

Article

# Communicating Gender-Equality Progress, Reduces Social Identity Threats for Women Considering a Research Career

Una Tellhed \*  and Anna Jansson

Department of Psychology, Lund University, 22101 Lund, Sweden; psy.anna.jansson@gmail.com

\* Correspondence: una.tellhed@psy.lu.se; Tel.: +46-46-222-8687

Received: 13 December 2017; Accepted: 18 January 2018; Published: 26 January 2018

**Abstract:** Since the majority of top-level researchers are men, how does this vertical gender-segregation affect students' perceptions of a research career? In the current study, an experimental manipulation either reminded students of academia's current dominance of men or of its improving gender-balance. The results showed that women primed with the dominance of men anticipated much higher social identity threats (e.g., fear of discrimination) in a future research career as compared to a control group. In contrast, women primed with the improving gender-balance anticipated much lower threat. Further, the dominance of men prime increased men's interest in the PhD program, as compared to controls. Women's interest was unaffected by the prime, but their lower interest as compared to men's across conditions was mediated by their lower research self-efficacy (i.e., competence beliefs). The results imply that communicating gender-equality progress may allow women to consider a career in research without the barrier of social identity threat.

**Keywords:** gender segregation; social identity threat; career interest; self-efficacy; academia

---

## 1. Introduction

Every year on 10 December, the Nobel Prize is awarded to the world's most excellent researchers. Watching the ceremony is a reminder of the vertical gender segregation in academia, defined as an uneven hierarchical gender distribution, since 95% of the Nobel Laureates thus far have been men ([Nobel Media AB 2017](#)). Even in countries where women dominate higher education, top-level researchers are predominately men ([European Commission 2016](#); [Shen 2013](#); [Sugimoto et al. 2013](#); [Universitetskanslerämbetet \(Universitetskanslerämbetet UKÄ\)](#)).

How does being reminded of the vertical gender segregation in academia affect students' perceptions of a potential future research career? In this study, we experimentally test how framing its gender balance as currently dominated by men, versus becoming more gender-equal, affects students' anticipated social identity threats and career control, as well as their level of self-efficacy and interest in a future research career. It is important to understand how the vertical gender-segregation in academia affects students' perceptions of an academic career in order to identify ways to lift barriers that may keep women from reaching their full career potential in research.

The data for the current study is collected in Sweden, the country that awards the Nobel Prize. Although known as one of the most gender equal countries in the world ([World Economic Forum 2017](#)), 73% of the full professors in Sweden are men ([Universitetskanslerämbetet UKÄ](#)).

### 1.1. Social Identity Threats and Identity Safety

According to social identity theory ([Tajfel and Turner 1979](#)), people desire to view their social identities, like their gender, positively. Therefore, if an environmental cue suggests that an individual's social identity is negatively valued in a domain, it can cause social identity

threat, including stereotype threat, where vigilance is raised and performance may suffer (see (Inzlicht and Schmader 2012; Major and O'Brien 2005; Spencer et al. 2016), for reviews). Social identity threat includes the fear of becoming negatively stereotyped and discriminated in a domain (Cheryan and Plaut 2010; Murphy et al. 2007; Petriglieri 2011; Steele et al. 2002) and may diminish a person's sense of control (Chithambo et al. 2014; Fischer and Bolton Holz 2010). Previous research has shown that contexts dominated by men can trigger social identity threat in women (Inzlicht and Ben-Zeev 2000; Major and O'Brien 2005; Murphy et al. 2007; Sekaquaptewa et al. 2007; Steele et al. 2002). In the current study, we expand this research by testing the hypothesis that reminding students that most top-level researchers are men increases women's anticipated social identity threat and reduces their sense of control over an imagined future research career.

Previous research has shown that social identity threat can be lifted by creating an identity safe environment, where individuals in numerical minority, or in a stigmatized group, are assured they are welcome, supported and valued (e.g., Davies et al. 2005; Holmes et al. 2016; Petriglieri 2011). In this study we test the novel hypothesis that simply reminding students that academia is becoming more vertically gender-balanced, can function as an identity safety prime. We hypothesize that it reduces the level of social identity threat that women may otherwise anticipate in a future research career. If this simple technique is empirically supported, it may have practical value in helping individuals pursue their occupational goals without the barrier that social identity threat may create.

### 1.2. Interest and Self-Efficacy

Social identity threat tends to be unrelated to interests in a domain (e.g., Cheryan and Plaut 2010). However, repeated exposure to social identity threat can push people to withdraw from a career path, despite interest in it (Thoman et al. 2013; Woodcock et al. 2012). In a study of gender minorities in higher education, Steele et al. (2002) found that women in majors dominated by men experienced higher levels of social identity threats than other students and were more likely to think about changing their major as compared to others. Relatedly, Gibney et al. (2011) found that when employees perceive that their organization obstructs their goal fulfilment, they tend to disidentify with the organization.

Although not related to social identity threats, it is well-established that men and women tend to have different career interests and choose different types of careers (e.g., Cejka and Eagly 1999; Su et al. 2009; Tellhed et al. 2017, 2018). These gender differences have multiple antecedents and are shaped in a lengthy socialization process (Eccles 1994). However, in the current study, we aim to test if simply varying the way academia's gender-skewness is presented, which may affect students' interest in a future research career. We have only found one previous study with a similar design. In that study, Heilman (1979) found that women's interest in an occupation increased and men's interest decreased when it was described as soon becoming horizontally gender-balanced (i.e., with equal numbers of men and women, disregarding hierarchical gender differences). We expand this previous study by priming vertical gender segregation and by the focus on academia. Since people tend to be more interested in careers that are dominated by their gender ingroup than their gender outgroup, we hypothesize that being reminded that most successful researchers are men increases men's and decreases women's interest in the PhD program as compared to a control group. It is less clear how an improving gender-balance prime relates to gender differences in career interest. Although Heilman (1979) found that it decreases men's interest, more recent research in Sweden and in the US has shown that gender-balanced career paths tend to be perceived as highly attractive by both men and women (Diekmann et al. 2010; Tellhed et al. 2018). In the current study, we therefore exploratory test the effect of the improving gender-balance prime on men's and women's interest in the PhD program.

Further, previous research has found that women's lower interest in occupations that are horizontally dominated by men, which tends to be statistically mediated by women's lower self-efficacy, defined as doubts that one has the right competence to succeed in a domain (e.g., Bandura 1977; Betz and Hackett 1981; Hackett 1995; Lent et al. 1994; Tellhed et al. 2017, 2018). We will replicate this research by testing if a gender difference in interest in the PhD program is

statistically mediated by a gender difference in the belief that one has what it takes to succeed in research.

Lastly, even if women have lower research self-efficacy than men, we predict that Swedish students will reject a stereotype that men have a greater aptitude for research than women. Meta-analyses tend to find only small psychological gender differences (Hyde 2014). Also, Sweden is a country with a strong gender equality ideology (SOU 2014; Wahl 1992), and statements that one sex is better than the other is generally frowned upon. However, previous research has shown that it is sufficient to simply be aware that a negative stereotype exists, for stereotyped group members to subsequently suffer from stereotype threat, which may disrupt their individual performance assessments (Steele 1997; Tellhed and Adolfsson 2017).

### 1.3. Summary of the Design and Hypotheses

To summarize, we will experimentally manipulate information to Swedish university students regarding the vertical gender-segregation in academia, and compare the outcomes of two manipulations with a control group. In the experimental conditions, the students will either be reminded of the current vertical dominance of men in academia or be reminded that the vertical gender-balance in academia is improving.

The main hypotheses are

**Hypothesis 1.** (1a) *Women who are reminded of the current vertical gender segregation in academia anticipate stronger social identity threats in a future research career as compared to a control group and as compared to (1b) women who are reminded of the improving gender-balance in academia.*

**Hypothesis 2.** (2a) *Men who are reminded of the current vertical gender segregation in academia have higher interest in the PhD program, while (2b) women exposed to this prime have lower interest in the PhD program as compared to controls.*

**Hypothesis 3.** *A gender difference in interest in the PhD program is mediated by a gender-difference in research self-efficacy.*

## 2. Method

### 2.1. Participants

One hundred and ninety Social Science students at a large University in Sweden volunteered to participate in the study. Recruitment occurred in class, where a male research assistant asked for volunteers. Coding of the Hypothesis inquiry measure (see below) indicated that four participants guessed the main hypotheses of the experiment and were therefore excluded from further analyses, which left 93 men and 93 women. The mean age was 24.70 ( $SD = 5.48$ ).

### 2.2. Materials

All materials are here translated from Swedish to English, by the researchers.

The experimental manipulation consisted of written facts regarding the vertical gender-segregation in the Swedish academia. For ethical considerations, only well-known facts were chosen. The two experimental groups read that the purpose of the study is to learn more about men's and women's interest in a future academic career. The participants in the current vertical gender-segregation condition further read that academia is currently strongly gender-skewed. This initial information was followed by four points of facts illustrating the vertical dominance of men. The facts read, "Over 70% of all full professors in Sweden are men, although women make up the majority of university students," "The majority of Swedish government funding is still awarded to

researchers who are men," "Today, men are still more likely than women to become full professors," and "95% of the Nobel Prize Laureates have been men."

The participants in the improving gender-balance condition read that academia is becoming more vertically gender-balanced, followed by four points of facts illustrating this. The facts read, "The gender-balance is currently equal amongst PhD students," "The number of university lecturers and full professors who are women is increasing," "Equal numbers of men and women currently earn a PhD in Sweden," and "Many of the top-level researchers at this university are currently women." The control group simply read that "This study's purpose is to learn more about students' interest in a future academic career," and did not read any facts about the gender-skewness in academia.

The level of anticipated of social identity threat was measured by two items, similar to the one's used by [Steele et al. \(2002\)](#). They read, "How likely do you think it is that you will be judged by negative gender stereotypes, if you choose to work as a researcher in the future?" and "How likely do you think it is that you will be discriminated (treated unfairly) because of your gender if you choose to work as a researcher in the future?." The responses were indicated on a scale ranging from "Not at all" (1) to "Very" (7).  $\alpha$  was 0.87.

Anticipated career control was measured by the item "A successful research career is largely dependent on factors outside of the researcher's control." The scale ranged from "Not correct at all" (1) to "Precisely correct" (7).

The participants' interest in a future research career was measured by the item "How interested are you in applying to the PhD program?" Responses ranged from "Not at all interested" (1) to "Very interested" (7).

The measure of research self-efficacy was based on Betz and Hackett's (1981) career self-efficacy measure, with the adaptation to a Likert scale ([Maurer and Pierce 1998](#)). The participants were asked to indicate their level of certainty that they have what it takes to "complete the PhD program (and earn a PhD)" and to "work as a researcher" on a scale ranging from "Not certain at all" (1) to "Completely certain" (7).  $\alpha$  was 0.92.

The research stereotype accuracy measure read "Do you believe that either men or women are better suited to work as researchers"? Responses were indicated on a scale ranging from 1–7, where 1 indicated the response "Women are better suited," 4 indicated "There is no gender difference," and 7 indicated "Men are better suited."

To check the effectiveness of the experimental manipulation, the participants were asked to indicate if they primarily think of men or women, when they hear the word "researcher." Responses were given on a scale ranging from "Primarily women" (1) to "Primarily men" (7).

Last in the survey, the participants were asked to describe what they believed the hypotheses of the study were.

### 2.3. Procedure

The survey was distributed by a male research assistant to the participants in their lecture hall during a break between lectures. Before handing out the survey, he explained that the purpose was to investigate students' interest in an academic career. To comply with the ethical guidelines for research on humans, he also informed the students that participation is voluntary, that the data is treated anonymously, and that they may withdraw from participation at any time without consequences. They were asked to fill out the questionnaire individually and not look at each other's answers.

The experimental manipulation text was printed on page 2 of the questionnaire, and the three versions of the survey had been randomized prior to the data collection so that the participants were randomly assigned to either one of the two experimental conditions or the control group. The measures that explicitly mentioned gender were placed last in the questionnaire as to not prime the control group with the category gender. When the participants had completed the survey, everyone was fully debriefed regarding the experimental manipulation and the study's hypotheses and all questions were

answered. No one communicated any discomfort regarding the study's manipulation or other aspects of the study.

### 3. Results

For the descriptive statistics of means and standard deviations, see Table 1. Assumption testing and outlier screening was conducted on all variables, with no serious violations detected.

**Table 1.** Descriptive statistics for all variables separated by participant gender and the experimental conditions.

	Men Male-Dominance Prime		Women Male-Dominance Prime		Men Control Group		Women Control Group		Men Gender-Equality Prime		Women Gender-Equality Prime	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Social identity threat	2.11	1.17	4.38	1.53	2.02	0.95	3.44	1.54	2.11	1.19	2.90	1.55
Career control	3.87	1.46	4.37	1.47	3.50	1.38	3.28	1.22	3.94	1.22	3.13	1.20
Interest	4.23	2.06	3.13	1.80	2.70	1.62	2.87	1.66	3.75	1.85	2.68	1.74
Self-efficacy	4.63	1.81	4.03	1.62	4.32	1.60	3.72	1.81	4.73	1.37	3.79	1.79
Gender stereotype	4.03	0.32	3.97	0.18	4.03	0.41	4.09	0.39	4.00	0.00	3.97	0.48
Manipulation check	5.39	1.17	5.13	1.14	4.70	1.06	5.12	0.91	4.88	0.87	4.61	1.05

#### 3.1. Manipulation Check

A two-way between groups ANOVA found a small significant main effect of the experimental manipulation on the manipulation check,  $F(2, 180) = 3.98, p = 0.02, \eta_p^2 = 0.04$ . Post-hoc comparisons using the Tukey HSD test indicated that the participants in the current vertical gender-segregation condition associated researchers significantly stronger with men as compared to the improving gender-balance group,  $p = 0.02$ . No other effects were significant.

#### 3.2. Social Identity Threat (Hypothesis 1)

A two-way between-groups ANOVA showed a large main effect of participant gender,  $F(1, 180) = 57.37, p < 0.01, \eta_p^2 = 0.24$ , a small main effect of the experimental manipulation,  $F(2, 180) = 4.95, p < 0.01, \eta_p^2 = 0.05$ , and a small interaction effect,  $F(2, 180) = 4.69, p < 0.01, \eta_p^2 = 0.05$ , on social identity threat. One-way ANOVAs, separate for the genders, showed that only the women were affected by the experimental manipulation, and the effect size was large,  $F(2, 90) = 7.17, p < 0.01, \eta^2 = 0.14$ . Post-hoc comparisons, using the Tukey HSD test, indicated that the women in the current vertical gender segregation condition anticipated significantly greater social identity threat in a future research career, both as compared to the control group,  $p = 0.05$ , and to the improving gender-balance condition,  $p < 0.01$ , where the anticipated threat was the lowest. This supported Hypothesis 1a and 1b.

Replicating previous research (e.g., Chithambo et al. 2014) a regression analysis further showed that social identity threat predicted perceived career control,  $B = 0.22, \beta = 0.26, p < 0.01, F(1, 185) = 12.84, p < 0.01$ . A two-way between groups ANOVA showed a small effect of the experimental manipulation on perceived career control,  $F(2, 180) = 5.18, p < 0.01, \eta_p^2 = 0.05$ , no main effect of participant gender,  $F < 1$ , and a small interaction effect,  $F(2, 180) = 3.74, p = 0.03, \eta_p^2 = 0.04$ . Follow up analysis showed that only the women's beliefs were affected by the experimental manipulation, and the effect size was large,  $F(2, 90) = 8.16, p < 0.01, \eta^2 = 0.15$ . The women who were primed with the current vertical gender segregation attributed academic success more strongly to factors outside individual control as compared with the women in the control group,  $p < 0.01$  and the women in the improving gender-balance condition,  $p < 0.01$ .

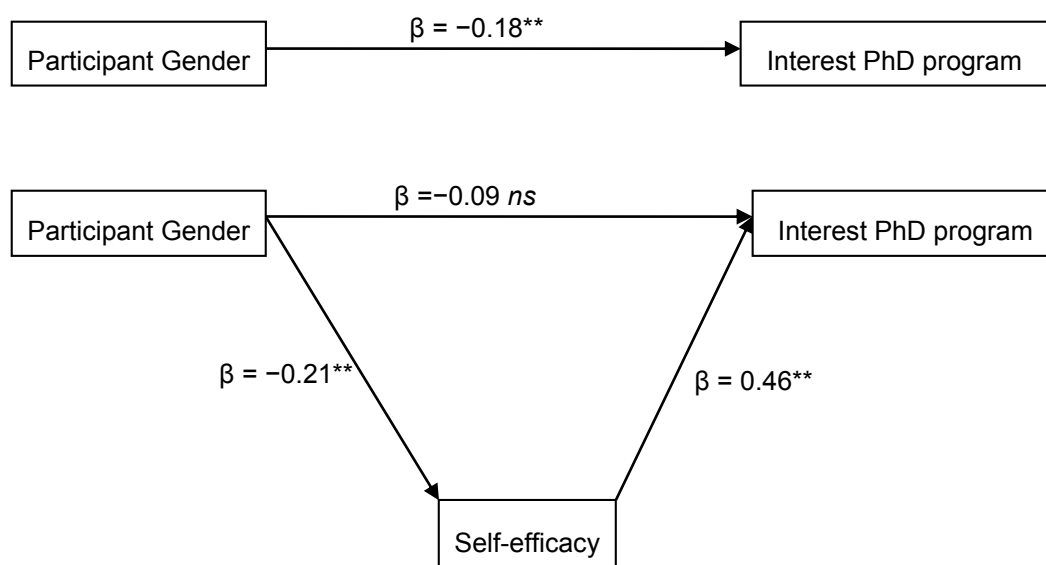
#### 3.3. Interest (Hypothesis 2)

A two-way between-groups ANOVA showed a main effect of participant gender,  $F(1, 180) = 6.35, p = 0.01, \eta_p^2 = 0.03$ , a main effect of the experimental condition,  $F(2, 180) = 3.80, p = 0.02, \eta_p^2 = 0.04$ , and a marginally statistically significant interaction effect,  $F(2, 180) = 2.54, p = 0.08, \eta_p^2 = 0.03$ , on

interest in the PhD program. One-way ANOVAs showed that men's interest was dependent on the experimental manipulation,  $F(2, 90) = 5.39, p < 0.01, \eta^2 = 0.11$ , and the effect size was moderate. Post-hoc comparisons, using the Tukey HSD test indicated that the men who were reminded of the current vertical gender segregation in academia were significantly more interested in the PhD program as compared to the men in the control group,  $p < 0.01$ , which supported Hypothesis 2a. Men's interest was also marginally significantly higher in the improving gender balance condition as compared to controls,  $p = 0.07$ . However, the women's interest in post graduate school was unaffected by the experimental manipulation,  $F < 1$ , which contrasted Hypotheses 2b.

### 3.4. Mediation Test (Hypothesis 3)

We next conducted a mediation analysis to test if the gender difference in interest was mediated by a gender difference in research self-efficacy. A series of multiple regressions first showed that participant gender predicted interest,  $B = -0.68, \beta = -0.18, p = 0.01, R^2 = 0.03, F(1, 185) = 6.34, p = 0.01$ , and self-efficacy,  $B = -0.72, \beta = -0.21, p < 0.01, R^2 = 0.05, F(1, 185) = 8.71, p < 0.01$ , and that self-efficacy predicted interest,  $B = 0.50, \beta = 0.46, p < 0.01, R^2 = 0.21, F(1, 185) = 49.22, p < 0.01$ . When interest was regressed on both participant gender and self-efficacy, self-efficacy was a significant predictor of interest,  $B = 0.48, \beta = 0.44, p < 0.01$ , but participant gender was not,  $B = -0.33, \beta = -0.09, p = 0.19, R^2 = 0.22, F(1, 185) = 25.59, p < 0.01$ . Significance testing of the mediation effect (using the modification of Sobel (1982) test by Baron and Kenny (1986)), showed that self-efficacy significantly mediated the gender difference in interest in the PhD program,  $z = -2.67, p < 0.01$ , which supported Hypothesis 3. See Figure 1.



**Figure 1.** Self-efficacy significantly mediated the overall gender difference in interest in the PhD program, \*  $p < 0.05$ , \*\*  $p < 0.01$ .

Lastly, exploratory ANOVAs showed no effect of the experimental manipulation on research self-efficacy nor an interaction effect (manipulation  $\times$  gender),  $F:s < 1$ . There were no significant main effect or interaction effect on the research stereotype accuracy measure,  $F:s < 1$ . A one sample  $t$ -test showed that the overall mean for this last measure,  $M = 4.02, SD = 0.34$ , did not significantly differ from the scale's midpoint (4), which was indicative of "No gender difference,"  $t < 1$ . Thus, the participants did not appear to believe in a gender difference in research ability.



## 4. Discussion

### 4.1. Social Identity Threat and Career Control

The results of this study expand previous research by demonstrating that reminding students of the well-known fact that most top-level researchers are men has a large effect on women's social identity threats. As compared to a control group, the women primed with the current vertical gender-segregation in academia were much more worried about becoming negatively stereotyped and discriminated by gender if they would pursue a career in research. Like others have found, the level of social identity threat was related to reductions in expectations of career control (Chithambo et al. 2014; Fischer and Bolton Holz 2010), and the women primed with the dominance of men were much more likely to believe that a researcher's career success is out of his/her control as compared to a control group. The men anticipated much lower threats than the women, and their level of threat and perceived career control were unaffected by the experimental priming.

It is worrying that academia's vertical gender segregation appears to threaten women contemplating a career in research. Few students, especially those interested in pursuing a research career, are likely to miss the fact that men dominate top-level research. Social identity threat is a stressor that no students should have to endure, and much previous research has demonstrated its many negative effects on for example performance expectations, motivation, and health (see (Inzlicht and Schmader 2012; Pascoe and Smart Richman 2009; Schmitt et al. 2014; Spencer et al. 2016); and reviews).

It is therefore promising that our results demonstrate that women's anticipated social identity threat was largely reduced and their sense of career control largely increased when they were informed that the gender-balance in academia is improving. It thus appears that simply informing students that increasing number of women now become top-level researchers may largely lower women's fear of becoming negatively stereotyped and discriminated in a research career. This novel finding shows the power in communicating gender-equality progress and could have important implications for those invested in reducing the vertical gender segregation in academia.

Importantly, while teachers and academic leaders may want to clearly communicate any gender-equality progress to their students, they should also pay attention to the actual developments regarding gender-equality. Recently, the EU reported that gender-equality development is halting in some respects and even declining in some European countries (European institute for gender equality (European Institute for Gender Equality EIGE)). Also, many Swedish women have recently reported about widespread sexual harassment and sexism in academia in connection to the hashtag #MeToo (#Akademiupproret Academic Uproar). We cannot assume that the vertical gender segregation and its associated threats for women in academia will dissipate, without further reforms.

### 4.2. Interest and Self-Efficacy

The results further expanded previous research by demonstrating that priming men with facts about the vertical gender segregation in academia, substantially increased their interest in applying to the PhD program, as compared to a control group. This was expected, since men and women tend to be more interested in career-paths which are dominated by their gender ingroup (e.g., Su et al. 2009), although the direct effect of an experimental gender-balance prime has rarely been empirically tested (but see (Heilman 1979)). Also, being reminded of the improving gender-balance in academia marginally increased men's level of interest as compared to controls. Interestingly, the direction of this effect was opposite to Heilman's result (1979), who in contrast found that such a prime lowered men's career interest. This may perhaps indicate a change in young men's attitude toward working in gender-balanced careers since 1979. This conclusion corresponds with recent research, which indicates that gender-balanced career paths are typically perceived as highly attractive to both men and women (Diekmann et al. 2010; Tellhed et al. 2018).

Contrary to our hypothesis, reminding women of the vertical dominance of men in academia did not lower their interest in the PhD program as compared to controls. Instead, their interest was slightly lower than men's across conditions and was statistically mediated by women's slightly lower self-efficacy or confidence that they have what it takes to succeed in research, which was also unaffected by the experimental prime. This mediation result replicated much previous research, which has shown that gender differences in self-efficacy explain women's lower interest in careers that are dominated by men (e.g., [Hackett 1995](#); [Tellhed et al. 2018](#)). The result implies that to improve women's interest in a research career, women's research self-efficacy needs to be strengthened. In Sweden women generally perform better academically than men and earn the majority of academic degrees ([Universitetskanslerämbetet UKÄ](#)), which suggests that many women have an excellent aptitude for research. Future research may want to test if combining an improving gender-balance prime with individual aptitude feedback may work to reduce both women's social identity threat and increase their self-efficacy. The group average on the research stereotype accuracy measure indicated a strong agreement among the participants that there is no gender difference in research aptitude. But, as stereotype threat research has shown, a belief in stereotype accuracy is not necessary for numerical minorities to be negatively affected by negative ingroup stereotypes ([Inzlicht and Schmader 2012](#); [Spencer et al. 2016](#)). Therefore, it is important to also combat negative stereotypes concerning women's competence.

## 5. Limitations

The research assistant who collected the data was male, which may have strengthened the impact of the vertical gender segregation prime for the participants. A suggestion for future replications is to vary the gender of the experimenter in order to explore if this affects the strength of the prime. Previous studies suggest that it may ([Marx and Goff 2005](#); [Stout et al. 2011](#)).

Another limitation is the use of convenience sampling and that all participants were Social Science students, a field that is horizontally dominated by women (although vertically dominated by men). Future studies may want to test if the effect of the vertical gender-segregation prime is even stronger in STEM-fields, which are horizontally dominated by men. It could also be relevant to measure the participants' current experience of gender-related social identity threat. People who have previously experienced social identity threat tend to have increased vigilance for future threat and may therefore be more strongly affected by vertical gender segregation cues ([Major and O'Brien 2005](#)).

One may also want to replicate the current study in countries that are rated lower on gender equality as compared to Sweden ([European Institute for Gender Equality EIGE](#); World Economic Forum), since the increasing gender-balance prime may have a different effect in countries where progress toward gender equality has been slower. However, the vertical gender segregation in Sweden's labor market is strong, even in international comparisons ([European Commission 2009, 2014](#); [Sugimoto et al. 2013](#)).

It could also be relevant to replicate the design using indirect measures that are less sensitive to social desirability concerns (see [Lane et al. 2012](#)). For instance, it is possible that the participants' would associate research aptitude more with men than with women on an implicit measure though explicitly rejecting such gender stereotypes. We also encourage measuring explicit associations of researchers with men versus with women separately, as opposed to the combined approach in this study, to aid interpretations.

Finally, future research may also want to include an organizational identification measure, since it tends to be reduced by perceived organizational obstructions ([Gibney et al. 2011](#)). Perhaps women who are reminded of the vertical gender segregation in academia identify less with their university, while a gender-equality prime increases identification.



## 6. Conclusions

To conclude, the results from this study suggest that the current vertical gender-segregation in academia has different effects for men and women respectively. For students who are men, this insight may raise their interest in pursuing a research career, while it makes students who are women fear discrimination and a loss of control should they pursue an academic career. This gloomy outlook for women is, however, brightened by the result that simply informing students that the gender balance is improving in academia reduces the threat women perceive and strengthen their sense of career control. Further, since women's lower interest in the PhD program as compared to men's was mediated by women's lower research self-efficacy, it implies a need to strengthen women's competence beliefs and make them see their full potential. By reminding talented women of the improving gender balance in academia, and assuring them that they have what it takes to do research, hopefully, more women will fantasize about their future great scientific discoveries rather than imagining a hostile academia when they hear about the Nobel Prize Laureates.

**Author Contributions:** Una Tellhed (U.T.) conceived and designed the experiment; we thank Puria Farhang for collecting the data; Una Tellhed and Anna Jansson (A.J.) analyzed the data; U.T. and A.J. wrote the paper.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

- #Akademiupproret (Academic Uproar). 2017. Visste inte om jag skulle dö—Sen våldtog han mig [Didn't Know If I Would Die—Then He Raped Me]. *Svenska Dagbladet*. November 24. Available online: <https://www.svd.se/visste-inte-om-jag-skulle-do--sen-valdtog-han-mig> (accessed on 10 December 2017).
- Bandura, Albert. 1977. Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review* 84: 191–215. [CrossRef] [PubMed]
- Baron, Reuben M., and David A. Kenny. 1986. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology* 51: 1173–82. [CrossRef] [PubMed]
- Betz, Nancy E., and Gail Hackett. 1981. The relationship of career-related self-efficacy expectations to perceived career options in college women and men. *Journal of Counseling Psychology* 28: 399–410. [CrossRef]
- Cejka, Mary A., and Alice H. Eagly. 1999. Gender-stereotypic images of occupations correspond to the sex segregation of employment. *Personality and Social Psychology Bulletin* 25: 413–23. [CrossRef]
- Cheryan, Sapna, and Victoria C. Plaut. 2010. Explaining underrepresentation: A theory of precluded interest. *Sex Roles* 63: 475–88. [CrossRef] [PubMed]
- Chithambo, Taona P., Stanley J. Huey Jr., and Yolanda Cespedes-Knadle. 2014. Perceived discrimination and Latino youth adjustment: Examining the role of relinquished control and sociocultural influences. *Journal of Latina/o Psychology* 2: 54–66. [CrossRef]
- Davies, Paul G., Steven J. Spencer, and Claude M. Steele. 2005. Clearing the air: Identity safety moderates the effects of stereotype threat on women's leadership aspirations. *Journal of Personality and Social Psychology* 88: 276–87. [CrossRef] [PubMed]
- Diekman, Amanda B., Elisabeth R. Brown, Amanda M. Johnston, and Emily K. Clark. 2010. Seeking congruity between goals and roles: A new look at why women opt out of science, technology, engineering, and mathematics careers. *Psychological Science* 21: 1051–57. [CrossRef] [PubMed]
- Eccles, Jacquelynne S. 1994. Understanding women's educational and occupational choices: Applying the Eccles et al. model of achievement-related choices. *Psychology of Women Quarterly* 18: 585–609. [CrossRef]
- European Institute for Gender Equality (EIGE). 2017. Gender Equality Index 2017. Measuring Gender Equality in the European Union 2005–2015. Available online: <http://eige.europa.eu/rdc/eige-publications/gender-equality-index-2017-measuring-gender-equality-european-union-2005-2015-report> (accessed on 10 December 2017).
- European Commission. 2009. *Gender Segregation in the Labour Market: Root Causes, Implications and Policy Responses in the EU*. Luxembourg: Publications Office of the European Union, Available online: <http://ec.europa.eu/social/main.jsp?catId=738&langId=sv&pubId=364&furtherPubs=yes> (accessed on 10 December 2017).

- European Commission. 2014. *A New Method to Understand Occupational Gender Segregation in European Labour Markets*. Luxembourg: Publications Office of the European Union, Available online: [http://ec.europa.eu/justice/gender-equality/files/documents/150119\\_segregation\\_report\\_web\\_en.pdf](http://ec.europa.eu/justice/gender-equality/files/documents/150119_segregation_report_web_en.pdf) (accessed on 10 December 2017).
- European Commission. 2016. *She Figures 2015: Gender in Research and Innovation*. Luxembourg: Publications Office of the European Union, Available online: [https://ec.europa.eu/research/swafs/pdf/pub\\_gender\\_equality/she\\_figures\\_2015-final.pdf](https://ec.europa.eu/research/swafs/pdf/pub_gender_equality/she_figures_2015-final.pdf) (accessed on 10 December 2017).
- Fischer, Ann R., and Kenna Bolton Holz. 2010. Testing a model of women's personal sense of justice, control, well-being, and distress in the context of sexist discrimination. *Psychology of Women Quarterly* 34: 297–310. [CrossRef]
- Gibney, Ray, Thomas J. Zagenczyk, Bryan J. Fuller, Kim Hester, and Turanay Caner. 2011. Exploring organizational obstruction and the expanded model of organizational identification. *Journal of Applied Social Psychology* 41: 1083–109. [CrossRef]
- Hackett, Gail. 1995. Self-efficacy in career choice and development. In *Self-Efficacy in Changing Societies*. Edited by Albert Bandura. New York: Cambridge University Press, pp. 232–58.
- Heilman, Madeline E. 1979. High school students' occupational interest as a function of projected sex ratios in male-dominated occupations. *Journal of Applied Psychology* 64: 275–79. [CrossRef]
- Holmes, Oscar, IV, Marilyn V. Whitman, Kim S. Campbell, and Diane E. Johnson. 2016. Exploring the social identity threat response framework. *Equality, Diversity and Inclusion: An International Journal* 35: 205–20. [CrossRef]
- Hyde, Jane Shibley. 2014. Gender similarities and differences. *Annual Review of Psychology* 65: 373–98. [CrossRef] [PubMed]
- Inzlicht, Michael, and Talia Ben-Zeev. 2000. A threatening intellectual environment: Why females are susceptible to experiencing problem-solving deficits in the presence of males. *Psychological Science* 11: 365–71. [CrossRef] [PubMed]
- Inzlicht, Michael, and Toni Schmader. 2012. *Stereotype Threat: Theory, Process, and Application*. New York: Oxford University Press.
- Lane, Kristin A., Jin X. Goh, and Erin Driver-Linn. 2012. Implicit science stereotypes mediate the relationship between gender and academic participation. *Sex Roles* 66: 220–34. [CrossRef]
- Lent, Robert W., Steven D. Brown, and Gail Hackett. 1994. Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior* 45: 79–122. [CrossRef]
- Major, B., and L. T. O'Brien. 2005. The social psychology of stigma. *Annual Review of Psychology* 56: 393–421. [CrossRef] [PubMed]
- Marx, David M., and Phillip A. Goff. 2005. Clearing the air: The effect of experimenter race on target's test performance and subjective experience. *British Journal of Social Psychology* 44: 645–57. [CrossRef] [PubMed]
- Maurer, Todd J., and Heather R. Pierce. 1998. A comparison of Likert scale and traditional measures of self-efficacy. *Journal of Applied Psychology* 83: 324–29. [CrossRef]
- Murphy, Mary C., Claude M. Steele, and James J. Gross. 2007. Signaling threat: How situational cues affect women in math, science, and engineering settings. *Psychological Science* 18: 879–85. [CrossRef] [PubMed]
- Nobel Media AB. 2017. Nobel Prize Awarded Women. Available online: [https://www.nobelprize.org/nobel\\_prizes/lists/women.html](https://www.nobelprize.org/nobel_prizes/lists/women.html) (accessed on 12 December 2017).
- Pascoe, E. A., and L. Smart Richman. 2009. Perceived discrimination and health: A meta-analytic review. *Psychological Bulletin* 135: 531–54. [CrossRef] [PubMed]
- Petriglieri, Jennifer L. 2011. Under threat: Responses to the consequences of threats to individuals' identities. *Academy of Management Review* 36: 641–62. [CrossRef]
- Schmitt, Michael T., Nyla R. Branscombe, Tom Postmes, and Amber Garcia. 2014. The consequences of perceived discrimination for psychological well-being: A meta-analytic review. *Psychological Bulletin* 140: 921–48. [CrossRef] [PubMed]
- Sekaquaptewa, Denise, Andrew Waldman, and Mischa Thompson. 2007. Solo status and self-construal: Being distinctive influences racial self-construal and performance apprehension in African American women. *Cultural Diversity and Ethnic Minority Psychology* 13: 321–27. [CrossRef] [PubMed]
- Shen, Helen. 2013. Inequality quantified: Mind the gender gap. *Nature* 495: 22–24. [CrossRef] [PubMed]

- Sobel, Michael E. 1982. Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological Methodology* 13: 290–12. [CrossRef]
- SOU. 2014. *Män och Jämställdhet. Betänkande av Utredningen om män och Jämställdhet*. Stockholm: Fritzes Offentliga Publikationer.
- Spencer, Steven J., Christine Logel, and Paul G. Davies. 2016. Stereotype threat. *Annual Review of Psychology* 67: 415–37. [CrossRef] [PubMed]
- Steele, Claude M. 1997. A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist* 52: 613–29. [CrossRef] [PubMed]
- Steele, Jennifer, Jaquelyn B. James, and Rosalind C. Barnett. 2002. Learning in a man's world: Examining the perceptions of undergraduate women in male-dominated academic areas. *Psychology of Women Quarterly* 26: 46–50. [CrossRef]
- Stout, Jane G., Nilanjana Dasgupta, Matthew Hunsinger, and Melissa McManus. 2011. STEMing the tide: Using ingroup experts to inoculate women's self-concept in science, technology, engineering, and mathematics (STEM). *Journal of Personality and Social Psychology* 100: 255–70. [CrossRef] [PubMed]
- Su, Rong, James Rounds, and Patrick I. Armstrong. 2009. Men and things, women and people: A meta-analysis of sex differences in interests. *Psychological Bulletin* 135: 859–84. [CrossRef] [PubMed]
- Sugimoto, Cassidy R., Vincent Larivière, Chauqun Ni, Yves Gingras, and Blaise Cronin. 2013. Global gender disparities in science. *Nature* 504: 211–13. [CrossRef]
- Tajfel, Henri, and John Turner. 1979. An integrative theory of inter-group conflict. In *The Social Psychology of Intergroup Relations*. Edited by William G. Austin and Stephen Worchel. Monterey: Brooks/Cole, pp. 33–47.
- Tellhed, Una, and Caroline Adolfsson. 2017. Competence and confusion: How stereotype threat can make you a bad judge of your competence. *European Journal of Social Psychology*. [CrossRef]
- Tellhed, Una, Martin Bäckström, and Fredrik Björklund. 2017. Will I fit in and do well? The importance of social belongingness and self-efficacy for explaining gender differences in interest in STEM- and HEED-majors. *Sex Roles* 77: 86–96. [CrossRef] [PubMed]
- Tellhed, Una, Martin Bäckström, and Fredrik Björklund. 2018. The role of ability beliefs and agentic vs. communal career goals in adolescents' first educational choice. What explains the degree of gender-balance? *Journal of Vocational Behavior* 104: 1–13. [CrossRef]
- Thoman, Dustin, Jessi L. Smith, Elizabeth R. Brown, Justin Chase, and Joo Young K. Lee. 2013. Beyond performance: A motivational experiences model of stereotype threat. *Educational Psychology Review* 25: 211–43. [CrossRef] [PubMed]
- Universitetskanslerämbetet (UKÄ). 2016. *Kvinnor och Män i Högskolan. Rapport 2016:6. [Women and Men in Higher Education. Report 2016:6]*. Stockholm: Universitetskanslersämbetet, Available online: <http://www.uka.se/download/18.5d85793915901d205f9a852/1487841854015/rapport-2016-10-14-kvinnor-och-man-i-hogskolan.pdf> (accessed on 10 December 2017).
- Universitetskanslerämbetet (UKÄ). 2017. *Andelen Kvinnliga Professorer Har Ökat till 26 Procent. [The Number of Female Full Professors Has Risen to 26 Per Cent]*. Available online: <http://www.uka.se/om-oss/aktuellt/nyheter/2017-04-27-andelen-kvinnliga-professorer-har-okat-till-27-procent.html> (accessed on 12 March 2017).
- Wahl, Anna. 1992. *Könsstrukturer i Organisationer: Kvinnliga Civilekonomers och Civilingenjörers Karriärutveckling. [Gender Structures in Organizations: The Career Development of Female MBA:s and Civil Engineers]*. Stockholm: Ekonomiska forskningsinstitutet vid Handelshögskolan.
- Woodcock, Anna, Paul R. Hernandez, Mica Estrada, and Wesley P. Schultz. 2012. The consequences of chronic stereotype threat: Domain disidentification and abandonment. *Journal of Personality and Social Psychology* 103: 635–46. [CrossRef] [PubMed]
- World Economic Forum. 2017. *The Global Gender Gap Report 2017*. Cologny and Geneva: World Economic Forum, Available online: <https://www.weforum.org/reports/the-global-gender-gap-report-2017> (accessed on 10 December 2017).

