





Reactions to male-favouring versus female-favouring sex differences: A pre-registered experiment and Southeast Asian replication

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Two studies investigated (1) how people react to research describing a sex difference, depending on whether that difference favours males or females, and (2) how accurately people can predict how the average man and woman will react. In Study 1, Western participants ($N = 492$) viewed a fictional popular-science article describing either a male-favouring or a female-favouring sex difference (i.e., men/women draw better; women/men lie more). Both sexes reacted less positively to the male-favouring differences, judging the findings to be less important, less credible, and more offensive, harmful, and upsetting. Participants predicted that the average man and woman would react more positively to sex differences favouring their own sex. This was true of the average woman, although the level of own-sex favouritism was lower than participants predicted. It was not true, however, of the average man, who – like the average woman – reacted more positively to the female-favouring differences. Study 2 replicated these findings in a Southeast Asian sample ($N = 336$). Our results are consistent with the idea that both sexes are more protective of women than men, but that both exaggerate the level of same-sex favouritism within each sex – a misconception that could potentially harm relations between the sexes.

From the moment of its inception, science has had to struggle with the fact that certain theories and findings – from the heliocentric model of the solar system to anthropogenic climate change – are highly controversial. Though commonly viewed as a problem on the political right, ideologically motivated science scepticism has now been documented on both sides of the political aisle (Ditto *et al.*, 2018; Kahan, Peters, Dawson, & Slovic, 2017; Washburn & Skitka, 2018). One area of research that tends to be more troubling to people on the left is that related to sex differences (Pinker, 2016). A large literature suggests that men and women differ, on average, in a number of psychological traits, including interest in casual sex, propensity for aggression, and cognitive abilities such as mental rotation and verbal fluency (Archer, 2019; Halpern, 2012; Stewart-Williams & Thomas, 2013a, 2013b). Although clearly influenced by social factors, various lines of evidence suggest that, at least in some cases, these differences are shaped as well by biological (i.e., inherited) factors: They appear across cultures, have been linked to prenatal hormonal exposure,

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and can be found in other animals subject to comparable Darwinian selection pressures (Archer, 2019; Stewart-Williams, 2018; Stewart-Williams & Halsey, 2020). However, although the research on human sex differences is relatively robust, the topic has sometimes sparked controversy, both within academia and outside it.

Two controversies in particular illustrate this point. First, in 2005, Harvard president Lawrence Summers provoked protests and ultimately had to resign after arguing that part of the reason that men are overrepresented in certain STEM fields may be that men are more variable in intellectual abilities, and thus that somewhat more men than women are found among the most cognitively able (as well as among the least). Second, in 2017, software engineer James Damore was fired from Google for suggesting that factors other than discrimination – most notably, average sex differences in interests and preferences – help to explain the predominance of men in the tech sector. Psychological sex differences are clearly a controversial topic.

But are all sex differences equally controversial? Much of the outrage surrounding the Summers and Damore affairs revolved around the perception that the differences they were positing put men in a better light than women. As a number of commentators have pointed out, though, sex differences that put *women* in a better light – for instance, the fact that women have better verbal skills, on average, and are less disposed to violence (Archer, 2019; Halpern, 2012; Stewart-Williams & Thomas, 2013b) – tend not provoke such consternation. The law professor Ann Althouse (2005) alluded to this asymmetry when she observed that, if you want to do research on sex differences and avoid censure, you have to interpret any findings in such a way as to show that women are superior. The hypothesis that people react more positively to female- than male-favouring sex differences has implications for the conduct and public reception of research on this topic, and was the main focus of the studies reported in this paper.

Women (and children) first

At first glance, this hypothesis might seem counterintuitive; after all, it appears to clash with the widely held view that people in general, and men in particular, typically hold more negative stereotypes of women than of men (see, e.g., Eagly & Mladinic, 1994, pp. 2–5; Glick & Fiske, 2001, p. 110; Mercier, Celniker, & Shariff, 2020). However, several lines of evidence support the expectation.

First, people commonly have more positive attitudes and feelings about women than men, and their stereotypes of women tend to include a greater number of desirable traits. Eagly and Mladinic (1994) dubbed this the Women Are Wonderful (or WAW) effect, and it appears to be fairly widespread (Eagly, Nater, Miller, Kaufmann, & Sczesny, 2020; Glick *et al.*, 2004). Because people tend to evaluate women more positively, research demonstrating male-favouring sex differences may elicit a more negative reaction, and a stronger inclination to explain away the results.

Second, people tend to be more concerned about harms suffered by women than men. For example, people see aggression perpetrated against women as more serious than aggression perpetrated against men (Harris & Knight-Bohnhoff, 1996; Stewart-Williams, 2002); are more willing to give up potential participation money to prevent an electric shock being delivered to a woman (FeldmanHall *et al.*, 2016); and in the classic hypothetical trolley dilemma, express greater willingness to push a man than a woman off a footbridge to stop an out-of-control train killing five people further along the track (FeldmanHall *et al.*, 2016). Similarly, in real-world settings, criminal defendants who harm women tend to receive harsher sentences than those who harm men, all else being equal

(Curry, Lee, & Rodriguez, 2004; Glaeser & Sacerdote, 2003; Shatz & Shatz, 2012). To the extent that unfavourable scientific findings about a group are seen as a harm to the group's members, people may be more concerned about findings unfavourable to women than those unfavourable to men.

Third, in many situations, people are more protective of women than men. This tendency, which is sometimes considered a form of *benevolent sexism* (Glick & Fiske, 1997), manifests itself in a range of ways. For example, people are more likely to help women than men; more likely to support policies aimed at helping women; and more willing to donate money to a female-only homeless shelter than a male-only shelter (Eagly & Crowley, 1986; Reynolds *et al.*, 2020). Certainly, there are instances where females' welfare is treated as secondary to males'; female-biased infanticide is probably the most extreme and unambiguous example. However, at least in the modern West, the general trend appears to run in the opposite direction.

All of this could potentially impact people's reactions to claims about sex differences. Specifically, people may react less positively to claims about male-favouring sex differences than they do about differences that favour females. They may find the former harder to believe, and judge the evidence supporting them to be less persuasive (Colombo, Bucher, & Inbar, 2016; Lord, Ross, & Lepper, 1979; Winegard *et al.*, 2018, 2019). Moreover, to the extent that they *do* accept the claims, they may view them as more unpleasant and potentially harmful, and prefer to chalk them up to nurture rather than nature – in part because people often conflate 'natural' with 'good', and in part because people assume that, if the differences are due to nurture, they might then be more easily eradicated. Such reactions may be more pronounced among individuals who see men as greatly privileged over women, and who therefore tend to interpret any male-favouring sex differences as a product of injustice and discrimination – a tendency more common on the political left (Winegard *et al.*, 2018). Still, if the reasoning above is correct, we would expect the preference for female-favouring differences to be fairly widespread: the rule rather than the exception.

Gender tribalism

There is, however, a complication. Although both sexes may tend to react more positively to female-favouring than male-favouring sex differences, they might not do so to the same degree. One of the best-supported findings in social psychology is that people are prone to ingroup biases: They perceive members of their own groups more favourably than those of others (Tajfel, Billig, Bundy, & Flament, 1971). Ingroup biases can form along any dimension of group identity, gender included. Both sexes appear to be prone to gender-ingroup biases (although note that several studies suggest that females are more prone than males; Moore, 1978; Olsen & Willemsen, 1978; Rudman & Goodwin, 2004). Importantly, gender-ingroup biases may affect people's assessments of research related to sex differences (Handley *et al.*, 2015).

If gender-ingroup biases were the only relevant variable, the expectation would be that men would react more positively to male-favouring differences whereas women would react more positively to female-favouring differences. We call this the *Gender Tribalism hypothesis*. For the reasons discussed in the last section, it seems unlikely that gender-ingroup biases are the only relevant variable. However, it may be that such biases will moderate the tendency to react more positively to female-favouring sex differences, such that this tendency will be stronger among women than men (for comparable findings, see

Eagly & Mladinic, 1994; Fortune, 2006; Glick *et al.*, 2004; Herlitz & Lovén, 2013; Reynolds *et al.*, 2020; Veldkamp *et al.*, 2017).

Lay estimates of gender bias

An additional question is whether people have an accurate view of how the average man and woman would react to research describing male-favouring versus female-favouring sex differences. Contrary to a long-held belief in social psychology, people's stereotypes about major demographic groups tend to be reasonably accurate, and gender stereotypes are no exception to this rule (Jussim, 2012; Jussim, Crawford, & Rubinstein, 2015). Is this the case, though, when it comes to the contentious issue of men and women's proneness to gender bias? In one study, Stewart-Williams (2002) found that both sexes tend to overestimate the extent to which people are biased in favour of their own sex in their reactions to aggression perpetrated by men versus women. Meanwhile, other research suggests that people *underestimate* the extent to which men hold pro-female attitudes (Diekmann, Eagly, & Kulesa, 2002; Fortune, 2006). In light of such studies, it seems probable that people will exaggerate the extent to which individuals react more positively to sex differences that flatter their own sex, and more negatively to sex differences that flatter the other – a pattern that could potentially stoke conflict between the sexes.

STUDY 1: PRE-REGISTERED EXPERIMENT

Based on the foregoing discussion, the aim of our first study was to test the following hypotheses:

1. On average, both sexes will react more positively to female-favouring than male-favouring sex differences.
2. This effect will be moderated by participant sex, such that, on average, the preference for female-favouring differences will be stronger among women than men.
3. Both sexes will tend to overestimate the extent to which the average man and woman are biased in favour of their own sex in their reactions to male- versus female-favouring sex differences.

An additional aim was to explore the relationship between people's reactions to research on sex differences and two other variables that, as discussed, are likely to influence those reactions: their political orientation and their belief in male privilege. Note that the study and hypotheses were pre-registered with OSF; see <https://osf.io/6n5up/>.

Method

Participants

Participants were recruited via the website Prolific.co (which pays people a small sum to complete online surveys and experiments), supplemented with a convenience sample consisting largely of people responding to advertisements on the social media website Reddit. A minimum sample size of 210 was calculated in advance using the freeware program G*Power, with alpha set at .05 and power at .95, and looking for at least a medium effect size (Faul *et al.*, 2007). The final sample included 492 individuals: 256 men and 236 women. Of these, 313 came from Prolific.co and 179 came from Reddit. The age range of the sample was 18 to 73 years ($M = 31.78$, $SD = 10.3$). Most participants were White

(84.1%); had some college/university education (94.5%); and resided in the United States (47%), the United Kingdom (35.2%), or Canada (11.8%). Most had no religion (61.9%) or were Christians (31.4%). Participants varied in religiosity, ranging from the very religious (1) to the very non-religious (5); the most common response, however, was 'very non-religious' (44.7%), and thus the average level of religiosity was somewhat skewed towards the low-religiosity side of the scale ($M = 3.76$, $SD = 1.32$). The full range of political views was represented in the sample; however, the average fell somewhat to the left of the political spectrum ($M = 2.99$, $SD = 1.47$, on a scale spanning from 1 [*Extremely left or liberal*] to 7 [*Extremely right or conservative*]).

Materials and procedure

After providing some basic demographic information, participants were presented with one of four versions of a popular-science article (which, unbeknownst to them, was invented for the present study). Two versions of the article reported on a sex difference in a desirable trait (drawing ability), and two reported on a sex difference in an undesirable trait (lying frequency). Within each of these conditions, one version of the article presented a male-favouring version of the hypothetical finding (i.e., men scored higher on drawing ability or lower on lying frequency), whereas the other presented a female-favouring version (the reverse). We did not have any specific hypotheses regarding the two traits used in the study, or any expectation that the valence of the traits would have any meaningful effects. The main rationale for including them was that it would allow us to begin to assess whether any effects of the variable Sex Favoured were merely idiosyncratic reactions unique to any one particular trait, or to desirable versus undesirable traits in general. We chose drawing ability and lying because neither is associated with a strong gender stereotype, and thus we could plausibly claim a sex difference in either direction for both.

Each of the hypothetical articles included both a verbal description of the putative sex difference and a bar graph to complement the description. Participants were asked to 'read the excerpt and study the graph carefully – carefully enough that you'll be able to answer questions about them later'. Having done this, they then completed four questionnaires.

Reaction-to-Research Questionnaire

The first questionnaire asked participants for their views about the study and its findings. Specifically, it asked them how interesting, important, plausible, surprising, offensive, harmful, and upsetting they thought the results were; how well-conducted they thought the study was; how inherently sexist they thought research of this kind is; and to what extent they thought the sex difference was due to nurture more than nature. All responses were registered on Likert-type scales ranging from 1 to 7, with anchors appropriate to each item (e.g., 'not plausible at all' versus 'extremely plausible'; 'not harmful at all' versus 'extremely harmful'). The one exception was the Nurture > Nature item, which used a 1 to 5 scale, where 1 meant 100% nature and 5 meant 100% nurture.

How Does the Average Man/Average Woman Think?

The next two questionnaires were designed to elicit participants' predictions about how the average man and woman would respond to the hypothetical research. To do this, we

repeated the questions from the Reaction-to-Research questionnaire, except that instead of asking participants about their own reactions, we asked them what they thought the reactions of the average man and average woman doing the study would be.

Male-Privilege Belief Scale

The fourth and final questionnaire asked participants for their views about how privileged men and women are in society. The items in this questionnaire were adapted from the four-item 'Belief in White Privilege' measure devised by Martin and Nezelek (2014), except with 'men' replacing 'Whites', and 'women' replacing 'non-Whites', for each of the items. (So, for example, the item 'Do you think Whites have fewer opportunities or more opportunities than non-Whites?' was replaced with 'Do you think men have fewer opportunities or more opportunities than women?') The response scales ranged from -3 to 3 , with scores greater than 0 indicating a belief that men are privileged over women, scores less than 0 indicating a belief that women are privileged over men, and 0 indicating a belief that neither sex is privileged over the other.

Results

Data were analysed using a series of two-way ANOVAs. The factors were Sex Favoured and Participant Sex. We did not include Trait Valence as an additional factor, because preliminary analyses showed that it did not interact consistently with Sex Favoured or Participant Sex, and, in the few cases where it did, it did not change the direction of the effects in question. This provides initial evidence that the effects of Sex Favoured and Participant Sex are not unique to any particular trait, or to desirable versus undesirable traits, but are relatively robust.

Participants' reactions to the research

To begin with, we examined participants' reactions to the research. To get an overall sense of their reactions, we created an aggregate Reaction-to-Research variable, based on the individual items in the survey, other than the Nurture > Nature item. We excluded the latter because it correlated only weakly with the rest. The nine remaining items had a good level of internal consistency ($\alpha = .8$). Note that we reverse-scored the five items indicating a negative reaction to the research, namely Surprising, Offensive, Harmful, Upsetting, and Inherently Sexist.¹ Thus, higher scores on the aggregate item indicated a more positive view of the research.

To assess Hypothesis 1, we looked at the effect of Sex Favoured on participants' responses to the hypothetical popular-science article. Consistent with expectations, participants were more positive about the female-favouring sex differences than the male-favouring ones ($F_{1, 488} = 30.90, p < .001, d = 0.5$; see Figure 1, 'Overall: Aggregate Variable'). To get a more nuanced picture, we also looked at the main effects of Sex Favoured on each of the individual items (see Tables S1 and S2 for the descriptive and inferential statistics related to the individual items). In most cases, the main effects were significant. As Figure 1 shows, when the reported sex difference favoured females,

¹ In principle, surprise could be a positive or a negative reaction; however, the item correlated much more strongly with the others when treated as a negative reaction.

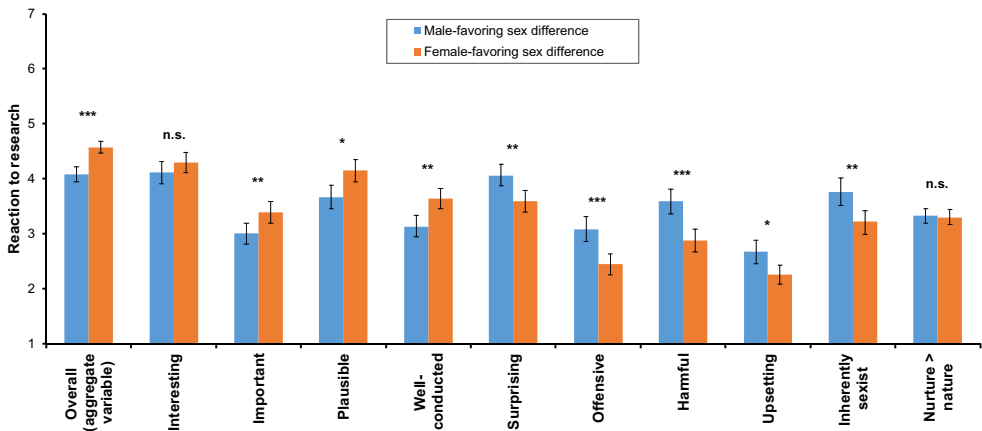


Figure 1. Participants' reactions to hypothetical research describing a male-favouring versus a female-favouring sex difference: overall (aggregate variable) and individual items (Study 1). Higher scores on the aggregate variable indicate a more positive reaction; higher scores on the individual items indicate stronger agreement that the descriptor applies to the hypothetical findings. In general, participants reacted more positively to female-favouring than male-favouring differences. * $p < .05$; ** $p < .01$; *** $p < .001$; n.s.: not significant. Error bars = 95% CIs.

participants viewed the findings as more important and plausible, and the study as better-conducted. Conversely, when the reported sex difference favoured *males*, participants viewed the hypothetical findings as more surprising, offensive, harmful, and upsetting, and such studies as more inherently sexist. Contrary to expectations, Sex Favoured did not affect how interesting participants found the study, or the extent to which they attributed the findings to nurture more than nature.

There was a small but significant main effect of Participant Sex: Averaging across experimental conditions, men were somewhat more positive overall about the research ($F_{1, 488} = 8.79, p = .003, d = 0.26$). Contrary to Hypothesis 2, though, there was little evidence of gender-ingroup bias in participants' responses to the male- versus female-favouring sex differences. For the aggregate variable, there was no interaction between Sex Favoured and Participant Sex, indicating that both sexes preferred the female-favouring differences to the male-favouring differences to a similar degree ($F_{1, 488} = 2.38, p = .124, d = 0.14$). An analysis of the individual items largely confirmed this pattern: Sex Favoured did not interact with Participant Sex for most of the individual items. There were, however, two exceptions. First, women thought the study was better-conducted when it revealed a female-favouring sex difference ($F_{1, 229} = 20.46, p < .001, d = 0.6$), whereas men thought it was equally well-conducted regardless of the favoured sex ($F_{1, 249} = 1.22, p = .271, d = 0.14$). Second, women saw the study as more potentially harmful when it revealed a male-favouring difference ($F_{1, 231} = 23.02, p < .001, d = 0.63$), whereas men did not see it as any more or less harmful ($F_{1, 253} = 3.54, p = .061, d = 0.24$). In short, female participants drove the main effects of Sex Favoured on the variables Well-Conducted and Harmful. These findings are broadly consistent with Hypothesis 2; the preponderance of evidence, however, is not. (See Tables S1 and S2 for all the relevant descriptive and inferential statistics).

Political orientation and belief in male privilege

Our next goal was to explore the associations between participants' reactions to the research and two possible predictor variables: political orientation and belief in male privilege. As mentioned, political orientation was measured using a single item, with the average participant falling somewhat to the left of the political spectrum ($M = 2.99$ on a 1–7 scale where 1 represents *strongly left* and 7 *strongly right*). Belief in male privilege, in contrast, was measured using the four-item scale discussed earlier. The items had a high level of internal consistency ($\alpha = .88$) and thus were aggregated. As noted, the scale ranged from -3 to 3 , with positive values representing the view that men are privileged over women and negative values the reverse. Both sexes tended to see men as privileged over women, though on average, women did so to a greater extent ($M = 1.52$, $SD = 1.01$ for women vs. $M = 0.81$, $SD = 1.2$ for men; $F_{1, 490} = 49.33$, $p < .001$, $d = 0.64$). Only a minority of participants (11.2%) saw women as more privileged than men. This included 16.4% of the men and 5.5% of the women.

To explore how political orientation and belief in male privilege impacted participants' reactions to the hypothetical findings, we ran a moderation analysis using PROCESS Model 3 (Hayes, 2017), with Sex Favoured as the independent variable, Reaction to Research as the dependent variable, and political orientation and male-privilege belief as moderators. Following Aiken and West (1991), all variables were mean-centred prior to running the analysis. The overall model was significant ($R^2 = .168$, $F_{7, 477} = 13.76$, $p < .001$). Sex Favoured was by far the strongest unique predictor of reactions to the research, with participants responding more favourably to female- than to male-favouring sex differences, as discussed ($B = 0.521$, $t_{477} = 5.88$, $p < .001$). Political orientation was also a significant predictor, albeit a notably weaker one: The more right-leaning that participants were, the more positive their reaction to the research overall ($B = 0.066$, $t_{477} = 2.12$, $p = .034$). Male-privilege belief was not a significant predictor of participants' overall reactions to the research ($B = -0.054$, $t_{477} = -1.38$, $p = .168$).

These findings were qualified, however, by significant interactions between Sex Favoured and political orientation ($B = -0.186$, $t_{477} = -3.01$, $p < .001$), and between Sex Favoured and male-privilege belief ($B = 0.395$, $t_{477} = 5.06$, $p < .001$). To explore these interactions, we ran a pair of multiple regressions: one for participants exposed to male-favouring findings and one for participants exposed to female-favouring findings, using political orientation and male-privilege belief as the predictor variables. Together, these variables partially predicted participants' reactions to both experimental conditions (male-favouring: $R^2 = .154$, $F_{2, 242} = 22.1$, $p < .001$; female-favouring: $R^2 = .047$, $F_{2, 237} = 5.83$, $p = .003$).

The effects of political orientation were somewhat modest. The more that participants leaned to the left politically, the less positively they reacted to the male-favouring findings ($B = 0.157$, $t_{242} = 3.39$, $p = .001$): a small but significant effect. Political orientation had no effect on reactions to the female-favouring findings ($B = -0.03$, $t_{237} = -0.74$, $p = .459$).

The effects of male-privilege belief, while also modest, were larger and more consistent. The more privileged that participants thought men are over women, the less positively they responded to the male-favouring differences ($B = -0.248$, $t_{242} = -4.28$, $p < .001$), and the more positively they responded to the female-favouring differences ($B = 0.15$, $t_{237} = 2.91$, $p = .004$). Conversely, the more privileged that people thought *women* are over men, the more positively they responded to the male-favouring differences and the less positively they responded to the female-favouring differences. The regressions for male-privilege belief are shown in Figure 2. Notice that the regression

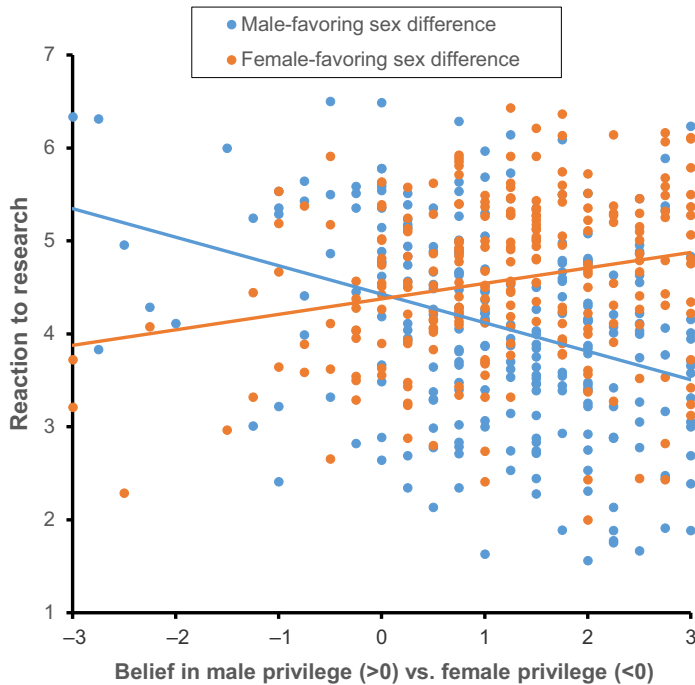


Figure 2. Participants' reactions to hypothetical research showing a male- versus a female-favouring sex difference as a function of belief in male versus female privilege (Study 1). Higher scores indicate more positive reactions. The regression lines show that the more privileged that participants think men are over women, the more positive their reaction to female-favouring sex differences and the less positive their reaction to male-favouring ones (and the opposite for the minority who believe that women are privileged over men).

lines crossover at almost exactly the zero point on the Male-Privilege Belief Scale. This suggests that participants who believed that neither sex is more or less privileged than the other were the least likely to react differently to the hypothetical sex differences depending on which sex was favoured.

Participants' predictions about men and women's gender biases

To explore participants' predictions about how the average man and woman would react to male- versus female-favouring sex differences, we first created two aggregate variables from the individual items in the predictions questionnaires: one for predictions about the average man and one for predictions about the average woman. Again, the Nurture > Nature items were excluded as they reduced the internal consistency of the resulting aggregate variables. The remaining items exhibited a high level of internal consistency ($\alpha = .86$ for the average-man variable; $\alpha = .9$ for the average-woman). Participants' predictions are shown in Figure 3, alongside the actual findings of the study.

We start with participants' predictions regarding the average man. Consistent with Hypothesis 3, participants predicted that, overall, the average man would respond more positively to male-favouring than female-favouring sex differences ($F_{1, 486} = 345.13$, $p < .001$, $d = 1.62$). Looking at the individual items, the main effect of Sex Favoured was

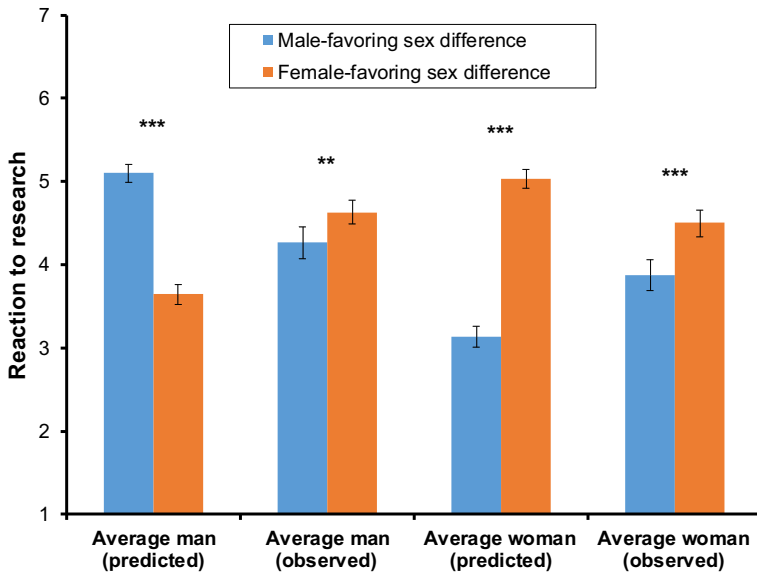


Figure 3. Participants' predictions regarding the reactions of the average man and the average woman to male-favouring versus female-favouring sex differences, alongside the actual reactions observed (Study 1). Higher scores indicate more positive reactions. Participants predicted much larger own-sex-favouring reactions than were actually observed, and – in the case of the average man – got the direction of the effect wrong. * $p < .05$; ** $p < .01$; *** $p < .001$; n.s., not significant. Error bars = 95% CIs.

significant for all the average-man items (see Tables S3 and S4 for the relevant descriptive and inferential statistics). Participants predicted that the average man would find the male-favouring results more interesting, important, and plausible, and would agree more that the study was well-conducted. Conversely, participants predicted that the average man would find the *female*-favouring results more surprising, offensive, harmful, and upsetting, and would agree more that such studies are inherently sexist. Finally, participants predicted that the average man would think that nurture played a larger role, and nature a smaller one, in shaping a female-favouring sex difference than a male-favouring one.

The participants' predictions were uniformly false. Contrary to their collective expectations, the average man reacted more positively overall to the *female*-favouring than the male-favouring sex differences ($F_{1, 254} = 8.35, p = .004, d = 0.36$; see Figure 3). For the individual items, as mentioned, the average man either reacted more positively to the female-favouring differences, or did not react differently depending on which sex was favoured.

There was no main effect of Participant Sex for the average-man aggregate variable ($F_{1, 486} = 2.42, p = .121, d = 0.1$). There was, however, a Sex Favoured * Participant Sex interaction ($F_{1, 486} = 22.79, p < .001, d = 0.43$). Post-hoc tests revealed that, although both sexes predicted that the average man would react more positively to male-favouring than female-favouring sex differences, female participants predicted a stronger own-sex bias among males than males did themselves. Specifically, female participants predicted that the average man would have a stronger positive reaction to the male-favouring sex differences than male participants predicted ($F_{1, 245} = 5.91, p = .016, d = 0.31$), and a less positive response to the female-favouring differences ($F_{1, 241} = 17.76, p < .001$,

$d = 0.54$). A similar pattern was evident for eight of the individual items; for the other two, there was no Sex Favoured * Participant Sex interaction (see Tables S3 and S4).

We now turn to participants' predictions regarding the average woman. Again consistent with Hypothesis 3, participants predicted that, overall, the average woman would react more positively to female-favouring than to male-favouring sex differences ($F_{1, 485} = 506.79, p < .001, d = 2.04$; see Figure 3). Breaking this down, the main effect of Sex Favoured was significant for all the average-woman individual items, and in each case was the mirror image of the average-man prediction (see Tables S5 and S6). Participants predicted that the average woman would find the female-favouring sex difference more interesting, important, and plausible, and would agree more that the study was well-conducted. Conversely, participants predicted that the average woman would find the *male*-favouring sex difference more surprising, offensive, harmful, and upsetting, and would agree more strongly that such studies are inherently sexist. Finally, participants predicted that the average woman would think that nurture played a larger role, and nature a smaller one, in shaping male-favouring sex differences than differences favouring females.

Consistent with the participants' predictions, the average woman did react more positively to female- than to male-favouring sex differences ($F_{1, 234} = 26.36, p < .001, d = 0.67$; see Figure 3). Note, though, that the actual effect size was an order of magnitude smaller than the predicted one ($d = 0.67$ vs. 2.04 , respectively). Looking at the individual items, participants were correct in all of their predictions, except when it came to Interesting and Nurture> Nature, for which there was no effect of Sex Favoured for either sex.

There was no main effect of Participant Sex for the aggregate average-woman variable ($F_{1, 485} = 0.36, p = .551, d = 0.04$), and no interaction between Participant Sex and Sex Favoured ($F_{1, 485} = 0.15, p = .698, d = 0.004$). Thus, whereas women predicted more own-sex bias from the average man than men did, men did not predict more own-sex bias from the average woman than women did. This was the case as well for most of the individual items (see Tables S5 and S6).

Discussion

Consistent with Hypothesis 1, both sexes reacted more positively to the female- than the male-favouring sex differences. Contrary to Hypothesis 2, this tendency was generally no stronger among female participants. Finally, consistent with Hypothesis 3, participants overestimated the extent to which people would be biased in favour of their own sex, with women overestimating men's ingroup bias more than men overestimated women's. These findings are consistent with the idea that both sexes are more protective of women than men, but that people tend not to be aware of this.

STUDY 2: PRE-REGISTERED SOUTHEAST ASIAN REPLICATION

If people are more protective of women, why might that be? In our view, there are two main possibilities. The first is that it traces to physical differences between the sexes. This includes the fact that, on average, women are less strong than men, and thus more vulnerable. It also includes the fact that, because the minimum biological expenditure required to produce offspring is greater for women than men, women are more 'reproductively valuable': If half the men in a group were eliminated, the

group could still produce about as many offspring as it would otherwise; if half the *women* were eliminated, they could not (Baumeister, 2010; Reynolds *et al.*, 2020). In either case or in both, the differences could create biological and/or cultural selection pressures for greater protectiveness of women (and/or a tendency to control women).

A second explanation is that the protectiveness gap arises from ideas and ideologies that are unique to the West or to WEIRD nations (Henrich *et al.*, 2010). One such ideology has been dubbed *equalitarianism* by Winegard *et al.* (2018, 2019). This moral worldview – which is more common on the political left – involves a strong focus on perceived victim groups, a belief that any disadvantages of victim groups are due to discrimination from privileged groups, and a consequent aversion to any claim that puts privileged groups in a better light. In the context of gender, equalitarianism may result in what Seager and Barry (2019) call the *gamma bias*: a tendency to focus on and exaggerate ways in which men are privileged and women disadvantaged, and to ignore or minimize ways in which the reverse is the case.

Needless to say, a hybrid model is also possible: People may be more protective of women for reasons that transcend culture, but this baseline tendency may be amplified in the modern West. Nonetheless, *to the extent* that the greater protectiveness of females stems from universal physical differences, we would expect it to extend beyond Western borders. The aim of this second study was to begin to assess this expectation.

To that end, we reran our original experiment in a less Westernized, more traditionally religious, and less gender-egalitarian world region: Southeast Asia (World Economic Forum, 2018). Our reasoning was that, if the original results replicated in such a different cultural milieu, this would provide preliminary evidence that the female-favouring preference documented in Study 1 is not merely a product of contemporary Western mores. Once again, the study and hypotheses were pre-registered with OSF; see <https://osf.io/mwaz2/>.

Method

Participants

Participants were recruited via Southeast Asian user groups on Reddit and Facebook, and via several social networks unique to Southeast Asia. Unlike Study 1, participants were not paid for their participation. The final sample consisted of 336 individuals: 192 men and 144 women. The age range was 18–67 years ($M = 25.2$, $SD = 6.58$). Most participants were single (87.2%) and had at least some college education (69.7%). Most were from Brunei (41.4%), Malaysia (20.8%), Indonesia (10.1%), or the Philippines (8.3%). Ethnically, most were Southeast Asians (69.9%), East Asians (31.8%), or South Asians (4.8%) living in Southeast Asia. Around 38.7% were Muslims, 18.5% were Christians, 12.5% were Buddhists, and 26.2% had no religion. Mean religiosity was 3.18 ($SD = 1.12$), on a scale spanning from 1 (*very religious*) to 5 (*very non-religious*). Mean political orientation was 3.06 ($SD = 1.28$), on a scale spanning from 1 (*extremely left*) to 7 (*extremely right*).

Materials and procedure

The materials and procedure were identical to those used for the Western sample. All materials were in English.

Results

The raw dataset contained a lot of missing data, with only 135 participants (40.18%) completing every item. As such, we ran an Estimation Maximization missing values analysis to impute the values of missing items. Data were analysed using a series of two-way ANOVAs, with the factors being Sex Favoured and Participant Sex. Trait Valence once again did not interact with either of these variables and thus was not included as an additional factor. To simplify the analysis, we focused on the three aggregate variables: Reaction to Research, Average-Man Predicted, and Average-Woman Predicted. These were constructed in the same way as the aggregate variables for Study 1, using all the individual items other than Nurture > Nature, which only weakly correlated with the rest. All three variables had a good level of internal consistency ($\alpha = .77, .82, \text{ and } .85$, respectively). See Tables S7 and S8 for all the descriptive and inferential statistics related to Study 2.

Participants' reactions to the research

Consistent with Study 1, participants were more positive overall about the female- than the male-favouring sex differences ($F_{1, 332} = 16.46, p < .001, d = 0.47$; see Figure 4, 'Total Sample: Observed'). Also consistent with Study 1, men were somewhat more positive about the research overall ($F_{1, 332} = 4.41, p = .037, d = 0.25$). In addition, and once again consistent with Study 1, there was no interaction between Sex Favoured and Participant Sex ($F_{1, 332} = 0.63, p = .43, d = 0.09$), suggesting that men and women did not differ in the strength of their pro-female preference.

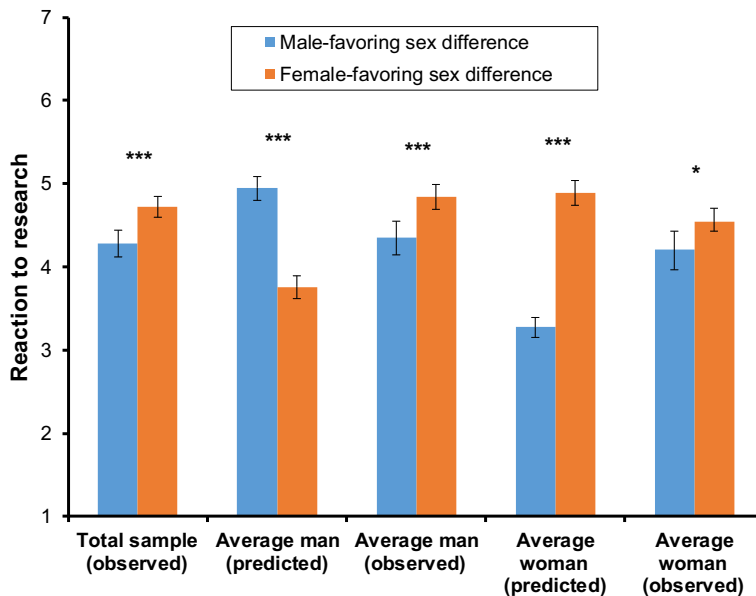


Figure 4. Southeast Asian participants' reactions to male-favouring versus female-favouring sex differences, and their predictions regarding the reactions of the average man and average woman (Study 2). Higher scores indicate more positive reactions. The pattern of findings, and even the effect sizes, are strikingly similar to those of the Western sample. * $p < .05$; ** $p < .01$; *** $p < .001$; n.s., not significant. Error bars = 95% CIs.

To determine whether there were any differences between the Southeast Asian and Western samples, we created a combined dataset and reran the analysis using Culture as an additional independent variable. We found only one significant effect: On average, Southeast Asian participants had a slightly more positive reaction to the research ($M = 4.51$, $SD = 0.95$) than Western participants ($M = 4.32$, $SD = 1.02$; $F_{1, 820} = 6.15$, $p = .013$, $d = 0.19$). There were no significant two- or three-way interactions involving Culture and the other two variables (all $ps > .05$).

Finally, because the Nurture > Nature variable was not included in the aggregate variable, we analysed it separately. Unlike Study 1, there was a main effect of Sex Favoured for this variable ($F_{1, 332} = 6.47$, $p = .011$, $d = 0.24$). The direction of the effect, however, was the opposite of what we predicted: Participants attributed a slightly larger role to nurture for the *female*-favouring differences ($M = 3.65$, $SD = 0.93$) than the *male*-favouring ones ($M = 3.42$, $SD = 1$). There was also a main effect of Participant Sex: Female participants attributed a larger role to nurture ($M = 3.76$, $SD = 0.92$) than did males ($M = 3.37$, $SD = 0.98$; $F_{1, 332} = 14.59$, $p < .001$, $d = 0.41$). There was no interaction between Sex Favoured and Participant Sex ($F_{1, 332} = 1.08$, $p = .299$, $d = 0.11$).

Political orientation and belief in male privilege

The four items of the Male-Privilege Belief Scale had a reasonable level of internal consistency ($\alpha = .71$) and thus were aggregated. Both sexes tended to view men as privileged over women, although on average, women did so more ($M = 1.26$, $SD = 0.84$ vs. $M = 0.44$, $SD = 1.07$; $F_{1, 334} = 57.67$, $p < .001$, $d = 0.85$). While this sex difference was larger than that for the Western sample ($d = 0.85$ vs. $d = 0.64$), the mean scores for both sexes were lower, suggesting a weaker belief in male privilege among Southeast Asians. Around 18.5% of participants viewed women as more privileged than men: 26.6% of the men and 7.6% of the women. The equivalent figures for the Western sample were 11.2%, 16.4%, and 5.5%, respectively.

To explore the impact of political orientation and male-privilege belief on participants' reactions to the research, we repeated our moderation analysis using Sex Favoured as the independent variable, Reaction to Research as the dependent, and political orientation and male-privilege belief as moderators. The overall model was again significant ($R^2 = .142$, $F_{7, 283} = 6.71$, $p < .001$). As with Study 1, Sex Favoured was the strongest unique predictor of participants' reactions ($B = 0.471$, $t_{283} = 4.38$, $p < .001$). Unlike Study 1, however, political orientation did not predict participants' overall reactions to the research ($B = 0.047$, $t_{283} = 1.1$, $p = .273$), whereas male-privilege belief did: The more privileged that participants thought males are over females, the less positively they reacted to the research overall ($B = -0.178$, $t_{283} = -3.43$, $p < .001$).

There was no interaction between Sex Favoured and political orientation ($B = -0.05$, $t_{283} = -0.58$, $p = .559$). There was, however, a significant interaction between Sex Favoured and male-privilege belief ($B = 0.236$, $t_{283} = 2.29$, $p = .02$). To dissect this interaction, we ran a pair of linear regressions: one for participants exposed to the male-favouring differences and one for participants exposed to the female-favouring differences. Mirroring Study 1, male-privilege belief partially predicted participants' reactions to the male-favouring sex differences ($R^2 = .12$, $F_{1, 160} = 21.85$, $p < .001$): The more privileged that participants thought men are over women, the less positive their reactions were to the male-favouring sex differences ($B = -0.303$, $t_{160} = -4.13$, $p < .001$). Unlike Study 1, however, male-privilege belief did not predict participants'

responses to the female-favouring differences ($R^2 = .011$, $F_{1, 172} = 1.88$, $p = .172$, $B = -0.067$, $t_{172} = -0.92$, $p = .36$).

Participants' predictions about men and women's gender biases

The findings relevant to the participants' predictions are shown in Figure 4. Replicating Study 1, participants predicted that the average man doing the study would respond more positively to the male-favouring differences than the female-favouring differences ($F_{1, 332} = 169.71$, $p < .001$, $d = 1.34$). Also replicating Study 1, this prediction was false: The average man responded more positively to the *female*-favouring differences ($F_{1, 190} = 14.35$, $p < .001$, $d = 0.54$). There was no effect of Participant Sex ($F_{1, 332} = 2.76$, $p = .098$, $d = 0.09$). However, there was a significant interaction between Participant Sex and Sex Favoured ($F_{1, 332} = 13.46$, $p < .001$, $d = 0.41$). As with Study 1, women predicted a stronger pro-male bias among men ($F_{1, 142} = 112.72$, $p < .001$, $d = 1.77$) than men themselves predicted for their own sex ($F_{1, 190} = 54.36$, $p < .001$, $d = 1.07$).

Turning to the average-woman findings, and replicating Study 1, participants predicted that the average woman doing the study would respond more positively to the female-favouring than the male-favouring sex differences ($F_{1, 332} = 325.86$, $p < .001$, $d = 2$). As with Study 1, this prediction was accurate in terms of the direction of the effect ($F_{1, 142} = 4.4$, $p = .038$, $d = 0.35$), but not the effect's magnitude: The actual level of own-sex bias among females was notably lower than the predicted level ($d = 0.35$ vs. $d = 2$, respectively). Finally, and once again replicating Study 1, there was no effect of Participant Sex ($F_{1, 332} = 0.55$, $p = .459$, $d = 0.14$), and no interaction between Participant Sex and Sex Favoured ($F_{1, 332} = 0.03$, $p = .855$, $d = 0.02$).

Discussion

Study 2 replicated most of the findings of Study 1, but in a very different cultural context. This provides preliminary evidence that the tendencies revealed in Study 1 are not solely a product of modern Western culture, but have deeper, more pervasive roots.

GENERAL DISCUSSION

The studies described above yield five main conclusions: (1) People react more positively to research revealing female-favouring than male-favouring sex differences. (2) Gender tribalism has relatively little impact, at least among men. (3) People's reactions are related in part to their political views and belief in male privilege. (4) People overestimate the level of own-sex bias exhibited by women and falsely assume that men will exhibit an own-sex bias in evaluating research on sex differences. (5) These tendencies are not unique to the West, but are found as well in at least one non-Western region: Southeast Asia. Below, we consider each of these findings in turn.

People react more positively to female-favouring sex differences

As expected, participants in both samples reacted more positively to female-favouring than to male-favouring sex differences. Participants found the female-favouring differences more congenial and judged the research revealing them to be higher in quality. This is consistent with other work in the area (e.g., Winegard *et al.*, 2018), and makes good

sense in light of research suggesting that people tend to be more positive about women, more concerned about harms suffered by women, and more protective of women than men (Eagly & Mladinic, 1994; Reynolds *et al.*, 2020; Stewart-Williams, 2002). If the female-favouring preference is widespread (which seems plausible), this could have implications for the science of human sex differences. As well as helping to determine which findings the general public accepts or rejects, it could potentially influence which questions researchers ask, which studies IRBs approve, and which results get published and promoted. We have no direct evidence that this is actually the case. Still, in light of recent concerns about ideological bias in psychology (Duarte *et al.*, 2015), it is a possibility we should at least consider.

Gender tribalism has relatively little impact, at least among men

Contrary to expectations, women did not consistently react more positively than men to female-favouring sex differences, or men less negatively than women to male-favouring differences. For a few individual items, such a trend was evident, suggesting that gender tribalism may have a small impact on people's reactions. Overall, though, the sexes differed little in how they responded to the hypothetical research. Both tended to find the female-favouring differences more agreeable.

There are several ways to interpret this. One is that women exhibit an own-sex bias whereas men do not. This interpretation is consistent with research suggesting that gender is more important as a group identity for women than men (e.g., Hook, 2019). Indeed, in both our studies, men exhibited an *other*-sex bias, perhaps as a result of protectiveness towards women. On the other hand, it could be argued that it would be something of a coincidence if women's gender-ingroup bias and men's protectiveness towards women happened to lead to near-identical levels of pro-female favouritism. Thus, an alternative explanation would be that the pro-female reactions of both sexes stem from attitudes and inclinations not specific to either, including a general protectiveness towards women. If so, then although women do exhibit a bias in favour of members of their own sex, this is not necessarily *because* they are members of their own sex. Gender-ingroup biases may play little role.

Note that, although this interpretation is consistent with our data, it is somewhat surprising given other research showing reliable own-sex biases. For that reason, we are reluctant to completely rule out a role for gender-ingroup biases at this stage. What we are willing to say, though, is that – at least in our two samples – the tendency of both sexes to react more positively to female- than male-favouring sex differences is considerably stronger and more reliable than any differences in how each sex reacts to them.

People's reactions are related in part to their political views and belief in male privilege

Perhaps surprisingly, political orientation explained relatively little of the variance in people's reactions to male- versus female-favouring sex differences. In the Western sample, the more that participants leaned to the left politically, the more negatively they responded to the male-favouring differences. However, the strength of the association was weak, and there was no relationship between political orientation and responses to the female-favouring differences. Moreover, in the Southeast Asian sample, political orientation failed to predict responses to either type of sex difference or to the research overall.

Belief in male privilege was a somewhat more powerful predictor. In the Western sample, the more privileged that participants believed men are over women, the more positive their reactions were to the female-favouring sex differences, and the less positive their reactions were to the male-favouring differences. Conversely, the more privileged that participants believed *women* are over men, the more they exhibited the opposite pattern of reactions. This was partially replicated in the Southeast Asian sample: Belief in higher levels of male privilege predicted less positive reactions to the male-favouring differences. Male-privilege belief did not, however, predict participants' reactions to differences favouring females.

These findings suggest that part of the reason that many people react more positively to female- than male-favouring sex differences is that they view women as somewhat downtrodden (Winegard *et al.*, 2018). As a result, male-favouring differences may be seen as a manifestation of unjust privilege and prejudice, whereas female-favouring differences may be seen as the underdog prevailing against the odds. That said, belief in male privilege explained a relatively modest fraction of the variance, and is presumably only one contributing factor among many.

People overestimate the level of gender bias exhibited by both sexes, but especially men

Participants were decidedly inaccurate in their predictions about how the average person would respond to the hypothetical sex differences. Both sexes predicted that the average person would exhibit a strong own-sex bias: that is, that the average woman would react more positively to female- than male-favouring differences, whereas the average man would do the reverse. These predictions were misguided in several ways. First, participants greatly overestimated the level of own-sex bias found in either sex: People expected considerably more gender-ingroup bias than was actually present. Second, in their predictions about the average man, participants not only overestimated the magnitude of the bias, they also got the direction of the effect wrong. Specifically, they assumed that the average man would react more positively to the male-favouring differences, when in fact he reacted more positively to the female-favouring ones. This represents a notable exception to the rule of *stereotype accuracy*: the observation that people's stereotypes of demographic groups tend to be reasonably accurate (Jussim, 2012; Jussim *et al.*, 2015).

Why did participants overestimate the level of gender bias? An initial suggestion might be that people tend to overestimate the magnitude of *all* effects in psychology, and thus that there is nothing unique about this particular instance. This could not be a complete explanation, however, as it would not account for the fact that participants predicted that men would exhibit an own-sex bias when they actually did the opposite. One possibility is that gender bias is a prominent culture-war topic, and that people think that men are biased in favour of their own sex for the simple reason that they are so often *told* that men are biased in favour of their own sex. The results of the two studies reported here suggest, however, that this generalization might not be accurate, or at least not widely applicable.

The fact that people overestimate the magnitude of gender favouritism found in both sexes could have important societal implications (Stewart-Williams, 2002). An exaggerated impression of the level of favouritism people exhibit towards their own sex is unlikely to foster positive relations between the sexes. On the contrary, it could foster resentment and suspicion. It might even function as a self-fulfilling prophesy, as people seek to obtain advantages for their own sex defensively assumed to be sought by the other (Fortune, 2006). When it comes to gender, and potentially other demographic categories

as well, the main lesson to be drawn from social psychological research into ingroup–outgroup biases might not be that people are biased in favour of their own groups – most people know that already – but rather that people commonly overestimate the extent of these biases. If so, a more accurate view of the situation might help to foster more harmonious relationships among groups (Lees & Cikara, 2020; Stewart-Williams, 2002).

These tendencies are not unique to the west

Study 2 not only replicated most of the findings of Study 1, but did so in a non-Western sample from a less gender-egalitarian region of the world, namely Southeast Asia. The fact that the results were so similar in such a different cultural setting should shift our priors somewhat towards the view that these results are not purely a product of progressive sentiments found largely in the Western world. To explain the data, we may also need to invoke more deep-seated causes: causes that cut across cultural lines, such as pan-human anatomical and reproductive differences between the sexes. Certainly, our replication study canvassed only one non-Western region, and certainly, the sample was probably atypical in a number of ways (discussed below). As such, the findings should shift our priors only modestly. Nevertheless, they do provide preliminary evidence that the pattern observed in our first study is more widespread and has less localized causes than we might otherwise suspect.

A curious and unanticipated finding was that, on average, our Southeast Asian sample was less persuaded than our Western one that men are privileged over women. This seems somewhat anomalous given that Southeast Asia generally has lower levels of gender equality (World Economic Forum, 2018), and suggests that Westerners are overestimating inequality, that Southeast Asians are underestimating it, or some combination of both. Regardless of the exact answer, the finding may itself be a product of the different levels of gender inequality found in the respective regions. In societies with high levels of gender equality, people may be more conscious of any remaining inequalities; in societies where such issues have received less attention, even sizeable inequalities may sometimes be overlooked. Ironically, then, people in the most progressive societies may see themselves as having made less progress, as a direct result of the progress they've made – and vice versa for people living in more traditional societies (cf. Levari *et al.*, 2018; Lukianoff & Haidt, 2018).

Limitations

The studies presented here had several limitations. One is that both samples were somewhat left-leaning politically, with more than two-thirds classing themselves as at least a little left of centre. As such, one might wonder whether the findings represent the reactions of people in general *or* the reactions of *left-leaning* people in general. Given the weak connection between participants' political orientations and their reactions to the hypothetical findings, the first scenario seems plausible to us; however, this remains to be demonstrated conclusively.

A second limitation is that, although we replicated the study in a non-Western region, we only replicated it in one. Furthermore, because the replication sample was recruited online, and completed the questionnaire in English, it may have been unrepresentative in terms of socioeconomic status, education, and religiosity. Finally, the sample size for the Southeast Asian replication, though meeting the minimum requirements specified by G*Power, was smaller than that of the Western one, and the completion rate was lower.

For all these reasons, any conclusions regarding the prevalence of the female-favouring preference demonstrated in our studies must for now be tentative. Future research should attempt to replicate the findings in a wider range of less Westernized populations.

Conclusion

When it comes to research on sex differences, both sexes respond more positively to findings that favour females than those that favour males. This is due in part to a belief in male privilege and may be reversed among the minority of people who believe that women are privileged over men. Although both sexes consistently prefer female-favouring sex differences, people *predict* that both sexes will prefer sex differences that favour their own sex. In doing so, they overestimate the extent to which women react more positively to female-favouring differences and incorrectly assume that men will react more positively to male-favouring differences. The idea that people are strongly biased towards members of their own sex appears to be an error – an unfortunate cognitive distortion that could potentially have a damaging impact on relations between the sexes.

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Conflicts of interest

All authors declare no conflict of interest.

Author contributions

Steve Stewart-Williams, PhD (Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Supervision; Writing – original draft). Chern Yi Marybeth Chang (Data curation; Investigation; Methodology; Validation). Xiu Ling Wong (Data curation; Investigation; Methodology; Validation). Jesse D. Blackburn (Data curation; Investigation). Andrew G. Thomas, PhD (Data curation; Formal analysis; Investigation; Project administration; Supervision; Writing – review & editing).

Data availability statement

The data that support the findings of this study are openly available from OSF at <http://doi.org/10.17605/OSF.IO/6N5UP> (Study 1) and <http://doi.org/10.17605/OSF.IO/MWAZ2> (Study 2).

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[Correction added on 22 August 2020, after first online publication: The references have been updated in this version]

Supporting Information

The following supporting information may be found in the online edition of the article:

Table S1. Participants' reactions to the hypothetical sex-differences research (Study 1).

Table S2. Inferential statistics related to participants' reactions to the hypothetical sex-differences research (Study 1).

Table S3. Participants' predictions regarding the reactions of the average man to hypothetical sex-differences research (Study 1).

Table S4. Inferential statistics related to participants' predictions about the average man (Study 1).

Table S5. Participants' predictions regarding the reactions of the average woman to hypothetical sex-differences research (Study 1).

Table S6. Inferential statistics related to participants' predictions about the average woman (Study 1).

Table S7. Southeast Asian participants' reactions to the hypothetical sex-differences research, predictions about the average man, and predictions about the average woman (Study 2).

Table S8. Inferential statistics related to Southeast Asian participants' reactions to the hypothetical sex-differences research, predictions about the average man, and predictions about the average woman (Study 2).