hypothesis, we ran a multiple regression with self-inspiration as the main predictor, participants’ age, GPA, and pretest level of interest in the research career as the covariates, and their posttest level of interest in the research career as the outcome. The model was significant, *F*(4, 145) = 63.98, *p* < .001, *R2* = .67, as was self-inspiration as a predictor, *β* = 4.55, *SE* = 1.69, *t* = 2.70, *p* = .008. H3 was therefore supported.

 Finally, hypothesis 4 suggested that the interaction effect between perceived attainability, portrayals of role models, and family role salience on women’ interest in the research career will be mediated through their self-inspiration in response to the role models. A Model 11 moderated mediation analysis with *k* = 10,000 bootstrap estimates was conducted using the PROCESS macro (Hayes, 2013) to test this hypothesis, with the two experimental manipulations and family life role salience as the predictors, participants’ age, GPA, and pretest level of interest in the research career as the covariates, self-inspiration as the mediator, and participants’ posttest level of interest in the research career as the outcome variable.

Overall, the model was significant, *F*(10, 137) = 2.05, *p* = .03, *R2* = .15. The significant three-way interaction observed in the analysis run to test H2 was significantly mediated via self-inspiration to impact participants’ posttest level of interest in the research career. As seen in Table 4, for participants with *low family life role salience*, this mediation effect was significant when participants were exposed to *family role models* after reading the high attainability message compared to reading the low attainability message, *β* = 3.43, boot *SE* = 1.74, bootstrapping CI [.83 – 8.07]. For participants with *high family life role salience*, this mediation effect was significant when participants were exposed to *non-family role models* after reading the high attainability message compared to reading the low attainability message, *β* = 2.51, boot *SE* = 1.53, bootstrapping CI [.17 – 6.40]. Thus, H4 was supported.

# Discussion

 Based on role congruity theory and social comparison theory, the current study examined the effects of perceived attainability, portrayals of family vs. non-family role models, and family role salience on women’s self-inspiration in response to female role models, and subsequently their interest in research careers. The results showed that perceived attainability did not uniformly impact women’s self-inspiration (rejecting H1). Instead, the effect of perceived attainability depended on both the type of role models as well as women’s family role salience. For women with *low family role salience* (family role is personally unimportant to them), perceived attainability had positive impact when combined with *family role models* (portrayed in both the family and the career role). For women with *high family role salience* (family role is personally important to them), perceived attainability had positive impact when combined with *non-family role models* (portrayed in the career role only). This pattern of result is inconsistent with H2. However, self-inspiration did increase women’s interest in the counter-stereotypical career (supporting H3), and the significant interaction effect between perceived attainability, portrayals of role models, women’s family life role salience was mediated by self-inspiration and positively impacted interest in the research career (supporting H4).

 Overall, our study provides broad support to the positive impact of perceived attainability on upward social comparison to female role models: Exposure to the high attainability message leads to high self-inspiration, which in turns leads to higher interest in the counter-stereotypical career. However, the effect depended on the type of role models as well as family role salience. Women who did not consider having a family to be highly important found the family role models to be more inspiring after reading the high attainability message than the low attainability message, but the effect did not hold for non-family role models. Vice versa, women who consider having a family to be highly important found the non-family role models to be more inspiring after reading the high attainability message than the low attainability message, but not when they read messages with family role models. In other words, contrary to our predictions, high perceived attainability was effective when the role models were portrayed in domains less self-relevant to participants. When the role models were more self-relevant, the high vs. low attainability messages did not lead to differential impact on self-inspiration.

 This pattern of result can be interpreted using existing model and previous empirical findings concerning self-relevance and upward social comparison. The self-evaluation maintenance (SEM) model (Tesser, 1988) suggests that when an individual compare to a similar upward comparison target, domain’s self-relevance serves to moderate the outcome. When the domain is less self-relevant, the target’s achievement is less likely to prompt self-evaluation and can instead reflect well on the individual. When the domain is more self-relevant, the target’s achievement is more likely to prompt self-evaluation and the realization that one is falling short on a domain essential to one’s self-concept. In other words, as the domain’s self-relevance increases, the target’s achievement becomes more threatening to the individual. Within the context of female role models in a counter-stereotypical domain, Betz and Sekaquaptewa (2012) showed that STEM-disidentified female students (to whom a stereotypical role is more self-relevant) perceived a feminine scientist to be less attainable compared to STEM-identified students (to whom a stereotypical role is less self-relevant). Thus, our findings are consistent with this perspective: When the role models’ portrayal was more self-relevant to participants, they present a bigger upward comparison threat to participants. The high attainability message was able to buffer against the less self-relevant threat, but not the more self-relevant one.

In terms of theoretical contribution, the study connects the literature on role congruity theory and social comparison theory to consider how audience members respond to role model messages. Based on this theory integration, the experiment tested the effect and boundary condition of a new operationalization of perceived attainability in the form of a realistic message. In terms of practical contribution, the findings add to our understanding of how media role models should be designed and implemented. First, they emphasize the importance of increasing perceived attainability when successful and desirable role models are presented. Second, they underlie the need to understand individual differences, specifically what women consider to be self-relevant and personally important. In the context of women in science, feminine or family role models may invoke less perceived incongruity and thus be more attractive, especially to women to whom the female gender role or other stereotypical roles are important, but they are also likely to induce a bigger upward comparison threat, reducing interest in the stereotypically male, research-oriented careers. Thus, communication strategies using media role models may want to avoid portrayal of extremely accomplished individuals in the most self-relevant domain to avoid invoking a strong upward comparison threat; or use a stronger attainability induction, such as tailored messaging (Kreuter & Wray, 2003) and transitional characters (Vaughan & Rogers, 2000) to help women overcome the stronger upward comparison threat from female role models in a self-relevant domain.

Tailored messaging can increase the perceived similarity between the audience and the role models while avoiding role models that are so successful in the most self-relevant domain that they become intimidating. Transitional characters – for example, portrayals of female researchers who start out struggling to balance career and family and gradually become better at handling both– can show that even successful people struggle sometimes, make the role models more relatable, and provide the audience with specific instructions as to how to effectively balance both roles. Transitional role models can also overcome a potential shortcoming of the current approach: Depictions of role models who seemingly can handle both roles without difficulty may not accurately portray the reality of being a woman in science, and such perception may lead to job dissatisfaction and discontinuation. Future studies should directly examine the role of self-relevance within this context and test the impact of these message features. Finally, more research is needed to fully understand the implications of the message features tested in this study for campaigns and interventions.

More generally, this notion carries important implications for the use of role models in other communication contexts to encourage health behaviors (Lee & Shapiro, 2015), risk-mitigation behaviors (Keller & Brown, 2002), and academic engagement and performance (Zirkel, 2002). It is especially pertinent because low perceived attainability to a desired target has been shown to be one of the factors leading to decreased physical and psychological well-being (Kuijer & De Ridder, 2003), and negative affect and body image issues (Strahan, Wilson, Cressman, & Buote, 2006). Understanding the psychological processes underlying audience’s responses as well as what message features and individual characteristics are likely to prompt what kind of responses can allow us to create more effective messages for our purposes.

Limitations of the study include the use of a non-representative sample, a moderate operationalization of perceived attainability, the use of a two-item measure for career interest, the potential short-term effect of our messages, and the lack of consideration for a developmental perspective. Our sample was composed female professional students, who were part of the target audience: young women who are completing their higher education in STEM fields and actively making career decisions in their immediate future. Still, female students in one veterinary medicine program in the Midwest are not representative of all women with various individual differences, which may affect how the messages are processed and interpreted. Additionally, there was not a substantial difference between the low and the high attainability message: Although the stimuli pretest showed significant difference between versions, they only differed by one point on a scale of 1-7 (*M* = 5.04 for high and *M* = 3.91 for low), and the low attainability version was moderately attainable. Because the focus of the study was on message strategies that can be easily utilized in a communication campaign to influence women’s career decisions, the comparison was made between a regular career information sheet that the target audience would realistic encounter and a career sheet designed to increase perceived attainability. Still, while our operationalization was more appropriate for this context, it did not maximize the difference in perceived attainability between conditions. Future studies should include a no-message condition or a condition designed to more drastically lower perceived attainability, as well as examine other message features that can more strongly induce it as mentioned above.

Further, career interest was measured with only two items. Future research may consider using an established, validated scale to better assess participants’ interest in counter-stereotypical careers. In addition, the effects of one attainability message and three role models messages may be short-lived, especially when they have to compete with a media environment in which women are heavily portrayed in stereotypical roles only (Women’s Media Center, 2015). Finally, the pretest-posttest experimental design with one message exposure of the current study cannot fully examine the much more complex process of career interest development that occurs throughout the adolescent and young adulthood periods. Thus, the effects found here also need to be considered in conjunction with other important developmental factors.

The issue of female underrepresentation in STEM fields, especially in research-oriented careers, is both persistent and complex, caused by many social factors. It thus requires attention and insight gained from various disciplines, as well as a concerted effort from multiple social institutions. From a communication perspective, while the focus of this study is a more effective use of media role models considering the theoretical frameworks of role congruity and social comparison, we acknowledge the crucial role of the overall media environment in reinforcing gender roles and stereotypes, and that messages from campaigns and interventions may be diluted by these portrayals of women. Other personal and institutional factors, such as partner’s support, social norms, career and promotion opportunities, and laws and regulations regarding women’s issues, also play an important role in women’s career decisions. This line of research aims to be part of the effort to bring more women into STEM fields where their skills and talents can be better used. These fields are vital to the progress and development worldwide, the lack women’s participation costs us all a lot of human resources and expertise. As the United Nations declared, “the world needs science, and science needs women” (UN News Center, 2017).

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Table 1

*Pretest Means and Standard Deviations of Female Role Model Stimuli Articles*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Portrayal of Family | Enjoyable | Interesting | Informative | Realistic |
|  | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Role Model: Claire |  |  |  |  |  |  |  |  |  |  |
| Family | 6.14a | 1.29 | 4.57 | 1.16 | 4.50 | 1.23 | 4.79 | 1.05 | 3.93 | 1.27 |
| Non-family | 2.71b | 2.02 | 4.50 | 1.91 | 4.93 | 1.69 | 4.64 | 1.45 | 5.00 | 2.08 |
| Role Model: Julie |  |  |  |  |  |  |  |  |  |  |
| Family | 5.57a | 1.78 | 5.25 | 1.44 | 5.00 | 1.32 | 4.81 | 1.05 | 4.56 | 1.21 |
| Non-family | 1.55b | 1.43 | 5.29 | 1.49 | 5.14 | 1.35 | 4.50 | 1.79 | 4.50 | 1.16 |
| Role Model: Stella |  |  |  |  |  |  |  |  |  |  |
| Family | 5.39a | 2.21 | 4.22 | 1.56 | 4.06 | 1.66 | 3.89 | 1.53 | 3.83 | 1.79 |
| Non-family | 2.00b | 1.37 | 4.00 | .91 | 3.85 | 1.41 | 3.85 | 1.41 | 4.54 | 2.07 |

*Note.* Subscripts denote significant differences at *p* < .05

All variables were measured on a 1-7 scale.

Table 2

*Factor Loadings for Perception of the Role Models using Principal Component Analysis with Oblimin Rotation*

|  |  |  |
| --- | --- | --- |
| Items  | Factor 1 | Factor 2  |
| I feel connected to [role model].\* | .861 | .068 |
| [Role model] is inspiring.\* | .780 | -.377 |
| [Role model] is similar to me. | .760 | .468 |
| [Role model] is likable. | .682 | -.535 |
| I feel different from [role model]. (reverse coded) | .678 | .469 |
| [Role model] is competent. | .653 | -.599 |
| [Role model]’s life is desirable. | .541 | .589 |

*Note*. Asterisks denote items that were included in the self-inspiration scale.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Table 3 |  |  |  |  |  |  |
| *Bivariate Correlation Coefficients between Variables* |  |  |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| 1) Age | - |  |  |  |  |  |
| 2) Pretest interest in research careers | .04 | - |  |  |  |  |
| 3) GPA | -.27\*\* | .04 | - |  |  |  |
| 4) Family role salience | -.11 | -.16 | .09 | - |  |  |
| 5) Self-inspiration  | -.08 | -.02 | .02 | .16\* | - |  |
| 6) Posttest interest in research careers | .03 | .82\*\*\* | .03 | -.05 | .06 | - |
| Note: \**p* < .05 \*\**p* < .01 \*\*\**p* < .001 |  |  |  |  |  |

Table 4

*Conditional Indirect Effect of Perceived Attainability on Posttest Interest in the Counter-Stereotypical Career via Self-Inspiration at Different Levels of Role Model Portrayals and Family Life Role Salience*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *β* | *SE* | Lower bound CI | Upper bound CI |
| Feminine role models |  |  |  |  |
| High family role salience | -1.75 | 1.61 | -5.93 | .63 |
| Low family role salience | 3.43 | 1.74 | .83 | 8.07 |
| Neutral role models |  |  |  |  |
| High family role salience | 2.51 | 1.53 | .17 | 6.40 |
| Low family role salience | -.74 | 1.99 | -5.78 | 2.30 |

Endnote

1. In preparation of the main study and to identify relevant theoretical frameworks, a series of exploratory qualitative interviews (*N* = 6) was conducted with students who were currently pursuing a veterinary medicine degree and who had an interest in research and research careers. The sample consisted of 4 women and 2 men, ages ranging from 23 to 28 years old. These interviews took place before the quantitative study was designed and conducted. Participants were asked open-ended questions regarding current and future academic and career plans, what opportunities and challenges they had faced or anticipated in pursuing these plans, and what factors made them more or less likely to follow a research career. The wordings of the questions did not mention any specific factor or concern to avoid priming participants. Follow-up questions were asked after participants had brought up specific factors or concerns themselves. The interviews were conducted and transcribed by the lead author. Mentions or current or future career-family or career-romance conflicts were coded.
Three of the four female participants anticipated future conflicts between having a family and having a research career, and indicated that such conflict made them hesitant about pursing this career path. Two of the three female participants were concerned with having to delay starting a family and having children until their thirties if they were to pursue a research career, and indicated that such a late start would be undesirable. The other female participant indicated that she was single, and being in veterinary school made it hard to find a romantic partner. Both male participants brought up past or current romantic struggles: one participant recently broke up with his girlfriend, and the other was in a long-distance relationship; but neither participant indicated concerns for future career-family conflict. [↑](#endnote-ref-1)