

**Title:** Is the Political Slant of Psychology Research Related to Scientific Replicability?

**Authors:** D. A. Reinero<sup>1</sup>, J. A. Wills<sup>1</sup>, W. J. Brady<sup>12</sup>, P. Mende-Siedlecki<sup>3</sup>, J. T Crawford<sup>4</sup>, J. J. Van Bavel<sup>15\*</sup>

**Affiliations:** <sup>1</sup>Department of Psychology, New York University, New York, NY, USA.

<sup>2</sup>Department of Psychology, Yale University, New Haven, CT, USA.

<sup>3</sup>Department of Psychological and Brain Sciences, University of Delaware, Newark, DE, USA.

<sup>4</sup>Department of Psychology, The College of New Jersey, Ewing, NJ, USA.

<sup>5</sup>Center for Neural Science, New York University, New York, NY, USA.

\*Correspondence to: jay.vanbavel@nyu.edu

**One Sentence Summary:** The specific ideological slant of psychology research findings (liberal vs. conservative) is not associated with the likelihood the finding will replicate in subsequent research or be cited in the media or scientific literature.

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# **Abstract**

*(word count 230)*

Social science is a field predominantly composed of liberals, and critics have argued that this liberal representation may reduce the robustness of research by embedding liberal values into the research and peer-review process. In an adversarial collaboration, we examined whether the ideological slant of research findings in psychology is associated with lower rates of scientific replicability. We analyzed 194 original psychology articles that had been subject to a later replication attempt (with a total sample of 1,331,413 participants across replications) by having psychology doctoral students (Study 1) and an online sample of U.S. residents (Study 2), from across the political spectrum, code the ideological slant (liberal vs. conservative) of the original research abstracts. The methods and analyses for both studies were pre-registered. In both studies, the liberal or conservative slant of the original research was not associated with whether or not the results successfully replicated: less than 2% of the variance in replication success was explained by ideological slant. The results remained consistent regardless of the ideology of the coder. Further, ideological slant was unrelated to both subsequent citation patterns and the original study effect size, and not consistently related to the original study sample size. However, we found weak evidence that more ideological research (regardless of ideology) was less replicable, and strong evidence that variables related to statistical robustness were consistent predictors of replication success. We discuss the implications for social science, politics, and replicability.

Keywords: Replication, politics, ideology, liberal, conservative, bias

# Main Text

## Introduction

There is a growing debate about the political composition of faculty members at post-secondary institutions and its effect on research and teaching. Numerous studies suggest that many academic fields are predominantly composed of Democrats or liberals<sup>1</sup> (Eagan et al., 2014; Gross, 2013; Gross & Simmons, 2014; Hamilton & Hargens, 1993; Ladd Jr & Lipset, 1975; Lazarsfeld & Thielens, 1977). A recent report of 40 leading American universities found that faculty who were registered Democrats outnumbered those who were registered Republicans across five kinds of departments (Langbert, Quain, & Klein, 2016). The imbalance was smallest in Economics (4.5:1), larger in Psychology (17.4:1), and largest in History (33.5:1)<sup>2</sup>. Recent data on psychologists' self-reported political ideology (e.g., (Duarte et al., 2015; Inbar & Lammers, 2012; Skitka, 2012; Von Hippel & Buss, 2017), suggests that roughly 85-90% of the field is liberal<sup>3</sup>. This has led to speculation that the large number of liberals in many academic fields might influence research and teaching.

Many have argued that political homogeneity among academics undermines the validity of some social psychological research (Buss & von Hippel, 2018; Crawford & Jussim, 2018; Duarte et al., 2015; Eagly, 1995; Redding, 2001) and jeopardizes the objectivity that science strives to achieve (Crawford, 2017; Jussim, Crawford, Anglin, & Stevens, 2015). According to this perspective, a homogenous group without enough dissenting minorities can lead to groupthink (Crano, 2012; Fiske, Harris, & Cuddy, 2004; Janis, 1972). For example, the sociologist Musa al Gharbi (2018) asserted that “ideologically-driven errors likely permeate a good deal of social research,” and psychologist Jonathan Haidt (2016) considers “the rapid loss of political diversity, over the last 20 years, to be the second-greatest existential threat to the field of social psychology, after the ‘replication crisis’.” This perspective may be echoed by members of the general public as well, who believe research in the social sciences is partially geared towards obtaining evidence consistent with researchers' ideologies (Hannikainen, 2018).

These growing concerns led at least one commentator to speculate that this political imbalance may have contributed to the low rates of replicability in psychology (Brooks, 2015), and propelled the Dutch government to pass a motion recommending that the Royal Netherlands Academy of Arts and Sciences study whether ideological bias affects research outcomes (Brugh, 2017a, 2017b). However, no work has formally tested the relationship between the ideological slant of research and its scientific robustness. To address this gap, the current paper examines the relationship between political ideology and the replicability of psychology research in a sample 194 original psychology articles that had been subject to a later replication attempt (with a total sample of 1,331,413 participants across replications).

The specific concern expressed by some critics is that a discipline composed overwhelmingly by scientists who are liberal might result in one-sided questions or

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<sup>1</sup> While political party identification (Democrats) and ideology (liberal) are different and have diverged at various times in the past (Barber & McCarty, 2015), currently the Democratic party trends liberal/left-leaning and the Republican party trends conservative/right-leaning (Levendusky, 2009).

<sup>2</sup> The other two departments were Law (8.6:1) and Journalism (20:1). The overall ratio across all universities and departments was 11.5 Democrats to 1 Republican. The sample size from the report was 7,243 faculty.

<sup>3</sup> Exact percentages vary, e.g., when focusing on economic issues, Inbar & Lammers' 2012 survey suggest less of an imbalance: 63.2% liberal and 17.9% conservative.

mischaracterizations of other political viewpoints, and that these scholars might be more lenient when reviewing liberal-leaning research (and/or stricter with conservative-leaning research). If the research or review process was selectively compromised, it could allow liberal-leaning claims based on flimsy evidence to be published – even if they are unlikely to hold up to scientific replication. This could be viewed as a form of *liberal bias*.

There is extensive evidence that political identities can engage motivated cognition (Kahan, 2012; Van Bavel & Pereira, 2018). Research on politicized topics such as climate change (Pew Research Center, 2016), gun violence, vaccinations (Kahan, Braman, Cohen, Gastil, & Slovic, 2010) and health care reform (Nyhan, Reifler, & Ubel, 2013), suggest that public belief in these data diverge along partisan lines. In addition, a recent meta-analysis found that both liberals and conservatives engage in motivated reasoning (Ditto et al., 2018; but see Baron & Jost, 2018).

Such motivated political cognition might influence various stages of the scientific process (see Duarte and colleagues, 2015), from the study design and data analysis, to editorial decisions and citation patterns. Indeed, there is evidence that peer review may be susceptible to the social preferences of reviewers and editors. For instance, single-blind reviewing confers a significant advantage to papers with well-known authors and authors from high-prestige institutions relative to double-blind review (Tomkins, Zhang, & Heavlin, 2017). In addition, male STEM faculty rate research less favorably when it finds evidence of a gender bias against women in STEM (while women rate research less favorably when it *does not* find evidence of gender bias against women in STEM; Handley, Brown, Moss-Racusin, & Smith, 2015). These findings raise the possibility that scientists may express similar forms of bias towards papers that do not align with their own political ideology.

Given the political base rates of academia, peer-reviewers are likely to be liberal, and biases have been documented among social scientists' interpretations and evaluations of research (MacCoun, 1998). For instance, a review of 68 papers containing empirical evidence on journal peer-review concluded that the peer-review system was unfair and discouraged innovation – a conclusion supported by evidence that “findings that conflict with current beliefs are often judged to have deficits.” (Armstrong, 1997)<sup>4</sup>. A more recent analysis of 306 politically relevant abstracts from the Society for Personality and Social Psychology revealed that liberals are characterized slightly more positively than conservatives, and that conservatives are more often the target of explanation than liberals (Eitan et al., 2018).

More broadly, if a scientist's personal political identity or beliefs cannot be sufficiently divorced from their own research, the scientist might (1) solely form hypotheses that align with an ideologically-congruent narrative (e.g., a liberal professor solely studying the inaccurate and pernicious effects of social stereotypes); (2) embed their personal ideological values into how they measure variables or broader constructs (e.g., leading survey questions or scales lacking construct validity); (3) look for ideologically-congruent results (e.g., p-hacking results until a pattern emerges that supports their worldview); (4) interpret and report results in an ideologically-congruent manner (e.g., framing their findings under ideologically-congruent theories and using value-laden language in the abstract and manuscript); (5) try to publish results that are ideologically-congruent and place results that are ideologically-incongruent in a file-drawer. If the many liberals in academia (particularly those in the social sciences where theories are more politically-relevant) all pursued the above listed practices, it would result in a heavily

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<sup>4</sup> That said, scientific beliefs are instilled through the accumulation of evidence, and scientists may merely be acting as rational Bayesian agents when challenges to current beliefs are presented.

skewed distribution of research topics, a distortion of many topics through one-sided framing, and ultimately results that may not be reliable or replicable.

On the other hand, if scientists dogmatically followed contemporary ideological beliefs and ignored logic and empirical evidence, they would not have discovered that the world is round, advanced the theory of evolution, or invented modern medicine. While scientists are not immune to human heuristics such as confirmation bias (Nickerson, 1998), they tend to be both more open-minded (Lounsbury et al., 2012) and require more empirical consistency (Hogan & Maglienti, 2001) than non-scientists. As such, scientists are more willing than others to consider new, convincing data even if it counters a dominant theory. Perhaps more importantly, the norms of science attenuate the biases of individual scientists by institutionalizing vigorous debate and criticism (Merton, 1973). For instance, the peer-review process is well-designed to diminish groupthink since reviews are normally conducted in parallel by anonymous reviewers at arm's length from the authors.

The current research was designed to address the role of political ideology on the quality of scientific papers. Empirical evidence on this topic is scant and there is reason to believe that scholars may overestimate the role of ideological bias in the research literature. For instance, the size of ideological bias in the recent study cited above of abstracts from the *Society for Personality and Social Psychology* was not only small (Cohen, 1988), but it was significantly smaller than a separate set of raters predicted (Eitan et al., 2018). Thus, even when the peer-review process was limited to reading and evaluating abstracts, there was much weaker evidence of ideological bias than expected. Moreover, these abstracts had only undergone minimal peer review since the underlying features of scientific robustness (e.g., statistical power, effect size) are rarely available in conference abstracts. As such, the attributes of scientists and the process of journal peer-review may mitigate against the potential for ideology to significantly influence research and publication decisions since these individual differences and structural factors place a higher value on truth.

In two studies, we examined whether the ideological slant of research (i.e., whether research conclusions are more consistent with a liberal or conservative worldview) was associated with less replicable or statistically robust (i.e., effect size and sample size of the original research) published psychology research. We also examined whether liberal findings are cited and discussed more often than conservative findings (Jussim, Crawford, Anglin, Stevens, 2016). We defined left (liberal) and right (conservative) according to contemporary American politics. The key difference between the two studies is the coders we used to determine the ideological slant of the original research: in Study 1 we used a politically balanced sample of six psychology doctoral students (including pairs of self-identified liberals, moderates, and conservatives), and in Study 2 we used a larger, politically diverse sample of American residents (using an online Mechanical Turk sample). To mitigate the possible influence of our own views, we formed an “adversarial collaboration” (Kahneman, 2003; Tetlock & Mellers, 2011) using two sets of authors who were simultaneously testing the same question with different theoretical commitments (Mellers, Hertwig, & Kahneman, 2001). Further, both sets of authors independently pre-registered their methods and analyses (Nosek & Lindsay, 2018; Shrout & Rodgers, 2018). Despite each study being run by a different set of authors, the results of both studies were strikingly similar, and so we present them together to show the robust nature of our findings across different types of coders (expert vs. lay coders) and scientific methods. We focus on inferences that are consistent across both studies.

## Method

We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study. All analyses are pre-registered (Study 1 pre-registration: <https://osf.io/nh9gj/>, Study 2 pre-registration: <https://osf.io/5ke68/>) unless otherwise explicitly stated as exploratory. We adhere to all of our pre-registered analyses and report any deviations from our pre-registrations (see Supplemental Material section “Deviations from Pre-Registration”). All data analyses were performed using R version 3.5.1 (R Core Team, 2018), assisted by the following packages: “tidyverse” (Wickham, 2017b), “psych” (Revelle, 2018), “lme4” (Bates, Mächler, Bolker, & Walker, 2015), “lmerTest” (Kuznetsova, Brockhoff, & Christensen, 2017), “sjPlot” (Lüdtke, 2018b), “MuMIn” (Bartoń, 2018), “moments” (Komsta & Novomestky, 2015), “fmsb” (Nakazawa, 2018), “ggeffects” (Lüdtke, 2018a), “MASS” (Venables & Ripley, 2002), “scales” (Wickham, 2017a), “devtools” (Wickham, Hester, & Chang, 2018), “metafor” (Viechtbauer, 2010) and “colorspace” (Zeileis, Hornik, & Murrell, 2009).

In both studies, coders rated the ideological slant of 194 original psychology articles<sup>5</sup> that were also subject to a replication attempt<sup>6</sup>. This dataset included 479 replication attempts<sup>7</sup> from eight different publicly available repositories, involving 1,331,413 participants (see pre-registrations for further information; Study 1 pre-registration: <https://osf.io/nh9gj/>, Study 2 pre-registration: <https://osf.io/5ke68/>; all data (<https://osf.io/pc9xd/>) and code (<https://osf.io/zftxe/>) are available on Open Science Framework). Several replication attempts were part of large-scale efforts that sought to replicate some of the most influential original findings in psychology (e.g., Association for Psychological Science’s Registered Replication Reports). Other replication efforts explicitly sought to minimize selection biases and maximize generalizability of the accumulated evidence (e.g., Reproducibility Project: Psychology), through choosing articles that range in topic and sub-discipline, time period, differing levels of certainty and existing impact, classic and contemporary effects, and publication outlets, (e.g., Many Labs). The eight repositories were the following: Association for Psychological Science’s Registered Replication Reports (Simons, Holcombe, & Spellman, 2014), Curate Science (LeBel & Battista, 2014), Many Labs 1 (Klein et al., 2014), Many Labs 2 (Klein et al., 2018), Many Labs 3 (Ebersole et al., 2016), Pre-Publication Independent Replications (Schweinsberg et al., 2016), Reproducibility Project: Psychology (OSC, 2015), Social Psychology Journal Special Issue (SPJSI, 2014). To our knowledge, our paper provides the largest analysis of replications in the social sciences.

### Participants

*Study 1.* In the summer of 2016, we sent out a recruitment survey to the Society for Personality and Social Psychology mailing list calling for doctoral coders to rate psychology

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<sup>5</sup> Abstracts were used as proxies for original articles. In Study 1, all coders rated all 194 abstracts. In Study 2, each coder rated a random sample of 10 abstracts.

<sup>6</sup> Two original articles from the Curate Science repository did not have replication analyses that sufficiently matched the original to compare the two. Those two replication attempts were excluded.

<sup>7</sup> Some original articles had multiple labs attempting to replicate a single effect (e.g., APS RRR). Other original articles contained multiple effects that the replicator(s) attempted to replicate. For such instances, aggregate or meta-analytic effects are presented when provided in the replication article. Otherwise, where theoretically reasonable, multiple replication attempts/effects corresponding to the same original article were averaged and weighted by sample size.

abstracts on the political orientation of their study conclusions. We recruited psychology doctoral coders since they would have experience reading and comprehending published psychological research while lacking the in-depth knowledge of most of the original research, which was published well before they started their doctoral degree. We asked respondents to self-report their age, sex, current doctoral year, and ideology (5-point scale: 1 = “very liberal”, 3 = “moderate”, 5 = “very conservative”). We received 340 responses and randomly selected<sup>8</sup> an equal number of very liberal, moderate, and very conservative social psychology doctoral students, who were maximally balanced on age, sex, and year of doctoral training to minimize differences (see Table S1 for doctoral coder demographics). This sample of coders allowed us to determine if our conclusions would generalize to coders across the political spectrum.

*Study 2.* Although our doctoral coder sample was selected to provide political balance to minimize inadvertent bias, those restrictions left us with a small sample of coders. In Study 2, we recruited a much larger sample of US residents to serve as coders. Specifically, we recruited 511 online Mechanical Turk workers (47% Male,  $M_{age} = 37$  years; see Figure S1 for MTurk coder demographics). The number of online coders was informally determined such that every abstract had at least a dozen ratings. This sample of coders allows us to determine if our conclusions would generalize to a lay audience of non-experts.

### ***Materials and Procedure***

*Study 1.* To strengthen coding reliability, the selected doctoral coders completed two practice rounds, where they rated the ideological slant of 12 abstracts (4 in the first round and 8 in the second round). The abstracts were selected to represent liberal and conservative findings (as well as moderate and non-politically relevant findings) and each coder received feedback after each round regarding their accuracy (see Supplementary Material “Practice Round Process for Study 1” for details). Practice abstracts were selected from the same journals and time period as the test abstracts, though no practice abstract overlapped with a test abstract.

Before completing any ratings, coders were given example definitions of liberalism and conservatism, along with flattering and unflattering profiles of liberals and conservatives (Tetlock & Mitchell, 1993) to provide a reminder about the common divergences between these ideologies and relative anchors for the different ends of the ideological slant scale. In Study 1, ideological slant was rated on a 5-point scale (1 = *very left leaning*, 2 = *slightly left leaning*, 3 = *politically relevant but no lean*, 4 = *slightly right leaning*, 5 = *very right leaning*). We also included an option to code the abstract as not politically relevant (“does not apply”) to allow greater sensitivity of our measure and avoid conflating a moderate abstract with one that was not politically relevant. Ratings from a coder that were along the 1-5 scale were considered politically relevant, whereas a rating of “does not apply” was considered not politically relevant.

After successfully completing the two practice rounds, coders then read the abstracts of the 194 original psychology articles in our database and rated the ideological slant of the study’s research conclusion (surveys were chunked into three waves to avoid rating fatigue). All original abstracts were re-formatted to plain text and standardized to avoid incidentally providing clues to our coders as to which journal they came from. For each abstract, doctoral coders also rated the sub-discipline of the abstract, choosing from among five options: personality, social,

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<sup>8</sup> Our random selection was limited to respondents who had self-identified as either “very liberal”, “moderate”, or “very conservative” to provide maximal balance across the ideological spectrum.

developmental, cognitive, or perception<sup>9</sup>. The doctoral coders also rated the contextual sensitivity of an abstract using the 5-point scale from Van Bavel et al. (2016) (*1 = context is not at all likely to affect the results, 3 = context is somewhat likely to affect the results, 5 = context is very likely to affect the results*), and rated how robust the results seemed on a 5-point scale (*1 = not at all robust, 2 = slightly robust, 3 = moderately robust, 4 = very robust, 5 = extremely robust*). The order of rating context sensitivity and robustness was randomized. We then recorded whether the coder was familiar with the results of prior work on contextual sensitivity and replicability and gathered demographics.

We averaged the 1-5 ideological slant scale ratings to form an average measure of ideological slant for each abstract. Although it was not part of our pre-registered analysis plan, we also analyzed our data using random effect models which include a random intercept and slope for each rater, thus incorporating the individual ratings of each coder. Following our pre-registered rule, if at least four of the six coders (i.e., the majority of coders) rated the abstract as not politically relevant, that abstract was coded as not politically relevant and was not included in the primary analysis. We also averaged all six coders' ratings of contextual sensitivity and robustness to produce respective mean scores for each abstract.

*Study 2.* In Study 2 the online coders viewed a brief prompt and then rated a random selection of 10 abstracts from the same set of 194 anonymized abstracts from Study 1. Just as in Study 1, we calculated the ideological slant of each abstract by averaging the ratings from the online coders (and using individual coder ratings for random effect models). In contrast to Study 1, the online coders did not undergo practice rounds and were not shown example definitions of liberalism and conservatism, nor the flattering and unflattering liberal and conservative portraits. Instead, they were required to use their own sense of political ideology to guide their ratings. In addition, the ideological slant scale was on a 7-point scale (*1 = consistent with a conservative worldview; 4 = unrelated to conservative or liberal worldviews; 7 = consistent with a liberal worldview*)<sup>10</sup>. Unlike Study 1, Study 2 was unable to distinguish between an abstract lacking political relevance and one that was merely politically moderate. Moreover, the online coders did *not* rate each abstract on sub-discipline, contextual sensitivity, or robustness.

After rating the abstracts, the online coders completed an 8-item political knowledge measure consisting of items typically used in the American National Election Studies (range = 0 to 8, with higher scores indicating greater knowledge). This was followed by a measure of political engagement (i.e., interest in politics, importance of politics, summation of sources of political news and information; normalized scores to range from 0 to 1, with higher scores indicating greater engagement; (Malka, Soto, Inzlicht, & Lelkes, 2014)). We then recorded age, gender, ethnicity, political ideology (*1 = very liberal; 7 = very conservative*), party identification, and educational attainment. These methodological differences between Study 1 and Study 2 were a result of the independent nature of our “adversarial collaboration,” and allow us to examine the generalizability and replicability of our findings under slightly different operationalizations determined by authors with different theoretical commitments.

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<sup>9</sup> If the doctoral coders felt more than one sub-discipline applied, they were asked to select the two most relevant.

<sup>10</sup> For ease of interpretation and to match Study 1, we reverse scored the ideological slant scale from Study 2 such that a rating of 1 = consistent with a liberal worldview, and a rating of 7 = consistent with a conservative worldview.



## Results

### *Ideological Slant Rating Agreement*

*Study 1.* The doctoral coders showed strong inter-rater reliability with respect to whether an abstract was politically relevant or not, intra-class correlation ( $ICC(3,6) = .84$ ) (Shrout & Fleiss, 1979). When we examined the 52% (101 of 194) of abstracts deemed politically relevant, agreement of the precise ideological slant was lower,  $ICC(3,6) = .64$ , though still acceptable (Cicchetti, 1994; Koo & Li, 2016). This suggests that determinations of political relevance were easier to determine, but ideological slant ratings were more challenging to ascertain – even among expert coders with prior training. Importantly, the doctoral coders were only in a “majority disagreement” on the liberal-conservative direction of the ideological slant 4% of the time (cases where at least a third of the coders said it was liberal and at least a third of the coders simultaneously said it was conservative, i.e., where the majority of coders were split; see Supplementary Material section “Ideological Slant (Dis)Agreement” for details). This suggests that although relative agreement was sometimes a challenge, very few abstracts resulted in the majority of doctoral coders producing ratings that classified an abstract’s slant on opposite sides of the political spectrum.

*Study 2.* Ideological slant rating agreement was similar using the online coders ratings. As the 511 online coders rated a random selection of 10 abstracts from the database, each abstract received an average of 26 ideological slant ratings in Study 2. Utilizing Spearman-Brown’s formula<sup>11</sup> the online coders showed similar levels of agreement for ideological slant,  $ICC(1,26) = .57$ . The online coders were only in a “majority disagreement” 7% of the time (operationalized the same way as in Study 1; see Supplementary Material section “Ideological Slant (Dis)Agreement” for details).

### *Ideological Slant Rating Distributions*

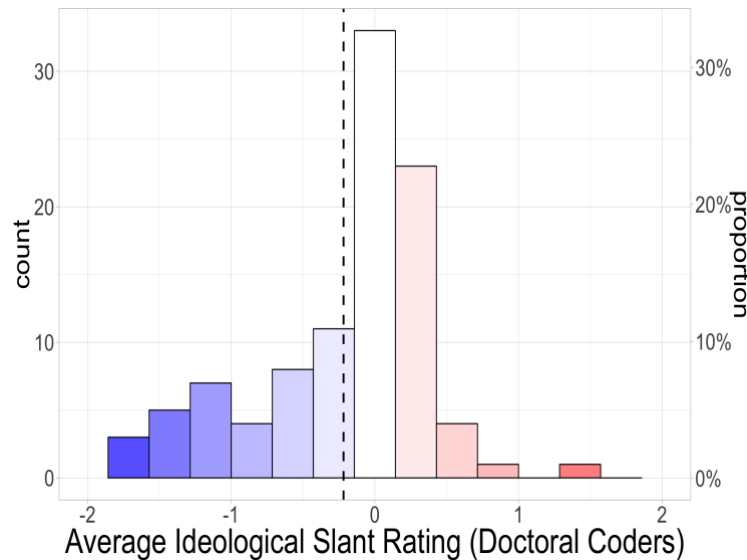
Given the large proportion of liberal researchers in psychology, we first examined whether the ideological content of abstracts matched the ideological distribution of scientists from the field. Some estimates suggest that the liberal skew of psychologists themselves has an effect size ranging from Pearson  $r = .63$  (Cardiff & Klein, 2005) to Pearson  $r = .89$  (Langbert et al., 2016) (where an effect size of 0 would imply an equal number of liberals and conservatives), with social psychologists specifically producing an effect size of Pearson  $r = .87$  (Inbar & Lammers, 2012; Von Hippel & Buss, 2017). However, both the doctoral (Figure 1) and online coder<sup>12</sup> (Figure 2) distributions of average ideological slant ratings were fairly normal with very few abstracts on the political extremes. The distributions of the abstracts were modestly shifted toward the political left though the mean score was close to the midpoint: doctoral coders  $M = 2.78$  (midpoint of 3),  $t(100) = -3.58$ ,  $p < .001$ , Pearson  $r = .34$  (20% of politically relevant

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<sup>11</sup> The default calculation for  $ICC(1,k)$  is to assume that  $k$  = the total number of raters. That is appropriate if every rater gives a judgment on every abstract (as in Study 1), but this is not the case for Study 2. As such, we used Spearman-Brown’s formula:  $(k*r) / (1+(k-1)*r)$ , where  $k$  = the number of ratings per abstract and  $r$  = the single rater reliability derived from an ICC that assumes each rater gave a judgment on every abstract (see Shrout & Fleiss, 1979).

<sup>12</sup> As Study 2’s scale did not allow for distinguishing abstracts that were politically relevant or not, the distribution of ideological slant ratings from Study 2 includes all abstracts in the database ( $N = 194$ ), whereas Study 1’s distribution stems from the subset of articles deemed politically relevant based on the doctoral coder’s ratings ( $N = 101$ ).

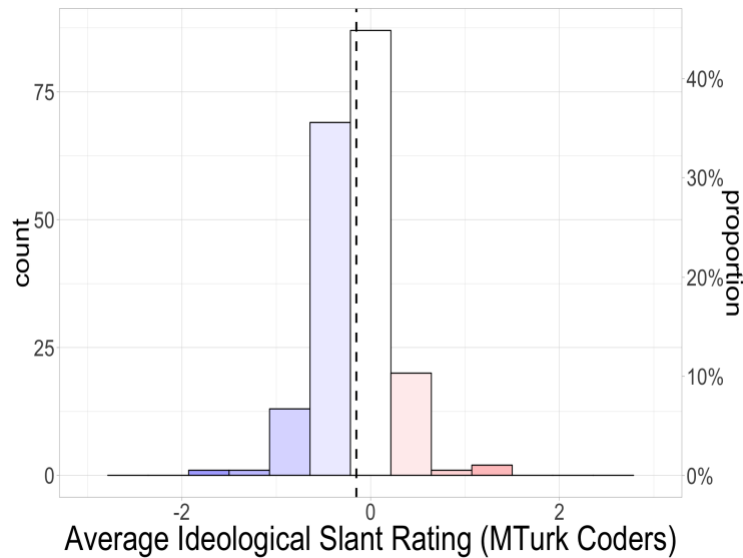
abstracts were rated as liberal-leaning, 4% were rated as conservative-leaning) and online coders  $M = 3.85$  (midpoint of 4),  $t(193) = -5.51$ ,  $p < .001$ , Pearson  $r = .37$  (3% of all abstracts were rated as liberal-leaning, 2% were rated as conservative-leaning)<sup>13</sup>. Thus, trained doctoral coders and untrained lay online coders rated psychology abstracts in a similar manner<sup>14</sup> and the mean ideology of published papers, although slightly left of center, appeared to be quite different from the ideological makeup of scientists in the field.



**Fig. 1.** Distribution of average ideological slant ratings from Study 1's doctoral coders (centered on the midpoint of the scale). Scores of -2 reflect a very left-leaning abstract; +2 reflects a very right-leaning abstract. Dotted vertical line represents mean. Skewness = -0.82, kurtosis = 3.44.

<sup>13</sup> Each study's ideological slant scale was divided into thirds to create a "liberal bin" a "moderate bin" and a "conservative bin".

<sup>14</sup> That Study 1 and Study 2's distributions are similar is supported by the fact that the two sets of ideological slant ratings are significantly positively correlated with each other, Spearman  $r = .29$ ,  $p < .001$  (across all abstracts where computing an ideological slant score was possible, i.e., when all six doctoral coders from Study 1 rated an abstract as "does not apply", that abstract could not receive an ideological slant score).



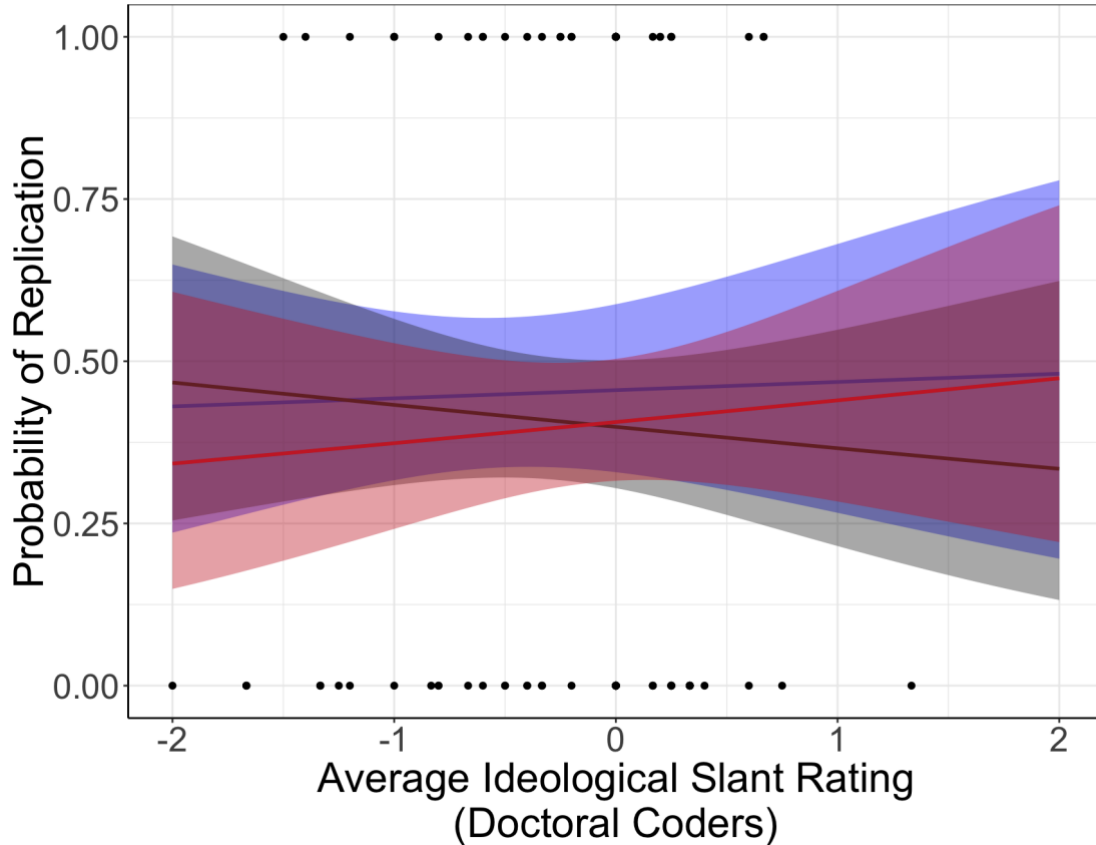
**Fig. 2.** Distribution of average ideological slant ratings from Study 2's online coders (centered on the midpoint of the scale). Scores on the left (-3) reflect an abstract consistent with a liberal worldview, scores at zero reflect an abstract that is unrelated to a conservative or liberal worldview, scores on the right (+3) reflect an abstract consistent with a conservative worldview. Dotted vertical line represents mean. Skewness = 0.26, kurtosis = 5.25.

### ***Ideological Slant and Replicability***

**Study 1.** We next examined the relationship between the ideological slant of psychology results with the likelihood that the results were successfully replicated in subsequent research (as per our pre-registration, replication was defined as a binary evaluation of whether research replicated or not). We conducted a mixed model logistic regression for the politically relevant abstracts, estimating a random intercept and slope for each doctoral coder<sup>15</sup>. We found no evidence that ideological slant was associated with replicability,  $OR = 1.03$ ,  $SE = 0.10$ ,  $p = .781$ , 95% CI [0.85, 1.24].<sup>16</sup> Moreover, this null result remained consistent when statistically adjusting for covariates previously shown to be related to replicability (e.g., effect size of the original research; see Model S1). Indeed, less than 1% of the variance in replicability could be explained by the ideological slant of the original research alone (*Nakagawa-Schiegg-Johnson* (*N-S-J*) *pseudo*  $R^2 = 0.02\%$ ). Further, the null association remained consistent regardless of the doctoral coder's ideology, all interaction  $p$ 's  $> .342$  (see Figure 3 and Model S1a and Model S1b). Indeed, we explored the zero order correlations (Spearman) for each coder and found all to be non-significant: moderate female:  $r = -.06$ ,  $p = .543$ ; moderate male:  $r = -.00$ ,  $p = .970$ ; very conservative female:  $r = -.02$ ,  $p = .876$ ; very conservative male:  $r = .07$ ,  $p = .537$ ; very liberal female:  $r = .11$ ,  $p = .533$ ; very liberal male:  $r = .04$ ,  $p = .736$ .

<sup>15</sup> Our pre-registration originally stated that we would use the average political lean score for each abstract in a fixed effect model, however, to avoid losing meaningful variance, we updated to run random effect models. The results are consistent either way, see Models S2-S6 for the various other models.

<sup>16</sup> This model provides a warning of a singular fit, so we also performed a Bayesian model which provided nearly identical estimates, and as such we retain the reported mixed model above.



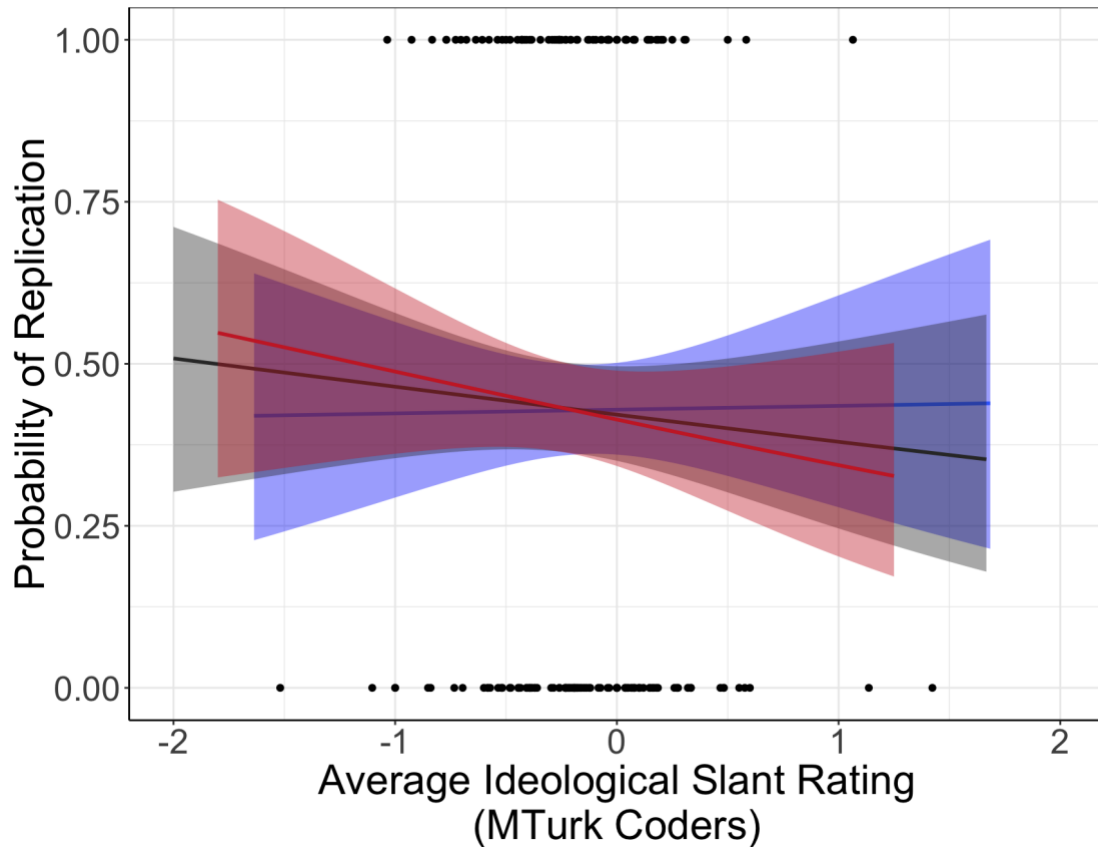
**Fig. 3. Ideological slant predicting replicability, grouped by ideology of the coder.**

Binary logistic regression models showing that ideological slant was not significantly associated with replicability, regardless of the ideology of the doctoral coders (blue = liberals, grey = moderates, red = conservatives). For ease of interpretation, the unweighted fixed effect model is shown here. -2 = very left-leaning, 0 = moderate, 2 = very right-leaning.

The overall results were also robust to various other models (e.g., fixed effect models which use the average slant score for each abstract, as well as exploratory weighted models which give more weight to abstracts that have more ratings (a coder’s rating of “does not apply” was not used to calculate the average slant score hence some abstracts have fewer ratings) or have more agreement among the ratings; see Models S2-S6). In addition, the null association remained consistent when focusing solely on social or personality psychology abstracts<sup>17</sup>,  $OR = 1.04$ ,  $SE = 0.10$ ,  $p = .667$ , 95% CI [0.86, 1.26]. As a further robustness check, we ran the same fixed and random effect models including all abstracts – not just the politically relevant subset – and found similar results (see Models S7-S12). Thus, testing numerous models, we found no support for a *liberal bias* (or *conservative bias*) with respect to a specific ideological slant and replicability.

<sup>17</sup> As per our pre-registration, any abstract where at least one doctoral coder had categorized the study as related to social or personality psychology was counted as such. These results hold even when changing the sub-discipline categorization to be more based on consensus, such that any abstract receiving 3 or more votes for a given sub-discipline (i.e., at least half of the coders) was counted as such,  $OR = 1.07$ ,  $SE = 0.10$ ,  $p = .489$ , 95% CI [0.88, 1.29].

*Study 2.* We performed the same mixed model logistic regression as Study 1, this time using the online coders' ratings. Replicating our results from Study 1, we did not find evidence that ideological slant was associated with replicability,  $OR = 0.98$ ,  $SE = 0.02$ ,  $p = .432$ , 95% CI [0.94, 1.03]. This result remained null when adjusting for covariates previously shown to be related to replicability (e.g., effect size of the original research; see Model S21). Less than 2% of the variance in replicability could be explained by the ideological slant of the original research alone ( $N-S-J$  pseudo  $R^2 = 1.95\%$ ). Moreover, the null association remained consistent regardless of the online coder's ideology, all interaction  $p$ 's  $> .464$  (see Figure 4 and Model S21a and Model S21b).



**Fig. 4. Ideological slant predicting replicability, grouped by ideology of the coder.**

Binary logistic regression models showing that ideological slant was not significantly associated with replicability, regardless of the ideology of the online coders (blue = liberals, grey = moderates, red = conservatives). For ease of interpretation, the unweighted fixed effect model is shown here. -3 = consistent with a liberal worldview, 0 = unrelated to conservative or liberal worldview, 3 = consistent with conservative worldview.

The overall results were also robust to various other models (the same model variations as done for Study 1, though giving more weight to abstracts that had more ratings revealed a significant effect when not adjusting for covariates; see Models S22-S26). In addition, the null association did not change when focusing just on social or personality psychology abstracts<sup>18</sup>,

<sup>18</sup> The sub-discipline of each abstract was borrowed from the aforementioned rating system done by the doctoral coders in Study 1.

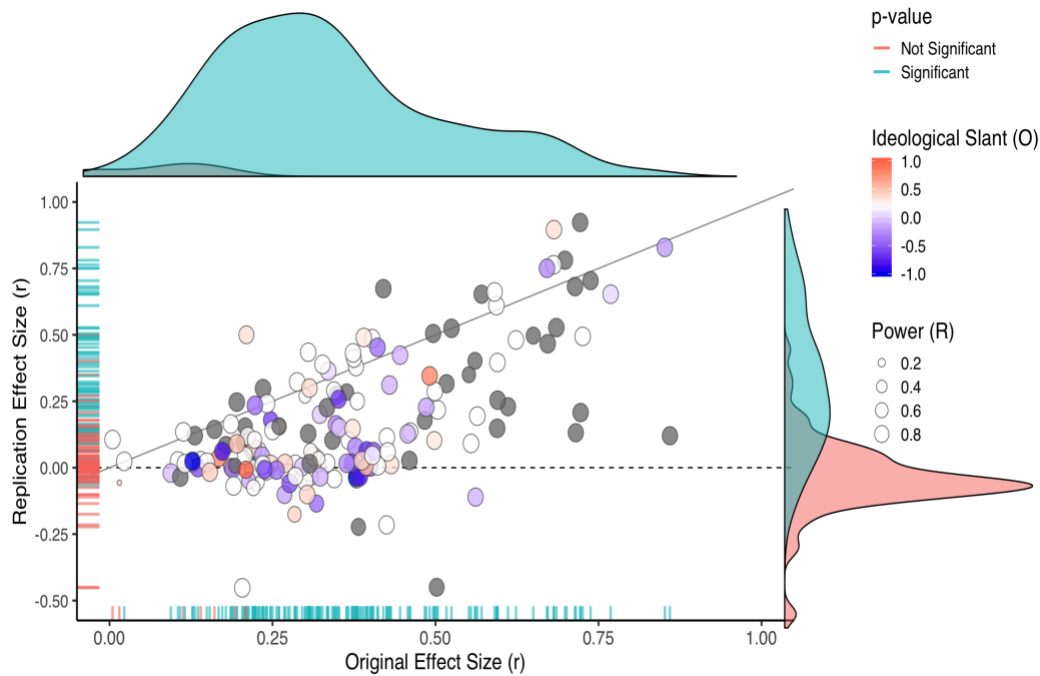
$OR = 0.96$ ,  $SE = 0.03$ ,  $p = .161$ , 95% CI [0.92, 1.01]. Thus, testing numerous models, we replicated our null results from Study 1, and found no evidence of a *liberal bias* (or *conservative bias*) with respect to a specific ideological slant and replicability.

### ***Ideological Slant and Statistical Robustness***

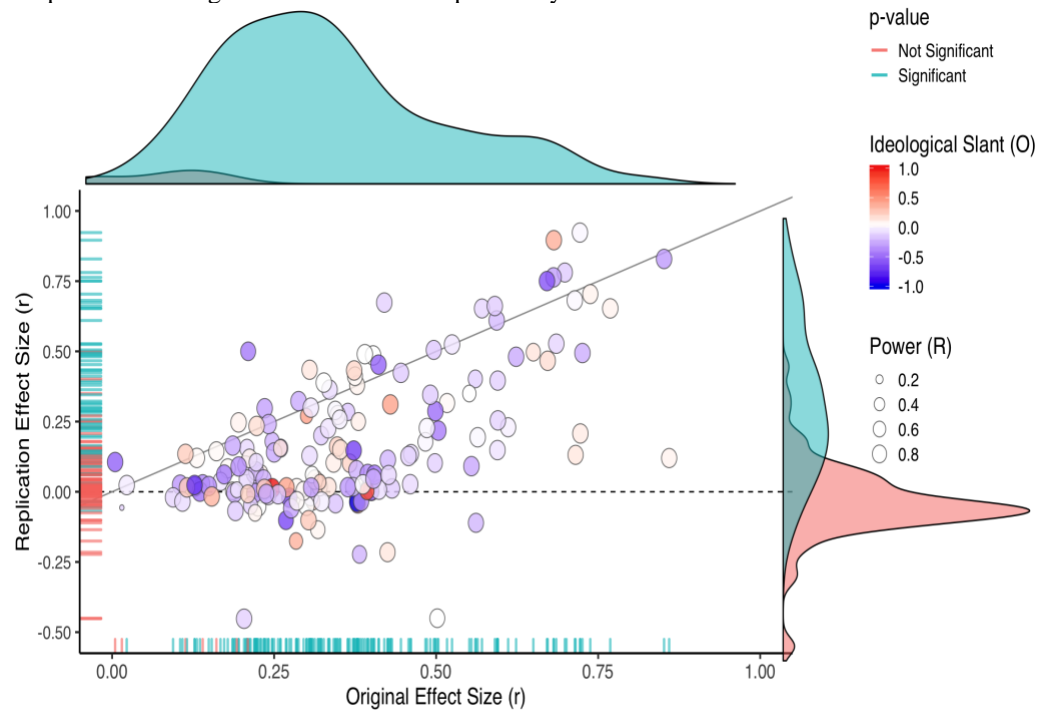
While replicability is a cornerstone of the scientific method and an overall measure of the robustness of research findings, replication success is due to numerous factors. Therefore, we examined the relationship between ideological slant and several objective measures of the robustness of the original research. For example, if liberal reviewers and editors are more prone to overlook statistical red-flags (e.g., tiny sample sizes or weak effects) when a research finding accords with their own personal political ideology (or conversely, increase the standards of evidence required when reviewing research that clashes with their own ideology), then liberal-leaning research in the literature should be associated with smaller sample sizes or weaker effects. As such, in several exploratory analyses, we examined whether ideological slant was associated with objective indices of statistical robustness, such as the sample size and effect size of the original research.

Using the doctoral coders' ratings, ideological slant was not significantly associated with the effect size of the original research (Spearman  $r = -.07$ ,  $p = .461$ ), and this null result was replicated using the online coders' ratings (Spearman  $r = .00$ ,  $p = .976$ ). Using the doctoral coders' ratings, ideological slant was not significantly associated with the sample size of the original research (Spearman  $r = .17$ ,  $p = .091$ ) and, if anything, this pattern flipped when using the online coders' ratings (Spearman  $r = -.14$ ,  $p = .055$ ). Due to the opposite findings that did not achieve statistical significance, there is no clear evidence for a relationship between ideological slant and sample size. In sum, there is no obvious relationship between these measures of statistical robustness and ideological slant. Across a diverse range of abstracts and coding performed by both trained doctoral-level students and untrained lay online coders, we do not find evidence that replicability or statistical robustness of psychological science is significantly associated with the ideological slant of the research.

The lack of association between ideological slant and our various measures of statistical robustness can also be seen in Figure 5 (doctoral coders) and Figure 6 (online coders). While most original findings were statistically significant (density plot top edge), most replication attempts were not (density plot right edge), yielding an overall replication rate of 42%. Correspondingly, replication effect sizes tended to be smaller than the original effect sizes (data points falling below the diagonal line), though the two were significantly positively correlated, Pearson  $r(190) = .56$ ,  $p < .001$ , indicating that the size of the original findings largely predicted the size of the replication findings. Ideological slant, however, shows no clear relationship to these measures of statistical robustness.



**Fig. 5. Original study effect size versus replication effect size (correlation coefficients). Doctoral coders in Study 1.** Diagonal line represents replication effect size equal to original effect size. Dotted line represents replication effect size of 0. Points below the dotted line were effects in the opposite direction of the original. Density plots are separated by significant (aqua green) and nonsignificant (light red) effects. Range normalized ideological slant of data points ranges from very left-leaning (-1, blue), to moderate (0, white), to very right leaning (1, red), with grey data points reflecting abstracts that are not politically relevant.

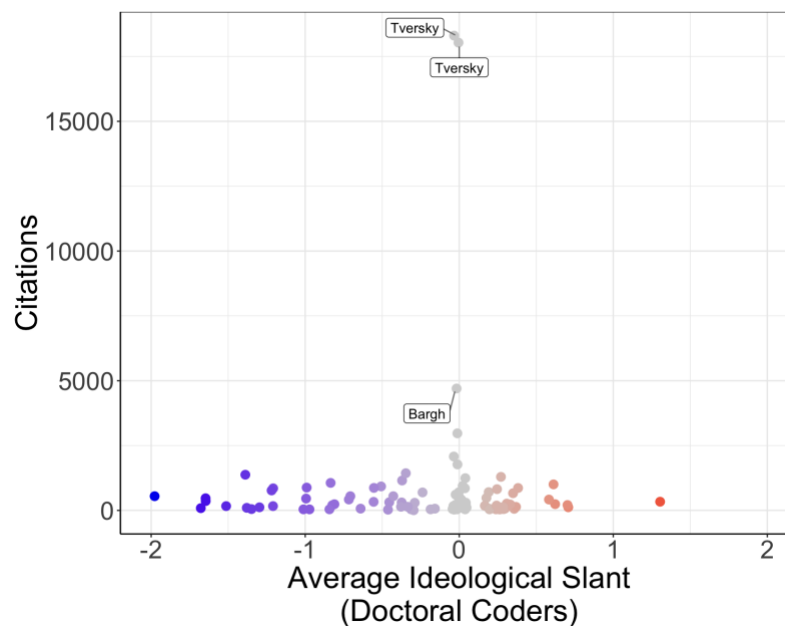


**Fig. 6. Original study effect size versus replication effect size (correlation coefficients). Online coders in Study 2.** Diagonal line represents replication effect size equal to original effect size. Dotted line represents replication effect size of 0. Points below the dotted line were effects in the opposite direction of the original. Density plots are

separated by significant (aqua green) and nonsignificant (light red) effects. Range normalized ideological slant of data points ranges from consistent with a liberal worldview (-1, blue), to unrelated to conservative or liberal worldviews (0, white), to consistent with a conservative worldview (1, red).

### ***Ideological Slant and Post-Publication Impact***

Our data do not provide evidence that ideological slant is associated with replicability or statistical robustness. However, some critics argue that liberal findings are cited and discussed more often than conservative findings (Jussim, Crawford, Anglin, Stevens, 2016). Therefore, we conducted exploratory analyses to determine whether ideological slant predicted citation counts and Altmetric scores<sup>19</sup> (a measure of how widely a paper is discussed online, such as in public policy documents, mainstream media, blogs, Facebook, Twitter, Wikipedia, etc.) of the original research. Based on the doctoral coders' ratings, ideological slant was not associated with citation counts (Spearman  $r = -.06$ ,  $p = .413$ ; Figure 7) nor Altmetric scores (Spearman  $r = -.005$ ,  $p = .948$ ; Figure 8). These null results replicated using the online coders' ratings for both citations (Spearman  $r = -.07$ ,  $p = .314$ ; Figure 9) and Altmetric scores (Spearman  $r = -.04$ ,  $p = .541$ ; Figure 10). Instead, a few seminal papers (e.g., Tversky's research on decision making) receive the bulk of citations and a few popular findings (e.g., Rand's research on intuitive cooperation) receive the most online attention<sup>20</sup>, and this appears to be unrelated to the ideological content of the research.

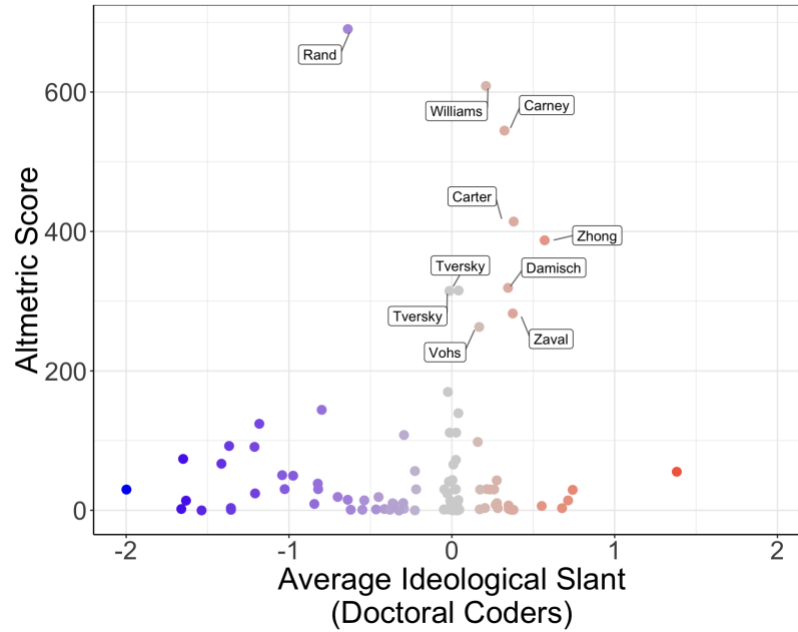


**Fig. 7.** Average ideological slant ratings from Study 1's doctoral coders (centered on the midpoint of the scale) and citation counts of the original research. Scores of -2 reflect a very left-leaning abstract; +2 reflects a very right-leaning abstract. The ideology of the finding was unrelated to citations.

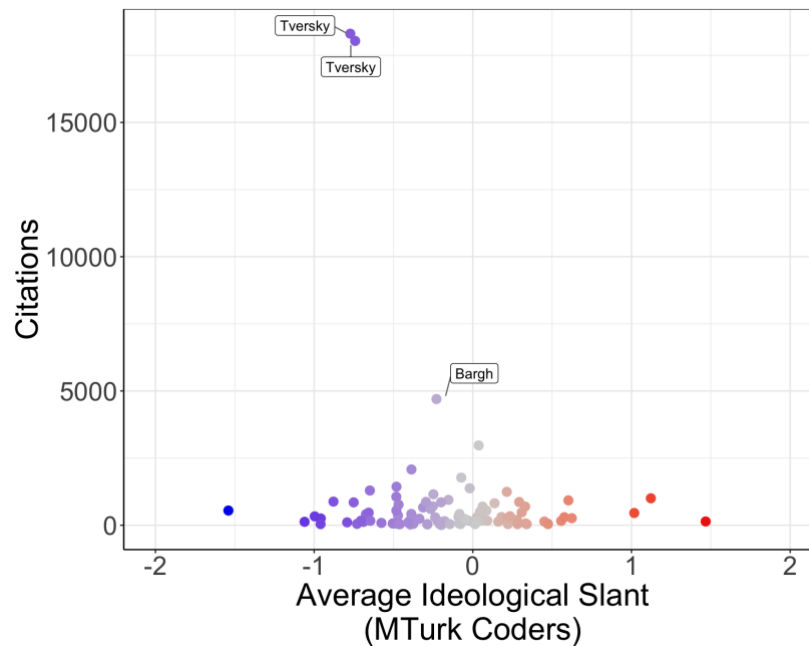
<sup>19</sup> Scraping of citation counts (via Google Scholar) and Altmetric scores (via Altmetric) conducted as of Nov. 21, 2018.

<sup>20</sup> We also note that articles published before social media became popular (around 2004) likely suffer from not having had the opportunity to be shared widely online, though only ~22% of articles were pre-2004.

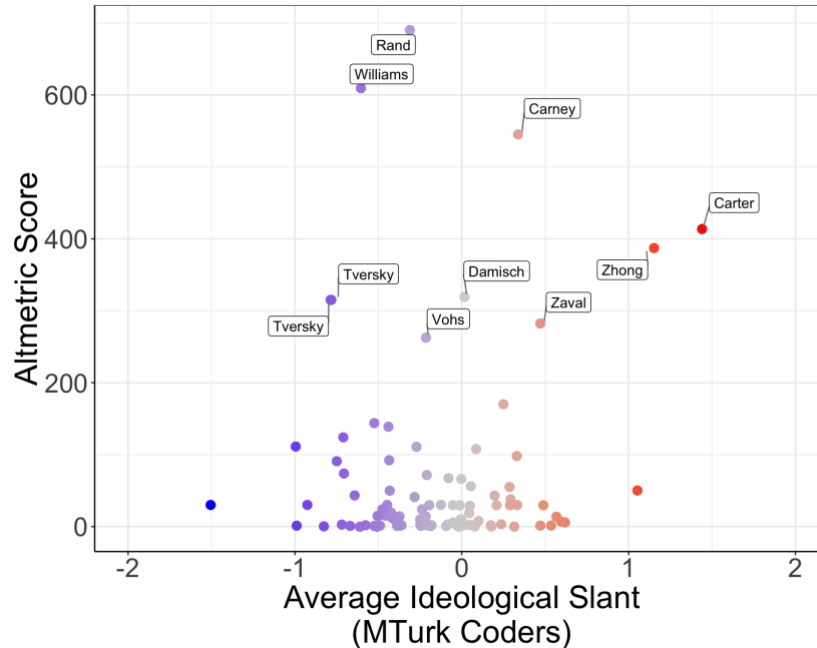




**Fig. 8.** Average ideological slant ratings from Study 1's doctoral coders (centered on the midpoint of the scale) and Altmetric scores of the original research. Scores of -2 reflect a very left-leaning abstract; +2 reflects a very right-leaning abstract. The ideology of the finding was unrelated to the Altmetric score.



**Fig. 9.** Average ideological slant ratings from Study 2's online coders (centered on the midpoint of the scale) and citation counts of the original research. Scores on the left (-3) reflect an abstract consistent with a liberal worldview, scores at zero reflect an abstract that is unrelated to a conservative or liberal worldview, scores on the right (+3) reflect an abstract consistent with a conservative worldview. The ideology of the finding was unrelated to citations.

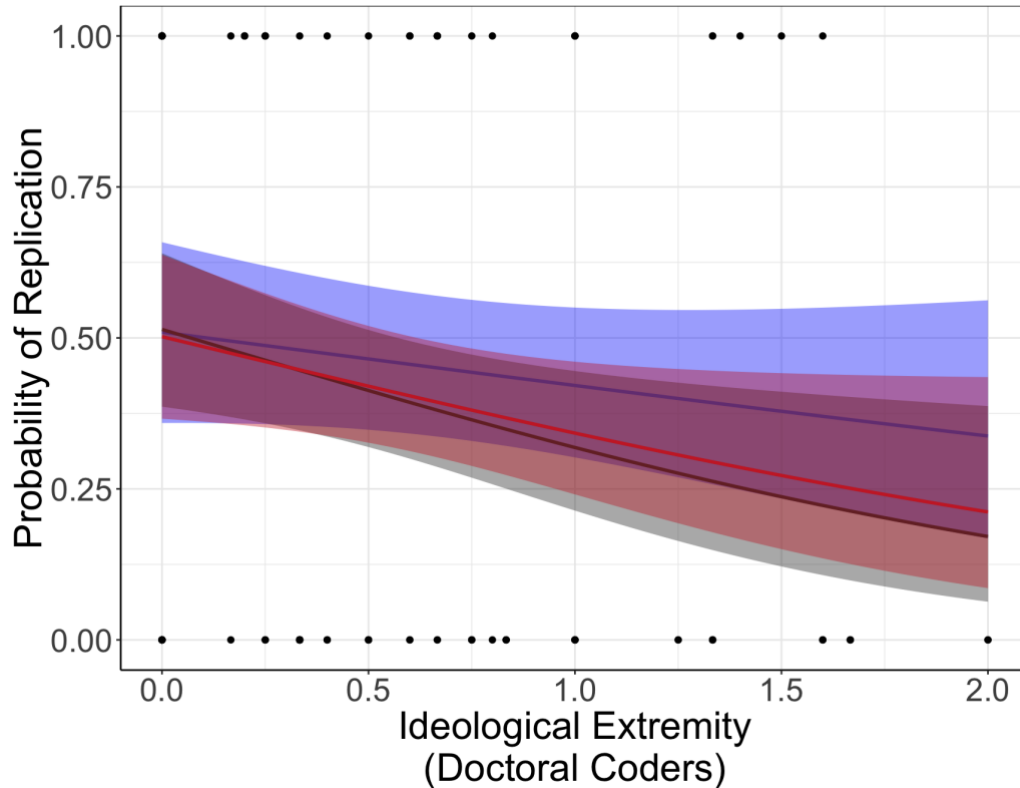


**Fig. 10.** Average ideological slant ratings from Study 2's online coders (centered on the midpoint of the scale) and Altmetric scores of the original research. Scores on the left (-3) reflect an abstract consistent with a liberal worldview, scores at zero reflect an abstract that is unrelated to a conservative or liberal worldview, scores on the right (+3) reflect an abstract consistent with a conservative worldview. The ideology of the finding was unrelated to Altmetric score.

### ***Ideological Extremity and Replicability***

Although the specific ideological slant (i.e., *liberal* vs. *conservative*) of psychology research was not related to replicability, it is possible that research with more of an ideological slant, regardless of whether the research is liberal or conservative-slanted, is less replicable. To test this possibility, we midpoint-centered and computed the absolute value of each coder's rating for every abstract (to create a measure of *ideological extremity*) and performed a mixed model logistic regression, estimating a random intercept and slope for each coder. Specifically, we centered each abstract's rating on the midpoint of the scale (i.e., for Study 1, which used a 1-5 scale, we subtracted 3 from each abstract's rating). Thus, a rating of 3 (a moderate abstract) would become a 0, a rating of 1 (a liberal abstract) would become -2, and a rating of 5 (a conservative abstract) would become +2. Then we took the absolute value of these midpoint-centered ratings. This gave us a measure of how ideologically extreme an abstract was overall, regardless of whether it was leaning in the liberal or conservative direction.

*Study 1.* We found a statistically significant effect, such that abstracts describing more ideologically extreme research were less likely to replicate,  $OR = 0.66$ ,  $SE = 0.12$ ,  $p < .001$ , 95% CI [0.52, 0.85]. This result also held when adjusting for covariates previously shown to be related to replicability (e.g., effect size of the original research; see Model S13). Focusing solely on social or personality abstracts continued to show evidence of an effect:  $OR = 0.64$ ,  $SE = 0.13$ ,  $p < .001$ , 95% CI [0.50, 0.82].

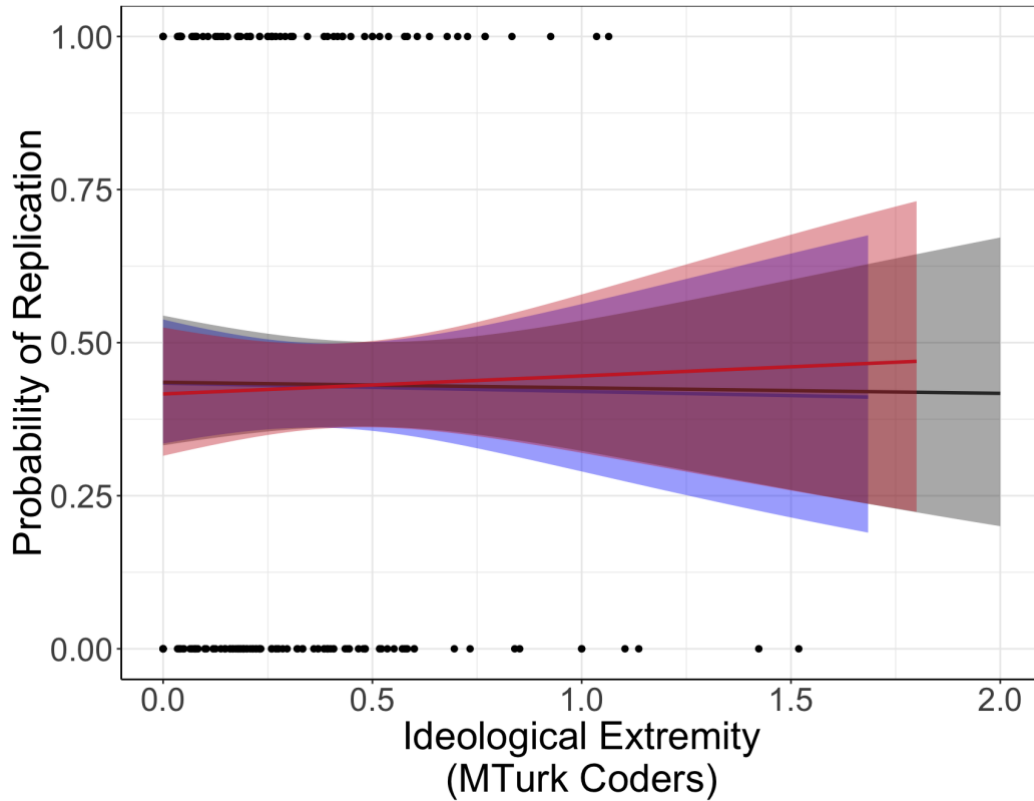


**Fig. 11. Ideological extremity predicting replicability, grouped by ideology of the coder.**

Binary logistic regression models showing that ideological extremity was significantly associated with replicability, though only among moderates and conservative doctoral coders (blue = liberals, grey = moderates, red = conservatives). For ease of interpretation, the unweighted fixed effect model is shown here.

These results were also robust to various model specifications (the same model variations as done when testing ideological slant) although our originally pre-registered unweighted fixed effect model subset on politically relevant abstracts was only marginally significant (see Figure 11 and Models S14-S20). However, all other fixed effect, random effect, and exploratory weighted models revealed a significant effect, both when ideological extremity was a sole predictor and when adjusting for covariates. Taken together these data suggest that research with greater ideological slant – whether liberal or conservative – is associated with reduced replicability.

*Study 2.* These findings were partially replicated using the online coders' ratings. We found a statistically significant effect, such that abstracts describing more ideologically extreme research were less likely to replicate,  $OR = 0.94$ ,  $SE = 0.03$ ,  $p = .036$ , 95% CI [0.88, 1.00]. This result became marginally significant once adjusting for covariates previously shown to be related to replicability (e.g., effect size of the original research; see Model S27). Moreover, focusing solely on social or personality abstracts did not show evidence of an effect:  $OR = 1.01$ ,  $SE = 0.04$ ,  $p = .811$ , 95% CI [0.94, 1.08].



**Fig. 12. Ideological extremity predicting replicability, grouped by ideology of the coder.**

Binary logistic regression models showing that ideological extremity was not consistently significantly associated with replicability, regardless of the ideology of the doctoral coders (blue = liberals, grey = moderates, red = conservatives). For ease of interpretation, the unweighted fixed effect model is shown here.

In addition, as in Study 1, the unweighted fixed effect model did not show a significant effect (see Figure 12). However, other exploratory models revealed a significant effect (weighted fixed effect and both unweighted and weighted random effect; see Models S28-S30) when ideological extremity was a sole predictor, and across the weighted models when adjusting for covariates. Taken together, although the ideological extremity effect appeared robust based on the doctoral coders' ratings, it was inconsistent based on the online coders' ratings, and as such we urge caution in drawing strong conclusions given the mixed results.

### ***Ideological Extremity and Statistical Robustness***

Mimicking our analyses of ideological slant, we also conducted exploratory analyses to examine whether ideological extremity was associated with statistical robustness of the original research. Using the doctoral coders' ratings, ideological extremity was not associated with the effect size of the original research (Spearman  $r = -.05$ ,  $p = .624$ ), and this null result was replicated using the online coders' ratings (Spearman  $r = -.07$ ,  $p = .357$ ).

Using the doctoral coders' ratings, ideological extremity was significantly negatively associated with the sample size of the original research (Spearman  $r = -.34$ ,  $p < .001$ ), suggesting that more ideological research is associated with smaller sample sizes. However, this result was in the opposite direction when using the online coders' ratings (Spearman  $r = .17$ ,  $p = .015$ ), suggesting that more ideological research is associated with larger sample sizes. As such,

ideological extremity was not consistently related to the effect size or sample size of the original research.

## General Discussion

The current research examines a contentious issue: can the ideological composition of a scholarly field undercut the scientific rigor of the research? To address this question, we analyzed a set of nearly 200 psychology studies and subsequent replication attempts. Although there are many more psychologists who are liberal the results in the literature did not completely mirror the heavy ideological skew of psychologists. While there were more findings consistent with a liberal than a conservative worldview, the average ideology of research was fairly centrist, and the majority of research was either non-political (48% according to doctoral coder ratings) or politically relevant but without a clear ideological slant (74% among the politically relevant subset, according to doctoral coder ratings). More importantly, liberal findings were just as likely to replicate, and, in exploratory analyses, as statistically robust as conservative findings and as likely to be cited or mentioned in the media. These results remained consistent across both liberal, moderate, and conservative coders, expert and lay coders, and when numerous covariates known to account for replicability were added to our statistical models.

Instead, we found mixed evidence for an *ideological extremity* effect, such that more ideologically slanted research (regardless of liberal vs. conservative ideological slant) was between 34% (Study 1) and 6% (Study 2) less likely to replicate. These results were stable across all model specifications that statistically adjusted for variables associated with statistical robustness in Study 1, but in Study 2, the effect of ideological extremity was reduced when statistically adjusting for variables related to statistical robustness. On one hand, the preliminary *ideological extremity* effect in our data accords with concerns about highly politicized research (Tetlock, 1994). On the other hand, the majority of our analyses suggest that statistical robustness is the consistent predictor of replicability rather than the ideological slant or extremity of a research topic. These results suggest that it is important to focus on study characteristics such as sample size and effect size to help improve replicability. Moreover, we urge caution in interpreting our *ideological extremity* effect as most studies in our database were not hyper-political and there may be a restriction of range.

While we did not find evidence of a *liberal bias* in scientific replicability in these data, perceptions of political bias still exist, both among laypeople (Hannikainen, 2018) and academics. For example, Eitan and colleagues (2018) found that academics (students and professors) believed that personal political beliefs slightly bias scientific research (Pearson  $r = .62$ ) and that social psychology is biased against conservatives (Pearson  $r = .83$ ). The fact that we find some evidence of an *ideological extremity* effect coupled with the fact that there tends to be more liberal-leaning research in psychology offers one possible explanation. If highly ideological research is less replicable, but people are only sampling one side of the political spectrum due to a shifted distribution of published research, it would appear rational to arrive at the conclusion that liberal-leaning research is less robust. Of course, our findings suggest that such an asymmetric sampling may inadvertently miss the possibility that the root cause is in fact a symmetric ideological bias in scientific replicability.

Moreover, when scientists use the word “bias,” they often mean different things at different times. For example, bias may refer to the skewed political distribution of psychologists themselves or the possible tendency to study certain topics (though our distributions of

ideological slant were fairly normal). While Duarte and colleagues (2015) hypothesize reasons for the large number of liberals in the field (see also Haidt et al., 2011), our data suggest that the political skew of psychologists is not tightly coupled with the political skew of the literature itself, and future work should seek to disentangle these discrepancies.

In other instances, bias might refer to the systematic tendency to evaluate research differently based on its ideological slant. Duarte and colleagues (2015) cite evidence of such a peer-review political bias from Abramowitz and colleagues (Abramowitz, Gomes, & Abramowitz, 1975). Yet this study has methodological shortcomings<sup>21</sup> and even Abramowitz and colleagues themselves admit that “the amount of bias detected might be so slight as to be meaningless in the real world of publish or perish” (pg. 193). In fact, similar tentative evidence of peer-review bias has even been found against liberal-leaning diversity research (King, Avery, Hebl, & Cortina, 2018) and gender bias research (Cislak, Formanowicz, & Saguy, 2018). This suggests that both liberal and conservative perspectives may experience subtle bias, but that overall the peer-review process mitigates most egregious instances of political favoritism<sup>22</sup>.

Still, some data suggest that discrimination based on the political orientation of research may exist. For instance, a survey of 292 members of the Society for Personality and Social Psychology found that respondents self-reported a willingness to discriminate against a hypothetical grant application or paper, at least to some minimal extent (i.e., chose a scale point above “not at all”), if there was a feeling that it took a “politically conservative perspective” (Inbar & Lammers, 2012). However, our data suggests that tenuous liberal research does not systematically find its way into the published literature. Duarte and colleagues acknowledge that, “the lack of political diversity is not a threat to the validity of specific studies in many and perhaps most areas of research in social psychology” (pg. 2 (Duarte et al., 2015)). It remains possible that their claims may apply to a very small subsection of psychology, if any, as we found no evidence that research aligned with a majority viewpoint (liberalism) was less replicable or less statistically robust than research aligned with a minority viewpoint (conservatism).

Although our data, to our knowledge, provide the first test of whether the ideological slant of research is associated with scientific replicability, there are a number of limitations to our work. One important limitation is that our sample was not a random sample of the entire field of psychological research. Although the largest database we used was intentionally designed to sample a relatively representative group of high impact psychology papers (OSC, 2015), our sample was nevertheless limited to studies where replication data were readily available and thus is not completely representative of the entire field. While selection biases could occur, there are at least two possible counterarguments mitigating this issue. First, given that psychologists have historically prioritized surprising results, it might be more likely that replicators would choose studies that surprised them or which they were skeptical about (e.g., studies that didn’t align with

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<sup>21</sup> Abramowitz et al. (1975) asked research psychologists to rate the suitability of a manuscript for publication. The methods and analyses were held identical for all reviewers, but the main finding was *presumably* ideologically congruent or incongruent for a left-leaning person. Most problematically, the ideology of the reviewers was *assigned* by Abramowitz et al. based on the reviewer’s past contributions to certain journals or membership with certain societies, which may be a noisy measure of reviewer ideology. In addition, most measures of bias were non-significant or marginal. Finally, this study was conducted nearly 45 years ago such that contexts may have now shifted.

<sup>22</sup> Although subtle political bias on either side should not be ignored, there are heated and unresolved debates as to the source of possible forms of bias – and if it should even be considered a bias – and such a lengthy explication is beyond the scope of this article (Baron & Jost, 2018).

their own personal political ideology). With a predominantly liberal field, conservative findings would be most surprising. Second, many of the studies selected for replication were chosen because they represent some of the most influential findings in psychology (e.g., RRR) or were specifically chosen to reflect a range of effects and contexts (e.g., Many Labs). Therefore, replicators made explicit efforts to identify a combination of important and representative research. Future research should examine whether these findings extend to other areas of psychology, as well as other social sciences, as larger and more representative samples will be most likely to produce generalizable knowledge.

A second important limitation is that measuring ideological slant is challenging. Labels such as “liberal” or “conservative” may be too broad to capture the nuanced ideologies and assorted political attitudes of people (Ditto et al., 2018). For example, we did not differentiate between the ideological slant for social, economic, or foreign policy subcategories (Inbar & Lammers, 2012). In addition, we decided on using the binary political spectrum of American politics, which is quite common (Inglehart & Klingemann, 1976; Jost, Glaser, Kruglanski, & Suloway, 2003), but still debated among political scientists (Feldman & Johnston, 2014). Moreover, political contexts and relative ideologies rapidly shift, and what we refer to as “liberal” today may differ from its usage 50 years ago (e.g., many older liberals might claim that current mainstream liberals are quite moderate relative to the 1960’s). As such, our data speak to the current construction of American politics. In addition, the specific ideological slant of many studies was not clear cut in many cases, as reflected by our lower ideological slant reliability across coders. This suggests that debates about political bias may hinge on idiosyncratic definitions rather than a clear, shared definition of ideology that can be easily observed and coded. Future research should further clarify ideological slant and continue to pursue additional operationalizations of ideological slant to accumulate evidence.

It is unclear whether the personal political beliefs of scientists have a measurable influence on the replicability and robustness of the published literature. The peer-review process may be sufficient to weed out most political papers that are not backed by sufficient scientific data, and scientists may be more motivated by scientific identities and norms when they are writing and reviewing papers (Merton, 1973). In fact, the identity of scientist is more likely to be salient during this process which can help reduce motivated political cognition (Van Bavel & Pereira, 2018). It is unclear from our data, however, when people can or do pursue value-free science (Longino, 1990; Richardson & Polyakova, 2012; Rykiel, 2001; Sears, 1994). Indeed, we are all shaped by our experience and science cannot avoid at least some aspect of subjectivity. As such, we believe that pursuing adversarial collaborations (Shi, Teplitskiy, Duede, & Evans, 2017) and performing “turnabout” tests, wherein a hypothesis is inverted to test a reverse claim, may be a helpful guard against confirmation bias and groupthink (Duarte et al., 2015; McGuire, 1997; Washburn & Skitka, 2018).

The current research also speaks to the quality and replicability of research more broadly. Sparked by difficulty in replicating findings in genetics (Hirschhorn, Lohmueller, Byrne, & Hirschhorn, 2002), pharmacology (Prinz, Schlange, & Asadullah, 2011), oncology (Begley & Ellis, 2012), biology (Reaves, Sinha, Rabinowitz, Kruglyak, & Redfield, 2012), psychology (Open Science Collaboration, 2015), and economics (Chang & Li, 2015), researchers have turned the microscope on themselves and started a dialogue about best research practices. Some of science’s most well-known journals (e.g., *Nature* and *Science*) and funding agencies have called for more replications and implemented new procedures to enhance the robustness of published research (Baker, 2016; Bollen, Cacioppo, Kaplan, Krosnick, & Olds, 2015; McNutt,

2014; Nature, 2013, 2017). Many factors reduce replicability, including the publication of false-positives (Cohen, 1992; Simmons, Nelson, & Simonsohn, 2011), publication bias (Ferguson & Heene, 2012), and low fidelity replications (Gilbert, King, Pettigrew, & Wilson, 2016). The current research suggests that more ideologically extreme research may be another factor associated with reduced replication rates. However, this result applies equally to liberal and conservative findings and may be partially related to the contextual sensitivity of highly political findings (Crawford, Vodapalli, Stingel, & Ruscio, 2018; Van Bavel et al., 2016).

Taken together our results are a starting point for a richer conversation about the role and influence of politics in science. It seems that our intuitions about ideological bias may at times be imprecise (Eitan et al., 2018). Our findings provide clear evidence that statistical robustness (such as sample size and effect size) is a consistent predictor of replicability, rather than the ideological slant or extremity of a research topic. As such, it might be more fruitful to shift our focus from the politics of scientists to their research practices. We hope other researchers are able to build off of our work, as these issues are critical for scientists' epistemological pursuits.



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