

Enduring Influence of Stereotypical Computer Science Role Models on Women's Academic Aspirations

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Abstract

The current work examines whether a brief exposure to a computer science role model who fits stereotypes of computer scientists has a lasting influence on women's interest in the field. One-hundred undergraduate women who were not computer science majors met a female or male peer role model who embodied computer science stereotypes in appearance and stated interests or the same role model who did not embody these stereotypes. Participants and role models engaged in an interaction that lasted approximately 2 minutes. Interest in majoring in computer science was assessed following the interaction and 2 weeks later outside the laboratory. Results revealed that exposure to the stereotypical role model had both an immediate and an enduring negative effect on women's interest in computer science. Differences in interest at both times were mediated by women's reduced sense of belonging in computer science upon interacting with the stereotypical role model. Gender of the role model had no effect. Whether a potential role model conveys to women a sense of belonging in the field may matter more in recruiting women into computer science than gender of the role model. Long-term negative effects of exposure to computer scientists who fit current stereotypes in the media and elsewhere may help explain current gender disparities in computer science participation.

Keywords

stereotyped attitudes, STEM, occupational interest, occupational attitudes, role models, nontraditional careers

A number of programs exist to encourage women and girls to enter science, technology, engineering, and mathematics (STEM) fields. For instance, female students at Massachusetts Institute of Technology (MIT) give presentations to middle and high school students through the Women's Initiative program (see MIT, 2011), websites feature biographies of scientists and engineers (e.g., see National Academy of Engineering, 2010), and technology companies run camps at which girls have the opportunity to meet employees (e.g., Microsoft's Digigirlz; Microsoft, 2012). These interventions are based on the assumption that one-time exposure to a role model—someone who is seen as competent and successful in her or his field (Lockwood, 2006; Lockwood & Kunda, 1997)—will improve students' long-term interest in entering that field. However, as part of these efforts, women are often exposed to computer scientists and engineers who fit current stereotypes of those in the field, such as being singularly focused on technology and socially isolated (Margolis & Fisher, 2002; Schott & Selwyn, 2000). For instance, the National Academy of Engineering's (2010) *Engineer Your Life* website targeting high school girls features a female engineer who designs Star Wars video games and started programming as a child (<http://engineeryourlife.org>). In the current study, we examine whether one-time exposure to a role model who fits

computer science stereotypes deters women from computer science for up to two weeks after exposure.

Two characteristics of STEM fields have previously been theorized to be important determinants of women's interest and success in these fields. The first is the extent to which the field transmits current STEM stereotypes. Current stereotypes of the people in computer science include being socially awkward, obsessed with technology, and unskilled at relationships (Margolis & Fisher, 2002; Schott & Selwyn, 2000). Such stereotypes are perceived as incongruent with the female gender role (Cheryan, Plaut, Davies, & Steele, 2009; Diekmann, Brown, Johnston, & Clark, 2010; Nosek, Banaji, & Greenwald, 2002). As a result, they are a short-term deterrent to women's, but not men's, interest in these fields (Cheryan et al., 2009). For instance, women, but not men, who were exposed to a computer science environment containing stereotypical objects (e.g., Star Wars posters, video games)

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expressed lower interest in pursuing computer science than women who were exposed to the same environment with non-stereotypical objects (e.g., art posters, water bottles). Differences in women's interest were mediated by their lower sense of belonging in computer science upon exposure to the stereotypical objects (Cheryan, Meltzoff, & Kim, 2011; Cheryan et al., 2009). Feeling a sense of belonging in an academic field is a powerful predictor of subsequent interest in that field (Gaucher, Friesen, & Kay, 2011; Murphy, Steele, & Gross, 2007; Walton & Cohen, 2007).

Role models can also transmit stereotypes of STEM fields. Television and movies, for example, often depict scientists and engineers in a stereotypical manner (e.g., CBS's television show *The Big Bang Theory* and the movies *Revenge of the Nerds* and *Real Genius*). Exposure to these stereotypes is particularly problematic for women, many of whom do not associate themselves with these stereotypical characteristics (Cheryan et al., 2009; Diekmann, Clark, Johnston, Brown, & Steinberg, 2011) and do not feel similar to those who fit these stereotypes (Cheryan, Siy, Vichayapai, Drury, & Kim, 2011). When women were exposed to a stereotypical computer science role model, they reported lower expected success in computer science immediately after the encounter compared to those who encountered no role model or a nonstereotypical computer science role model, regardless of whether the role model was a woman or a man (Cheryan, Siy, et al., 2011). Encountering a computer science exemplar who fits stereotypes may signal to women that computer scientists generally fit these stereotypes (Smith & Zárate, 1990). Nonstereotypical role models, in contrast, may change stereotypes and encourage women to enter STEM, or may be disregarded because their deviance from computer science stereotypes causes them to be seen as unrepresentative of their field (Fiske & Neuberg, 1990; Wilder, 1981, Kunda & Oleson, 1995).

The second characteristic of STEM fields theorized to increase women's participation and success is the presence of other women. Female role models are known to have beneficial effects for women who are already highly identified with STEM by protecting these women against harmful gender stereotypes about women's abilities (Lockwood, 2006; Marx & Roman, 2002; Stout, Dasgupta, Hunsinger, & McManus, 2011; see also Rios, Stewart, & Winter, 2010). However, beneficial effects of female role models may be less pronounced for women who are not highly identified with STEM because concerns about negative gender stereotypes are less personally relevant to them (Schmader, Johns, & Forbes, 2008; Steele, 1997). Instead, for these women, concerns about whether they will fit in with the people in STEM are a stronger predictor of their interest in entering that field than concerns about negative gender stereotypes (Cheryan & Plaut, 2010). As a result, interventions that are designed to address negative gender stereotypes, such as those that use female role models, may be

less effective in increasing interest among women who are not already identified with STEM. Indeed, large-scale correlational studies have found that female role models are no more effective than male role models in inspiring women and girls to enter STEM fields (Canes & Rosen, 1995; Sonnett, 2009). Experimental work has also found that female computer science role models were no better than male role models at increasing the anticipated success of women who had yet to enter computer science (Cheryan, Siy, et al., 2011). For women who are not highly identified with STEM fields (i.e., those we recruited for the present study), male role models may be just as effective as female role models.

The current study differs from previous work in two ways. First, previous experiments on gender disparities in STEM tested for effects within a single session (Cheryan, Siy, et al., 2011; Diekmann et al., 2011; Lockwood, 2006; Marx & Roman, 2002; Stout et al., 2011). However, students make academic decisions at critical time points (e.g., during course registration) and in locations that are different from where they are exposed to role models, making it crucial to understand whether effects extend beyond immediate exposure. Although many people who have achieved success in computer science do not fit the stereotypes of the field (Borg, 1999), even one exposure to stereotypes could reduce women's interest in computer science for a significant period of time after the encounter.

Second, experimental research on role models has focused on performance and self-concepts (Cheryan, Siy, et al., 2011; Lockwood, 2006; Marx & Roman, 2002) and has yet to measure changes in *interest in entering* STEM fields. Although interest is related to abilities and self-concept (Wigfield & Eccles, 2000), it is a distinct construct that predicts who chooses to pursue STEM fields, even when controlling for STEM abilities (Jacobs, Finken, Griffin, & Wright, 1998). Indeed, women's preferences, and not their abilities, are theorized to be the primary factor contributing to their underrepresentation in STEM (Ceci, Williams, & Barnett, 2009). In the case of computer science, there is no longer a gender gap in quantitative ability on standardized tests prior to entering college (Hyde, Lindberg, Linn, Ellis, & Williams, 2008); yet, women compose less than 15% of first-year undergraduates intending to major in computer science (National Science Foundation, 2012). Understanding the factors that deter women's interest is critical for recruiting more women into this field.

In the study we present here, women engaged in a brief interaction with a computer science stereotypical or nonstereotypical female or male role model. We hypothesized that women's interest in computer science would be compromised by exposure to a stereotypical versus a nonstereotypical computer science role model, regardless of the model's gender and that this difference in interest would endure for up to two weeks beyond the laboratory session. We further predicted these differences in interest would be mediated by women's lower sense of belonging in computer science. We also

included a baseline condition (no role model) to investigate which role model may be driving the effects. In order to focus on recruiting new candidates to computer science, participants were female college students who were not already computer science majors. This work thus joins other interventions that examine how to recruit women into computer science (Cohoon & Aspray, 2006). Many of these women have the quantitative abilities and background to enter computer science (Hyde et al., 2008). However, interest in computer science among this college population remains low, even as other STEM fields (e.g., biology) have achieved gender parity at the undergraduate level. Elucidating the factors that deter college women from computer science is a necessary step toward informing interventions that might entice future recruits.

Method

Participants

A final sample of 100 female undergraduates in the psychology participant pool who were not computer science majors participated. Eleven other participants (six in the nonstereotypical condition; five in the stereotypical condition) were eliminated for misremembering the confederate's major as something other than computer science ($n = 6$) and for suspecting that the confederate was an actor ($n = 5$). Participants most commonly reported intended majors were psychology (20%), biology (19%), and biochemistry (8%), and the majority of the participants were in their first (43%) or second (29%) year of college. Participants' race or ethnicities included White (46%), Asian or Asian American (31%), Latino or Hispanic (4%), Black or African American (1%), other (1%), multiracial (12%), and unreported (5%).

Procedure

Participants were told that the purpose of our study was to examine "how people get to know each other." In line with previous work on role models (Lockwood & Kunda, 1997; Marx & Roman, 2002; Stout et al., 2011), upper-level undergraduates were used as role models so that participants would relate to them. Instances in which upper-level undergraduates are chosen to be role models for other undergraduates include teaching assistants and resident advisors. Six undergraduate confederates (three female and three male) were used as role models. Confederates were all White because whiteness is part of the computer science stereotype (Kendall, 1999; Margolis, Estrella, Goode, Holme, & Nao, 2008).

Participants and role models engaged in a task from Cheryan, Siy, et al. (2011) in which they asked questions of each other, and then these participants completed a questionnaire about their interaction. Participants and confederates were provided with an identical list of questions to ask each other. Questions included first name, year in school, major,

hometown, hobbies, favorite movie, favorite television show, and favorite magazine. Participants were randomly assigned to first either ask or answer questions, and then these roles were reversed. Answers were stated aloud. Confederates' answers to the first four questions were the same across confederates: "Jennifer/David," "junior," "computer science," and "Seattle." Stereotypicality of the role model was manipulated via confederates' stated hobbies (stereotypical: "video games, watching anime, and programming;" nonstereotypical: "playing sports, hanging out with friends, listening to music"), favorite movie (stereotypical: "*Star Wars*;" nonstereotypical: "*American Beauty*"), favorite television show (stereotypical: "*Mystery Science Theater 3000*;" nonstereotypical: "*The Office*"), and favorite magazine (stereotypical: "*Electronic Gaming Monthly*;" nonstereotypical: "*Rolling Stone*"), as well as through their clothing (stereotypical: glasses, a T-shirt that read "I code therefore I am," and sandals with socks; nonstereotypical: solid T-shirt and flip flops). (All answers were pretested for computer science stereotypicality in Cheryan, Siy, et al., 2011). Thus, the topic of computer science was mentioned once when confederates were asked their major and not otherwise discussed. The interaction was complete when both participants and confederates had asked and answered all the questions. Confederates were trained to have identical nonverbal behaviors across the two conditions (confirmed by video coding; see below) and trained to limit other conversation if initiated by participants. Interactions lasted on average 1 minute and 56 seconds (ranged from 1 minute and 11 seconds to 3 minutes and 18 seconds).

After the interaction, confederates and participants were separated, and participants completed a questionnaire in which they recalled their partner's responses (name, major, etc.). Two critical follow-up items asked about their partner's major to measure interest in computer science: "How likely are you to major in that field?" and "How much have you considered majoring in that field?"; lab session including baseline (described below), $r(N = 151) = .67, p < .001$; 2 week, $r(N = 95) = .64, p < .001$. Sense of belonging in computer science was measured by asking how much they felt like they fit in their partner's major. Participants were also asked how well they got along with their partner, how much they liked their partner, and how similar they were to their partner. Questions were rated on 7-point scales with endpoints of 1 (*not at all*) and 7 (*very much*). The study concluded with demographic questions. Two weeks later, participants were e-mailed a link to an online questionnaire with the same questions to complete outside the laboratory. Ninety-five of the 100 participants completed the online questionnaire. Participants were debriefed at the end of the study and were told that their partner was an actor.

Baseline

In order to assess which condition was driving effects, we collected interest in computer science at baseline from a

second sample of 51 female participants from the same population who were not computer science majors.¹ They were brought into the lab to ostensibly complete the same interaction study; however, rather than meeting a confederate, they were told that the partner had failed to appear for the study. Participants proceeded to the questionnaire and drew a slip from a container to determine which major they would evaluate; all slips said “computer science.” Procedures were identical to the main study in all other ways. Collecting baseline data at a different time has been used in previous research (e.g., Cheryan et al., 2009; Master, Markman, & Dweck, 2012), but caution is still warranted when interpreting baseline data.

Video Coding of Confederates' Behaviors

To ensure that confederates' nonverbal behaviors did not differ across the two conditions, three trained coders who were unaware of the hypotheses viewed silent videos of the confederate in each interaction. Coders tallied the number of smiles, nods, and laughs. They also rated the amount of eye contact on a 7-point scale with endpoints 1 (*no eye contact*) and 7 (*a lot of eye contact*). Agreement across coders was satisfactory for the number of times confederates smiled ($\alpha = .88$), nodded ($\alpha = .82$), and laughed ($\alpha = .93$). Agreement was lower for the amount of eye contact ($\alpha = .60$). Coders' responses were averaged for each nonverbal behavior.

Results

Confederates' Nonverbal Behaviors

Video coding revealed that confederates' behaviors—including eye contact and number of smiles, nods, and laughs—did not differ across conditions, $t_s < 1.3$, $p_s > .20$. Stereotypical role models and nonstereotypical role models were equally liked, and participants reported getting along with both role models equally well, $t_s < 1.7$, $p_s > .10$. Confederates were therefore not inadvertently more friendly or encouraging in one condition.

Interest in Computer Science

A 2 (stereotypicality; between subjects) \times 2 (role model gender; between) \times 2 (Time; within) mixed-model analysis of variance (ANOVA) on interest revealed a main effect of stereotypicality, $F(1, 91) = 6.11$, $p = .02$, $d = .50$. Women reported less interest in computer science after interacting with a stereotypical role model ($M = 1.18$, $SD = .43$) than with a nonstereotypical role model ($M = 1.52$, $SD = .85$). A follow-up t -test at Time 1 indicated that stereotypical female role models decreased women's interest in computer science even more than nonstereotypical male role models, $t(53) = 2.84$, $p = .01$, $d = .84$. There was also a main effect of time, $F(1, 91) = 4.98$, $p = .03$, $d = .18$, such that women

expressed less interest at Time 1 ($M = 1.30$, $SD = .62$) than at Time 2 ($M = 1.43$, $SD = .80$).² When times were examined separately, women reported less interest in computer science after interacting with a stereotypical than a nonstereotypical role model at both Time 1 ($M_{\text{ster}} = 1.14$, $SD = .38$ vs. $M_{\text{non}} = 1.44$, $SD = .73$), $F(1, 96) = 6.23$, $p = .01$, $d = .52$, and Time 2 ($M_{\text{ster}} = 1.24$, $SD = .49$ vs. $M_{\text{non}} = 1.59$, $SD = .96$), $F(1, 91) = 4.40$, $p = .04$, $d = .46$. There was no main effect of role model gender, $F(1, 91) < 1$, $p = .70$, and no interactions between any variables, $F_s(1, 91) < 1.7$, $p_s > .20$.

Compared to Baseline

A one-way ANOVA on interest in computer science (collapsed across role model gender because baseline participants did not encounter a role model and because of null effects of role model gender) revealed a significant effect of condition, $F(2, 148) = 6.43$, $p = .002$. Tukey's post hoc comparisons revealed that women in the baseline condition expressed more interest in computer science ($M = 1.74$, $SD = 1.13$) than those who interacted with a stereotypical role model ($M = 1.14$, $SD = .39$), $p = .001$, $d = .71$, and a similar level of interest in computer science as those who interacted with the nonstereotypical role model ($M = 1.44$, $SD = .73$), $p = .17$. These results suggest that encountering a stereotypical role model reduced women's interest in computer science compared to baseline.

Sense of Belonging in Computer Science

A 2 (stereotypicality) \times 2 (role model gender) \times 2 (time) mixed-model ANOVA on sense of belonging revealed a main effect of stereotypicality, $F(1, 91) = 4.64$, $p = .03$, $d = .44$. Women reported a lower sense of belonging in computer science after interacting with a stereotypical role model ($M = 1.60$, $SD = .89$) than with a nonstereotypical role model ($M = 2.10$, $SD = 1.33$). There was also a main effect of time, such that women reported a lower sense of belonging at Time 1 ($M = 1.71$, $SD = 1.08$) than at Time 2 ($M = 2.03$, $SD = 1.27$), $F(1, 91) = 11.51$, $p < .001$, $d = .27$. There was no main effect of role model gender, $F(1, 91) = 1.55$, $p = .22$, and there were no interactions, $F(1, 91)s < 1.13$, $p_s > .29$.

Sense of Belonging as a Mediator

Did the stereotypical role model reduce women's interest by indicating to women that they did not belong in their field? We conducted a mediation analysis, using the Statistical Package for the Social Sciences (SPSS) macro from Preacher and Hayes (2004) with 5,000 bootstrap resamples, to examine whether the relationship between stereotypicality of the role model and interest in computer science at both Time 1 and Time 2 was mediated by sense of belonging. At Time 1, in Steps 1 and 2, interacting with a stereotypical role model decreased women's interest, $b = -.30$, $SE = .12$, $p = .01$, and

sense of belonging in computer science, $b = -.42$, $SE = .21$, $p = .048$, compared to interacting with a nonstereotypical role model. In Steps 3 and 4, sense of belonging predicted interest in computer science upon controlling for stereotypicality, $b = .36$, $SE = .04$, $p < .001$, and stereotypicality was no longer related to interest, $b = -.15$, $SE = .09$, $p = .12$; 95% confidence interval did not include 0 $[-.31, -.01]$. At Time 2, sense of belonging in computer science once again mediated the relationship between role model stereotypicality and interest (Step 1: $b = -.34$, $SE = .16$, $p = .04$; Step 2: $b = -.57$, $SE = .26$, $p = .03$; Step 3: $b = .36$, $SE = .05$, $p < .001$; Step 4: $b = -.14$, $SE = .14$, $p = .31$; 95% confidence interval did not include 0 $[-.44, -.02]$). Interacting with a stereotypical role model decreased women's sense of belonging in computer science compared to interacting with a nonstereotypical role model, and this decrease accounted for women's reduced interest in computer science at both times.

Ruling Out Perceived Similarity as a Mediator

Cheryan, Siy, et al. (2011) demonstrated that perceived similarity to the role model mediated effects on anticipated success. Did the stereotypical role model also reduce women's interest due to a lack of perceived similarity to the role model? To test this possibility with interest in the field, we conducted a 2 (stereotypicality) \times 2 (role model gender) \times 2 (time) mixed-model ANOVA. Consistent with past results, women rated themselves as less similar to the stereotypical ($M = 2.03$, $SD = 1.13$) than the nonstereotypical ($M = 3.42$, $SD = 1.18$) role model, $F(1, 91) = 41.07$, $p < .001$, $d = 1.20$. However, similarity did not significantly mediate the relationship between stereotypicality and interest; the 95% confidence intervals included 0 (Time 1: $[-.18, .15]$; Time 2: $[-.44, .01]$). Whereas similarity to the role model may be important in determining self-concepts (e.g., self-efficacy; Brown, Novick, Lord, & Richards, 1992; Cheryan, Siy, et al., 2011; Mussweiler, 2001, 2003), sense of belonging in a field may be a better predictor of future interest in entering that field (Cheryan et al., 2009; Gaucher et al., 2011).

Discussion

Women who encountered a role model who embodied computer science stereotypes were less interested in majoring in computer science and felt less belonging in the field compared to women who interacted with a nonstereotypical role model or no role model. Women's reduced interest in computer science was mediated by a lower sense of belonging in the field upon interacting with a stereotypical role model. Deleterious effects of exposure to the stereotypical role model lasted up to 2 weeks and extended outside the context in which women encountered the role model. Our findings are particularly notable because interactions were on average less than 2 minutes long. The continued presence of these stereotypes in the media (Steinke et al., 2007) and in

interventions designed to recruit women into STEM fields may contribute to increasing gender disparities in participation in these fields.

Our findings also revealed that female role models were no more effective than male role models in inspiring women and girls to develop an interest in computer science. In fact, nonstereotypical male role models were *more* effective in increasing women's interest than female role models who fit current stereotypes. Female role models may be effective in reducing stereotype threat for women who already strongly identify with their field (Marx & Roman, 2002; Stout et al., 2011) and in improving women's attitudes about their own abilities (Rios et al., 2010), but they may be less important in motivating women to enter these fields (see also Drury, Siy, & Cheryan, 2011). When it comes to recruiting women into computer science, whether a role model projects current stereotypes of the field may be more important than whether that role model is female or male. Role models may be successful if they elicit a sense of belonging, even if they do not share demographic similarity (Ensher, Grant-Vallone, & Marelich, 2002; Ensher & Murphy, 1997).

Nonstereotypical role models did not appear to encourage women to enter computer science or increase women's sense of belonging in the field over baseline (see also Cheryan, Siy, et al., 2011, for similar results). One possible explanation for why nonstereotypical role models did not improve outcomes over baseline could be that nonstereotypical role models were designed to represent the "average" college student and did not share a unique similarity with participants (e.g., same birthday). Sharing a unique similarity may make role model influence more likely to occur (e.g., Brown et al., 1992). A second possibility is that nonstereotypical role models may have been perceived as atypical of the field or unrealistic precisely because they did not fit stereotypes (Betz & Sekaquaptewa, in press; Hoyt & Simon, 2011). As a result, they may have had a limited influence on changing the broader image of computer science (Kunda & Oleson, 1995).

How do we go about changing the image of computer science in light of the fact that exposure to a nonstereotypical role model did not increase women's interest in computer science? Such change may require extended contact with a nonstereotypical exemplar (Wright, Aron, McLaughlin-Volpe, & Ropp, 1997) or exposure to multiple nonstereotypical exemplars (Weber & Crocker, 1983). Using other vehicles of stereotype change, such as creating and exposing women to nonstereotypical computer science environments (Cheryan et al., 2009) and widely disseminating nonstereotypical media representations, may also be effective tools for explicitly changing the image of computer science.

Practice Implications

Our work may be useful to educators, policy makers, and other practitioners for several reasons. First, these findings

demonstrate that interventions that promote current stereotypes of the field, even inadvertently, may be less effective in changing women's and girls' attitudes toward a field than interventions that downplay or alter these stereotypes. One concrete way to downplay these stereotypes is to present an image of male-dominated fields that is more consistent with aspects of the female gender role that women deem important (e.g., ability to work with and help others; Evans & Diekmann, 2009). Second, practitioners who use role models to aid recruitment should pay careful attention to whether these role models convey a sense of belonging to recruits. In our study, we accomplished this goal using the role model's appearance and stated preferences. Other methods could include sharing a unique similarity (e.g., being from the same hometown; Brown et al., 1992) or emphasizing shared values (Ensher et al., 2002). Third, male role models also play an important role in recruiting women into computer science and should consider whether they may be promoting a stereotypical image of the field. Finally, the current prevalence of representations of scientists and engineers who fit current stereotypes in American media may be preventing more women from entering the field of computer science. Consciously changing these representations and disseminating new ones may be necessary to increase the number of women who choose to enter the field. Interventions to alter stereotypes that are developed based on these findings could be used in concert with other changes—such as changing curriculum (Rios et al., 2010) and eliminating negative stereotypes about women's abilities (Campbell & Collaer, 2009; Davies, Spencer, & Steele, 2005; Oswald, 2008)—to recruit more women into male-dominated fields.

Limitations and Future Directions

Future work should examine other possible causes for the effect of stereotypical role models and whether additional mechanisms are involved. For instance, feeling a sense of connection or identification with role models has previously been shown to mediate role model influence (Lockwood & Kunda, 1997; Stout et al., 2011). Women may feel a lower sense of connection or identification with stereotypical role models because these role models embody characteristics that are perceived as incompatible with the female gender role (Diekmann et al., 2011; Evans & Diekmann, 2009). An additional possibility is that women may feel normative pressure not to associate with the stereotypical computer science role model because they may fear being judged negatively by their peers for doing so (Bosson, Prewitt-Freilino, & Taylor, 2005). Future work should examine whether some components of the stereotype (e.g., appearance, certain preferences) may steer women away from computer science more than others and whether a role model's status within a field interacts with her or his gender and stereotypicality to predict recruiting effectiveness (Hoyt & Simon, 2011).

We chose to investigate computer science because its masculine stereotypes and low representation of women are theorized deterrents to women's interest in the field. However, we do not know from the current study whether these findings extend beyond computer science to other STEM fields and to group memberships more broadly. These findings could, for instance, shed light on how to encourage and discourage people from joining certain groups (e.g., smokers; Chassin, Presson, Sherman, Corty, & Olshavsky, 1981; Niedenthal, Cantor, & Kihlstrom, 1985). An additional limitation is that participants were prompted to answer questions about the role model before they were asked for their interest in computer science. Future work should examine whether stereotypical role models serve as deterrents even when role models are not explicitly first called to mind. Finally, sense of belonging was measured using a single item and not directly manipulated. Researchers should continue investigating the role that belonging plays in drawing students into academic fields (e.g., Walton & Cohen, 2007).

Conclusions

Encouraging women to enter computer science is important because it enables the incorporation of women's perspectives into the myriad of contributions that computer science makes to modern society and also provides women access to lucrative and high status careers. Furthermore, computer science departments grant more undergraduate degrees than mathematics and the physical sciences combined and thus have the potential to attract many more women into STEM fields (National Science Foundation, 2009). The enduring effect of single brief exposures to stereotypical role models makes it important to consider how we choose to represent STEM fields to prospective students. Our findings highlight that it is not simply the gender of a role model that matters in recruiting women into computer science, but whether a potential role model conveys to women a sense of belonging in the field.

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Notes

1. Of the 51 baseline participants, 27 were run independently and 24 were included from the baseline condition of Cheryan, Siy, et al. (2011). Baseline procedures were the same across studies.
2. Women's increased interest in computer science outside the laboratory was not predicted but may have occurred for a number

of reasons. First, completing Time 2 measures online instead of on paper may have primed women to express an interest in computer science. Second, the online nature of the questionnaire may have made women feel more anonymous and comfortable reporting interest in a masculine field. Third, answering questions about their interest in computer science at Time 1 may have been an intervention of sorts that caused women to consider computer science. Finally, the effect of stereotypicality on interest appeared to decay somewhat (but not significantly) from Time 1 ($M = 1.12$, $SD = .37$) to Time 2 ($M = 1.24$, $SD = .56$), contributing to the increase in overall interest at Time 2.

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