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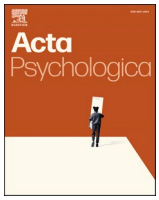

Gender stereotypes about psychological science: Female, male, or both?

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ABSTRACT

While the science = male stereotype has been demonstrated in the natural sciences, little is known about gender stereotypes about psychological science. Studying gender stereotypes about psychological science is particularly interesting due to the divergent hypotheses that can be derived from previous research and theory. On the one hand, psychological science may be stereotyped as male because men are overrepresented in higher academic positions and scientific contributions. On the other hand, psychological science may be stereotyped as female because it is the science of human feeling, thinking and behaving – a subject considered to be stereotypically female. The aim of the present research was to provide empirical evidence on gender stereotypes about psychological science among students of psychology. In three preregistered online studies (total $N = 630$) conducted at German-speaking universities, we measured various facets of gender stereotypes about psychological science, students' sense of belonging in the academic field and their psychological science-related identity. Self-report measures revealed a female gender stereotype about psychological science, albeit participants reported awareness of the male overrepresentation among psychology professors. Perceived gender ratios correlated with gender stereotypes. Furthermore, gender stereotypes were related to sense of belonging in the academic field among female students. The present findings contribute to a better understanding of gender-related phenomena in the domain of psychological science.

1. Introduction

While extensive research has been conducted to understand gender stereotypes about the natural sciences or STEM (science, technology, engineering, mathematics) and their contribution to the underrepresentation of women in research and academia (Ceci et al., 2009; Ceci et al., 2014; Ceci & Williams, 2011; Schmader, 2023), the social sciences and psychological science in particular have only recently attracted interest in this context (Casad et al., 2022; Gruber et al., 2021; Lin & Li, 2023; Odic & Wojcik, 2020; Orchowski et al., 2021; Van Veelen & Derks, 2022b). In their review, Gruber et al. identified gender gaps favoring men in psychological science (e.g., women psychology PhDs are less likely to remain in academia). Their discussion of possible mechanisms explaining these gaps included speculations on gender stereotypes about the field of psychological science and about women's and men's traits and abilities. Yet, to our knowledge, no prior research has specifically targeted gender stereotypes in psychological science. In the present research, we seek to fill this gap by examining various facets of gender stereotypes about psychological science among psychology students in Germany, using indirect and direct measures. Additionally, we explore the relationship between these stereotypes and students' psychological science-related identity and sense of belonging in the field. As far as we know, this research is the first to provide comprehensive empirical data on gender stereotypes about psychological science and related constructs among psychology students, potentially marking a crucial step toward understanding gender-related phenomena in the domain of psychological science.

1.1. Divergent hypotheses for gender stereotypes about psychological science

Current theorizing and evidence do not allow clear-cut predictions on the direction of gender stereotypes. Depending on the perspective, both a *psychological science = male* and a *psychological science = female* stereotype appear plausible.

On the one hand, previous research has shown that students across

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various majors associate science in general more with men than with women (e.g., McPherson et al., 2022; Smyth & Nosek, 2015). Developmental research based on the Draw-A-Scientist Test documents that children are more likely to draw a man than a woman when asked to draw a scientist (Chambers, 1983). This science = male stereotype has been documented to emerge in late elementary school and increases in strength as children grow older (Miller et al., 2018). Thus, if science in general is stereotyped as male, it stands to reason that psychological science might be viewed in a similar manner. It should be noted, however, that the prototypical scientist that comes to mind when asked to draw a scientist more likely resembles a researcher in the natural sciences (e.g., wearing a lab coat; Ferguson & Lezotte, 2020), and that psychological science is perceived as less scientific than the natural sciences by students and lay people (Krull & Silvera, 2013; Lilienfeld, 2012). Therefore, it remains to be shown whether the science = male stereotype indeed extends to psychological science.

A further argument for the psychological science = male stereotype is based on social role theory (Eagly & Steffen, 1984). According to social role theory, gender stereotypes stem from the distribution of women and men into social roles. Based on this rationale, the gender ratio of psychological scientists should determine gender stereotypes about psychological scientists. Historically, psychological science has been male dominated, which remains evident in the gender distribution of senior faculty positions and eminent psychologists (Diener et al., 2014; Eagly & Miller, 2016; Gruber et al., 2021). Although women are now overrepresented at the undergraduate level, their representation decreases with each step up the academic ladder. For example, in Germany, the country where the present research was conducted, only 41 % of tenured psychology professors were women in 2022 (compared to 76 % women at the undergraduate level; Statistisches Bundesamt (Destatis), 2023a, Statistisches Bundesamt (Destatis), 2023b). This reversal of gender ratios, combined with the numerical dominance of men among faculty, may lead to the perception that academic psychological science is a male-dominated field.

On the other hand, however, other research and theorizing suggest a psychological science = female stereotype. For example, according to research on general gender stereotypes and gender differences, women are (considered to be) more interested in people, whereas men are (considered to be) more interested in things (Su et al., 2009). As psychological science is concerned with advancing our knowledge about human thinking, feeling and behaving (i.e., with understanding people), it appears likely that psychological science is stereotyped as female.

There is indeed empirical evidence that people associate the domain of psychology with women. In particular, Carli et al. (2016) asked undergraduate students to rate the extent to which several traits are characteristic of a successful psychologist, an adult man, or an adult woman. Results showed that trait ratings of psychologists were more similar to trait ratings of women, as compared to trait ratings of men, suggesting a psychologist = female stereotype. Furthermore, Boysen et al. (2022) observed that participants associated femininity with psychology, assigned more feminine than masculine traits to people studying psychology, and rated psychology as more likely to meet the needs of women. However, both studies asked participants to rate *a psychologist* or the domain of *psychology*, rather than a *psychological scientist* or the discipline of *psychological science*. It thus remains unclear which subtype of psychologists participants imagined. If they envisioned a psychologist working in applied settings outside academia, such as counseling or psychotherapy, it is less surprising that they reported a female stereotype. Women are highly overrepresented in these applied psychology professions (Olos & Hoff, 2006), and these professions are communal in nature, which in turn is associated with women more than with men (Croft et al., 2015; Diekman et al., 2017; Eagly et al., 2020). Thus, it remains an open question whether the female gender stereotype found in the studies by Carli et al. and Boysen et al. applies to psychological scientists and the discipline of academic psychological science.

1.2. Gender stereotypes, sense of belonging, and identity

Gender stereotypes about psychological science may be related to students' sense of belonging in the field and their psychological science-related identity. This reasoning is based on related research in STEM domains (for overviews, see Cheryan et al., 2017; Dasgupta, 2011; Diekman et al., 2017; Master & Meltzoff, 2020; Schmader, 2023): Women, compared to men, have been shown to experience lower sense of belonging in STEM. The perception of female underrepresentation in many STEM fields and corresponding STEM = male gender stereotypes decrease women's sense of belonging. A reduced sense of belonging, in turn, negatively impacts career intentions and decisions in STEM (Binning et al., 2024; Cheryan et al., 2009; Lewis et al., 2017; Master & Meltzoff, 2020; Murphy et al., 2007). Similarly, women have been shown to identify less with STEM than men. Furthermore, STEM = male stereotypes are associated with lower STEM identities among women, and lower STEM identities are negatively related to career intentions in STEM (Nosek et al., 2002; Starr, 2018; Starr & Leaper, 2022; Stout et al., 2011).

It appears sensible to assume that mechanisms similar to those observed in the STEM domain may also play a role in psychological science: Perceptions of female underrepresentation in academic positions may be related to gender stereotypes about psychological science. Furthermore, gender stereotypes may be associated with science identities and sense of belonging in the field. The present research seeks to examine these relationships.

1.3. The present research

To date, no research has studied gender stereotypes about psychological science among students of psychology. To fill this gap, we conducted three online studies, using cross-sectional designs, with psychology students at German-speaking universities. We sampled only psychology students for two reasons. First, their perception of psychological science may differ from other people's perception because they are more familiar with the gender ratios in academic positions and the scientific nature of psychology. Second, their perception of psychological science is particularly interesting because they bear the future generation of potential academics. Given that women are highly overrepresented in the population of psychology students, we expected an imbalanced gender distribution in our sample, limiting the possibility to analyze differences between the perspectives of male and female students of psychology. For these analyses, we therefore combined the data of the three studies.

Across the three studies, we asked participants to estimate gender ratios among psychology professors at German universities to investigate whether they perceived a male overrepresentation. We assessed several facets of gender stereotypes about psychological science and psychological scientists, using self-report measures. In particular, we assessed gendered associations with the field of psychological science (cf. Nosek et al., 2002), associations of gender and competence in psychological science (cf. Stout et al., 2011), beliefs about gendered abilities (cf. Farrell & McHugh, 2017; Lane et al., 2012), and agency and communion stereotypes about researchers (cf. Carli et al., 2016). To provide a comprehensive picture of gender stereotypes, we also employed two indirect measures of gender stereotypes, an Implicit Association Test in Study 1 (Karpinski & Steinman, 2006), and a Misattribution Task in Studies 2 and 3 (Ye & Gawronski, 2018). Indirect measures can reveal spontaneous activations of associations that may diverge from deliberately reported beliefs (Gawronski, 2024), but recent discussions suggest that their results should be interpreted with caution (Corneille & Gawronski, 2024). Additionally, we assessed students' psychological science-related identity and their sense of belonging in the field (cf. Cheryan et al., 2009; Stout et al., 2011) to examine how these constructs relate to gender stereotypes and perceived gender ratios.

The design, methods, and hypotheses of all studies reported in this

article were preregistered (Study 1 prior to data analyses at https://osf.io/xd9qe, Studies 2 and 3 prior to data collection at https://osf.io/tsgpc and at https://osf.io/9atgy). We report how we determined sample size, all data exclusions, manipulations, and measures in the studies. The fully anonymized data, analysis codes, and research materials are available at https://osf.io/bqn6j and https://osf.io/udr2c. All studies were programmed and run online using PsyToolkit (Stoet, 2010, 2017), data were analyzed using IBM SPSS v29.

2. Study 1

Study 1 was conducted in 2020/2021. Participants reported their gender associations with psychological science and their gender associations with competent people in psychological science (Nosek et al., 2002; Stout et al., 2011). As an indirect measure of gender associations with psychological science, we adapted the Single-Category Implicit Association Test (SC-IAT; Karpinski & Steinman, 2006). Contrary to the standard IAT, the SC-IAT does not require a complementary target category, the choice of which may influence the results. Additionally, participants completed self-report measures of their sense of belonging in psychological science and their psychological science identity (Cheryan et al., 2009; Stout et al., 2011). Furthermore, they estimated the gender ratio among professors of psychology (Koenig & Eagly, 2014).

2.1. Method

2.1.1. Participants

Participants were psychology students, recruited via the participant pool management software at the University of Regensburg (Sona-Systems; https://www.sona-systems.com) and via nationwide student social media groups. As compensation, they received 0.5 course credit or could take part in a lottery of online shop vouchers (randomly drawing 40 vouchers worth 5€ among 100 participants). We determined sample size based on a power analysis with G*Power 3.1 (Faul et al., 2007), conservatively assuming a small effect size of $d_z = 0.20$ in a one-sample *t*-test (two-tailed) at $\alpha < 0.05$ with $1 - \beta = 0.80$ power. This analysis yielded a minimum sample size of 199 participants. Initially, 226 participants fully completed the online study. Based on preregistered exclusion criteria, we excluded data of participants if they were enrolled at a non-German-speaking university ($n = 1$), if their error rate in the SC-IAT was greater than 20 % ($n = 5$; Karpinski & Steinman, 2006), and if their rate of slow or non-responses in the SC-IAT (no response within the response window of 1500 ms) exceeded 10 % ($n = 2$).[1] The final sample size was $N = 219$ (188 female and 31 male; with a median age of 22 years, ranging from 18 to 50 years). The majority of participants were enrolled in a Bachelor's program ($n = 150$, 68 %), while the remainder were enrolled in a Master's program. Forty-two percent of participants ($n = 92$) were students at the University of Regensburg. The remaining participants were students from various other universities.

2.1.2. Procedure

Participants were informed that the study was investigating the perception of psychological science. First, they completed an SC-IAT, a speeded categorization task in which participants classified one item at a time into one of two categories by pressing the left or right response key. Items from the categories of psychological science (e.g., "psychological research"), male names (e.g., "Peter"), and female names (e.g., "Anna") were shown on the computer screen, one at a time. The procedure of the SC-IAT followed the procedure suggested by Karpinski and Steinman (2006). Participants completed four blocks in which psychological science and female names were assigned to a shared response key and male names to the other (*science-female block*). These alternated with four blocks in which psychological science and male names were assigned to a shared response key and female names to the other (*science-male block*). The response mapping of the first block was counterbalanced between participants. Each block consisted of 24 trials, presented in individual random order. Each block included 7 target psychology trials. A science-female block further contained 7 trials with female names and 10 trials with male names, while a science-male block reversed this ratio, with 7 male name trials and 10 female name trials. These ratios were designed to prevent the formation of response biases (Karpinski & Steinman, 2006). The first science-female block and the first science-male block were treated as practice blocks, and response latencies were therefore not analyzed. The logic of the measurement is that responses are facilitated when two mentally associated categories are mapped onto the same response key. Therefore, response time differences between the science-male and the science-females blocks are interpreted as an indication of the direction and strength of gender associations with psychological science.

After completion of the SC-IAT, participants completed several self-report measures using 7-point Likert scales (for an overview, see Table 1). First, they indicated the extent to which they associated psychological science with a particular gender (Nosek et al., 2002). Then, they answered three items assessing associations of gender and competence in psychological science (Stout et al., 2011). Additionally, they estimated the gender ratio among professors of psychology at German universities. Then, they completed two items assessing their sense of belonging to psychological science (Cheryan et al., 2009) and two items assessing their psychological science-related identity (Stout et al., 2011). Afterwards, they completed an adapted version of the motivation to act without prejudice scale (Banse & Gawronski, 2003) with items modified to assess the motivation to control gender stereotyping. Finally, participants provided demographic information, including gender, age, German language proficiency, university, whether they were enrolled in a bachelor or master program, and their current semester. At the end, participants were fully debriefed in written form.

2.1.3. Materials

The target category in the SC-IAT was labeled "Psychological Science" and the items were "psychological science", "psychological research", "department of psychology", "psychology professorship", and "chair in psychology".[2] The attribute categories were labeled "female" and "male" and items were 10 female and 10 male German names taken from Rudolph et al. (2007, see Supplemental Materials Table S1).

2.2. Results

2.2.1. Estimated male gender ratio among professors

Participants estimated that 60.5 % ($SD = 18.5$) of psychology professors at German universities were men. This value differed significantly from a gender-balanced ratio of 50 %, $t(218) = 47.84$, $p < .001$, $d_z = 3.23$, 95 % CI [2.90, 3.56], indicating that participants perceived a male overrepresentation in faculty positions.[3]

2.2.2. Self-reported gender associations

Table 2 provides an overview of the descriptive statistics of self-reported gender stereotypes. One-sample *t*-tests indicated that participants associated psychological science with female rather than male, $t(218) = -3.56$, $p < .001$, $d_z = -0.24$, 95 % CI [−0.38, −0.11].

[1] We applied this exclusion criterion because the online IAT was programmed such that the next trial started if no response was given within the response window.

[2] In German, the stimulus words were „Psychologische Wissenschaft", „Psychologische Forschung", „Psychologisches Institut", „Psychologie-Professur", and „Lehrstuhl für Psychologie".

[3] Hypothesis not preregistered.

Table 1
Overview of self-report measures in Studies 1 through 3.

Construct	Item	Scale	Study 1	Study 2	Study 3
Science–gender association	How much do you associate [science field] with "female" or "male"?	-3 = *very female*, 0 = *neither female nor male*, 3 = *very male*	✓	✓	✓
Researcher–gender association	When I think of researchers in [science field], I think of …	-3 = *mostly women*, 0 = *both women and men*, 3 = *mostly men*	–	✓	✓
Competent people–gender association	When I think of people who are very good at [competent in, talented in] [science field] I think of …	-3 = *mostly women*, 0 = *both women and men*, 3 = *mostly men*	✓ PS: α = 0.71	✓ PS: α = 0.53 NS: α = 0.69 HU: α = 0.78	–
Competent researchers–gender association	When I think of researchers in [science field] who are very good at [competent in, talented in] [science field] I think of …	-3 = *mostly women*, 0 = *both women and men*, 3 = *mostly men*	–	✓ PS: α = 0.88 NS: α = 0.88 HU: α = 0.92	✓ PS: α = 0.79 NS: α = 0.86 HU: α = 0.85
Female gender competence beliefs	Women are generally very good at [competent in, talented in] [science field].	1 = *disagree completely*, 7 = *agree completely*	–	–	✓ PS: α = 0.94 NS: α = 0.91 HU: α = 0.93
Male gender competence beliefs	Men are generally very good at [competent in, talented in] [science field].	1 = *disagree completely*, 7 = *agree completely*	–	–	✓ PS: α = 0.92 NS: α = 0.92 HU: α = 0.92
Agency stereotypes about researchers	Researchers in [science field] typically… give up very easily – never give up easily. are little assertive – are very assertive. go to pieces under pressure – stand up well under pressure. are not at all self-confident – are very self-confident.	7-point bipolar scale	–	✓ PS: α = 0.74 NS: α = 0.74 HU: α = 0.85	✓ PS: α = 0.68 NS: α = 0.74 HU: α = 0.82
Communion stereotypes about researchers	Researchers in [science field] typically… are little caring – are very caring. are not at all friendly – are very friendly. are very cold in relations with others – are very warm in relations with others. are little empathetic – are very empathetic.	7-point bipolar scale	–	✓ PS: α = 0.79 NS: α = 0.81 HU: α = 0.86	✓ PS: α = 0.79 NS: α = 0.83 HU: α = 0.85
Sense of belonging	I feel a sense of belonging to people who do research in [science field]. I feel similar to people who do research in [science field].	1 = *disagree completely*, 7 = *agree completely*	✓ PS: α = 0.75	✓ PS: α = 0.76 NS: α = 0.83 HU: α = 0.86	✓ PS: α = 0.76 NS: α = 0.85 HU: α = 0.87
Science identity	[Science field] is important to me. [Science field] is an important part of my life.	1 = *disagree completely*, 7 = *agree completely*	✓ PS: α = 0.85	✓ PS: α = 0.78 NS: α = 0.82 HU: α = 0.86	✓ PS: α = 0.77 NS: α = 0.78 HU: α = 0.86
Motivation to control gender stereotyping	e.g., I pay attention that my behavior is not influenced by gender stereotypes.	1 = *disagree completely*, 5 = *agree completely*	✓ α = 0.82	✓ α = 0.83	✓ α = 0.81

Note. In Study 1, the science field was psychological science. In Studies 2 and 3, the science fields were psychological science, natural science, and humanities. A checkmark indicates that the measure was employed in the study. A dash indicates that the measure was not employed in the study. PS = psychological science, NS = natural science, HU = humanities. Values indicate Cronbach's alpha.

Furthermore, participants reported to more strongly think of women (than of men) when thinking about people who are competent in psychological science, $t(218) = -2.32$, $p = .021$, $d_z = -0.16$, 95 % CI [−0.29, −0.02]. According to conventional standards (Cohen, 1988), these female gender stereotype effects were small.

2.2.3. SC-IAT

We calculated a *D*-Score as described in Karpinski and Steinman (2006). Higher positive (negative) values indicate psychological science associations with male (female). The mean *D* score was $M = 0.08$ ($SD = 0.34$). The value differed significantly from zero, $t(218) = 3.44$ $p < .001$, $d_z = 0.23$, 95 % CI [0.10, 0.37] with a small effect size, indicating that participants' responses were facilitated in the psychological science –

Table 2
Mean self-reported gender stereotypes in Studies 1 through 3

Measure	Psychological science	Natural science	Humanities
Science Field–Gender Association			
Study 1	**−0.27** (1.12)		
Study 2	$\mathbf{-0.85}_{a}$ (1.05)	$\mathbf{0.85}_{b}$ (1.00)	$\mathbf{-0.56}_{c}$ (1.04)
Study 3	$\mathbf{-0.86}_{a}$ (1.11)	$\mathbf{0.73}_{b}$ (1.07)	$\mathbf{-0.39}_{c}$ (1.00)
Researcher–Gender Association			
Study 2	0.03_{a} (1.17)	$\mathbf{1.10}_{b}$ (1.01)	$\mathbf{-0.18}_{a}$ (1.19)
Study 3	-0.04_{a} (1.27)	$\mathbf{1.22}_{b}$ (1.18)	-0.08_{a} (1.14)
Competent People–Gender Association			
Study 1	**−0.12** (0.74)		
Study 2	$\mathbf{-0.37}_{a}$ (0.72)	$\mathbf{0.66}_{b}$ (0.79)	$\mathbf{-0.34}_{a}$ (0.80)
Competent Researcher–Gender Association			
Study 2	$\mathbf{-0.15}_{a}$ (0.74)	$\mathbf{0.56}_{b}$ (0.78)	$\mathbf{-0.22}_{a}$ (0.76)
Study 3	$\mathbf{-0.32}_{a}$ (0.85)	$\mathbf{0.63}_{b}$ (0.88)	$\mathbf{-0.13}_{c}$ (0.80)
Gender Competence Beliefs			
Study 3	$\mathbf{-0.52}_{a}$ (0.94)	$\mathbf{0.60}_{b}$ (0.88)	$\mathbf{-0.50}_{a}$ (0.81)

Note. Standard deviations are printed in parenthesis. Positive values reflect male stereotypes, negative values reflect female stereotypes. Values in bold differ significantly from the gender-neutral midpoint of the scale, as determined by one sample *t*-tests. Values within a row with different subscripts are significantly different from each other, as determined by paired sample *t*-tests with a Bonferroni correction applied for multiple comparisons (adjusted $\alpha = 0.017$).

male block compared to the psychological science – female block.

2.2.4. Relation between self-reported and indirectly measured gender associations

We found no significant correlation between SC-IAT *D*-scores and self-reported psychological science–gender associations, $r(219) = -0.02$, $p = .810$, 95 % CI [−0.15, 0.12]. The relation between SC-IAT *D*-scores and self-reported gender associations was not moderated by the motivation to control stereotypes (see Supplemental Materials Table S2).

2.3. Discussion

Self-report measures revealed that participants associated psychological science with female, and more strongly thought of women (than men) when thinking about people who are competent in psychological science. At the same time, participants were aware of the male overrepresentation among psychology professors. Unlike the self-report measures, the indirect SC-IAT scores indicated a slight psychological science = male response bias. To further examine the pattern of gender stereotypes, we conducted a second study in which we employed an alternative indirect measure of gender stereotypes and added further self-report items to more specifically assess gender stereotypes about *psychological scientists*.

3. Study 2

Study 2 was conducted in 2021. We used an adapted version of the Semantic Misattribution Procedure (SMP; Ye & Gawronski, 2018) as an indirect measure of gender stereotypes, employing primes related to psychological science, natural science, and the humanities. This allowed comparing psychological science with other science fields that have been demonstrated to be stereotyped as male (natural sciences) and female (humanities), respectively (Farrell & McHugh, 2017; Smyth & Nosek, 2015).[4] We administered the same self-report measures as in Study 1. To more specifically assess gender stereotypes about *psychological scientists*, we added items asking about gender associations with researchers in psychological science. Finally, we included self-report measures to assess students' stereotypes concerning researchers' communion and agency. While communion (i.e., an orientation toward other people and their well-being) is typically associated with women and psychologists, agency (i.e., an orientation toward the self and one's own mastery and goal attainment) is typically associated with men and scientists (Carli et al., 2016; Eagly et al., 2020).

3.1. Method

3.1.1. Participants

Participants were psychology students, recruited via the participant pool management software at the University of Regensburg and the University of Hamburg (Sona-Systems; https://www.sona-systems.com) and via nationwide student social media groups. As compensation, they received 0.5 course credits or could take part in a lottery of online shop vouchers (randomly drawing 30 vouchers worth 5€ among 100 participants). Initially, 272 participants fully completed the online study. Based on preregistered criteria, we excluded data of participants who were not students of psychology ($n = 5$), who were enrolled at a non-German-speaking University ($n = 1$), who reported technical problems with the online study ($n = 3$), who did not pass the attention check items ($n = 39$), who indicated having knowledge of Chinese ($n = 6$)[5], who gave the same response on all trials of the SMP ($n = 1$), or had more than 5 % missing responses in the SMP ($n = 3$). The final sample size was $N = 217$ (193 female, 22 male, 2 diverse; with a median age of 21 years, ranging from 18 to 61 years). The majority of participants were enrolled in a Bachelor's program ($n = 193$, 89 %), while the remainder were enrolled in a Master's program. Forty-one percent of participants were students at the University of Regensburg ($n = 88$), 22 % at the University of Hamburg ($n = 55$), and the rest were from various other universities. A sensitivity analysis with G*Power 3.1 indicated that our sample size allowed us to detect a minimal effect size of $d_z = 0.19$ in a one-sample *t*-test at a power of $1 - \beta = 0.80$ and a significance level of $\alpha = 0.05$ (two-tailed).

3.1.2. Procedure

The procedure of Study 2 followed the procedure of Study 1 with the exception that participants completed the SMP instead of the SC-IAT, and with some modifications and additions to the self-report measures of gender stereotypes (see Table 1). Participants were told that the SMP

[4] We used the term *natural science* instead of *STEM* in the comparison condition because natural science is more familiar to German participants, and because previous research on gender stereotypes conducted in Germany has also used it and found significant gender stereotypes (Nosek et al., 2009). Although other STEM fields may have stronger male stereotypes (Su & Rounds, 2015), the use of natural science as a comparison condition is sufficient for the purpose of our study.

[5] Because participants in the SMP are required to guess the meaning of Chinese ideographs, it is essential that they have no knowledge of Chinese.

was about intuitive recognition of Chinese ideographs. In the SMP, participants were presented with 60 Chinese ideographs (Payne et al., 2005), each at a time, and were asked to intuitively guess whether the ideograph may refer to a female or male name, by using the D or K key, respectively. Immediately before each ideograph a prime was presented. The primes were the verbal terms "psychological science", "natural science", and "humanities".[6] Participants were instructed to ignore the primes. Each SMP trial started with the presentation of a fixation cross in the center of the screen for 500 ms, followed by a prime word for 150 ms, a blank screen for 50 ms, a Chinese ideograph for 100 ms, a grey pattern mask in the center and the response labels "female name" and "male name" on the left and right side of the screen. The pattern mask and the response labels were presented until participants responded.[7] The intertrial-interval was 500 ms. The experimental block consisted of 60 trials in random order. Each prime word was presented 20 times, each target was shown once. The combination of primes and targets was determined randomly. Before the experimental block, participants completed six practice trials, without prime presentation. According to the logic of the measure, potential gendered associations with the prime may bias judgments of the ideographs. Therefore, the ratio of male to female responses following each prime category is interpreted as an indicator of gendered associations.

After completion of the SMP, participants completed the same self-report measures of gender stereotypes about psychological science as in Study 1. To additionally assess gender stereotypes about scientists, we added items that specifically asked about associations with researchers in psychological science (see Table 1). Each gender stereotype item was first presented targeting psychological science, and then repeated targeting natural science and humanities, respectively. Afterwards, participants completed four items assessing agency-stereotypes and four items assessing communion-stereotypes about researchers in each of the three science fields, using bipolar scales (Abele et al., 2016, see Table 1). As in Study 1, participants estimated the gender ratio among psychology professors at German universities. Then, they answered the same items as in Study 1 assessing sense of belonging to psychological science and psychological science identity. These items were also presented with respect to natural science and humanities. Afterwards, they completed the same scale as in Study 1 to assess motivation to control gender stereotyping. Finally, participants answered the same demographic questions as in Study 1 and additionally indicated their knowledge of Chinese. In the self-report measures, we included two attention check items, requiring participants to select a particular response on the scales. At the end, participants were fully debriefed in written form.

3.2. Results

3.2.1. Estimated male gender ratio among professors

Participants estimated that 58.1 % (SD = 17.9) of psychology professors at German universities were men. This value differed significantly from a gender-balanced ratio of 50 %, $t(216) = 47.34$, $p < .001$, $d_z = 3.21$, 95 % CI [2.88, 3.54], indicating that participants perceived a male overrepresentation in faculty positions.[3]

3.2.2. Self-reported gender associations

Table 2 provides an overview of the descriptive statistics of self-reported gender stereotypes. Replicating the results from Study 1, one-sample t-tests indicated that participants associated psychological science with female rather than male, $t(216) = -11.93$, $p < .001$, $d_z = -0.81$, 95 % CI [−0.96, −0.66]. Furthermore, participants reported to more strongly think of women (than of men) when thinking about people who are competent in psychological science, $t(216) = -7.62$, $p < .001$, $d_z = -0.52$, 95 % CI [−0.66, −0.38]. The effect sizes were medium-to-large.

However, when asked specifically about researchers in psychological science, a one-sample t-test indicated that participants reported no gender-specific associations, $t(216) = 0.35$, $p = .729$, $d_z = 0.02$, 95 % CI [−0.11, 0.16]. In other words, when thinking about researchers in psychological science, they reported to equally think of men and women. Yet, when asked about researchers who are competent in psychological science, they reported to more strongly think of women than of men, $t(216) = -3.01$, $p = .003$, $d_z = -0.20$, 95 % CI [−0.34, −0.07], albeit with a small effect size.

Results from one-way repeated measures ANOVAS with science field as within-subjects variable (psychological science vs. natural science vs. humanities) are reported in the Supplemental Materials Table S3.[3] Results from paired-samples t-test are indicated in Table 2.[3] In a nutshell, gender stereotypes about psychological science and humanities were mostly similar (with the exception of science field–gender associations, which were significantly more female for psychological science compared to humanities), while both science fields differed significantly from the natural sciences.

3.2.3. Agency and communion stereotypes about researchers

Descriptive statistics of agency and communion stereotypes about researchers are reported in Table 3. A paired-samples t-test revealed that researchers in psychological science were perceived as more agentic than communal, $t(216) = 4.01$, $p < .001$, $d_z = 0.27$, 95 % CI [0.14, 0.41], with a small effect size.[3]

Results from a 3 (Science Field) x 2 (Stereotype Content) repeated measures ANOVA are reported in the Supplemental Materials Table S4.[3] Results from paired-samples t-tests are indicated in Table 3.[3] Researchers in psychological science were perceived as less agentic than researchers in the natural sciences, and as more agentic than researchers in the humanities. However, researchers in psychological science were perceived as similarly communal as researchers in the humanities, and as more communal than researchers in the natural sciences.

Taken together, researchers in psychological science were stereotyped as being high in both agentic and communal traits. Comparatively, they were rated slightly higher in agency than in communion. Compared to natural scientists, they were perceived as less agentic but more communal. In contrast, compared to researchers in the humanities, they were perceived as more agentic but equally communal.

3.2.4. SMP

We computed relative frequencies of male responses separately for the prime types (see Table 4 for descriptive statistics). A repeated measures ANOVA indicated that the frequencies of male responses differed as a function of prime type, $F(1.79, 387)$[8] $= 7.78$, $p < .001$, $\eta_p^2 = 0.04$. Paired-samples t-tests with a Bonferroni correction applied for multiple comparisons (adjusted $\alpha = 0.017$) revealed that male responses were less frequent after psychological science primes than after natural science primes, $t(216) = -3.46$, $p < .001$, $d_z = -0.24$, 95 % CI [−0.37, −0.10]. Responses did not differ between psychological science and humanities, $t(216) = -1.26$, $p = .210$, $d_z = -0.09$, 95 % CI [−0.22, 0.05]. However, male responses were more frequent after natural science than after humanities primes, $t(216) = 2.63$, $p = .009$, $d_z = 0.18$, 95 % CI [0.04, 0.31]. Thus, gender associations with psychological science were similar to those with the humanities, with both being less male and potentially gender-neutral compared to the natural sciences, albeit with small effect sizes.

[6] In German, the stimulus words were „Psychologische Wissenschaft", "Naturwissenschaft", and „Geisteswissenschaft".

[7] Because PsyToolkit requires setting a response window, we set a long response window of 10,000 ms.

[8] Greenhouse-Geisser corrected

Table 3
Mean agency and communion stereotypes about researchers in Studies 2 and 3.

Measure	Psychological science	Natural science	Humanities
Agency Stereotypes about Researchers			
Study 2	6.34_a (0.86)	6.50_b (0.88)	5.36_c (1.02)
Study 3	5.36_a (0.89)	5.66_b (0.90)	4.46_c (0.97)
Communion Stereotypes about Researchers			
Study 2	5.98_a (0.99)	4.63_b (0.81)	6.11_a (0.90)
Study 3	5.27_a (1.12)	3.69_b (0.91)	5.26_a (0.91)

Note. Standard deviations are printed in parenthesis. The scale ranged from 1 to 7. Values within a row with different subscripts are significantly different from each other, as determined by paired sample *t*-tests with a Bonferroni correction applied for multiple comparisons (adjusted $\alpha = 0.017$).

Table 4
Relative male response frequencies in the SMP in Studies 2 and 3.

Study	Psychological science	Natural science	Humanities	Female names	Male names
Study 2	0.51 (0.15)	0.57 (0.15)	0.53 (0.14)		
Study 3	0.51 (0.14)	0.53 (0.14)	0.52 (0.15)	0.45 (0.17)	0.60 (0.16)

Note. Standard deviations are printed in parenthesis.

3.2.5. Relation between self-reported and indirectly measured gender associations (SMP)

For correlational analyses, we calculated an SMP stereotype score using the following formula: SMP stereotype score = ($rf_{Natural\ Science}$ - $rf_{Psychological\ Science}$) - ($rf_{Psychological\ Science}$ - $rf_{Humanities}$), where"rf" represents the response frequencies of male responses. Positive values of the SMP stereotype score indicate that psychological science is more similar to natural science (than to humanities) in terms of gender associations. Negative values indicate that psychological science is more similar to humanities (than to natural science) in terms of gender associations. We found a significant correlation between SMP scores and self-reported psychological science-gender associations, $r(217) = 0.20$, $p = .004$, 95 % CI [0.07, 0.32]. Participants with larger self-reported male associations also showed stronger male associations in the SMP. The relation between SMP scores and self-reported gender associations was, however, not moderated by the motivation to control stereotypes (see Supplemental Materials Table S2).

3.3. Discussion

Results from self-report measures in Study 2 mainly replicated the findings from Study 1 that participants reported female associations with psychological science. Interestingly, associations with *researchers* in psychological science were gender neutral. At the same time, participants were aware of the male overrepresentation among faculty positions. Extending the findings from Study 1, Study 2 further showed that gender associations with psychological science were comparable to those of the humanities and differed from those of the natural sciences–in the direction of weaker male/stronger female associations. Furthermore, Study 2 revealed a trait profile of the typical psychological scientist as being high in both agency and communion.

Contrary to the results from the SC-IAT of Study 1, results from the SMP measure in Study 2 parallel participants' self-reported gender associations in that psychological science led to similar response patterns as the humanities but different from (i.e., less male than) the natural sciences. Given that the humanities have been shown to be stereotyped as female in previous research (Farrell & McHugh, 2017; Smyth & Nosek, 2015), this may point to a female gender stereotype about psychological science. Note, however, that results from the SMP only reveal relative differences between the three fields, but do not allow drawing any conclusions regarding the absolute strength of male vs. female associations.

4. Study 3

Study 3 was conducted in 2022 to replicate and extend the results from Study 2. The procedures and measures were largely the same, with few modifications as detailed below.

4.1. Method

4.1.1. Participants

Participants were psychology students, recruited via the participant pool management software at the University of Regensburg and the University of Hamburg (Sona-Systems; https://www.sona-systems.com), via nationwide student social media groups, and via the online participation platform SurveyCircle (https://www.surveycircle.com). As compensation they received 0.5 course credits or 2 €. Initially, 217 participants completed the online study. Based on preregistered criteria, we excluded participants who were enrolled at a non-German-speaking University ($n = 1$), who had technical problems with the online study ($n = 2$), who did not pass the attention check items ($n = 15$), and who indicated having knowledge of Chinese ($n = 5$). The final sample size was $N = 194$ (176 female and 18 male; with a median age of 21 years, ranging from 16 to 53 years). The majority of participants were enrolled in a Bachelor's program ($n = 176$, 91 %), while the remainder were enrolled in a Master's program. Fifty-two percent of participants were students at the University of Regensburg ($n = 106$), 20 % at the University of Hamburg ($n = 38$), and the rest were from various other universities. A sensitivity analysis with G*Power 3.1 indicated that our sample size allowed us to detect a minimal effect size of $d_z = 0.20$ in a one-sample *t*-test at a power of $1 - \beta = 0.80$ and a significance level of $\alpha = 0.05$ (two-tailed).

4.1.2. Procedures and materials

Materials and procedure were identical to Study 2, with the following exceptions. In the SMP, we counterbalanced response assignment (i.e., whether the left or right key was used to indicate that the ideograph refers to a female or male name) between participants, to control for potential response hand preferences. Furthermore, we included female and male first names (the same as in Study 1) as an additional gendered prime comparison condition in the SMP. Accordingly, we extended the SMP procedure to contain 100 trials by adding 40 trials with first name primes, with each name being presented twice in an individually randomized order. We therefore added another 40 Chinese ideographs as targets.

After completion of the SMP, participants completed the same self-report measures as in Study 2, with the following exceptions (see Table 1): We removed the items assessing competent people–gender associations, and we included six items assessing gender competence beliefs about psychological science, natural science and humanities (Farrell & McHugh, 2017; Lane et al., 2012). Gender competence beliefs are interesting because they reflect judgments about the perceived abilities of different genders in academic domains. They differ from mere gender associations, which may simply mirror gender ratios in academic participation rather than ability-related stereotypes. At the end, participants were fully debriefed in written form.

4.2. Results

4.2.1. Estimated male gender ratio among professors

Participants estimated that 54.0 % (SD = 17.5) of psychology professors at German universities were men. This value differed significantly from a gender-balanced ratio of 50 %, $t(193) = 42.60$, $p < .001$, $d_z = 3.06$, 95 % CI [2.72, 3.39], indicating that participants perceived a male overrepresentation in faculty positions.[3]

4.2.2. Self-reported gender associations

Replicating the results from the previous studies, a one-sample t-test indicated that participants reported female associations with psychological science, $t(193) = -10.81$, $p < .001$, $d_z = -0.78$, 95 % CI [−0.94, −0.62]. Similarly to Study 2, participants reported no gender associations with researchers in psychological science, $t(193) = -0.45$, $p = .652$, $d_z = -0.03$, 95 % CI [−0.17, 0.11]. In other words, when thinking about researchers in psychological science, they reported to equally think of men and women. However, and also replicating the results from Study 2, participants reported to think more strongly of women when thinking about researchers who are competent in psychological science, $t(193) = -5.21$, $p < .001$, $d_z = -0.37$, 95 % CI [−0.52, −0.23].

Results from one-way repeated measures ANOVAs with science field as within-subjects variable (psychological science vs. natural science vs. humanities) are reported in the Supplemental Materials Table S5.[3] Results from paired-samples t-test are reported in Table 2.[3] In a nutshell, gender associations with psychological science and humanities were mostly similar (except for science field–gender associations and competent researcher–gender associations, which were significantly more female for psychological science compared to humanities), while both science fields differed significantly from the natural sciences.

4.2.3. Gender competence beliefs

For ease of comparison, we calculated a gender competence belief score. We first averaged the items per science field and gender, and then computed a difference score between competence ascribed to men vs. women such that positive values indicate higher competence ascribed to men than to women, and negative values indicate higher competence ascribed to women than to men (for descriptive statistics, see Table 2). A one-sample t-test on the gender competence belief score against zero indicated that participants ascribed higher competence in psychological science to women relative to men, $t(193) = -7.70$, $p < .001$, $d_z = -0.55$, 95 % CI [−0.70, −0.40].

Results from a one-way repeated measures ANOVA with science field as within-subjects variable (psychological science vs. natural science vs. humanities) are reported in the Supplemental Materials Table S5.[3] In a nutshell, gender competence beliefs about psychological science were again comparable to those of the humanities, with participants ascribing higher competence to women than to men. They differed from the natural sciences, where participants ascribed higher competence to men than to women.

4.2.4. Agency and communion stereotypes about researchers

Descriptive statistics of agency and communion stereotypes about researchers are reported in Table 3. A paired-samples t-test revealed that researchers in psychological science were described as equally agentic as communal, $t(193) = 0.95$, $p = .342$, $d_z = 0.07$, 95 % CI [−0.07, 0.21].[3] Results from a 3 (Science Field) x 2 (Stereotype Content) repeated measures ANOVA are reported in the Supplemental Materials Table S6.[3] Results from paired-samples t-tests are indicated in Table 3.[3] In a nutshell, researchers in psychological science were perceived as less agentic than researchers in natural science, but as more agentic than researchers in the humanities. However, researchers in psychological science were perceived as similarly communal as researchers in the humanities, and as more communal than researchers in natural sciences.

Taken together, researchers in psychological science were stereotyped as being equally high in both agency and communion (while in Study 2, they were rated slightly higher in agency than in communion). Compared to natural scientists, they were perceived as less agentic but more communal. In contrast, compared to researchers in the humanities, they were perceived as more agentic but equally communal.

4.2.5. SMP

A first repeated measures ANOVA with prime name (female vs. male names) as within-subjects factor indicated that male responses were more frequent following male compared to female name primes, $F(1, 193) = 65.94$, $p < .001$, $\eta_p^2 = 0.26$, 90 % CI [0.17, 0.33] (see Table 4 for descriptives). This result indicates that the SMP-procedure was generally sensitive to gender-priming effects.

A second repeated measures ANOVA with science field (psychological science vs. natural science vs. humanities) as within-subjects factor did not yield a significant main effect, $F(2, 386) = 1.02$, $p = .363$, $\eta_p^2 = 0.005$, 90 % CI [0.00, 0.02]. Thus, unlike in Study 2 response frequencies did not differ as a function of science field, indicating that gender associations did not differ between fields.[9]

4.2.6. Relation between self-reported and indirectly measured gender associations (SMP)

We calculated SMP stereotype scores using the same formula as in Study 2. Different from Study 2, SMP scores were not significantly correlated with self-reported psychological science–gender associations, $r(194) = 0.11$, $p = .120$, 95 % CI [−0.03, 0.25]. The relation between SMP scores and self-reported gender associations was not moderated by the motivation to control stereotypes (see Supplemental Materials Table S2).

4.3. Discussion

Results from self-report measures in Study 3 largely replicated the findings from our previous studies: Participants reported female gender stereotypes about psychological science on all measures except one (they equally thought of both genders when thinking about researchers in psychological science). Extending previous findings, Study 3 further showed that participants attributed higher competence in psychological science to women compared to men. This result goes beyond mere gender associations, demonstrating that participants believed that women comparatively possess superior ability within this domain. As in Study 2, participants perceived researchers in psychological science as both communal and agentic. As such, they were associated both with stereotypically feminine (communal) and masculine (agentic) traits (Eagly et al., 2020), the latter of which are commonly attributed to scientists (Carli et al., 2016). Unlike Study 2, results from the SMP measure did not reveal different gender associations about the science fields.

5. Analyses using combined data from studies 1–3

The findings from Studies 1–3 raise several interesting questions that

[9] We had preregistered one-sample t-tests against 0.5 to investigate whether male response frequencies deviated from gender-neutrality. Male response frequencies following male name primes were significantly greater than 0.5, $t(193) = 9.00$, $p < .001$, $d_z = 0.65$, 95 % CI [0.49, 0.80], and male response frequencies following female name primes were significantly lower than 0.5, $t(193) = -3.77$, $p < .001$, $d_z = -0.27$, 95 % CI [−0.41, −0.13]. The larger effect size observed for male primes, compared to female primes, suggests a response bias favoring male responses. Consequently, a value of 0.5 cannot be considered as indicating gender neutrality. Given this, it would be inappropriate to test response frequencies following science primes against 0.5, and we therefore refrained from conducting these analyses.

can be approached by exploratory analyses of the combined data from the three studies with increased statistical power.[10] First, we investigated participant gender differences in gender stereotypes. Second, we investigated whether gender stereotypes were related to perceived gender ratios, as would be predicted by Social Role Theory (Eagly & Steffen, 1984; Koenig & Eagly, 2014). Third, we investigated participant gender differences in sense of belonging and science identity. Fourth, we investigated separately for female and male participants whether sense of belonging was related to perceived gender ratios and gender stereotypes, as was observed in the STEM domain (Master & Meltzoff, 2020; Schmader, 2023). Fifth, we investigated separately for female and male participants whether science identity was related to perceived gender ratios and gender stereotypes, as was observed in the STEM domain (Dasgupta, 2011; Schmader, 2023).

5.1. Participant gender differences in gender stereotypes

One may suspect that the strong female gender stereotypes found in self-report measures is mainly driven by the female overrepresentation in our sample. Across all studies, 88 % of participants were women — which is close to the typical female gender percentage of 76 % among students of psychology in Germany (Statistisches Bundesamt (Destatis), 2023a). For example, a simple gender-based ingroup preference or motivated ingroup enhancement may have biased participants self-reports (cf. ingroup favoritism observed in the meta-analyses on gender stereotypes by Eagly et al., 2020). To explore this possibility, we investigated participant gender differences in self-reported science–-gender associations. This measure was employed in all three studies, thus allowing aggregation to provide maximal statistical power. Across all studies, we obtained data from $n = 557$ female students and $n = 71$ male students (excluding data of participants with diverse gender identities, $n = 2$, from this analysis). A sensitivity analysis with G*Power indicated that this sample size allowed us to detect a minimal effect size $d = 0.35$ in a paired-samples t-test at a power of $1 - \beta = 0.80$ and a significance level of $\alpha = 0.05$ (two-tailed).

Indeed, women ($M = -0.70$, $SD = 1.13$) reported significantly larger female-psychological science associations than men ($M = -0.31$, $SD = 1.10$), $t(626) = -2.73$, $p = .006$, $d = -0.34$, 95 % CI [−0.59, −0.10]. Nevertheless, men's self-reported associations were significantly female according to a one-sample t-test, $t(70) = -2.37$, $p = .021$, $d_z = -0.28$, 95 % CI [−0.52, −0.04], as were women's, $t(556) = -14.61$, $p < .001$, $d_z = -0.62$, 95 % CI [−0.71, −0.53]. Thus, male psychology students also held female stereotypes about psychological science, albeit to a smaller extent than women, speaking against the possibility that the female gender stereotype was solely a result of ingroup-enhancing bias among female participants.

Both genders reported equal perceptions of a male overrepresentation among professors: Female participants estimated that 57.4 % ($SD = 18.1$) of professors were men, and male participants estimated that 60.0 % ($SD = 18.8$) of professors were men. These estimates did not significantly differ from each other, $t(626) = -1.14$, $p = .256$, $d_z = -0.14$, 95 % CI [−0.39, 0.10].

5.2. Estimated gender ratios and gender stereotypes

According to Social Role Theory, perceived gender ratios in social roles shape gender stereotypes (Eagly & Steffen, 1984). Thus, estimates of gender ratios in faculty positions should be related to gender stereotypes. As can be seen in Table 5, the estimated male gender ratio was significantly correlated with all self-report measures of gender stereotypes, albeit with small effect sizes ($0.14 \geq r \leq 0.23$). Participants who estimated a higher male gender ratio reported relatively stronger male gender stereotypes (or weaker female gender stereotypes). No such correlations were observed with indirectly measured gender stereotypes or with communion/agency stereotypes about researchers.

To better understand the relation between perceived gender ratios and psychological science-gender associations, we separately examined estimated gender ratios among psychology professors and self-reported researcher–gender associations (Studies 2–3). In the latter, participants were asked to indicate the extent to which they thought of women, men, or both, when thinking about researchers in psychological science. As such, this variable reflects participants' perceptions of gender ratios across all scientists, including those at lower career levels, such as PhD students and Postdocs. Note, that participants indicated to equally think of women and men on this measure. To examine the individual contributions of perceived gender ratios among professors vs. all scientists in predicting psychological science-gender associations, we conducted a linear regression analysis, using these two variables as predictors and psychological science–gender associations as the dependent variable. The model was significant, $R^2 = 0.03$, $p = .001$. The extent to which participants thought of men (vs. women) when thinking about researchers was significantly related to psychological science–male gender associations, $B = 0.15$, $\beta = 0.17$, $p < .001$, 95 % CI [0.07, 0.24]. The estimated male gender ratio among professors, however, was not related any more to science–male gender associations, $B = 0.001$, $\beta = 0.01$, $p = .779$, 95 % CI [−0.01, 0.01]. This post-hoc analysis, thus, suggests that psychological science-gender associations were more strongly related to perceived gender ratios across all psychological scientists than to perceived gender ratios in professorships.

5.3. Participant gender differences in sense of belonging and science identity

Women's sense of belonging ($M = 4.90$, $SD = 1.16$) did not differ significantly from men's ($M = 4.95$, $SD = 1.12$), $t(626) = -0.34$, $p = .733$, $d_z = -0.04$, 95 % CI [−0.29, 0.20]. Similarly, women's psychological science identity ($M = 5.62$, $SD = 1.06$) did not differ significantly from men's ($M = 5.52$, $SD = 1.21$), $t(626) = 0.74$, $p = .461$, $d_z = 0.09$, 95 % CI [−0.15, 0.34].

5.4. Sense of belonging in psychological science and estimated gender ratios/gender stereotypes

We investigated separately for female and male participants whether sense of belonging in psychological science was related to estimated gender ratios and gender stereotypes. Based on previous research in STEM (Dasgupta, 2011; Master & Meltzoff, 2020; Schmader, 2023), we expected that women would feel a higher sense of belonging if they perceived a higher female ratio and held stronger female gender stereotypes. As gender stereotypes were coded such that lower values indicate female stereotypes and higher values indicate male stereotypes, we expected a negative correlation for women. Among female participants, sense of belonging was indeed significantly correlated with estimated gender ratios such that female participants reported a higher sense of belonging the less they perceived academic professorship to be male dominated (see Table 6 for correlations of interest, and Supplemental Materials Table S7 for a full overview of correlations). Similarly, sense of belonging was related to four out of five self-report measures of gender stereotypes (but not indirectly measured gender stereotypes): Female participants reported a higher sense of belonging the more strongly they associated psychological science and psychological researchers with female, and the more strongly they believed women to be more competent than men in psychological science. Furthermore, they reported a higher sense of belonging the more strongly they described researchers in psychological science as communal. Agency stereotypes were unrelated to sense of belonging. In sum, results were mostly as expected for female participants, yet with small effect sizes. Correlations

[10] Note that we had preregistered for each study to explore correlations between gender stereotypes and other variables, these being participant gender, estimated gender ratios, sense of belonging, and science identity.

Table 5
Correlations among measures on combined data from Studies 1 through 3.

Measure	1	2	3	4	5	6	7	8	9	10
1. Estimated male gender ratio among professors	–	−0.05 (219)	−0.04 (411)	**0.14** (630)	**0.19** (411)	**0.17** (436)	**0.23** (411)	**0.18** (194)	0.01 (411)	−0.09 (411)
2. SC-IAT *D*-Score		–	–	−0.02 (219)	–	−0.02 (219)	–	–	–	–
3. SMP Score			–	**0.16** (411)	−0.02 (411)	−0.03 (217)	−0.01 (411)	−0.03 (194)	−0.02 (411)	0.05 (411)
4. Science Field – Gender Association				–	**0.18** (411)	**0.22** (436)	**0.21** (411)	**0.20** (194)	0.01 (411)	**−0.11** (411)
5. Researcher – Gender Association					–	**0.25** (217)	**0.43** (411)	**0.16** (194)	0.06 (411)	−0.07 (411)
6. Competent People – Gender Association						–	**0.53** (217)	**–**	0.03 (217)	**−0.25** (217)
7. Competent Researcher – Gender Association							–	**0.37** (194)	0.01 (411)	**−0.11** (411)
8. Gender Competence Beliefs								–	−0.08 (194)	−0.04 (194)
9. Agency Stereotypes about Researchers									–	**0.20** (411)
10. Communion Stereotypes about Researchers										–

Note. Values in bold are significant at $p < .05$. Sample size is printed in parentheses. All self-report measures refer to psychological science. The SMP stereotype score was calculated using the following formula: SMP stereotype score = ($rf_{Natural\ Science}$ - $rf_{Psychological\ Science}$) - ($rf_{Psychological\ Science}$ - $rf_{Humanities}$), where"rf" represents the response frequencies of male responses. Positive values of the SMP stereotype score indicate that psychological science is more similar to natural science (than to humanities) in terms of gender associations. Negative values indicate that psychological science is more similar to humanities (than to natural science) in terms of gender associations.

observed for male participants were non-significant with one exception, which was, however, driven by three individuals with extreme values. Note that results for men should be interpreted with caution because the small sample size limits reliability of the observed correlations (Schönbrodt & Perugini, 2013).

5.5. Psychological science identity and estimated gender ratios/gender stereotypes

Similarly to sense of belonging, we expected psychological science identity to be related to estimated gender ratios and gender stereotypes among women. In line with this reasoning, female participants reported a higher psychological science identity the less they perceived academic professorships to be male dominated (see Table 6 for correlations of interest, and Supplemental Materials Table S7 for a full overview of correlations).

Table 6
Correlations between gender stereotype measures and sense of belonging in psychological science and psychological science identity, separately by participant gender, on combined data from Studies 1 through 3.

Measure	Sense of Belonging		Science Identity	
	Women	Men	Women	Men
Estimated male gender ratio among professors	**−0.14** (557)	0.01 (71)	**−0.09** (557)	−0.16 (71)
SC-IAT *D*-Score	−0.07 (188)	−0.34 (31)	−0.09 (188)	−0.31 (31)
SMP Score	0.003 (369)	0.11 (40)	0.07 (369)	0.11 (40)
Science Field–Gender Association	**−0.16** (557)	0.05 (71)	**−0.10** (557)	−0.09 (71)
Researcher–Gender Association	0.01 (369)	0.12 (40)	−0.07 (369)	0.17 (40)
Competent People–Gender Association	**−0.14** (381)	**0.36** (53)	**−0.15** (381)	0.10 (53)
Competent Researcher–Gender Association	**−0.12** (369)	−0.11 (40)	−0.07 (369)	−0.09 (40)
Gender Competence Beliefs	**−0.20** (176)	−0.27 (18)	−0.14 (176)	−0.10 (18)
Agency Stereotypes about Researchers	0.07 (369)	0.06 (40)	0.07 (369)	0.05 (40)
Communion Stereotypes about Researchers	**0.17** (369)	0.03 (40)	**0.11** (369)	0.22 (40)

Note. Values in bold are significant at $p < .05$. Sample sizes are printed in parenthesis.

Furthermore, we observed significant correlations in the expected direction between science identity and gender stereotypes on two out of five self-report measures (but not indirectly measured gender stereotypes): Female participants reported a higher psychological science identity the more strongly they associated psychological science with female, and the more strongly they associated competence in psychological science with women. Furthermore, they reported a higher psychological science identity the more strongly they described researchers in psychological science as communal. Again, agency stereotypes were unrelated to identity. In sum, results were partially as expected for female participants, yet with small effect sizes. Correlations observed for male participants were non-significant. But note again that results for men should be treated with caution because the small sample size limits reliability of the observed correlations (Schönbrodt & Perugini, 2013).

6. General discussion

The present research investigated gender stereotypes about psychological science and related cognitions in three studies sampling psychology students at German-speaking universities. We proposed competing hypotheses regarding the direction of these gender stereotypes: On the one hand, the male dominance in higher academic positions and scientific contributions suggests formation of a male stereotype. On the other hand, the perception of psychological science as a discipline focused on the study of human thinking, feeling, and behavior—a stereotypically feminine subject—along with previous findings of female stereotypes about psychology in general, suggests formation of a female stereotype.

6.1. Self-reported gender stereotypes: Psychological science = female

The majority of self-report measures in Studies 1 through 3 consistently revealed female gender stereotypes about psychological science, with effect sizes ranging from small to large. In particular, participants reported to associate psychological science with female more than with male, and to more strongly think of women (than of men) when thinking about people or researchers who are competent in psychological science. Furthermore, they indicated to believe that women in general

(compared to men) were more competent in psychological science. These beliefs were evident among both female and male participants, rendering it unlikely that they were solely driven by potential ingroup-favoritism among the predominantly female sample.

These findings are consistent with previous studies showing a female stereotype in the broader domain of psychology and psychologists in general (Boysen et al., 2022; Carli et al., 2016). Importantly, our findings extend this previous research by demonstrating a female stereotype specifically related to *psychological science* among *psychology students*. This distinction is crucial: First, perceptions of psychology as a whole and of psychologists working in applied fields such as counseling or psychotherapy may differ from perceptions of academic psychological scientists. Second, stereotypes held by psychology students may differ from other participants' stereotypes as the former are more familiar with the scientific nature of the field and the male overrepresentation in higher academic positions. Finally, investigating psychology students' gender stereotypes is important because these may play a role in their academic career decisions.

Our findings of a psychological science = female stereotype may initially seem surprising from the perspective of Social Role Theory: Given that participants perceived a male overrepresentation among psychology professors, one would expect them to form respective male gender stereotypes. While the main effects did not demonstrate such pattern, results of the correlational and regression analyses were consistent with Social Role Theory: Participants who estimated a higher male gender ratio among psychology professors reported relatively stronger male gender stereotypes (or weaker female gender stereotypes). Furthermore, participants' perceptions of gender ratios across all psychological scientists (thus, including those at lower career levels), which were perceived as gender-balanced in our studies, more strongly predicted psychological science-gender associations than their estimates of professors' gender ratios. It should be noted, however, that these latter results must be interpreted with caution, as the regression analysis was conducted post-hoc, and the variables were not specifically designed to measure differences in perceived gender ratios across subgroups of psychological scientists. Nevertheless, the findings point to the notion that, for psychology students, perceived gender ratios among scientists including the next-higher career levels (PhD students and Postdocs) may be more strongly related to gender stereotypes than those at more distant career levels (Professors). As a further caveat it should be noted that the results are correlational, and therefore not suited for directional causal inferences. We cannot determine whether perceived gender ratios affected the formation of gender stereotypes, as suggested by Social Role Theory, whether gender stereotypes affected estimates of gender ratios, or whether any third variable contributed to the observed correlations.

6.2. Indirectly measured gender stereotypes: Inconsistent results

In contrast to the clear-cut findings from self-report measures, the results from indirect measures of gender stereotypes were inconsistent across measures and studies. While the SC-IAT used in Study 1 suggested a psychological science = male stereotype, the SMP in Study 2 revealed that the gender stereotype about psychological science was similar to the humanities and distinct from the natural sciences. This pattern in Study 2 may point to a female stereotype about psychological science, based on previous findings of a female stereotype about the humanities (Farrell & McHugh, 2017; Smyth & Nosek, 2015). The SMP in Study 3, however, did not reveal different stereotypes about the science fields. These null effects may have been caused by the methodological changes. The SMP in Study 3 was modified to include female and male names as primes, which evoked strong priming effects on participants' responses. We suspect that the inclusion of gendered names as primes reduced the measure's sensitivity to the potentially weaker priming effects stemming from the science field primes. A potentially better comparison condition may be gender-neutral primes.

How can the contradictory findings from the IAT and the SMP be explained? As the results from self-report measures replicated across studies it appears unlikely that the divergent findings stem from differences in participant samples or time. Another potential candidate are differences between the SC-IAT and the SMP regarding their measurement procedure and potential impact of spontaneous activation of gender stereotypes on the measurement outcomes (Gawronski, 2024). However, it is an ongoing debate whether, how and to what extent different indirect measures reflect automatic processes (Corneille & Gawronski, 2024).

A further candidate are the comparison conditions presented in the measures. In the SC-IAT, only the category of psychological science was presented, whereas in the SMP, natural sciences and humanities were included as additional categories. The inclusion of other science fields may have influenced the temporal construal of psychological science within the measurement situation (cf. Paulus & Wentura, 2016; Scherer & Lambert, 2009). Psychological science may have been perceived as relatively female compared to the male-dominated natural sciences, but as relatively male when considered in isolation. Finally, the measures also differed in the stimuli presented. In the SMP, the prime stimuli were the category labels ("psychological science", "natural sciences", "humanities"). In contrast, the stimuli in the SC-IAT were items related to psychological science (e.g., psychological research, department of psychology, chair of psychology). These items may have further influenced the construal of psychological science, emphasizing its academic context.

In sum, the present results remain inconclusive regarding whether spontaneous associations with psychological science are predominantly female or male. Therefore, future research is necessary to further elucidate this question. However, according to recent discussions, the indirect measures currently available come with many limitations and disadvantages, casting doubt on their potential to provide valid evidence (Corneille & Gawronski, 2024).

6.3. Sense of belonging and science identity: Relation with gender stereotypes

Based on research in STEM fields (Schmader, 2023), we had reasoned that perceived gender ratios and gender stereotypes may be related to participants' sense of belonging in the field of psychological science and their psychological science identity but expected differences for women and men. In line with this reasoning, women (but not men) reported a higher sense of belonging and a higher science identity the less they perceived men to be overrepresented in psychological science and the more strongly they stereotyped the discipline as female. These findings align with research in STEM, which shows similar relationships between sense of belonging, science identity, and gender stereotypes (Master & Meltzoff, 2020; Schmader, 2023). The present findings are particularly intriguing, as psychological science was stereotyped as female by our participants (in contrast to the male stereotype about STEM). This suggests that the relationships between gender stereotypes and belonging/identity in women are not confined to fields stereotyped as male but may represent a more universal phenomenon.

Notably, we did not find significant correlations between stereotypes and belonging or identity in our sample of men, although we interpret these null results cautiously because of the limited sample size. If taken at face value, this lack of correlation for men might signal that men's identity and belonging may be less dependent on their minority/majority status and corresponding gender stereotypes within a domain. This reasoning is in line with previous research in STEM, which similarly showed no relationship between sense of belonging and stereotypes among men (Block et al., 2018; but see Nosek & Smyth, 2011). On the other hand, research in HEED (health care, early education and domestic sphere) has shown that men's (reduced) sense of belonging in HEED was related to their (reduced) interest as well as to gender discrimination in HEED (Moss-Racusin et al., 2024; Tellhed et al., 2017). More research is, thus, needed to examine these mechanisms among male psychology

students in depth.

6.4. Trait stereotypes: Psychological scientists are perceived as communal and agentic

Generally, communion and agency are strongly linked to gender stereotypes: While women are typically perceived as more communal, men are typically perceived as more agentic (Eagly et al., 2020). Our findings revealed that psychological scientists were perceived as high in both communion and agency (cf. Carli et al., 2016). In contrast, natural scientists were perceived as predominantly agentic, whereas researchers in the humanities were perceived as predominantly communal. The perception of psychological scientists as being high in both traits suggests a more nuanced, multifaceted gender stereotype. Psychological scientists appear to combine stereotypically feminine and masculine traits—at least in the eye of psychology students. But note, that this pattern could also result from mere ingroup favoritism, as demonstrated in research on the Stereotype Content Model, where the ingroup is typically perceived as high in both warmth and competence (Fiske et al., 2002).

We further observed that female participants' sense of belonging, and their science identity were related to communion (not agency) stereotypes about psychological scientists. This observation is in line with the Goal Congruity Model in STEM research (Diekman et al., 2017). According to this model, women are deterred from pursuing careers in STEM due to a perceived misfit between their communal orientations and their view of STEM fields as lacking communal opportunities. In a similar vein, communal orientations perceived within psychological scientists appear to be relevant for female participants' sense of belonging to the field and their science identity. Notably, recent research has found that female (but not male) early-career academics perceived a misfit between their self-concept and the stereotype of a (solely) agentic successful academic, which was correlated with exit intentions (Van Veelen & Derks, 2022a). Future research may investigate if and to what extent these relationships can be interpreted as causal and are thus informative for future interventions or policy decisions. For example, a potential conclusion could be that communal role models in academic positions and an academic culture that values communion may help to enhance women's sense of belonging and science identity, ultimately attracting women to an academic career.

6.5. Gender participation gap in academic psychology

While research in STEM has demonstrated that gender stereotypes are shaped by perceived gender ratios and contribute to career decisions through their impact on belonging/identity or—more generally—fit experiences (Schmader, 2023), similar research addressing the gender participation gap in academic psychology is scarce. Although our research was not designed to identify the factors contributing to female underrepresentation in academic psychology, it serves as an initial step toward understanding a small but significant piece of this complex puzzle. Future research needs to establish whether there are actual causal relations from gender stereotypes onto belonging/identity. Moreover, future research needs to address the role of gender stereotypes and belonging/identity in academic career decisions within psychological science. If gender stereotypes are found to influence such decisions, our observation of a psychological science = female stereotype among current psychology students offers hope that future generations of female psychologists may be more likely to pursue academic careers. However, it is important to note that our participant samples consisted mainly of undergraduate psychology students. Perceptions of psychological science may change as students advance in their academic careers and become more familiar with an academic culture that strongly values agency (Van Veelen & Derks, 2022a). Furthermore, as they progress up the academic ladder, the male overrepresentation at the highest career level may play an increasingly important role in shaping gender stereotypes, sense of belonging, and, eventually, career decisions. Finally, gender stereotypes held by those in positions of power may fuel social exclusions and gate-keeping effects, making it more difficult for women to be selected for high-level academic positions (Begeny et al., 2020; Moss-Racusin et al., 2012; Cyr et al., 2021; but see, Ceci et al., 2023). Future research should therefore examine gender stereotypes across all career levels to further elucidate whether and to what extent they play a role in the gender participation gap in academic psychology.

6.6. Summary

The present research demonstrated that psychology students hold female stereotypes about psychological science. Perceived gender ratios among psychological scientists were related to these gender stereotypes. Women's sense of belonging in the field and their science identity were predicted by perceived gender ratios, gender stereotypes, and communion stereotypes about researchers.

CRediT authorship contribution statement

Regina Reichardt: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Mareike Röttger:** Writing – review & editing, Methodology, Investigation, Formal analysis. **Frauke Mann:** Writing – review & editing, Methodology, Investigation. **Nicole Renschler:** Writing – review & editing, Methodology, Investigation. **Jana Mangels:** Writing – review & editing, Investigation. **Juliane Degner:** Writing – review & editing, Conceptualization.

Consent to participate

All participants provided written informed consent electronically by selecting a checkbox prior to participation, in accordance with institutional ethical guidelines.

Ethical considerations

The research reported in this article was conducted in accordance with the Declaration of Helsinki and in accordance with the APA's ethical principles in the conduct of research with human participants. Ethical approval was not required for this research, according to the regulations in Germany.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT in order to improve the language of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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Data availability

The datasets generated during and/or analyzed during the current study are available in the osf repository https://osf.io/udr2c.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.actpsy.2025.105443.

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