ABSTRACT

THE ROLE OF FEMALE EXEMPLARS IN CHANGING CAREER ATTITUDES

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According to the goal congruity model, a contributing factor in women’s underrepresentation in science, technology, engineering, and mathematics (STEM) is that STEM careers are perceived to impede the fulfillment of communal goals. The current research considers whether exposure to a female STEM exemplar, by changing perceived communal goal affordances, elicits more positive attitudes toward STEM among individuals who highly value communal goals. In Study 1, exposure to a female versus male scientist did not affect attitudes toward the scientist career. With individuating information that the female scientist was gender-prototypic in Study 2, communally-oriented participants reported more positive attitudes toward the career. This effect was mediated by perceived communal goal affordances. These findings indicate that exposure to a STEM exemplar can influence perceived communal goal affordances, providing a theoretical contribution to the goal congruity model and practical implications for interventions aimed at increasing the presence of communally-oriented individuals in STEM.
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A Thesis

Submitted to the
Faculty of Miami University
in partial fulfillment of
the requirements for the degree of
Master of Arts
Department of Psychology
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Oxford, Ohio
2011
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THE ROLE OF FEMALE EXEMPLARS IN CHANGING CAREER ATTITUDES

Although women’s presence has increased in previously male-dominated careers, such as law and medicine, there remains a gender disparity in the fields of science, technology, engineering, and mathematics (STEM; as evidenced by degrees granted in these fields; Snyder, Dillow, & Hoffman, 2009). Extensive research has investigated women’s underrepresentation in STEM, typically considering such factors as self-efficacy, gender-differentiated encouragement in math and science courses, and cultural stereotypes about women’s competence (Ceci & Williams, 2007). Rather than focusing solely on issues of competence, the current research instead adopts a goal affordance perspective, suggesting that career interest is determined in part by beliefs about whether a career will fulfill highly-valued goals (Evans & Diekman, 2009). In this framework, then, it is important to understand cues that affect perceptions of goal affordances in STEM careers. The current research considers how the gender of a STEM career exemplar might affect beliefs about communal goal endorsement, and thus affect attitudes toward STEM careers.

The Goal Affordances Explanation

Recent research has taken a goal affordances approach to the STEM gender gap, suggesting that women’s underrepresentation cannot be fully accounted for by competence-related explanations. According to this new framework, careers are perceived as differentially allowing for the fulfillment of certain goals. Furthermore, from a role congruity perspective, congruity between one’s own goals and perceptions of a career’s goal affordances facilitates interest in that career (Evans & Diekman, 2009). Research taking this approach has therefore considered beliefs about the extent to which STEM careers fulfill different goals. Of particular interest were goals relating to communion (other-oriented characteristics) and agency (self-oriented characteristics; Bakan, 1966). Compared to STEM and other male-stereotypic careers, female-stereotypic careers were seen as particularly unlikely to fulfill agentic goals. STEM careers, however, were perceived as especially unlikely to afford communal goals (Diekman, Brown, Johnston, & Clark, 2010).
This pattern of perceived goal affordances is critical to understanding trends in women’s occupations over time. The role congruity perspective holds that people are motivated to align their behavior with the social roles they occupy; sex-differentiated roles thus have important implications for the goals that men and women endorse (Diekman & Eagly, 2008). In the traditional division of labor, men tend to hold breadwinner roles requiring self-oriented characteristics, while women tend to hold caretaker roles requiring other-oriented characteristics, and gender differences in personality reflect these roles’ demands (Eagly, Wood, & Diekman, 2000). As would be expected, women’s more recent adoption of male-stereotypic roles has been accompanied by an increase in agentic attributes. However, consistent with their stable prevalence in caretaker roles, women continue to report more communal characteristics than do men (Diekman & Eagly, 2008).

Given the stability of communion in the female gender role, beliefs about how much careers afford communal goals are important in explaining women’s occupational choices. In the Diekman et al. (2010) study of perceived goal affordances, women reported less interest in STEM careers than did men, and this relationship was partially mediated by communal goal endorsement. Thus, there is consensus around the perception that STEM careers inhibit communal goal fulfillment, but this belief is uniquely important to people who endorse communal goals.

*Malleability of Perceived Goal Affordances*

Although there appears to be general consensus about the goals that different careers afford, further research suggests that these beliefs are malleable. In an experiment manipulating perceived communal goal affordances (Diekman, Clark, Johnston, Brown, & Steinberg, 2011), undergraduate participants read about the typical tasks in the day of an entry-level scientist, and then reported their perceptions of and attitudes toward the career. The essential tasks of the scientist were the same across conditions, but some participants read about a scientist who spent much of the day working independently, while others read about a scientist who spent much of the day working with and helping others. The independent condition thus framed a stereotypical STEM career, whereas the collaborative condition framed a counterstereotypical STEM career that particularly afforded communal goals.
As predicted, participants exposed to the collaborative rather than independent framing believed that the scientist career was more likely to fulfill communal goals; thus, with counterstereotypic information, perceptions of career goal affordance were able to change, at least for this specific career. More important to the question of women’s underrepresentation in STEM, gender differences in attitudes toward the career were in line with the tendency for women to value communal goals more strongly than men. Women were more positive toward the career and predicted they would enjoy it more when it was communally-framed, consistent with their stronger endorsement of communal goals. In contrast, men’s ratings were unaffected by framing, reflecting the lesser importance of communion in the male gender role.

Consistent with these sex effects are analyses that considered individual differences in communal goal endorsement, which were predicted by participant sex. Specifically, although there was an overall tendency for more positive attitudes toward the career as it was perceived to afford more communion, this relationship was stronger for participants who endorsed communal goals more. Thus, in addition to the group-level effects based on sex differences in communion, communal goal affordances were more important to individuals who strongly endorsed communal goals.

This individual difference pattern corresponds with research on chronicity and accessibility. To the extent that individuals repeatedly use a construct (in this case, the construct of communion among individuals who strongly endorse communal goals), relevant constructs are likely to be more accessible (Higgins, King, & Mavin, 1982). In line with accessibility effects (e.g., Higgins, 1996), then, individuals who strongly endorse communal goals are likely to be more sensitive to communion-relevant information. In the framing study, individuals who strongly endorsed communal goals may have been more likely to judge the scientist career in relation to communion, such that high-communion participants demonstrated an especially strong relationship between perceived communal affordances and positivity.

These findings suggest that modifying perceptions of communal goal affordances within STEM may encourage communally-oriented individuals to enter those careers. However, this prior research used a fairly direct manipulation of communal goal affordances, comparing a career in which virtually every task was other-oriented to one in which tasks were heavily self-oriented. It would be beneficial to know whether a more subtle approach, such as exposure to a
woman in a STEM career, would have similar effects on perceived communal goal affordances and career ratings.

Inferences about Goals and Roles

Research on the content of gender stereotypes provides reason to expect that a female scientist would be perceived as more communal than a male scientist. Women tend to value communion more strongly, and people are generally aware of, and willing to make generalizations about, this gender difference. There is thus strong consensus surrounding the traits that differentiate men and women; specifically, women are believed to possess more communion-relevant traits (e.g., warmth, cooperation, and sensitivity) than men (Diekman & Eagly, 2000; Prentice & Carranza, 2002). Important to the current research is the assumption that not only will a female scientist be perceived as more communal than a male scientist, but that this perception will generalize to beliefs that her career affords more communal goals.

The role congruity approach provides a framework for thinking about the relationship between roles and perceived goals. From a social role perspective, the direction of inference is from roles to traits and goals: Actors’ specific roles influence the traits and goals that they are perceived to possess (Diekman & Eagly, 2008). The current research examines whether the relationship is bidirectional, with an individual’s sex influencing beliefs about his or her role. Support for this hypothesis comes from the research of Cejka and Eagly (1999), in which the percentage of women in a given career was highly related to beliefs about how much feminine-stereotypic attributes (including communion) contribute to success in the career. It may be that traits, roles, and goals are so closely associated that simply having knowledge about one leads to an inference about the other. In that case, consensual beliefs about women’s communal attributes should transfer to their specific roles, resulting in greater perceived communal goal affordances than if the same roles were filled by men.

Naturalistic research specific to girls and women in STEM provides initial support for this prediction. After participating in an intervention including a presentation from a female scientist, girls perceived science as more altruistic (Weisgram & Bigler, 2006). Interestingly, perceptions of altruism increased regardless of whether the scientist’s presentation emphasized
the aspects of her career that involved helping others. It seems that the mere presence of a woman in the role led to an inference that the role involves altruism.

Subtyping Processes and Stereotype Change

When encountering a female scientist, then, perceivers could focus on the target as a woman, thus changing their beliefs about science careers to incorporate the broad female stereotypic trait of communion. However, an alternative possibility is that perceivers would focus on the target’s membership in a more specific group (i.e., her occupation). Although women’s roles may generally be inferred to fulfill more communal goals, in the case of a female scientist, perceivers have the additional category of scientist from which to form judgments. Even with only minimal levels of individuating information, people tend to subtype targets who deviate from group stereotypes (Kunda & Oleson, 1995), thus preserving existing stereotypes.

Given this tendency, it is important to consider whether participants will have grounds for constructing a subtype when exposed to a female scientist. Communion is strongly associated with women (Prentice & Carranza, 2002), but it is also perceived to be incongruent with STEM careers (Diekman et al., 2010). In order to maintain these disparate beliefs about women and STEM careers when encountering a female scientist, then, one might infer that her goals are more congruent with a specific subtype (e.g., the stereotypical lone scientist), and thus not infer communion. In this case, the predicted effect of exposure to a female scientist on perceived communal goal affordances should be attenuated or eliminated.

For knowledge of a female scientist to affect beliefs about communion in the science career, then, it may be necessary to counteract this subtyping process. Rothbart and John (1985) provide evidence that in order to draw an inference between a social category and a given member of that category, there must be a reasonable degree of fit between the two. It may not be sufficient for an exemplar to nominally belong to a group. Instead, there must be also some congruity between attributes of the exemplar and attributes of the group for generalization to occur.

Critical to the current research, women are numerical minorities as scientists, and so a female scientist may be subtyped unless she displays female-prototypic attributes. Thus, simply knowing that a scientist is a woman may not necessarily activate stereotypes of women in
There are consensual beliefs about the traits that women possess (e.g., communion), but also contradictory beliefs about the scientist career (i.e., that it is male-dominated and does not afford communion) that might make a female scientist a poor fit with her gender category. In this case, perceivers should be less likely to generalize stereotypes of women as communal to the specific scientist career. In contrast, a female scientist whose attributes indicate more gender-prototypicality should be seen as a better fit with the general category of women; perceivers in this instance should be more likely to generalize communal stereotypes from the female target to her scientist career.

The effect of exposure to a female scientist on the career’s perceived communal goal affordances should therefore depend on how well the target fits the prototype of women in general. Perceivers exposed to a female-prototypic scientist should generalize their beliefs about women’s communal attributes to the career, while those exposed to a less female-prototypic scientist should show reduced generalization of women’s communal attributes to the career.

**Overview**

Recent research has suggested that beliefs about goal affordances are critical to understanding interest in STEM careers among individuals who strongly endorse communal goals (Diekman et al., 2010; Diekman et al., 2011). It is thus worthwhile to consider what specific cues affect perceptions of how likely a career is to fulfill communal goals. The current studies investigated whether simple exposure to a woman in a STEM career increases positivity among women via changes in beliefs about opportunities for communal goal fulfillment.

Study 1 examined the effects of merely knowing that a woman rather than a man occupies the career, with the prediction that exposure to a female scientist would increase perceived communal goal affordances, and therefore increase positivity toward the career among participants more oriented toward communal goals. Study 2 then further explored these hypotheses by manipulating the gender-prototypicality of a female scientist. Perceivers should be less likely to subtype a female-prototypic scientist compared to a target with more gender-neutral attributes. I thus expected that the application of stereotypes about women’s communion would be amplified when the target is more female-prototypic, with the result that participants who
strongly endorsed communal goals would infer greater communal goal affordances, and thus be particularly positive toward a STEM career held by a more prototypic woman.

Study 1

The first study examined whether perceptions of a career are affected by the gender of a target person in that career. Participants were randomly assigned to read about a male or female scientist, such that scientist sex was manipulated on a between-subjects basis. The primary hypothesis was that, based on cultural stereotypes of women as communal, participants would perceive the same career as more likely to fulfill communal goals when held by a woman than a man. Because communion-related constructs are likely more accessible for individuals who chronically endorse communal goals, the effects of scientist sex on perceived communal goal affordances were expected to be especially pronounced among communally-oriented individuals. These perceptions of greater communal goal affordances were then expected to result in more positive attitudes toward the career.

Method

Participants

Introductory psychology students ($N = 95$, 44 men and 51 women) participated in exchange for partial course credit. Participants ranged in age from 18 to 28 years old, with a median age of 19 years. The majority of participants (84.2%) identified as Caucasian.

Procedure

Participants completed the experiment on a computer in a laboratory. Participants read a brief cover story explaining that the study was about how people respond to careers with which they may not be familiar, and that they had been assigned to learn about the career of entry-level scientist. They then read about the tasks in the typical day of an entry-level scientist, designed to be relatively neutral regarding communion (see Appendix for female scientist example). Scientist
gender was manipulated at the beginning of the career description by providing the scientist’s name (Gary or Lisa Johnson), selected to be equivalent in perceived competence and attractiveness (Kasof, 1993). Additionally, masculine or feminine pronouns were used throughout the description of the scientist’s day to emphasize the scientist’s gender. Aside from the scientist’s name and the pronouns, the description of the scientist’s day was identical in the female scientist and male scientist conditions.

After reading about the entry-level scientist’s day, participants then completed a measure of how strongly they endorse communal and agentic goals, followed by measures of their perceptions of and attitudes toward the career.

Measures

**Goal endorsement.** Participants rated how important several goals were to them on a scale ranging from 1 (*not at all important*) to 7 (*extremely important*), as used by Diekman et al. (2010). The items were averaged to form indices of communal goal endorsement (e.g., caring for others, helping others; $\alpha = .88$) and agentic goal endorsement (e.g., status, independence; $\alpha = .89$).

**Goal affordances.** Participants reported their perceptions of how much the career afforded communal goals (“If you were to work as an entry-level scientist, how much do you believe it would fulfill your own goals of intimacy, working with people, and helping others?”) and agentic goals (“If you were to work as an entry-level scientist, how much do you believe it would fulfill your own goals of power, achievement, and seeking new experiences or excitement?”), on a scale ranging from 1 (*not at all*) to 7 (*extremely*).

**Career positivity.** They then reported their general impression of the career on a scale ranging from 1 (*very negative*) to 7 (*very positive*), and predicted how much they would enjoy the career and how successful they would be in the career on a scale ranging from 1 (*not at all*) to 7 (*extremely*). These three items (general impression, predicted enjoyment, and predicted success) were averaged to create a composite score of positivity toward the career ($\alpha = .81$).
Results

Goal Endorsement

Goal endorsement ratings were submitted to a 2 (Goal Type) × 2 (Participant Sex) mixed model ANOVA, with goal type as a within-subjects factor. There was a main effect of goal type, $F(1, 93) = 5.33, p = .02$, qualified by a Goal Type × Participant Sex interaction, $F(1, 93) = 10.27, p = .002$. Consistent with hypotheses, women endorsed communal goals more strongly than men, $p = .003$ (for women, $M = 5.75, SD = .83$; for men, $M = 5.18, SD = .99$), and than agentic goals, $p = .0002$. As expected, there was no sex difference in agentic goal endorsement, $p = .40$ (for women, $M = 5.13, SD = .91$; for men, $M = 5.28, SD = .77$).

There was also an unexpected effect of scientist sex on agentic goal endorsement, $F(1, 93) = 3.85, p = .05$, such that participants in the male scientist condition reported stronger endorsement of agentic goals ($M = 5.37, SD = .81$) than participants in the female scientist condition ($M = 5.03, SD = .86$). However, there was no effect of scientist sex on communal goal endorsement, $p = .73$.

Goal Affordances

The primary hypothesis was that participants would perceive the scientist career to afford communion more with exposure to a female rather than male scientist, but I expected this effect to be especially pronounced for participants who strongly endorsed communal goals. Thus, I regressed perceived communal affordances on communal goal endorsement, scientist sex (dummy coded as 0 = male scientist and 1 = female scientist), and their interaction. There was no effect of scientist sex on perceived communal affordances, $B = .09, p = .75, \beta = .03$ and communal goal endorsement positively predicted perceived communal affordances, $B = .58, p = .01, \beta = .38$. This effect was qualified by a marginal Scientist Sex × Goal Endorsement interaction, $B = -.57, p = .07, \beta = -.28$. Contrary to hypotheses, there was an effect of communal goal endorsement on perceived communal affordances with exposure to a male but not a female scientist. As seen in Figure 1, communal goal endorsement positively predicted perceived
communal affordances in the male scientist condition, $B = .58, p = .02, \beta = .35$, whereas goal endorsement was unrelated to communal affordances in the female scientist condition, $p = .95$.

To further explore the marginal Scientist Sex × Goal Endorsement interaction, I performed simple slope tests on communal affordances with communal goal endorsement centered at 1 standard deviation below and 1 standard deviation above the mean. These analyses indicated that scientist sex did not result in differing perceived communal goal affordances among participants low in communal goal endorsement (1 standard deviation below the mean), $p = .26$, or among participants high in communal goal endorsement (1 standard deviation above the mean), $p = .15$. Thus, although communal goal endorsement marginally moderated the effect of scientist sex, there was no effect on perceived communal goal affordances within one standard deviation of mean communal goal endorsement.

**Career Positivity**

The composite score of career positivity was similarly regressed on communal goal endorsement, scientist sex, and their interaction. None of these approached significance as a predictor of career positivity, $ps > .25$.

**Discussion**

Taken as a whole, then, the results of Study 1 indicate that exposure to a male versus female scientist produced only minimal changes in perceived goal affordances, and did not produce corresponding changes in attitudes toward the scientist career. Given only information that a target scientist was female, participants who more strongly endorsed communal goals did not perceive the career to afford communion more, nor did they report more positive attitudes toward the career.

The one exception to the pattern of null effects was the aberrant finding that communal goal endorsement was positively related to perceived communal goal affordances in the male scientist condition. This effect may be a case of shifting standards (Biernat & Manis, 1994). Based on beliefs about women as communal, people may expect women’s careers more than men’s careers to afford communion in general. Given these baseline beliefs, even though the
tasks were held constant across scientist sex, there may have been more latitude in the male scientist condition to perceive some of the job’s tasks (e.g., meetings with research groups) as unexpected opportunities for communal goal fulfillment. In comparison, the female scientist’s career may have been perceived as unlikely to fulfill communal goals relative to more female-dominated careers. Most relevant to the study’s purpose, however, exposure to a female scientist did not produce higher perceived communal goal affordances or positivity toward the career, even among participants who strongly value communion.

Study 2

Study 1 failed to support the hypothesis that exposure to a woman in a STEM career increases perceived communal goal affordances for that career, based on stereotypes of women as communal. However, the hypothesized effect would require that participants categorize the female scientist at least partially in a broad gender category, rather than subtyping based on her occupation. Study 2, therefore, explored the effects of gender prototypicality in the female scientist specifically, with target prototypicality manipulated between subjects. I expected that participants, particularly those who strongly endorse communal goals, would infer greater communal goal affordances and thus be more positive toward a career held by a female-prototypic scientist. To examine this hypothesis, before reading about a female scientist’s typical day, participants read individuating information that either portrayed her as female-prototypic or was more neutral in terms of gender prototypicality.

Method

Participants

Introductory psychology students ($N = 156$, 59 men and 97 women) participated in exchange for partial course credit. Participants ranged in age from 18 to 22 years, with a median age of 19 years. The majority of participants (91.7%) identified as Caucasian.
Procedure

The procedure and measures generally followed those of Study 1, with a manipulation of the scientist’s female-prototypicality rather than sex. All participants read about the female scientist (Lisa Johnson). Before reading about the tasks in her day as an entry-level scientist, they read a brief introductory paragraph that included information about Lisa’s interests and hobbies. The specific information was pretested among 25 Miami University undergraduates, and selected based on ratings of female-prototypicality and communion. Specifically, the set of hobbies used in the female-prototypic condition (yoga, watching romantic comedies, and knitting) was rated as significantly more stereotypic of women than was the set of hobbies used in the gender-neutral condition (running, watching nature documentaries, and photography), $p < .001$, but the two sets did not differ in ratings of warmth, $p = .439$.

Following the introductory paragraph, participants then read the same career description as in Study 1, completed the goal endorsement measures, and provided ratings of goal affordances and career positivity. Goal endorsement items were averaged to create overall scores of communal goal endorsement ($\alpha = .86$) and agentic goal endorsement ($\alpha = .90$). Career rating items (general impression, predicted enjoyment, and predicted success) were averaged to create a composite score of career positivity ($\alpha = .77$).

Results

Goal Endorsement

Goal endorsement was submitted to a 2 (Goal Type) $\times$ 2 (Participant Sex) mixed model ANOVA, with goal type as a within-subjects factor. Replicating Study 1, there was a main effect of goal type, $F(1, 154) = 11.91$, $p = .0007$, qualified by the expected Goal Type $\times$ Participant Sex interaction, $F(1, 152) = 12.65$, $p = .0005$. Specifically, women endorsed communal goals more strongly than men, $p < .0001$ (for women, $M = 5.83$, $SD = .73$; for men, $M = 5.10$, $SD = .94$), and
than agentic goals, $p < .0001$. In contrast, there was no sex difference in agentic goal endorsement, $p = .61$ (for women, $M = 5.17, SD = .94$; for men, $M = 5.11, SD = .92$).

**Goal Affordances**

Perceived communal goal affordances were regressed on target prototypicality (dummy coded as 0 = neutral and 1 = female-prototypic), communal goal endorsement, and their interaction. Target prototypicality itself did not predict perceived communal goal affordances, $B = .28, p = .31, \beta = .08$, and communal goal endorsement emerged as a significant negative predictor, $B = - .52, p = .03, \beta = -.27$. This effect was qualified by a Prototypicality $\times$ Goal Endorsement interaction, $B = 1.03, p = .001, \beta = .40$ (see Figure 2). Further analyses within condition revealed that communal goal endorsement negatively predicted perceived communal goal affordances in the neutral condition, $B = - .52, p = .03, \beta = -.12$, but positively predicted perceived communal goal affordances in the prototypic condition, $B = .51, p = .01, \beta = .29$.

Simple slope tests with communal goal endorsement centered at one standard deviation below and one standard deviation above the mean indicated that at low communal goal endorsement, the career was perceived to afford communion more with a gender-neutral than a female-prototypic scientist, $t(152) = 3.06, p = .003$. This prototypicality effect was marginally reversed at high communal goal endorsement, $t(152) = - 1.71, p = .09$; high-communion participants perceived marginally higher communal goal affordances in the female-prototypic than gender-neutral condition. Thus, exposure to a female-prototypic, rather than gender-neutral, female scientist conveyed information that her career afforded more communion, particularly among participants who more strongly endorsed communal goals.

**Career Positivity**

As predicted, these differences in perceived communal goal affordances were then paralleled in attitudes toward the career. The composite career positivity variable was regressed on condition (dummy coded as 0 = neutral and 1 = female-prototypic), communal goal endorsement, $p = .81$.  

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1 There was no effect of target prototypicality on either agentic goal endorsement, $p = .50$, or communal goal endorsement, $p = .81$. 

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endorsement, and their interaction. Again, communal goal endorsement was a significant predictor of career positivity, $B = -.39, p = .02, \beta = -.28$. As expected based on previous research (Diekman et al., 2010), participants who more strongly endorsed communal goals rated the science career less positively. However, as seen in Figure 3, this effect was qualified by a Prototypicality × Goal Endorsement interaction, $B = .77, p = .0007, \beta = .42$. Regression analyses within condition revealed that communal goal endorsement negatively predicted career positivity in the neutral condition, $B = -.39, p = .03, \beta = -.25$, but positively predicted career positivity in the female-prototypic condition, $B = .38, p = .009, \beta = .30$.

To further interpret the Prototypicality × Goal Endorsement interaction on career positivity, I conducted simple slope tests with communal goal endorsement centered at 1 standard deviation above and below the mean. Participants who endorsed communal goals less were more positive toward the career with a gender-neutral than female-prototypic scientist, $t(152) = 2.89, p = .004$, whereas participants who endorsed communal goals more were more positive toward the career with a female-prototypic than gender-neutral scientist, $t(152) = -2.03, p = .04$.

Mediational Analyses

To provide evidence that beliefs about communal goal affordances underlie the condition-dependent effects of goal endorsement on career interest, I conducted separate mediational analyses within the neutral and prototypic conditions. Within the neutral condition, communal goal endorsement negatively predicted perceived communal affordances, $B = -.52, p = .03, \beta = -.24$, and career interest, $B = -.39, p = .03, \beta = -.25$; the relationship between communal goal endorsement and career interest was no longer significant when communal goal affordances were included as a predictor, $B = -.19, p = .22, \beta = -.12$ (see Figure 4). A Sobel test confirmed that this decrease was significant, $z = 2.01, p = .04$.

Within the prototypic condition, communal goal endorsement positively predicted perceived communal affordances, $B = .51, p = .01, \beta = .29$, and career interest, $B = .38, p = .009, \beta = .30$. The relationship between communal goal endorsement and career interest was reduced to nonsignificance when communal goal affordances were included as a predictor, $B = .20, p = .12, \beta = .16$ (see Figure 4). A Sobel test confirmed that this decrease was significant, $z = 2.28, p$
Perceived communal affordances thus partially mediated the relationship between communal goal endorsement and career interest in each condition: The negative relationship between communal goals and career interest in the neutral condition can be explained in part by decreased perceived communal goal affordances, and the positive relationship between communal goals and career interest in the prototypic condition can be explained in part by increased perceived communal goal affordances.

General Discussion

The current research contributes to the understanding of potential sources of perceived communal goal affordances and has implications for interventions designed to increase interest in STEM careers. Study 1 suggests that simple exposure to a female rather than male scientist does not change beliefs about communion in, or attitudes toward, STEM careers. Rather, as indicated by Study 2, the effect of exposure to a female scientist exemplar appears to depend upon qualities of the target (gender prototypicality) and the perceiver (communal goal endorsement). In a reversal of the typical findings, high communal goal endorsement was associated with higher STEM positivity toward following exposure to a female-prototypic scientist. Because strong communal goal endorsement is associated with decreased interest in STEM careers (Diekman et al., 2010), it is especially important to consider the factors that promote interest among those individuals.

Implications for STEM Interventions

The results of Study 1 suggest that people do not necessarily infer greater communal goal affordances based on exposure to a female rather than a male scientist; in fact, individual differences in goal endorsement predicted perceived communal goal affordances only in the male scientist condition. As a continuation of the present studies, it may be beneficial to first attempt to replicate this unexpected finding. If the effect consistently emerges, future research could more directly consider the shifting standards explanation. An initial step in this approach would be to obtain baseline estimates of perceived communal goal affordances in a male scientist’s and female scientist’s career, without any description of the career’s tasks, as was provided in the
current research. As an example, if people believe in the absence of any specific information that a male scientist spends less time working with others than a female scientist, this belief may influence the way that participants were interpreting the career descriptions in the current research.

In Study 2, the gender-neutral condition obtained the typical negative relationship between communal goal endorsement and positivity toward the scientist career. It is notable, then, that this pattern was reversed with exposure to a female-prototypic scientist. The negative relationship between goal endorsement and positivity was not simply eliminated, but actually changed direction, such that participants who strongly value communion were more positive toward the science career. From the goal affordances perspective, then, interventions intending to attract communally-oriented individuals (including women) to STEM might be more successful by altering their gender representation. Instead of focusing only on presenting exemplars of women in STEM, though, interventions might be more successful to the extent that they specifically include female-prototypic exemplars who communicate the possibility that a STEM career fulfills communal goals. Past research has examined the effects of exposure to female scientists in more naturalistic settings (Weisgram & Bigler, 2006), and an important extension of this work would be considering the role of gender prototypicality in such interventions.

Although exposure to female-prototypic scientists may generate more positivity toward a science career, the consequences of female prototypicality for women in STEM remain unknown. From a role congruity perspective (Eagly & Karau, 2002), women in STEM who are female-prototypic will be targets of prejudice to the extent that the female gender role is perceived to be incongruent with the career role. There is evidence for stereotypes linking STEM fields and men (e.g., Nosek, Banaji, & Greenwald, 2002; Thomas, Henley, & Snell, 2006). Moreover, communion is perceived to be incongruent with STEM careers (Diekman et al., 2010; 2011), but is also central to the female gender role and stereotypes of women (Diekman & Eagly, 2008; Prentice & Carranza, 2002). This discrepancy between the female gender role and the role of scientist may be especially salient with a female-prototypic scientist. Thus, by virtue of their female prototypicality, the exemplars who could be successful in attracting more communally-motivated individuals (including women) to STEM careers may themselves be targets of prejudice within their careers. An important extension of the current research would be to
consider whether gender prototypicality affects perceptions, particularly the perceived competence, of women in STEM careers.

Theoretical Contributions

The current research provides a theoretical contribution to the literature on role models and occupational choice. Previous research has demonstrated the importance of gender-matched role models, particularly for women considering male-dominated or male-stereotypic professions (e.g., Gilbert, 1985; Lockwood, 2006; Stake & Granger, 1978). Among women, having a female role model has been associated with outcomes such as better academic performance (Zirkel, 2002), and increased confidence in and motivation for role model-relevant careers (Stake & Noonan, 1985). These role model effects have generally been attributed to achievement-related factors. For example, in male-dominated fields, a female role model may signal that success is possible despite barriers to women (Lockwood, 2006). Similarly, gender-matched role models may buffer against stereotypes about women’s lack of competence in certain fields (Marx & Roman, 2002).

In contrast to these explanations, which focus on role models as changing beliefs about achievement or competence, the current research indicates that role models may exert influence in part by communicating information about goal affordances. Specifically, in Study 2, perceived communal goal affordances partially mediated the relationship between communal goal endorsement and positivity toward the scientist career. Thus, a female-prototypic scientist elicited more positive attitudes among communally-oriented individuals at least in part by changing beliefs about the possibility for communal goal fulfillment within the career.

Future Directions

It may be interesting to consider other cues to female prototypicality aside from characteristics of a target scientist. For example, work by Cheryan, Plaut, Davies, and Steele (2009) examined the effects of environmental cues on interest in computer science. In that research specifically, women who were exposed to a computer science classroom with objects nonstereotypical of the field (e.g., nature posters and phone books) reported greater interest in
computer science than women who were exposed to a computer science classroom with stereotypical objects (e.g., video games and Star Trek posters). Furthermore, this environmental effect on women’s interest was due to the greater perceived masculinity of the stereotypical environment. Environments and objects can thus serve to broadcast stereotypes, and gender stereotypes specifically. As an extension of the current research, it would be interesting to explore whether objects in the environment might similarly act as cues to femininity and communal goal affordances. Communion may be signaled directly by objects, such as family photos, or seating arrangements that encourage collaboration. Additionally, there may be objects that are not directly relevant to communion (e.g., flowers or feminine art) but would make an environment appear more female-stereotypic. If so, it is possible that communal goal affordances might be affected by environmental cues as well as target individuals, such that careers in more stereotypically feminine environments are perceived to afford communal goals more.

Future research should also revisit the question of the precise role of communal goal endorsement in the goal congruity model. In prior research (Diekman et al., 2011), communal goal endorsement did not moderate the effect of career framing on perceived communal goal affordances, but instead moderated the consequences of those affordances, such that there was a stronger relationship between perceived affordances and attitudes among individuals who strongly valued communion. However, in the current research, goal endorsement had an effect at an earlier stage, influencing participants’ perceptions of communal goal affordances, which then resulted in differing attitudes.

It is possible that variation in the ambiguity of information that participants received about the career itself can account for these differences. Prior research directly manipulated the proportion of the scientist’s tasks that involved helping or working with others, such that there was little opportunity for individual differences in the accessibility of communion to influence perceived affordances. In contrast, the scientist’s tasks in the current research were deliberately ambiguous to leave room for the possibility that manipulation of the target scientist would influence interpretations of those tasks. Thus, in the previous research, communion was likely salient to participants regardless of their own goal endorsement, because the stimuli explicitly mentioned communion (or a lack of communion), whereas communion was likely less salient in the current research. Instead, communion may be a more accessible construct for participants who strongly endorse communal goals (Higgins et al., 1982), with the result that communally-
oriented participants were more sensitive to the gender prototypicality information, because it could be construed as providing information about communal goal affordances. To examine whether differences in accessibility can explain the effects of communal goal endorsement in the current studies, future research might include a more direct assessment of the accessibility of communion-related constructs.

Another question that arises from the current research regards the specific inferences that participants made when they did perceive opportunities for communal goal fulfillment. Consistent with prior research (Diekman et al., 2010; 2011), the reported studies assessed perceived communal goal affordances as a unitary construct. It is therefore not possible based on the current data to discriminate between the various aspects of communion, such as direct helping versus collaboration. A female-prototypic exemplar may differentially communicate information about the various aspects of communion, and these aspects may be differentially impactful on attitudes toward STEM careers. Future research extending this work could include items to assess the components of perceived communal goal affordances separately, thus refining understanding of the mechanisms by which a female-prototypic exemplar can elicit positivity toward a career.

Conclusion

The reported studies extend prior research about the interaction communal goal endorsement and perceived goal affordances on attitudes toward STEM careers. Taken together, these studies suggest that even given exposure to a female scientist, stereotypes of broader gender roles do not necessarily generalize to beliefs about the goals afforded by a career role. However, with a specifically female-prototypic target, participants who strongly valued communion perceived more opportunity to fulfill communal goals in the career, and thus reported more positivity toward the career. This is a reversal of the typical pattern, in which communal goal endorsement is negatively predictive of STEM career interest (Diekman et al., 2010; 2011). The current research thus contributes to the goal congruity model of STEM career pursuits, and has practical implications for efforts to recruit communally-oriented individuals who may otherwise view a STEM career as incompatible with their valued goals.
References


Prentice, D. A., & Carranza, E. (2002). What women and men should be, shouldn’t be, are allowed to be, and don’t have to be: The contents of prescriptive gender stereotypes. *Psychology of Women Quarterly, 26,* 269-281.


Appendix

8:15 a.m.: She comes in and checks her e-mail, then plans her day. She usually has to communicate with the Operations Group (they run the high-throughput screens) to check on the status of ongoing experiments so she can go from primary to secondary characterizations.

9:15 a.m.: She goes to the lab after about an hour to check on samples left overnight (for example, to see if a drug crystallized), characterize samples from the previous afternoon to integrate the data collected the previous day, and characterize new samples that have come in that day.

12:00 p.m.: The company runs presentations during lunch, where she and other employees learn what else is going on both within the company and with the Big Pharma companies who supply them with compounds. Speakers might be a group member from a different group giving an update, a patent lawyer briefing them on legal issues in patent protection and a member of the Products Group describing ongoing product development work.

1:00 p.m.: She does data analysis at her desk (e.g., powder x-ray diffraction, differential scanning calorimetry, thermal gravimetric analysis).

3:00 p.m.: She goes to her Group meeting (her group has 6 members) to update her supervisor on the status of projects, either independent projects or larger ones that have several team members. The supervisor will ask questions and give advice on running further experiments or recommending additional data points to collect. The supervisor also gives her a heads up on what compounds are coming in during the next few weeks. This gives her an idea of the workload in the group.

4:00 p.m.: She updates the lab notebook with either data she collected that day or experiments she started. She then gets started on experiments that can be set up and run overnight.

5:00 p.m.: She prepares for weekly meetings with the entire Solid State Chemistry Group (15 members). Typically, she makes a PowerPoint presentation using tables and charts of data, a summary and discussion points.

5:30 p.m.: She commutes home.
Figure 1
Effects of Communal Goal Endorsement and Scientist Sex on Perceived Communal Affordances

Note. Participants rated perceived communal goal affordances on a scale ranging from 1 to 7.
Figure 2
Effects of Communal Goal Endorsement and Prototypicality on Perceived Communal Affordances

Note. Participants rated perceived communal goal affordances on a scale ranging from 1 to 7.
Figure 3
Effects of Communal Goal Endorsement and Prototypicality on Career Positivity

Note. Participants rated career positivity items on scales ranging from 1 to 7.
Figure 4
Effects of Communal Goal Endorsement on Career Positivity, Mediated by Perceived Communal Affordances

Neutral Condition

Communal Goal Endorsement → Perceived Communal Goal Affordances

-0.52 (-0.24)*

Perceived Communal Goal Affordances → Career Positivity

0.38 (0.52)***

Unmediated: -0.39 (-0.25)*
Mediated: -0.19 (-0.12)

Prototypic Condition

Communal Goal Endorsement → Perceived Communal Goal Affordances

0.51 (0.29)*

Perceived Communal Goal Affordances → Career Positivity

0.36 (0.50)***

Unmediated: 0.38 (0.30)**
Mediated: 0.20 (0.16)

Note. Standardized coefficients are provided in parentheses.
* p < .05
** p < .01
*** p < .0001