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Ideological belief bias with political syllogisms

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ABSTRACT

The belief bias in reasoning occurs when individuals are more willing to accept conclusions that are consistent with their beliefs than conclusions that are inconsistent. The present study examined a belief bias in syllogisms containing political content. In two experiments, participants judged whether conclusions were valid, completed political ideology measures, and completed a cognitive reflection test. The conclusions varied in validity and in their political ideology (conservative or liberal). Participants were sensitive to syllogisms' validity and conservatism. Overall, they showed a liberal bias, accepting more liberal than conservative conclusions. Furthermore, conservative participants accepted more conservative conclusions than liberal conclusions, whereas liberal participants showed the opposite pattern. Cognitive reflection did not magnify this effect as predicted by a motivated system 2 reasoning account of motivated ideological reasoning. These results suggest that people with different ideologies may accept different conclusions from the same evidence.

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KEYWORDS Belief bias; motivated reasoning; cognitive reflection; political ideology

Political opponents disagree about policy, about what ought to be done when facing a given problem, and overcoming these disagreements is crucial to forming political consensus. There is also substantial evidence of a more troubling challenge to consensus-building: that political opponents increasingly disagree about reality, about what the facts on the ground are (Hochschild & Einstein, 2015). The literatures on motivated perception and confirmation bias provide ample evidence that this phenomenon occurs (Taber & Lodge, 2006), and the prevalence of “fake news” underscores the pervasiveness of the challenge (Pennycook & Rand, 2018). Implicit in the

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lamentations over “fake news” is the idea that, if only opposing sides could agree about the facts, they could proceed to focus their discourse on matters of policy. The current paper presents a third challenge to consensual political action, focusing on reasoning processes between *is* and *ought*, between the ground truth of data and the desired policy consequences. We examine the process of reasoning from premises to a logical conclusion, and suggest that political differences introduce bias into this process.

Appealing to an audience’s reasoning is at the core of political persuasion (Cobb & Kuklinski, 1997). Reasoning is, however, prone to biases. The *belief bias* is well documented in the reasoning literature. When people decide whether a conclusion is valid, their prior beliefs affect their decisions. Studies that have examined the role of beliefs in reasoning typically use objectively true statements as believable conclusions (e.g., *robins have feathers*) and objectively false statements as unbelievable conclusions (e.g., *whales can walk*). With both valid and invalid conclusions, participants are more likely to claim that believable conclusions are valid than unbelievable conclusions (e.g., Evans, Barston, & Pollard, 1983). Belief bias may be explained by dual process theories of cognition (Evans, 2008; for an alternate view, see Osman, 2004). Early dual process theorists claimed that relying on prior beliefs is a Type 1 process, whereas thinking about logical necessity is a Type 2 process (e.g., Evans, 2008). Type 1 processes are defined by their efficiency and seemingly heuristic quality, whereas Type 2 processes are defined by their relative slowness and reliance on working memory resources (e.g., De Neys, 2012). Dual process theory explanations are supported by studies showing that limiting the use of Type 2 processes, such as by forcing quick responses (Evans & Curtis-Holmes, 2005) or loading participants’ working memory (De Neys, 2006), increase the magnitude of belief bias. More recently, however, there has been debate about whether logic is exclusively a Type 2 process. Trippas, Handley, Verde, and Morsanyi (2016), for example, found that sensitivity to logical validity can occur with implicit processing. De Neys and Pennycook (2019) reviewed additional evidence for intuitive processing of logical principles and suggest revisions to traditional dual process theories.

The present study examined how people reason about syllogisms that contained conclusions that varied in their political ideology. In these cases, participants may exhibit a more idiosyncratic belief bias. For example, politically liberal participants may tend to believe that a liberal conclusion is valid and that a conservative conclusion is invalid, independent of the actual validity of the conclusion. We examined if people were more willing to accept conclusions consistent with their political ideology as well as if people’s ideology predicts the magnitude of this bias. There is indirect evidence that such a process could take place. For example, given data about

global temperature patterns, some people conclude that global warming is occurring and others do not; correspondingly, belief in global warming (Borick & Rabe, 2010) is higher among Democrats than Republicans in the United States. Similarly, given information about the number of people illegally crossing the U.S.-Mexico border, some people conclude that the border is fairly secure whereas others conclude that it is insecure, and indeed Republicans are more likely to support the construction of a border wall between the U.S. and Mexico than are Democrats (Gravelle, 2018). Thus, people appear to draw different conclusions from the same evidence based on their political ideology. Because political polarization in the United States has increased in recent years (Westfall, Van Boven, Chambers, & Judd, 2015) and individuals' ideology affects their conclusions on political policy issues, it is important to understand how political beliefs affect the willingness to accept conclusions. In essence, when considering belief bias in the context of politically-relevant syllogisms, it may be that political beliefs would affect conclusions' acceptance in a manner similar to the veracity of conclusions in traditional belief bias studies.

There is evidence of ideologically-motivated reasoning with tasks other than syllogistic reasoning. Participants take longer to process information inconsistent with their beliefs about a political candidate and search more for information about preferred candidates (Redlawsk, 2002). With political policy issues such as affirmative action and gun control, participants show confirmation bias by seeking out evidence consistent with their beliefs and they show disconfirmation bias by seeking counterarguments to evidence that is inconsistent with their beliefs (Taber, Cann, & Kucsova, 2009; Taber & Lodge, 2006). Thus, in the context of syllogistic reasoning, participants may be expected to judge ideologically-consistent conclusions as valid more frequently than ideologically-inconsistent conclusions. This could be taken as evidence for motivated reasoning.

Other studies have examined differences in cognitive reflection between liberals and conservatives. Cognitive reflection is the ability to inhibit intuitive, Type 1 responses that are incorrect in favor of deliberate, Type 2 responses that are correct (Frederick, 2005), and it is measured with a cognitive reflection test (CRT). Social conservatism (Deppe et al., 2015) and belonging to the Republican Party (Pennycook & Rand, 2019) are linked with lower CRT performance. Kahan (2013), however, found no differences between liberals and conservatives in CRT performance or in motivated reasoning. These studies report conflicting evidence for differences in CRT performance among liberals and conservatives.

CRT performance is closely related to the belief bias in reasoning. Correct responding on CRT problems and on reasoning problems when believability conflicts with validity both typically involve the inhibition of

Type 1 responses and engagement of Type 2 processes. Several studies have found a positive correlation between CRT performance and accuracy in reasoning problems when conclusions' validity and believability conflicted (Swan, Calvillo, & Revlin, 2018; Thomson & Oppenheimer, 2016; Toplak, West, & Stanovich, 2011; Trippas, Pennycook, Verde, & Handley, 2015). Moreover, some expanded versions of CRTs include items that specifically assess belief bias, suggesting that overcoming belief bias is a form of cognitive reflection (Baron, Scott, Fincher, & Metz, 2015; Calvillo & Burgeno, 2015).

CRT performance is also related to motivated reasoning according to an account of politically motivated reasoning, *motivated system 2 reasoning* (Kahan, Landrum, Carpenter, Helft, & Hall Jamieson, 2017). According to this account, motivated reasoning requires type 2 processes. Therefore, individuals with greater CRT performance should demonstrate greater motivated reasoning. The motivated system 2 reasoning account has received empirical support from some studies (Kahan, 2015; Kahan et al., 2017), but not from others (Pennycook & Rand, 2019). To summarize, observing that participants accept more ideologically-consistent than inconsistent conclusions would be evidence for motivated reasoning (similar to what has been reported by Taber & Lodge, 2006), and observing that CRT performance exacerbates this bias would be evidence for motivated system 2 reasoning (similar to what has been reported by Kahan, 2015).

In two experiments, we examined political belief bias and motivated reasoning with political syllogisms. This is the first study, to our knowledge, that has used political content in syllogisms that varied in the ideology of the conclusions. The present study, therefore, bridges the belief bias literature and the ideologically-motivated reasoning literature. In Experiment 1, college students judged the validity of a set of syllogisms with political content and a set with nonpolitical content. They also completed a CRT and political ideology measures. Experiment 2 used participants recruited from Amazon's Mechanical Turk and examined only judgments of the political syllogisms.

Experiment 1

Hypotheses and preregistration

We preregistered our data collection and analysis plans on the Open Science Framework. The preregistration, materials, and data are available at <https://osf.io/da82g/>. We preregistered the plan to calculate traditional reasoning indices (logic index, belief index, interaction index) and signal detection reasoning indices (SDT logic index, SDT belief index, SDT interaction index) for both nonpolitical and political syllogisms. Our preregistered plan

was to then correlate these indices with CRT performance and participants' conservatism. Based on comments from initial reviewers, we deviated from our preregistered plan and analyzed the data with Analyses of Covariance (ANCOVAs). Because our planned analyses were correlations, we made analogous predictions from the ANCOVAs. For nonpolitical syllogisms, we predicted that:

1. Participants would accept more valid conclusions than invalid conclusions;
2. Participants would accept more believable conclusions than unbelievable conclusions;
3. CRT performance would interact with validity (i.e., with greater CRT performance, there would be a greater difference between acceptance of valid and invalid conclusions);
4. CRT performance would interact with believability (i.e., with greater CRT performance, there would be less difference between acceptance of believable and unbelievable conclusions);

We did not predict any additional main effects or interactions. For political syllogisms, we predicted that:

5. Participants would accept more valid conclusions than invalid conclusions;
6. CRT performance would interact with validity (i.e., with greater CRT performance, participants would have a greater difference between acceptance rates of valid and invalid conclusions);
7. Participants' conservatism would interact with conclusions' conservatism (i.e., more conservative participants would accept more conservative conclusions than liberal conclusions whereas more liberal participants would accept more liberal conclusions than conservative conclusions);
8. There would be a three-way interaction between participants' conservatism, conclusions' conservatism, and CRT performance (i.e., participants with greater CRT performance would show a greater interaction between their conservatism and conclusions' conservatism);

We did not predict any additional main effects or interactions.

Hypotheses 7 and 8 tested the most novel aspects of this experiment. Support for Hypothesis 7 would demonstrate that participants exhibit a political belief bias. That is, they tend to accept more conclusions that are consistent with their political ideology. Support for Hypothesis 8 would show that CRT performance magnifies this tendency, consistent with the

motivated system 2 reasoning account. We did not predict an interaction between validity and believability. Although earlier belief bias studies showed a significant interaction, with the effect of believability larger with invalid syllogisms than with valid syllogisms (e.g., Evans et al., 1983), this finding is absent (Trippas et al., 2015) or inconsistent (Heit & Rotello, 2014) in more recent research. Additionally, this interaction may not be significant with simple syllogisms (Trippas, Handley, & Verde, 2013). Therefore, we did not predict an interaction between validity and believability. We also did not predict an interaction between validity and participants' conservatism. This interaction would show that participants' conservatism predicts their logical performance (i.e., the difference between accepting valid and invalid conclusions). We did not predict this interaction because of the inconsistent findings about whether conservatives are generally more biased than liberals (Baron & Jost, 2019; Ditto et al., 2019). We also examined the relationships between conservatism and CRT performance. Because of inconsistent results in previous studies of the relationship between CRT performance and conservatism (Deppe et al., 2015; Kahan, 2013), we did not make any predictions about this relationship.

Method

Power analysis

We conducted a power analysis to determine sample size. In a pilot study, the smallest relationship that we found that we predicted to be significant in the present study was $r = -.16$. According to G*Power (Faul, Erdfelder, Lang, & Buchner, 2007), we needed 304 participants to detect this effect with power = .80 (and two-tailed $\alpha = .05$). Thus, we collected data for the last four weeks of the Fall 2018 semester, and we preregistered a plan to continue data collection if we had fewer than 304 participants who did not meet any exclusion criteria. We did not conduct any analyses until we determined that we had more than 304 participants with usable data.

Participants

A total of 432 undergraduates completed the study in partial satisfaction of an introductory psychology course requirement. Based on preregistered exclusion criteria, eight participants were removed for having no variability in their reasoning responses and 10 participants were removed for having no variability in their political conservatism responses. The final sample ($N = 414$) consisted of 317 (76.6%) women, 94 (22.7%) men, 1 "other", and 2 who declined to select a gender. Age information of the sample is presented in Table 1. The sample consisted of 201 (48.6%) people who identified as Hispanic or Latino/a, 93 (22.5%) who identified as White or

Table 1. Descriptive statistics for age, Cognitive Reflection Test scores, Social and Economic Conservatism scores for the social (SECS-S) and economic (SECS-E) subscales, and Likert rating for political conservatism for participants in Experiments 1 and 2.

	<i>M</i>	95% CI	Median	Min	Max
Experiment 1 (<i>N</i> = 414)					
Age	19.92	[19.67, 20.17]	19.00	18.00	36.00
CRT	1.12	[0.98, 1.25]	1.00	0.00	7.00
SECS-S	58.14	[56.55, 59.74]	57.86	11.41	100.00
SECS-E	49.28	[48.01, 50.55]	48.00	10.00	94.00
Likert Conservatism	4.14	[3.99, 4.29]	4.00	1.00	9.00
Experiment 2 (<i>N</i> = 234)					
Age	37.63	[36.15, 39.11]	34.00	20.00	72.00
CRT	2.92	[2.63, 3.21]	3.00	0.00	7.00
SECS-S	57.24	[53.90, 60.58]	57.14	0.00	100.00
SECS-E	54.78	[52.14, 57.42]	52.00	2.00	100.00
Likert Conservatism	4.27	[3.94, 4.54]	4.00	1.00	9.00

Note. CRT could range from 0 to 7, SECS-S and SECS-E could range from 0 to 100, and Likert Conservatism could range from 1 to 9. Greater numbers represent more conservatism on the SECS and Likert item.

Caucasian, 48 (11.6%) who identified with multiple ethnicities, 42 (10.1%) who identified as Asian or Pacific Islander, 14 (3.4%) who identified as Black or African American, 13 (3.1%) who selected an “other” ethnicity, and 3 (0.7%) who identified as Native American or Alaska Native.

Materials

Syllogistic reasoning. The syllogistic reasoning task included 32 syllogisms; half were composed of nonpolitical content (adapted from De Neys & Dieussaert, 2005) and half were composed of political content. For the nonpolitical syllogisms, half had valid conclusions and half had invalid conclusions. Additionally, half of each validity type had believable conclusions and the other half had unbelievable conclusions. Each believable conclusion had a negated version appear as an unbelievable conclusion. For example, *Robins have feathers* was a believable conclusion and *Robins do not have feathers* was an unbelievable conclusion. The political syllogisms were designed to match the structure of the nonpolitical syllogisms. Again, there were eight valid and eight invalid syllogisms, half of which had conservative conclusions (e.g., *Immigrants have damaged American culture*) and half had liberal conclusions (e.g., *Creationism cannot be taught in public schools*). Each political syllogism’s conclusion had its negated version appear to make a conservative conclusion liberal and vice versa; for example, “*Immigrants have not damaged American culture*” was a liberal conclusion and “*Creationism can be taught in public schools*” was a conservative conclusion.

Cognitive reflection. We measured CRT performance with a seven-item scale. Each item had an intuitive but incorrect response and a more

deliberate correct response. The first three items were taken from Frederick's (2005) CRT. The other four items were taken from Toplak, West, and Stanovich's (2014) expansion of the CRT.

Political conservatism. We assessed political conservatism in two ways. First, participants rated their political liberalism/conservatism on a 9-point Likert scale from *extremely liberal* (1) to *extremely conservative* (9). We also used the 12-item Social and Economic Conservatism Scale (SECS; Everett, 2013), in which participants used a feeling thermometer to evaluate 12 items on a scale from 0 to 100 in 10-point increments where 0 represents "very negative" and 100 represents "very positive". Seven of the items measure social conservatism and five measure economic conservatism. Some items were reverse-coded so that higher scores always represent greater conservatism. For example, higher scores represent more negative feelings toward taxes and more positive feelings toward traditional marriage. The SECS provides mean scores for social and economic conservatism that range from 0 to 100, with higher numbers representing more conservatism. We preregistered our plan to calculate a composite score of political conservatism from the mean of the z-scores of the Likert item, the SECS-Social scores, and the SECS-Economic scores.

Procedure

Participants completed all measures online. Participants were instructed on the reasoning task and then completed four blocks of eight trials. The instructions (taken from Ball, Phillips, Wade, & Quayle, 2006) introduced participants to the reasoning task and told them to assume the two premises are true and to determine if the conclusion necessarily follows from them. Participants were then given an example and reminded of their task. Each block contained two trials of four types. Two of the blocks contained non-political syllogisms and two blocks contained political syllogisms. For the nonpolitical blocks, the four types were valid-believable, invalid-believable, valid-unbelievable, and invalid-unbelievable. For the political blocks, the four types were valid-conservative, invalid-conservative, valid-liberal, and invalid-liberal. Each conclusion and its negated version were in separate blocks. The order of the four blocks and the order of the trials within each block were randomized for each participant. Participants responded whether each conclusion logically followed from the premises and they rated their confidence in their responses on a 3-point scale (*not at all confident*, *moderately confident*, and *very confident*). After the reasoning task, participants completed the CRT, the SECS, and the Likert political conservatism item, provided demographic information, and were debriefed.

Table 2. Acceptance rates of nonpolitical conclusions by their validity and believability and of political conclusions by their validity and conservatism in Experiment 1.

	Valid		Invalid	
	<i>M</i>	95% CI	<i>M</i>	95% CI
Nonpolitical syllogisms				
Believable	.94	[.88, .91]	.81	[.78, .83]
Unbelievable	.34	[.31, .38]	.23	[.20, .25]
Political syllogisms				
Conservative	.51	[.48, .54]	.37	[.34, .40]
Liberal	.71	[.68, .73]	.66	[.63, .69]

Results

Political conservatism and cognitive reflection

Participants rated their political conservatism on a 9-point Likert item and with the SECS. The mean rating on the Likert item, the mean scores of the SECS-Social and SECS-Economic, and mean CRT performance are presented in Table 1.

Reasoning

Nonpolitical syllogisms. The acceptance rates of all types of syllogisms are listed in Table 2. We conducted an ANCOVA with validity and believability as repeated-measures variables, CRT performance and participants' conservatism as covariates, and conclusion acceptance as the dependent variable. There was a main effect of validity, $F(1, 410) = 13.22, p < .001, \eta_p^2 = .03$. Supporting Hypothesis 1, valid conclusions ($M = .62, 95\% \text{ CI } [.60, .65]$) were accepted more than invalid conclusions ($M = .52, 95\% \text{ CI } [.50, .54]$). There was also a main effect of believability, $F(1, 410) = 746.86, p < .001, \eta_p^2 = .65$. Supporting Hypothesis 2, believable conclusions ($M = .85, 95\% \text{ CI } [.84, .87]$) were accepted more than unbelievable conclusions ($M = .29, 95\% \text{ CI } [.26, .31]$). CRT performance and participants' conservatism did not have main effects on overall conclusion acceptance, $F(1, 410) = 1.01, p = .316, \eta_p^2 = .00$; $F(1, 411) = 0.35, p = .555, \eta_p^2 = .00$; respectively. Hypothesis 3 was also supported: validity interacted with CRT performance, $F(1, 410) = 29.97, p < .001, \eta_p^2 = .07$. To examine this interaction, we computed the correlation between the difference in participants' acceptance of valid and invalid conclusions and their CRT performance. This correlation was significantly positive, $r(412) = .26, p < .001$; participants with greater CRT performance had a greater difference between acceptance rates of valid and invalid conclusions. Hypothesis 4 was not supported: believability did not interact with CRT performance, $F(1, 410) = 3.25, p = .072, \eta_p^2 = .01$. No other interactions were significant.

Political syllogisms. The acceptance rates of all types of syllogisms are listed in Table 2. We conducted an ANCOVA with validity and conclusions'

conservatism as repeated-measures variables, CRT performance and participants' conservatism as covariates, and conclusion acceptance as the dependent variable. There was a main effect of validity, $F(1, 410) = 17.54$, $p < .001$, $\eta_p^2 = .04$. Supporting Hypothesis 5, valid conclusions ($M = .61$, 95% CI [.59, .63]) were accepted more than invalid conclusions ($M = .52$, 95% CI [.49, .54]). There was also a main effect of conclusions' conservatism, $F(1, 410) = 194.57$, $p < .001$, $\eta_p^2 = .32$: liberal conclusions ($M = .68$, 95% CI [.66, .71]) were accepted more than conservative conclusions ($M = .44$, 95% CI [.42, .47]). CRT performance and participants' conservatism did not significantly predict conclusions acceptance, $F(1, 410) = 0.00$, $p = .980$, $\eta_p^2 = .00$; $F(1, 410) = 0.86$, $p = .361$, $\eta_p^2 = .00$; respectively. Consistent with Hypothesis 6, CRT performance interacted with validity, $F(1, 410) = 14.37$, $p < .001$, $\eta_p^2 = .03$. To examine this interaction, we computed the correlation between the difference in participants' acceptance of valid and invalid conclusions and their CRT performance. This correlation was positive and statistically significant, $r(412) = .19$, $p < .001$; participants with greater CRT performance had a greater difference between acceptance rates of valid and invalid conclusions. Consistent with Hypothesis 7, conclusions' conservatism interacted with participants' conservatism, $F(1, 410) = 14.60$, $p < .001$, $\eta_p^2 = .03$. To examine this interaction, we computed the correlation between the difference in participants' acceptance of conservative and liberal conclusions and their conservatism scores. This correlation was positive and statistically significant, $r(412) = .26$, $p < .001$; more conservative participants accepted more conservative than liberal conclusions, whereas more liberal participants accepted more liberal than conservative conclusions. This relationship is illustrated in [Figure 1](#). Inconsistent with Hypothesis 8, the three-way interaction between participants' conservatism, conclusions' conservatism, and CRT performance was not significant, $F(1, 410) = 0.03$, $p = .855$, $\eta_p^2 = .00$. The only other significant interaction was the three-way interaction between validity, conclusions' conservatism, and participants' CRT performance, $F(1, 410) = 9.63$, $p = .002$, $\eta_p^2 = .02$.

Cognitive reflection and participants' conservatism. We did not make a prediction about participants' political conservatism and their CRT performance. Conservatism was positively correlated with CRT performance, $r(412) = .11$, $p = .024$. Participants with greater conservatism performed better on the CRT.

Experiment 2

In Experiment 1, we found evidence for the typical belief bias with nonpolitical syllogisms and for a political belief bias with political syllogisms. Participants accepted more conclusions that were consistent with their beliefs than they did conclusions that were inconsistent. We did not find

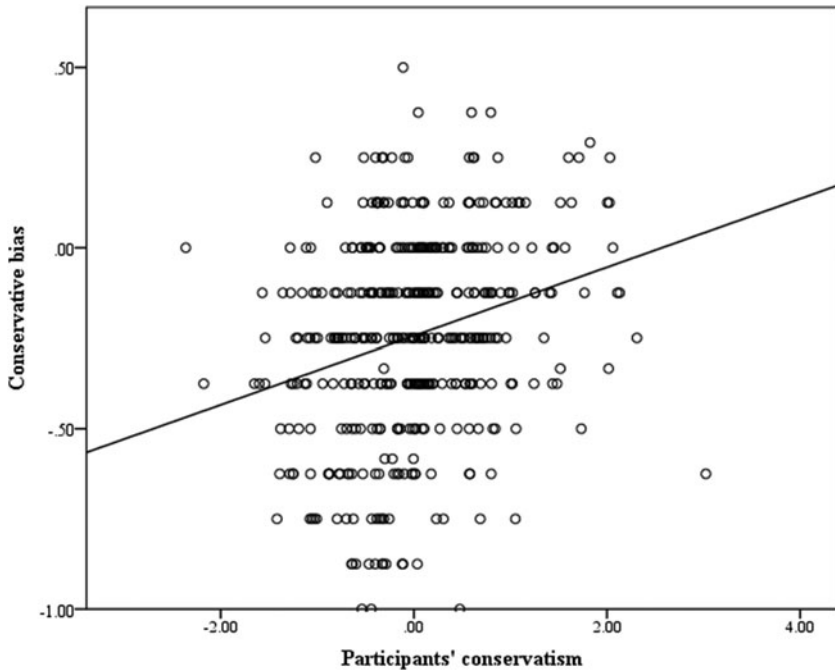


Figure 1. Scatterplot showing the relationship between participants' conservatism and the difference between the acceptance of conservative and liberal conclusions (conservative bias) in Experiment 1.

evidence for the motivated system 2 reasoning account. Participants with greater CRT performance did not demonstrate a larger political belief bias than those with worse CRT performance.

An important limitation of Experiment 1 was that the sample consisted entirely of college students. Self-concept clarity, the degree to which self-beliefs are well-defined, consistent, and stable, increases from young adulthood through middle age (Lodi-Smith & Roberts, 2010). Thus, college students' political ideology may not be as well-defined or stable as the political ideology of older participants. Political identity becomes more consistent with attitudes from ages 15 to 22 (Rekker, Keijsers, Branje, & Meeus, 2017), political partisanship changes from age 18 to 50 (Lyons, 2017), and more 50-year-olds than 27-year-olds have political identities that have reached an achievement status (Fadjukoff, Pulkkinen, & Kokko, 2016), suggesting that this may be the case. Further, because citizens aged 18–29 have the lowest voter turnout rates of any age group (McDonald, 2019), it may be that our participants were less politically engaged than older adults. Thus, we decided to replicate the findings from the political syllogisms with an online subject pool in Experiment 2.

Hypotheses and preregistration

We preregistered our data collection and analysis plans on the Open Science Framework. The preregistration, materials, and data are available at <https://osf.io/da82g/>. Our predictions are the same as those from the political syllogisms in Experiment 1. For clarity, we refer to Experiment 2's hypotheses with the same numbers used in Experiment 1.

Method

Power analysis

We conducted a power analysis to determine sample size. In Experiment 1, the smallest significant effect that we predicted and found was $\eta_p^2 = .033$. According to G*Power (Faul et al., 2007), we needed 232 participants to detect this effect with power = .80 (and $\alpha = .05$) in an ANCOVA. Thus, we collected data in batches until we had useable data from 232 participants.

Participants

A total of 251 Mechanical Turk workers completed the study for payment. Based on preregistered exclusion criteria, 17 participants were removed for admitting that they responded to some items without reading them. The final sample ($N = 234$) consisted of 114 (48.7%) women, 117 (50.0%) men, and 3 (1.3%) people who declined to select a gender. Age information of the sample is presented in Table 1. The sample consisted of 8 (3.4%) people who identified as Hispanic or Latino/a, 169 (72.2%) who identified as White or Caucasian, 13 (5.5%) who identified with multiple ethnicities, 17 (7.3%) who identified as Asian or Pacific Islander, and 27 (11.5%) who identified as Black or African American. Education levels for the sample were 2 (0.9%) with some high school, 23 (9.8%) high school graduates, 44 (18.8%) who had some college, 8 (3.4%) who had trade, technical, or vocational training, 23 (9.8%) who had an associate degree, 100 (42.7%) who had a bachelor's degree, 22 (9.4%) who had a master's degree, 5 (2.1%) who had a professional degree, 6 (2.6%) who had a doctoral degree, and 1 (0.4%) participant who did not respond to this question.

Materials

The materials were the same as those used in Experiment 1, except that the nonpolitical syllogisms were omitted.

Syllogistic reasoning. The syllogistic reasoning task included the same 16 political syllogisms used in Experiment 1.

Cognitive reflection. We measured CRT performance with the same seven-item scale as in Experiment 1.

Political conservatism. We assessed political conservatism in the same two ways as in Experiment 1. Participants rated their political liberalism/conservatism on a 9-point Likert scale and completed the SECS. As in Experiment 1, we computed composite scores by calculating the mean of the z-scores of the Likert items, the SECS-Social scores, and the SECS-Economic scores.

Procedure

Participants completed all measures online. Participants were instructed on the reasoning task and then completed two blocks of eight trials. Each block contained two trials of four types: valid-conservative, invalid-conservative, valid-liberal, and invalid-liberal. The order of the two blocks and the order of the trials within each block were randomized for each participant. Participants responded whether each conclusion logically followed from the premises and they rated their confidence in their responses on a 3-point scale (*not at all confident*, *moderately confident*, and *very confident*). After the reasoning task, participants completed the CRT, the SECS, and the Likert political conservatism item, provided demographic information, and were debriefed.

Results

The acceptance rates of all types of syllogisms are listed in Table 3. We conducted an ANCOVA with validity and conclusions' conservatism as repeated-measures variables, CRT performance and participants' conservatism as covariates, and conclusion acceptance as the dependent variable. There was a main effect of validity, $F(1, 230) = 6.12$, $p = .014$, $\eta_p^2 = .03$. Supporting Hypothesis 5, valid conclusions ($M = .72$, 95% CI [.69, .74]) were accepted more than invalid conclusions ($M = .47$, 95% CI [.44, .50]). There was also a main effect of conclusions' conservatism, $F(1, 230) = 68.67$, $p < .001$, $\eta_p^2 = .23$: liberal conclusions ($M = .68$, 95% CI [.65, .71]) were accepted more than conservative conclusions ($M = .51$, 95% CI [.48, .54]). CRT performance also had a significant effect on overall acceptance, $F(1, 230) = 3.98$, $p = .047$, $\eta_p^2 = .02$. To examine this main effect, we

Table 3. Acceptance rates of political conclusions by their validity and conservatism in Experiment 2.

Conclusion	Valid		Invalid	
	<i>M</i>	95% CI	<i>M</i>	95% CI
Conservative	.67	[.63, .71]	.34	[.30, .38]
Liberal	.76	[.73, .79]	.59	[.55, .64]

computed the correlation between the difference in participants' overall acceptance rate and their CRT performance. This correlation was significantly negative, $r(232) = -.15$, $p = .020$; as participants' CRT performance increased, they accepted fewer conclusions overall. Participants' conservatism did not significantly predict conclusion acceptance, $F(1, 230) = 0.13$, $p = .724$, $\eta_p^2 = .00$. Validity interacted with CRT performance, $F(1, 230) = 58.65$, $p < .001$, $\eta_p^2 = .20$, supporting Hypothesis 6. To examine this interaction, we computed the correlation between the difference in participants' acceptance of valid and invalid conclusions and their CRT scores. This correlation was positive and statistically significant, $r(232) = .47$, $p < .001$; participants with greater CRT performance had a greater difference between acceptance rates of valid and invalid conclusions. Supporting Hypothesis 7, conclusions' conservatism interacted with participants' conservatism, $F(1, 230) = 9.60$, $p = .002$, $\eta_p^2 = .04$. To examine this interaction, we computed the correlation between the difference in participants' acceptance of conservative and liberal conclusions and their conservatism scores. This correlation was positive, $r(232) = .20$, $p = .002$; more conservative participants accepted more conservative than liberal conclusions, whereas more liberal participants accepted more liberal than conservative conclusions. This relationship is illustrated in [Figure 2](#). Inconsistent with Hypothesis 8, the three-way interaction between participants' conservatism, conclusions' conservatism, and CRT performance was not significant, $F(1, 230) = 1.71$, $p = .192$, $\eta_p^2 = .01$.

We did not predict any additional interactions, but three were significant. The interaction between validity and conclusions' conservatism was significant, $F(1, 230) = 7.79$, $p = .006$, $\eta_p^2 = .03$. The difference between conservative and liberal conclusions' acceptance rates was greater for invalid arguments than it was for valid arguments. Conclusions' conservatism interacted with participants' CRT performance, $F(1, 230) = 4.78$, $p = .030$, $\eta_p^2 = .02$. To examine this interaction, we computed the correlation between the difference in participants' acceptance of conservative and liberal conclusions and their CRT performance. This correlation was not significant, $r(232) = .12$, $p = .067$; there was a nonsignificant trend toward participants with greater CRT performance to have a greater difference between acceptance rates of conservative and liberal conclusions. The four-way interaction between validity, conclusions' conservatism, participants' conservatism, and CRT performance was also significant, $F(1, 230) = 5.74$, $p = .017$, $\eta_p^2 = .02$.

We did not make a prediction about the relationship between participants' political conservatism and their CRT performance. Conservatism was negatively correlated with CRT performance, $r(232) = -.13$, $p = .047$. Participants higher in conservatism performed slightly more poorly on the CRT.

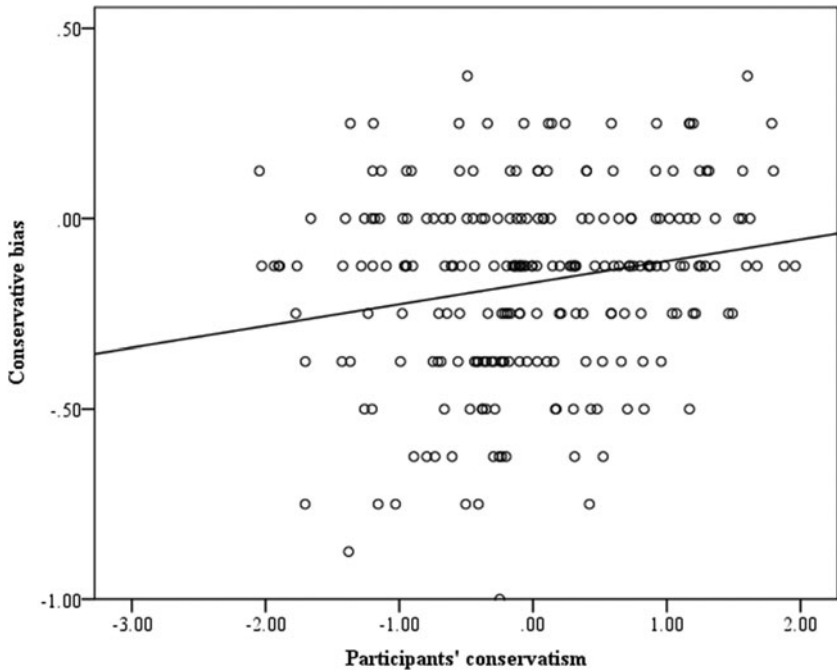


Figure 2. Scatterplot showing the relationship between participants' conservatism and the difference between the acceptance of conservative and liberal conclusions (conservative bias) in Experiment 2.

General discussion

In two experiments, we found an idiosyncratic political belief bias. Participants' political ideologies led them to accept conclusions consistent with their beliefs more often than conclusions that were inconsistent. This effect was evidenced by the interaction between participants' conservatism and the conservatism of conclusions, which occurred in both college students (Experiment 1) and Mechanical Turk workers (Experiment 2). These results are consistent with other findings on motivated political reasoning (Redlawsk, 2002; Taber et al., 2009; Taber & Lodge, 2006) and suggest that participants of different ideologies may accept different conclusions from the same premises. We also found a traditional belief bias with nonpolitical syllogisms, consistent with other belief bias studies (e.g., Evans et al., 1983), and we found that that validity did not interact with believability in Experiment 1, which is consistent with some recent research (e.g., Trippas et al., 2015).

We did not find evidence in either experiment for the motivated system 2 reasoning account of motivated reasoning. Participants with greater CRT performance did not demonstrate larger political belief bias. That is, the three-way interactions between conclusions ideology, participants'

ideology, and CRT performance were not significant. These results are consistent with some previous studies (Pennycook & Rand, 2019), but inconsistent with others (Kahan, 2015; Kahan et al., 2017). CRT performance did interact with validity in both experiments, showing that participants with greater CRT performance had a greater difference in acceptance rates of valid and invalid conclusions. Thus, CRT performance predicted logical performance in our reasoning tasks, similar to other studies (e.g., Toplak et al., 2011). CRT performance also led to fewer overall conclusions accepted in Experiment 2, but not in Experiment 1. Overall, CRT performance was a better predictor of logical performance than was participants' conservatism.

In both experiments, participants (overall) accepted more liberal than conservative conclusions. That is, participants were biased toward liberal conclusions. This finding would be expected if the samples were mostly liberal. The samples in both experiments, however, were fairly moderate in their political ideology. The mean responses to the Likert conservatism item were lower than the midpoint of the scale (leaning liberal), but the SECS scores tended to be greater than the midpoint of that scale (leaning conservative). Thus, overall the sample appeared moderate, yet they showed a liberal bias when reasoning with political syllogisms. We speculate on reasons for this below.

The present study's findings have implications for what Jost (2017a, 2017b) refers to as asymmetries between liberals' and conservatives' biases. Jost reviewed evidence of ideological asymmetries in a variety of psychological constructs, including CRT performance, between liberals and conservatives. The relationship between participants' conservatism and CRT performance was inconsistent across our experiments. In Experiment 1, this relationship was significantly positive, whereas it was significantly negative in Experiment 2. Jost (2017a) reviewed 13 studies that examined this relationship, showing that 11 of them have found a negative relationship and two of them showed no significant relationship. The result from Experiment 1 is the only result, to our knowledge, to show a positive relationship. Experiment 1 used college students, whereas Experiment 2 used Mechanical Turk workers. Further research is needed to examine moderators of the relationship between CRT performance and conservatism. One potential mediator is the degree of political involvement. The relationship between conservatism and cognitive ability appears to depend on whether participants reside in an area with high or low political involvement (Kimmelmeier, 2008). Validity did not interact with participants' conservatism in either experiment, suggesting that participants' conservatism did not relate to their logical performance (i.e., differences in acceptance rates of valid and invalid conclusions). Overall, the present study showed few asymmetries between liberals and conservatives.

One limitation of the present study was the specific set of syllogisms used. We attempted to create conclusions for political arguments that

were either liberal or conservative. However, our own biases may have led us to create more moderate or extreme conclusions based on our political ideologies. Furthermore, it is possible that some of the liberal conclusions were more socially desirable than conservative conclusions. People tend to respond to political questions in socially desirable ways (e.g., Streb, Burrell, Frederick, & Genovese, 2008) and social liberalism is associated with social desirability (Verhulst, Eaves, & Hatemi, 2012). This could explain why the politically moderate samples showed a liberal bias when reasoning. Future studies should employ different materials to test the generalizability of the present study's findings. Another limitation is that some of the significant results in the present study had small effect sizes. These findings should be interpreted considering the size of the reported effects.

To conclude, we found evidence for a political belief bias in two samples of participants. Participants' conservatism predicted differences in acceptance rates for conservative and liberal conclusions, but this political belief bias was not predicted by participants' CRT performance, inconsistent with the motivated system 2 reasoning account of motivated reasoning. These findings help to explain how people of different ideologies can draw different conclusions from the same information, and suggest reasons why straightforward appeals to logical arguments fail to inspire bipartisan support. The current findings, then, suggest that even overcoming "fake news"—agreeing on a consensus set of facts on the ground—may not be sufficient to elevate political discourse to a discussion of policy.

Disclosure statement

No potential conflict of interest was reported by the author(s).

References

- Ball, L. J., Phillips, P., Wade, C. N., & Quayle, J. D. (2006). Effects of belief and logic on syllogistic reasoning: Eye-movement evidence for selective processing models. *Experimental Psychology*, 53(1), 77–86. doi:10.1027/1618-3169.53.1.77
- Baron, J., & Jost, J. T. (2019). False equivalence: Are liberals and conservatives in the US equally "biased"? *Perspectives on Psychological Science*, 14(2), 292. Advance online publication. doi:10.1177/1745691618788876
- Baron, J., Scott, S., Fincher, K., & Metz, S. E. (2015). Why does the Cognitive Reflection Test (sometimes) predict utilitarian moral judgment (and other things)? *Journal of Applied Research in Memory and Cognition*, 4(3), 265–284. doi:10.1016/j.jarmac.2014.09.003
- Borick, C. P., & Rabe, B. G. (2010). A reason to believe: Examining the factors that determine individual views on global warming. *Social Science Quarterly*, 91(3), 777–800. doi:10.1111/j.1540-6237.2010.00719.x

- Calvillo, D. P., & Burgeno, J. N. (2015). Cognitive reflection predicts the acceptance of unfair ultimatum game offers. *Judgment and Decision Making, 10*, 332–341.
- Cobb, M. D., & Kuklinski, J. H. (1997). Changing minds: Political arguments and political persuasion. *American Journal of Political Science, 41*(1), 88–121. doi:10.2307/2111710
- De Neys, W. (2006). Dual processing in reasoning: Two systems but one reasoner. *Psychological Science, 17*(5), 428–433. doi:10.1111/j.1467-9280.2006.01723.x
- De Neys, W. (2012). Bias and conflict: A case for logical intuitions. *Perspectives on Psychological Science, 7*(1), 28–38. doi:10.1177/1745691611429354
- De Neys, W., & Dieussaert, K. (2005). *Individual differences in rational thinking time*. In Proceedings of the Annual Meeting of the Cognitive Science Society (Vol. 27, No. 27).
- De Neys, W., & Pennycook, G. (2019). Logic, fast and slow: Advances in dual-process theorizing. *Current Directions in Psychological Science, 28*(5), 503–509. doi:10.1177/0963721419855658
- Deppe, K. D., Gonzalez, F. J., Neiman, J. L., Jacobs, C., Pahlke, J., Smith, K. B., & Hibbing, J. R. (2015). Reflective liberals and intuitive conservatives: A look at the Cognitive Reflection Test and ideology. *Judgment & Decision Making, 10*, 314–331.
- Ditto, P. H., Liu, B. S., Clark, C. J., Wojcik, S. P., Chen, E. E., Grady, R. H., ... Zinger, J. F. (2019). At least bias is bipartisan: A meta-analytic comparison of partisan bias in liberals and conservatives. *Perspectives on Psychological Science, 14*(2), 273. doi:10.1177/1745691617746796
- Evans, J. S. B. (2008). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology, 59*(1), 255–278. doi:10.1146/annurev.psych.59.103006.093629
- Evans, J. S. B., Barston, J. L., & Pollard, P. (1983). On the conflict between logic and belief in syllogistic reasoning. *Memory & Cognition, 11*, 295–306. doi:10.3758/BF03196976
- Evans, J. S. B., & Curtis-Holmes, J. (2005). Rapid responding increases belief bias: Evidence for the dual-process theory of reasoning. *Thinking & Reasoning, 11*, 382–389. doi:10.1080/13546780542000005
- Everett, J. A. C. (2013). The 12 Item Social and Economic Conservatism Scale (SECS). *PLoS One, 8*(12), e82131. doi:10.1371/journal.pone.0082131
- Fadjukoff, P., Pulkkinen, L., & Kokko, K. (2016). Identity formation in adulthood: A longitudinal study from age 27 to 50. *Identity, 16*(1), 8–23. doi:10.1080/15283488.2015.1121820
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*(2), 175–191. doi:10.3758/BF03193146
- Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives, 19*(4), 25–42. doi:10.1257/089533005775196732
- Gravelle, T. B. (2018). Politics, time, space, and attitudes toward US–Mexico border security. *Political Geography, 65*, 107–116. doi:10.1016/j.polgeo.2018.05.012
- Heit, E., & Rotello, C. M. (2014). Traditional difference-score analyses of reasoning are flawed. *Cognition, 131*(1), 75–91. doi:10.1016/j.cognition.2013.12.003
- Hochschild, J. L., & Einstein, K. L. (2015). Do facts matter? Information and misinformation in American politics. *Political Science Quarterly, 130*(4), 585–624. doi:10.1002/polq.12398
- Jost, J. T. (2017a). Ideological asymmetries and the essence of political psychology. *Political Psychology, 38*(2), 167–208. doi:10.1111/pops.12407

- Jost, J. T. (2017b). The marketplace of ideology: "Elective affinities" in political psychology and their implications for consumer behavior. *Journal of Consumer Psychology, 27*(4), 502–520. doi:10.1016/j.jcps.2017.07.003
- Kahan, D. M. (2013). Ideology, motivated reasoning, and cognitive reflection. *Judgment and Decision Making, 8*, 407–424.
- Kahan, D. M. (2015). Climate-science communication and the measurement problem. *Political Psychology, 36*, 1–43. doi:10.1111/pops.12244
- Kahan, D. M., Landrum, A., Carpenter, K., Helft, L., & Hall Jamieson, K. (2017). Science curiosity and political information processing. *Political Psychology, 38*, 179–199. doi:10.1111/pops.12396
- Kemmelmeier, M. (2008). Is there a relationship between political orientation and cognitive ability? A test of three hypotheses in two studies. *Personality and Individual Differences, 45*(8), 767–772. doi:10.1016/j.paid.2008.08.003
- Lodi-Smith, J., & Roberts, B. W. (2010). Getting to know me: Social role experiences and age differences in self-concept clarity during adulthood. *Journal of Personality, 78*, 1383–1410. doi:10.1111/j.1467-6494.2010.00655.x
- Lyons, J. (2017). The family and partisan socialization in red and blue America. *Political Psychology, 38*(2), 297–312. doi:10.1111/pops.12336
- McDonald, M. P. (2019). *United States elections project: Voter turnout demographics*. Retrieved from <http://www.electproject.org/home/voter-turnout/demographics>
- Osman, M. (2004). An evaluation of dual-process theories of reasoning. *Psychonomic Bulletin & Review, 11*, 988–1010. doi:10.3758/BF03196730
- Pennycook, G., & Rand, D. G. (2018). Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition, 188*, 39–50. doi:10.1016/j.cognition.2018.06.011
- Pennycook, G., & Rand, D. G. (2019). Cognitive reflection and the 2016 US presidential election. *Personality and Social Psychology Bulletin, 45*, 224–239. doi:10.1177/0146167218783192
- Redlawsk, D. P. (2002). Hot cognition or cool consideration? Testing the effects of motivated reasoning on political decision making. *The Journal of Politics, 64*(4), 1021–1044. doi:10.1111/1468-2508.00161
- Rekker, R., Keijsers, L., Branje, S., & Meeus, W. (2017). The dynamics of political identity and issue attitudes in adolescence and early adulthood. *Electoral Studies, 46*, 101–111. doi:10.1016/j.electstud.2017.02.005
- Streb, M. J., Burrell, B., Frederick, B., & Genovese, M. A. (2008). Social desirability effects and support for a female American president. *Public Opinion Quarterly, 72*(1), 76–89. doi:10.1093/poq/nfm035
- Swan, A. B., Calvillo, D. P., & Revlin, R. (2018). To detect or not to detect: A replication and extension of the three-stage model. *Acta Psychologica, 187*, 54–65. doi:10.1016/j.actpsy.2018.05.003
- Taber, C. S., Cann, D., & Kucsova, S. (2009). The motivated processing of political arguments. *Political Behavior, 31*(2), 137–155. doi:10.1007/s11109-008-9075-8
- Taber, C. S., & Lodge, M. (2006). Motivated skepticism in the evaluation of political beliefs. *American Journal of Political Science, 50*(3), 755–769. doi:10.1111/j.1540-5907.2006.00214.x
- Thomson, K. S., & Oppenheimer, D. M. (2016). Investigating an alternate form of the cognitive reflection test. *Judgment and Decision Making, 11*, 99–113.
- Toplak, M. E., West, R. F., & Stanovich, K. E. (2011). The Cognitive Reflection Test as a predictor of performance on heuristics-and-biases tasks. *Memory & Cognition, 39*, 1275–1289. doi:10.3758/x13421-011-0104-1

- Toplak, M. E., West, R. F., & Stanovich, K. E. (2014). Assessing miserly information processing: An expansion of the Cognitive Reflection Test. *Thinking & Reasoning, 20*, 147–168. doi:[10.1080/13546783.2013.844729](https://doi.org/10.1080/13546783.2013.844729)
- Trippas, D., Handley, S. J., & Verde, M. F. (2013). The SDT model of belief bias: Complexity, time, and cognitive ability mediate the effects of believability. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 39*, 1393–1402. doi: 1037.a0032398
- Trippas, D., Handley, S. J., Verde, M. F., & Morsanyi, K. (2016). Logic brightens my day: Evidence for implicit sensitivity to logical validity. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 42*, 1448–1457. doi:[10.1037/xlm0000248](https://doi.org/10.1037/xlm0000248)
- Trippas, D., Pennycook, G., Verde, M. F., & Handley, S. J. (2015). Better but still biased: Analytic cognitive style and belief bias. *Thinking & Reasoning, 21*, 431–445. doi:[10.1080/13546783.2015.1016450](https://doi.org/10.1080/13546783.2015.1016450)
- Verhulst, B., Eaves, L. J., & Hatemi, P. K. (2012). Correlation not causation: The relationship between personality traits and political ideologies. *American Journal of Political Science, 56*(1), 34–51. doi:[10.1111/j.1540-5907.2011.00568.x](https://doi.org/10.1111/j.1540-5907.2011.00568.x)
- Westfall, J., Van Boven, L., Chambers, J. R., & Judd, C. M. (2015). Perceiving political polarization in the United States: Party identity strength and attitude extremity exacerbate the perceived partisan divide. *Perspectives on Psychological Science, 10*(2), 145–158. doi:[10.1177/1745691615569849](https://doi.org/10.1177/1745691615569849)