

# Lund

# Psychological Reports

Volume 13, No. 1, 2013

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**LUND UNIVERSITY**

Lund Psychological Reports  
Editor: Magnus Lindgren  
ISSN 1404-8035

# **The Relation between Students' Implicit Researcher-Gender Associations and Perceptions of a Research Career**

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## **Abstract**

Associations between the researcher occupation and gender, and the relation between such associations and career considerations, were examined. Study 1 revealed that students' perception of the researcher stereotype corresponds more to their perception of the male than the female stereotype. In study 2, the more females implicitly associated the role of researcher with women, the higher they rated their perceived competence as researchers, and the stronger their interest in a future research career tended to be. The results are discussed in relation to in-group preferences and stereotype threat.

*Keywords:* Implicit associations, occupational preferences, gender stereotypes

Social factors may influence career choice in a subtle way. The present research investigates the relationship between the stereotype of the typical researcher and gender stereotypes, and explores how implicit and explicit researcher-gender associations relate to students' competence judgments and interest in pursuing a research career.

Previous research has shown that stereotypes can affect its targets in a variety of domains and situations, for example through the process of stereotype threat (e.g. Schmader, Johns & Forbes, 2008). The theory of stereotype threat holds that when a person believes that there is a negative performance-related stereotype of the in-group, this creates a threat that can impair performance (Steele & Aronson, 1995). Repeated exposure to stereotype threat may lead to disengagement and disidentification processes through which negatively stereotyped individuals distance themselves from the stereotyped domain to protect their self-esteem (Crocker, Major & Steele, 1998; Major, Spencer, Schmader, Wolf & Crocker, 1998). For example, Nosek, Banaji and Greenwald (2002) discovered that the stronger implicit math – male associations women hold, the less they associate themselves with math. Similarly, Steele and Ambady (2006) found that priming gender categories has a negative impact on women's attitudes toward the math domain.

Gender trait stereotypes have been found to correspond to gender segregation on the labor market. For example, Cejka and Eagly (1999) were able to predict the distribution of men and women in 80 occupations from people's beliefs that gender-stereotypic attributes contribute to occupational success in those occupations. Furthermore, implicit gender stereotypes have been found to predict national gender differences in science and math achievement in several countries (Nosek et al., 2009). The educational and occupational domains that have received the most attention in research on the role of gender stereotypes and interest are math and science, entrepreneurship (Gupta, Turban & Bhawe, 2008), and leadership (Davies, Spencer & Steele, 2005). In other words, the focus has mainly been on traditionally male-dominated domains. For example, Gupta, Turban and Bhawe (2008) found that males reported greater entrepreneurial intentions than females in a control condition, but this gender difference disappeared when entrepreneurship was described as benefitting from gender neutral personality characteristics. This indicates that gendered perceptions of an occupation influence aspirations for pursuing a career in the field.

In the present research, we examine gender associations of the researcher occupation. As far as we know, our work is the first to address this issue. If perceptions

of researchers are gender-typed, this could have consequences for students who contemplate pursuing a career in academia. Considering that academia has traditionally been male dominated, we expect the occupational role of researcher to be male-typed. If so, female students who consider pursuing a career in academia could be at risk of being negatively influenced by the researcher stereotype.

People's career choices can be influenced by implicit processes, which may not be revealed in responses to self-report measures (Steffens, Jelenec & Noack, 2010). Implicit processes can be captured by indirect measures, which also have the advantage of being less susceptible to influence from social desirability concerns. In fact, implicit measures of stereotypes and attitudes tend to have greater predictive validity compared to explicit measures (Greenwald, Poehlman, Uhlmann & Banaji, 2009). This was nicely illustrated in a study by Steffens, Jelenec and Noack (2010) where implicit math-gender stereotypes predicted academic self-concept, achievement, and enrollment preferences above and beyond explicit stereotypes. Notably, this advantage regarding predictive validity was found for girls, but not for boys, indicating that the contribution of implicit measures sometimes depends on the participants' gender. It is possible that this can be explained by gender stereotypes in the math domain being a more sensitive topic for girls than for boys.

The present work regards the stereotype of researchers, and whether this stereotype affects students' perceptions of the occupation. We measure gender associations implicitly as well as explicitly. Based on the reviewed literature (e.g. Greenwald, Poehlman, Uhlmann & Banaji, 2009; Steffens, Jelenec & Noack, 2010) we expect our implicit measure to have unique predictive validity. Specifically, we expect that (a) students' perception of the researcher stereotype is male-typed, (b) students associate researchers more with males than females at the implicit and explicit level, and (c) implicit gender associations predict students' perceived competence as potential researchers, and their interest in a future research career.

## **Study 1**

The aim of study 1 is to investigate whether the researcher stereotype is gender-typed. Participants are asked about the cultural stereotype instead of their own personal views, to reduce effects of social desirability (Fiske, Cuddy, Glick & Xu, 2002). We expect that students' perception of the researcher stereotype is male-typed, compared to female-typed.

## Method

**Pilot study.** In a pilot study, 67 students (of which 34 were women) at Lund University were asked to rate adjectives on a 7-point scale (1 = *not at all*, 7 = *completely*) according to how well they describe “people’s general view of a typical researcher”.

In order to examine whether perceptions of the researcher stereotype reflects traditional gender stereotypes, we included the Bem Sex Role Inventory scale (BSRI; Bem, 1974), with the exception of a few items that are no longer representative of gender stereotypes (see Auster & Ohm, 2000). The BSRI items were spread out among the other adjectives in order to conceal the true purpose of the study. The participants rated a total of 77 adjectives. Forty-seven items (synonyms included) received ratings that significantly exceeded the mid value of the scale. We considered these items representative of the researcher stereotype and thus retained them for study 1. Those receiving the highest ratings were: “devoted to work”, “curious”, “disciplined”, “ambitious”, “smart”, “goal-oriented”, “analytic” and “defends one’s beliefs”.

We also compared the BSRI masculinity and femininity scales. As expected, the participants rated the items representing the BSRI masculinity scale as significantly more descriptive of a typical researcher, compared to those of the femininity scale ( $p < .001$ ). Hence, in line with our expectations, the researcher stereotype can be considered more male-typed than female-typed.

**Participants, materials and procedure.** Sixty students at Lund University (50 % females; age  $M = 22.25$ ,  $SD = 2.94$ ) participated in study 1. The participants were asked to rate to what extent they perceived the items selected from the pilot study to be representative of the societal stereotypes of a typical researcher, typical man, and typical woman, respectively (the order was counter balanced between participants). The ratings were made on a 7-point scale (1 = *do not agree at all*, 7 = *completely agree*).

## Results

As expected, typical researcher received the highest ratings ( $M = 5.36$ ,  $SD = 0.51$ ), followed by typical man ( $M = 4.8$ ,  $SD = 0.53$ ), and typical woman ( $M = 4.39$ ,  $SD = 0.52$ ).

To test the hypothesis that perceptions of the researcher stereotype are male-typed, compared to female-typed, two difference variables were calculated: one for the

difference between ratings of typical researcher and typical man, and the other for the difference between typical researcher and typical woman. A mixed ANOVA was carried out with these two difference variables as within factors, and participants' gender as the between factor. There was a main effect of stereotype,  $F(1, 58) = 28.34, p < .001$ , partial  $\eta^2 = .33$ . The difference in ratings between researcher and woman was larger than the difference between researcher and man, supporting the hypothesis. There was further a main effect of participant gender,  $F(1) = 4.73, p = .03$ , partial  $\eta^2 = .08$ , which occurred because the female participants gave somewhat higher ratings in general than the male participants. There was no significant interaction effect between stereotype and participant gender.

In sum, the results from the pilot study and study 1 support the prediction that the researcher stereotype is more male-typed than female-typed. The fact that there was no interaction between stereotype and participants' gender indicates that both men and women perceive the researcher stereotype as having more stereotypically male, compared to female, characteristics.

## Study 2

Having established that the cultural stereotype of researchers is relatively more male-typed, we turn to investigate students' personal researcher-gender associations. The aim of study 2 is to assess implicit associations between researcher and gender, and further to relate this implicit stereotype to students' interest in a research career as well as to their perceived competence as potential researchers. We expect that (1) there are stronger implicit associations between "researcher" and "male" than between "researcher" and "female", and (2) implicitly associating researcher with one's own gender corresponds to higher perceived competence as a potential researcher and interest in pursuing a future research career.

## Method

**Participants.** The participants in study 2 were 80 students at Lund University with mixed majors (41 males and 39 females; age  $M = 24.4, SD = 4.86$ ).

### Measures.

**The Single Category-Implicit Association Test.** The Implicit Association Test (IAT; Greenwald, McGhee & Schwartz, 1998) has been extensively employed for assessing attitudes and stereotypes. The IAT measures the difference in response

latencies between two categorization tasks, which is used as an indicator of implicit attitudes/stereotypes. Apart from the standard IAT, a few similar tests have been developed, of which one is the Single Category-IAT (SC-IAT; Karpinski & Steinman, 2006). The difference between the IAT and the SC-IAT is that the SC-IAT is not a relative measure; instead of two categories, the SC-IAT only has one. This difference is important for the present purposes since, for example, in a standard IAT that measures gender associations with math contrasting arts (e.g. Nosek, Banaji & Greenwald, 2002) a high score could indicate the presence of (a) strong male + math associations, (b) strong female + arts associations, (c) weak male + arts associations, and/or (d) weak female + math associations. The SC-IAT avoids this disadvantage by having only one category. Furthermore, when naturally opposing categories are unavailable, as is the case with the researcher category, the SC-IAT is particularly suitable. Thus, the major advantage of using the SC-IAT in the present study was that a straightforward estimate of the implicit stereotype could be obtained.

For our SC-IAT, five female and five male names were chosen from the twenty most common first names in Sweden, with emphasis on having similar length. To represent the researcher category, we chose five words such as "Professor", "researcher", and "PhD". The SC-IAT thus measured response latency for categorizing researcher – men's names compared to researcher – women's names. The test had 24 practice trials and 48 test trials.

***Explicit associations.*** The participants rated their explicit gender associations of the items used in the Single Category-Implicit Association Test (e.g. Professor) on a scale from -3 (*more strongly associated with women*) to 3 (*more strongly associated with men*). They were instructed to rate the items according to their spontaneous personal associations.

***Perceptions of a research career.*** We designed items that intended to measure students' interest in conducting scientific research, as well as their perceived competence as a potential researcher (e.g. "How interesting do you think it would be to work as a researcher?"; "To what extent do you think that you have what it takes to become a good researcher?"). These items were combined into a perceived competence scale (Cronbach's  $\alpha = .81$ ), and an interest scale (Cronbach's  $\alpha = .90$ ).

**Procedure.** The aim of the study was described as investigating people's perceptions of researchers. The participants first answered the questions about their perceptions of a future research career, whereby they completed the measure of explicit

associations, and lastly the implicit measure. This order of completion was to allow for an unbiased estimation of students' interest and perceived competence, i.e. one that would not be influenced by prior activation of gender conceptions. The participants were tested alone or in groups of up to five people.

## Results

IAT calculations followed the procedures of Karpinski and Steinman (2006), using the D-score algorithm. The hypothesis that students would have a tendency to associate researcher with males was not supported, mean  $D = .02$ ,  $SD = 0.39$ . A one-sample t-test showed that mean  $D$  did not differ significantly from zero,  $t(79) = .39$ ,  $p = .70$ , 95% CI [-0.07 - 0.10]. Neither was there a significant difference between men's ( $M = -.01$ ,  $SD = 0.39$ ) or women's ( $M = .05$ ,  $SD = 0.39$ ) implicit associations ( $t < 1$ ). To check for reliability, the test blocks were split into thirds. Cronbach's  $\alpha$  was .64, which is considered normal for a SC-IAT (Karpinski & Steinman, 2006).

Both men's ( $M = .71$ ,  $SD = 0.61$ ) and women's ( $M = .75$ ,  $SD = 0.56$ ) explicit researcher-gender associations differed significantly from zero, i.e. the response alternative which represented "neither men nor women",  $t(40) = 7.40$ , and  $t(38) = 8.49$ , both  $ps < .001$ . In other words, students explicitly associated the researcher items more with males than females. The explicit ratings of the researcher items (Cronbach's  $\alpha = .61$ ) did not correlate significantly with the D-measure ( $r = -.06$ ), which is to be expected since implicit and explicit stereotypes commonly correlate weakly (Nosek et al., 2007; Karpinski & Steinman, 2006).

The second hypothesis stated that associating researcher more with one's own gender would predict higher interest in a research career, as well as higher perceived competence. This prediction was partially supported. For female students, implicit associations predicted perceived competence, such that the stronger associations between researcher and female (or the weaker associations between researcher and male), the higher the perceived competence,  $r = -.34$ ,  $p = .03$ . For male students, the relationship was very weak,  $r = -.13$ ,  $p = .40$ . For female students, stronger researcher-female associations also corresponded to higher interest in a research career, although this relationship was only marginally statistically significant,  $r = -.29$ ,  $p = .08$ . Again, the correlation for male students was very weak,  $r = -.11$ ,  $p = .40$ . Results did not differ as a function of different areas of education or participants' age. The female students had marginally significantly higher interest ratings than the male students ( $M = 5.61$ ,  $SD$



= 1.17, and  $M = 5.10$ ,  $SD = 1.23$ , respectively),  $t(78) = 1.90$ ,  $p = .06$ . There were no gender differences in perceived competence ( $M = 4.77$ ,  $SD = 1.36$  for women;  $M = 4.77$ ,  $SD = 1.39$  for men). Neither interest ( $r = -.05$  for women,  $r = .06$  for men) nor perceived competence ( $r = -.25$  for women,  $r = .12$  for men) correlated significantly with explicit researcher-gender associations ( $ps > .1$ ).

In sum, associating researcher more with females predicted female students' perceived competence as a potential researcher, and tentatively their interest in a research career. However, we did not find support for the hypothesis that students would have stronger implicit researcher – male associations, compared to researcher – female associations.

## **General Discussion**

### **The Importance of Implicit Stereotypes for Career Considerations**

The results from study 2 emphasize the importance of female students' implicit associations between an occupational role and gender when they consider a possible career within the domain. The more our female participants associated the role of researcher with women (or, the less they associated it with men), the more competent they felt as a potential researcher, and the stronger their interest in a future career tended to be. Thus, consistent with previous research, implicit gender associations seem powerful enough to affect women's career aspirations. Previous research has shown that implicit stereotypes are to some extent malleable and can be modified through mental imagery (Blair, Ma & Lenton, 2001) and diversity education (Rudman, Ashmore & Gary, 2001). Attempts to reduce women's implicit associations of male dominated occupations with males may therefore encourage them to consider pursuing a career within that field.

Unlike female participants however, the connection between implicit gender associations and perceptions of the occupation was not observed for our male participants. Consistent with our findings are those of Steffens, Jelenec and Noack (2010), where implicit math-gender stereotypes predicted girls', but not boys', academic self-concept and enrollment preferences. This difference in predictive ability of implicit gender associations for females and males is perhaps due to the domain being male-typed. That is, given that the domains of math and academia are male-typed, the topic of gender may be more sensitive to girls and women, which could explain why implicit

gender associations predict their career aspirations, while males are seemingly unaffected. This suggests that it is important to consider the role of gender when drawing conclusions about the relative predictive advantage of implicit vs. explicit measures. More research is called for to investigate under which circumstances implicitly associating an occupation with gender may influence men's career aspirations. One can speculate that implicit stereotypes may predict men's career preferences in contexts where men are stereotyped as the more "misfit" gender, as may be the case in e.g. childcare occupations. Future research should thus benefit from considering more female-typed occupations and academic domains.

Furthermore, future studies could look into factors that might explain the relation between women's implicit gender associations and perceptions of a future career. One possible mediator is stereotype threat (Steele & Aronson, 1995). Alternatively, considering that women generally have stronger in-group preferences than men (Rudman & Goodwin, 2004; Nosek & Banaji, 2002), such bias is also a potential mediator for women, and if so, may explain why boys' (Steffens, Jelenec & Noack, 2010) and men's (in the present study) implicit gender associations appear to be of less importance for their career preferences. Specifically, choosing to work in a field that one associates more with women should be of greater importance for those women who have stronger in-group preferences.

### **The Cultural Stereotype of Researchers**

The results from study 1 showed that the ratings of the cultural stereotype of researchers were more similar to ratings of the cultural stereotype of a typical man compared to a typical woman. This was expected considering that pursuing a career in academia has traditionally been more common for men, which may have led to a general male-typed view of the profession. One can thus speculate that even when a field is becoming increasingly gender balanced (in the share of men and women), lingering gender stereotypes may still affect individuals, for example by causing stereotype threat. Because previous research indicates that individuals prone to experiencing stereotype threat are those that are moderately to highly identified with the domain (Nguyen & Ryan, 2008); in the context of academia, doctoral students may be more at risk than undergraduate students.

The method used in study 1 can be considered relatively unobtrusive because it is an indirect approach to tap the stereotype (Fiske, Cuddy, Glick & Xu, 2002). Even

though most people may not feel comfortable stating that they believe in gender stereotypes, responding to questions about cultural stereotypes is probably considerably less sensitive, and should therefore be a more valid estimate of stereotypes. Furthermore, because our method allows for a direct way to statistically test the degree of gender typing of occupations; it can be useful in further investigations of gender typing.

### **Implicit vs. Explicit Stereotypes**

Similar to study 1, in study 2 participants explicitly associated the researcher category more with males than females. Findings from study 1 and 2 thus suggest that there is a general male-typed view of researchers, while at the same time the expected researcher – male association was not observed at the implicit level. We interpret this lack of implicit association as unrelated to validity problems; if participants were trying to disguise their stereotypes while completing the SC-IAT, such strategic efforts would have been detectable in increased error rates (Karpinski & Steinman, 2006). Given that all participants in the present study had adequately low error rates, we assume that they did not apply such strategies. Similar to our lack of SC-IAT effect, Steffens, Jelenec and Noack (2010) found mixed results regarding implicit associations between math and gender as measured with the IAT.

A possible explanation for the lack of general implicit researcher-male associations is differences between perceptions of the cultural stereotype and implicit associations. Even though students are aware of a general stereotype portraying researchers as males, their implicit associations might rather reflect their perceptions of professors/researchers in their own academic field, where the general stereotype may not apply (see Nosek & Hansen, 2008; Garcia-Marques, Santos & Mackie, 2006). This may also help explain why only implicit, and not explicit, associations predicted female students' perceived competence and interest in pursuing a research career.

The fact that explicit associations were not able to predict perceptions of a research career highlights the unique contribution of implicit measures when investigating connections between gender associations and career considerations. Researchers are therefore wise to include implicit measures when investigating predictors of career considerations. If implicit rather than explicit associations are in fact better predictors of individuals' preferences and choices, the SC-IAT has promising

appeal for future studies because it allows for a more direct (rather than relative) estimate of a stereotype, compared to the standard IAT.

This work adds to the growing literature on the impact of gender associations on career related choices. If people judge their own competence and interest in a field according to their gender associations, this is likely to have consequences at the individual as well as the societal level; not only will individuals be at risk of not fulfilling their personal potentials and dreams, but the labor market will risk missing out on the most suitable candidates.

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