



The Role of Political Ideology and Open-Minded Thinking Style in the (in)Accuracy of Factual Beliefs

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Abstract

The paper investigates the role of political ideology and an open-minded thinking style (i.e., the tendency to reason based on rules of inference rather than intuitive heuristics) with respect to the accuracy of factual beliefs. In line with political asymmetry theory, we assumed that right-wing beliefs, in contrast to left-wing beliefs, are associated with more inaccurate factual beliefs. We also expected that the open-minded thinking style acts as a buffer against inaccurate factual beliefs among people with right-wing (but not left-wing) political affinities. To test these hypotheses, we conducted three studies (total $N=1120$) in which participants holding right- and left-wing beliefs, and displaying differing degrees of the open-minded thinking style (as measured by the Active Open-minded Thinking Style questionnaire), assessed policy-relevant facts congenial to left- as well as right-wing beliefs. The results of the study confirm the hypotheses proposed. The paper's findings contribute to the ongoing discussion around the ideological underpinnings of (un) biased cognition and the controversies concerning the role of cognitive factors in ideological polarization.

Keywords Accuracy in factual beliefs · Left-wing beliefs · Right-wing beliefs · Open-minded thinking style · Active open-minded thinking style

In this paper we investigate the open-minded thinking style, i.e., the tendency to reason based on rules of inference (rather than intuitive heuristics) and in a manner which takes different ideas or opinions into consideration (Price et al., 2015), with the assumption that this thinking style acts as a buffer against the inaccuracy of factual

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beliefs among right- (but not left-wing) adherents. Despite several previous studies already having demonstrated that the open-minded thinking style is linked to less biased cognition within the political domain (e.g., Svedholm & Lindeman, 2013; Swami et al., 2014; Pennycook et al., 2015), to the best of our knowledge, none of the previous studies went as far as investigating the actual degree of accuracy of the factual beliefs about key social realities held by their study participants. Instead, they looked at the correlations between (i) individual differences in thinking styles and/or ideology and (ii) factual beliefs about highly controversial issues, such as climate change or gun control. We, however, focus specifically on *how far* from the verifiable truth peoples' beliefs are, and whether the degree of disparity between the truth and their beliefs is correlated with their political ideology. Moreover, we analyze beliefs covering a broad range of issues that are current in contemporary social and political discourse. It seems to be especially important in light of the ongoing debate surrounding the cognitive basis of ideological polarization, which is partly fueled by seemingly incongruous findings. While some studies have revealed that cognitive factors (the open-minded thinking style among them), can indeed amplify ideological polarization (Kahan & Corbin, 2016; cf. Baron, 2017), others have found no effects stemming from these cognitive factors when it comes to judging the quality of evidence (Eichmeier & Stenhouse, 2019). The discrepancies between these findings, which are the cause of much contention, may in part be due to the fact that a single topic, or a very few specific, usually highly controversial topics, were broached in these various investigations.

Factual beliefs are, we feel, especially worthy of further research given that inaccurate beliefs with regards to certain facts, i.e., key realities, could contribute to the undermining of proper debate, and may widen disagreement more than is reasonable in relation to many important societal issues. In other words, disagreement on particular policies is likely to be gratuitously exacerbated when people's beliefs about the facts are dissimilar due to inaccuracies and misperceptions. Therefore, our findings add significantly to the ongoing discussion around the ideological underpinnings of biased versus accurate cognition, and carry implications for the means of reducing the occurrence of such misperceptions. Furthermore, they contribute to the debate about the role of the open-minded thinking style in bridging, as opposed to amplifying, ideological gaps. It is also worth noting that our research was conducted in an European country, thus extending the currently relevant knowledge, which until now has almost solely been based on studies conducted in the US.

Ideology¹ and accuracy in factual beliefs.

¹ Although the differentiation between the two strands of political beliefs (cultural and economic) seems to better explain ideology in modern societies (e.g., Feldman & Johnston, 2014; Malka et al., 2014), in this paper, we focus solely on the cultural dimension of political beliefs. This is because they seem to be the primary dimension of political ideology, and are also more predictive of value conflicts and attitudes toward various groups than economic beliefs (e.g., Crawford et al., 2017); another reason for this is because, importantly, in the Polish context, the 'culture war' seems to be focused around issues related to cultural or moral issues (e.g., abortion, LGBTQ+rights) rather than economic ones (Czarnek et al., 2019). Since we do actually acknowledge the importance both of these dimensions, we control for economic beliefs in all our analyses. However, for the sake of simplicity and comprehensibility, across the manuscript, we use the term "ideology" when refer to cultural political beliefs.

A vast body of research has demonstrated that beliefs about politically contentious facts are driven primarily by ideology or partisanship (Kahan, 2017; van Bavel & Pereira, 2018). For this reason, individuals can be expected to display a strong tendency to conform their understanding of the facts to the stance that prevails within their group, even when it conflicts with the actual facts, or the demands of logic and material self-interest. In addition, policy-relevant facts are usually suffused with culturally divisive meanings such that the pressure to form group-congruent beliefs will frequently supersede the desire to adopt a more factually-accurate stance (Kahan, 2017). Assessments that are aligned with one's political identity constitute a higher priority than achieving objective accuracy since any risk entailed by asserting factual inaccuracies constitutes a negligible cost when compared to the level of risk that a person might otherwise face, e.g., failing to achieve the desired outcome of a public policy debate (van Bavel & Pereira, 2018).

Although some research has shown that when confronted with controversial policy-relevant facts, both right- and left-wing adherents are found to be equally inaccurate in their perceptions, as many remain committed to their initial beliefs (e.g., Lord et al., 1979, Ditto et al., 2019; Ruggeri et al., 2021, Guay & Johnston, 2022), there are ample empirical reasons to question this notion. Firstly, research has demonstrated that this typically occurs when participants are asked to assess facts that favor the participant's political affinities (Baron & Jost, 2019). Secondly, there is a widely held claim that right-wing adherents are more prone to heuristic, simple and rigid information-processing, and less prone to strategic information processing than left-wing supporters, and that this pattern is stable and cross-cultural (Burke et al. 2013; Jost, 2017; Kossowska & van Hiel, 2003; Zmigrod et al., 2021). This asymmetry is found to be rooted in differences regarding epistemic needs for certainty and related traits, such as dogmatism and intolerance of ambiguity, with those on the right scoring high on these measures when compared to those on the left (Jost, 2017). Furthermore, other research has shown that right-wingers are more likely than left-wingers to: prioritize values of conformity and tradition, possess a strong desire to share reality with like-minded others, perceive within-group consensus when making political and non-political judgments, and, finally, be influenced by implicit relational cues and sources perceived to be similar to them. Moreover, they have a greater inclination to maintain homogenous social networks, and favor an 'echo chamber' environment that is conducive to the spread of misinformation (Jost et al., 2018). Hence, all these tendencies and preferences may lead to individuals who lean right being less open to new information that conflicts with their political identity; in turn, as a consequence, they end up being less accurate in their factual beliefs than their left-leaning counterparts. An additional assertion put forward to further explain these findings is that this asymmetry is linked to a higher sensitivity to partisan cues, leading to an increased salience of political identity among those on the right (vs. the left) (Kahan, 2017). Therefore, their cognition is driven more by the need to protect partisan identity than their information-processing preferences.

Taken together, despite the many perspectives in social science indicating that biased information processing ought to be equally prevalent among those on the left and right of the political spectrum, there is a host of empirical evidence that strongly challenges this stance. What is more, advances in the study of the link between ideol-

ogy and accuracy support our contention that a far more nuanced, context-sensitive examination of this link holds the key to understanding the extent to which such a disparity may exist with respect to the accuracy of both sides' factual beliefs. To this end, we work on the assumption that right-wingers are indeed to some degree less accurate in their factual beliefs than left-wingers, and, in our approach, expose individuals from both sides to politically topical facts congenial to both left- and right-wing beliefs, which are hotly debated in the country where the study was carried out (Poland). By doing so, we may prompt both left- and right-wing adherents to maintain highly indefensible positions. Furthermore, in this paper, we aim to investigate the boundary conditions of the effects of political ideology on factual beliefs. Here we will posit the notion that an open-minded thinking style can operate as a protective factor against misperceptions and mitigate the negative effects of right-wing ideology (but not its left-wing counterpart) on the accuracy of factual beliefs asserted by participants.

The role of an open-minded thinking style in (un)biased cognition and political beliefs.

The classic work on motivated cognition phenomena indicates that when people are motivated to be accurate, they expend more cognitive effort on issue-related reasoning, attend to relevant information more carefully, and process it more deeply, often using more complex rules (Kruglanski, 1989; Kunda, 1990). This motivation spurs people to engage in more complex and normatively "correct" attributional processing, and to avoid any reliance on superficial feedback and perceptually salient cues about one's opinion (Thompson et al., 1994). Measuring degrees of accuracy motivation reveals the link to processes which are involved in social and political cognition (Pennycook et al., 2015, 2020). These effects hold when accuracy motivation was measured as individual differences in the need for cognition, the fear of invalidity, or openness to experience (Pirce et al., 2015). Recently, several researchers have claimed that an active open-minded thinking style may reduce biased cognition (Baron, 2019, for an overview). This style of thinking is characterized by the tendency to weigh up new evidence that may go against a favorably held belief, by the readiness to spend sufficient time on a problem before quitting, and by the propensity to consider carefully the opinions of others in forming one's own. Many researchers have suggested that people high in this style actively prevent their thinking from being weighted toward their initial beliefs by devoting increased effort to seeking out and actively considering contrary evidence (Stanovich & West, 1997; Sa, West, & Stanovich, 1999). The key point is that it is not a cognitive ability (such as IQ) that is at work here but rather a thinking style: a tendency to think in a particular manner, i.e., that reflects people's goal management, epistemic values and epistemic self-regulation (Baron, 2019). This notion of a thinking style operates in a similar fashion to that of the concept of accuracy motivation as suggested by Kunda (1990).

From the research mentioned above, it follows that an active open-minded thinking style, being linked to the tendency to be willing to *override* prior beliefs and values when assessing facts, may *reduce* the role that ideology plays in establishing factual beliefs, due to the proactive and fair consideration of evidence that *runs counter to* one's prior beliefs. There are, however, some boundary conditions for the effect of an open-minded thinking style on unbiased cognition. For example, high

quality evidence alone can change beliefs held by people high on the active open-minded thinking style (low quality evidence can even lead to a boomerang effect, that is, a change in direction away from the standpoint being advocated; e.g., Petty & Cacioppo, 1986). Similarly, an active open-minded thinking style causes people to particularly doubt their *weakly* supported beliefs, rather than any kind of a belief whatsoever. For example, let us consider a person who believes that climate change is caused mainly by human activity, and whose belief is based on the overwhelming data and consensus among the vast majority of the experts. If they were to watch a TV show where a politician denied the role of humans in climate change, it is very unlikely that this person's beliefs would change, even if they are high on the active open-minded thinking style.

In addition, there is also some evidence to support the idea that this specific thinking style may make people less careful and less accurate, especially when they differ in political beliefs or partisanship (e.g., Kahan, 2017). For example, Kahan and Corbin (2016) showed that people tend to cling more to their prior beliefs, or beliefs congenial to their ideologies, when they are high on the active open-minded thinking style. Thus, it has been suggested that this style exacerbates ideological polarization instead of bridging the gap between adherents of different political positions (but see Stenhouse et al., 2018). The authors admitted as much in their paper and encouraged further research in order to understand these findings; this is the aim of the current study. We believe these unexpected effects might be partly accounted for by the specific topic being investigated (i.e., climate change²). Thus, instead of focusing on a single, extremely controversial, and politically polarizing issue, we investigated a broad range of topics regarding key social realities in order to verify the role of active open-minded thinking in the formation of ideological biases.

It is also worth noting that previous studies merely examined the correlations between individual differences (in thinking styles and/or ideology) and beliefs or the factual beliefs held by these individuals. In contrast, we focus specifically on *how far* from the actual truth peoples' beliefs are, and whether the degree of disparity between the verifiable facts and their beliefs is correlated with political ideology. As a result, our studies address all of the abovementioned problems.

Taking into consideration all of the above, we make an assumption that the active open-minded thinking style should be related to the espousal of more accurate factual beliefs. However, as there are certain groups of people that, on average, tend to be less accurate (e.g., right-wing vs. left-wing adherents, as demonstrated by several studies), an active open-minded thinking style may act as a buffer against these inaccuracies by encouraging people to cast doubt upon and look for counterevidence to those beliefs that are weakly supported. Hence, we expect that an active open-minded thinking style protects right-wing adherents against inaccuracies (in contrast to their left-wing counterparts).

Overview of the studies.

² Kahan also showed that AOT magnifies ideological polarization in gun control views (Kahan, 2017).

In three consecutive studies³, we tested the hypothesis that ideology predicts the accuracy of factual beliefs. Specifically, we expected that right- (vs. left-) wing ideology would be associated with lower accuracy when assessing policy-relevant facts congenial to left- and right-wing beliefs. However, an open-minded thinking style would then moderate this link between ideology and factual accuracy; in other words, people measuring highly in terms of an open-minded thinking style would be more accurate in their assessments than those measuring at lower levels. This moderation would especially be the case if they held right-wing beliefs, as these are beliefs which cause people to be particularly more prone to forming inaccurate factual beliefs.

We also placed an emphasis on the factual accuracy of those facts especially notable for being associated with politically contentious issues and events in Polish society, for both those on the right and the left. We identified a selection of items regarding issues which were intensely discussed at the time of the studies. Then, in a pilot study ($N=123$), we tested the importance of the selected issues among left- and right-wing adherents, and the correlations between political beliefs and the perceived importance of the topics. More detailed information about these issues and the results of the pilot study can be found in the Supplementary Materials, accompanied by explanations as to why these topics are so controversial in the contemporary Polish political environment (Section S1).

Seeing as Study 3 was conducted during the COVID-19 pandemic, we checked whether this had any influence on the link between ideology and the accuracy of factual beliefs. We theorized that the effects of ideology would be even more pronounced in these circumstances i.e., in conditions of heightened threat. This hypothesis is based on evidence that, during times of social crises (such as pandemics), people's political identities and their associated beliefs cause them to be even more sensitive to ideological cues (Hart & Nisbet, 2012; van Bavel & Pereira, 2018; Kahan, 2017). In many respects, compared with leftists, rightists tend to be more psychologically and physiologically sensitive to environmental stimuli that are negatively valenced, whether threatening, or merely unexpected and unstructured (Hibbing, 2014 for overview). Hence, we anticipated that this negativity bias would manifest itself in the form of even greater inaccuracy with respect to the factual beliefs held by this group.

In all three studies, we measured the accuracy of factual beliefs by asking participants about various politically contentious facts⁴. In addition, we enquired as to their confidence in their beliefs. In Studies 2 and 3, we measured open-minded thinking style via the Active Open-minded Thinking Style questionnaire (AOT, Haran et al., 2013). In all of the studies, we controlled for gender, economic beliefs, and the confidence participants had in their expressed beliefs. In Studies 2 and 3, political knowledge was also measured. In Study 3, additionally, to control for any anxiety related to the coronavirus pandemic, we posed an additional question: *To what extent are you afraid of becoming infected with SARS-CoV-2?*

³ We also ran another study, but the sample was heavily unbalanced. The details are in Supplementary Materials (Sect. 9).

⁴ Although this paper focuses on factual beliefs, we also investigate how participants respond when requested to estimate undetermined facts (see results in Supplementary Materials Section S6). All items are presented in Supplementary Materials (Sect. 1).

To safeguard the quality of the data, participants who completed the survey in too brief a time (<250 s), indicating inattentiveness and/or carelessness on their part, were excluded from the analysis. The chosen cut-off represents the minimum time a participant would need to spend in order to complete the survey if reading every question carefully. All participants were paid a base rate of approximately \$5 (20 PLN) for their participation in the study. Information on the methods for determining sample sizes and partisanship in all of the studies are presented in the Supplementary Materials (Sections S2 and S3). The analyses of the participants' confidence for all of the studies are also presented in the Supplementary Materials (Section S4).

This program of studies is approved by the Institutional Review Board. All participants gave informed consent to participate in the survey and could halt their participation at any point in time. All materials, scripts and data necessary for the replication of our results are available on the OSF page (<https://osf.io/d8yba/>).

STUDIES 1–3

As we will present the integrative analysis performed on the data from all three studies, we describe below the samples and methods used across all the studies. The separate analyses of data from particular studies are presented in the Supplementary Materials (Section S5).

Study 1

The aim of Study 1 is to test the link between ideology and factual accuracy. We hypothesize that right- (vs. left-) wing ideology is associated with greater inaccuracy with regards to factual beliefs.

Method

Participants.

Three hundred and forty one Poles (147 males and 194 females, 3 people did not report gender; $M_{\text{age}} = 40.21$, range: 20–75; $SD_{\text{age}} = 11.47$) were recruited via online social portals (e.g. Facebook, OLX, Gumtree) and were asked to complete the survey online from September 5th to 8th, 2019. The participants' level of education ranged from vocational ($N=71$), through high school ($N=62$), to university graduate level ($N=187$); some were university students ($N=21$).

Measures & Procedure

Accuracy of factual beliefs.

Participants were given a list of 7 questions representing policy-relevant facts. A complete list of the items can be found in Table 1. We requested that the participants respond to each issue, and instructed them that, if they do not know the answer or they are not sure, they should give a rough estimate or a guess.

Ideology.

The participants' political beliefs were assessed with the use of the Political Beliefs Questionnaire⁵ (Czarnek et al., 2017; assessments were ranged between 1 = "Strongly disagree" to 5 = "Strongly agree"; $M=2.66$, $SD=1.03$, Cronbach's $\alpha=0.84$). Based on the design of this tool, the higher the average score, the more right-wing the beliefs espoused.

Participants first responded to the Political Beliefs Questionnaire, then asked to provide assessments of the facts, and next asked about their age, gender, level of education, and partisanship. Lastly, they were thanked and debriefed.

Study 2

The aim of Study 2 is to replicate the findings from Study 1, and to test the hypothesis that the relationship between ideology and fact assessments is moderated by AOT. Thus, we propose that AOT acts as a buffer against inaccurate factual beliefs.

Method

Participants.

Our sample consisted of 353 Poles (136 males, 173 females, 44 did not indicate their gender; $M_{age} = 41.77$, range: 22–73; $SD_{age} = 12.06$) recruited via Pollster Research Institute using semi-Quota sampling by age, gender, education and political partisanship. The study was conducted online between February 24th and 27th 2020. As in Study 1, to maintain the quality of the data, 41 participants, who completed the survey too rapidly (<250 s), were excluded, also 8 participants did not finish the study. Thus, the final sample was comprised of 304 participants (125 males, 166 females, 13 did not provide gender; $M_{age} = 42.21$, range: 22–73; $SD_{age} = 12.20$). The participants' level of education again ranged from vocational ($N=28$), high school ($N=77$), to university graduate level ($N=175$); there was a relatively small number of students ($N=11$).

Measures & Procedure

We used the same methods as in Study 1 to measure the accuracy of factual beliefs (see Table 1) and ideological position (Cultural beliefs: $M=2.77$, $SD=1.00$, Cronbach's $\alpha=0.88$).

To measure open-minded thinking style, we applied the 7-item version of the AOT scale (Haran et al., 2013). Participants responded to items, such as "People should take into consideration evidence that goes against their beliefs" or "Changing your mind is a sign of weakness" (reverse-scored) (1 = "Strongly disagree" to 7 = "Strongly agree"; $M=4.80$, $SD=0.94$, Cronbach's $\alpha=0.78$).

The participants started the survey by filling in the Political Beliefs Questionnaire and the AOT scale. After this, they responded to the questions centering on facts. At

⁵ This scale comprises also of Economic Beliefs subscales. The correlations between Cultural and Economic Beliefs in all studies were small and negative ($r_s=-0.25$; -0.24 ; -0.29 for Study, 1, 2, 3 respectively).

the end, they were asked about their age, gender, level of education, partisanship, and political knowledge, and then, thanked and debriefed.

Study 3

The aim of Study 3 was to replicate the results of Studies 1 and 2, in a different socio-political context i.e., one in which the COVID-19 pandemic was taking place. Although the questions about facts were not directly related to COVID-19 in any way, we tested whether the effects of ideology are the same before and during the pandemic, and whether the joint effects of ideology and open-minded thinking style on accuracy are similar before and during this period.

Method

Participants.

Our sample consisted of 426 Polish participants (173 males, 252 females, and 1 other; $M_{age} = 37.39$, range: 18–79; $SD_{age} = 16.55$) recruited via the Pollster Research Institute using semi-Quota sampling by age, gender, education, and political partisanship. The study was conducted online between March 14th and 18th 2020, at the outset of the COVID-19 outbreak in Poland. As in Studies 1 and 2, to ensure the quality of the data, 35 participants, who responded too speedily (<250 s), were omitted from the analysis. Thus, the final sample comprises 391 Polish participants (161 males, 229 females, and 1 other; $M_{age} = 37.86$, range: 18–79; $SD_{age} = 16.86$). The participants' level of education was at various levels: vocational ($N=76$), high school ($N=93$), university degree ($N=112$), with some being students ($N=110$).

Measures & Procedure

We used the same methods as in Study 2 to measure the accuracy of factual beliefs (see Table 1), ideology ($M=2.63$, $SD=1.00$, Cronbach's $\alpha=0.89$) and AOT ($M=5.15$, $SD=0.99$, Cronbach's $\alpha=0.81$).

Participants completed an online survey which encompassed the Political Beliefs Questionnaire and AOT scale. Then, they responded to the questions about facts. Finally, they were asked about their age, gender, level of education, partisanship, fear of being infected by SARS-CoV-2, and political knowledge before being thanked and debriefed.

Results of Studies 1–3

We pooled the data from all three studies to address our hypotheses. From each participant's estimation of facts, we subtracted the correct answer for the given fact, transforming it into an absolute value. Thus, this measure represents the degree of departure from the actuality, irrespective of the direction of the bias, which allows for an averaging of the responses (Study 1: $M=13.2$, $SD=14.7$; Study 2: $M=19.0$, $SD=19.9$; Study 3: $M=19.1$, $SD=19.9$).

To account for the dependencies existing within the data, we used multilevel models in which responses were nested within participants and within items. The study number was introduced as a fixed effect⁶. Our focal predictor in every model were political beliefs⁷. In the subsequent models, we added interaction with AOT, and with the pre vs. during the pandemic period. In each model, we controlled for gender, age, education, economic beliefs, and confidence in one's responses. All of these predictors were introduced as fixed effects and scaled between 0 and 1. Continuous predictors, i.e., ideology and AOT, were centered on the grand mean.

Ideology and factual accuracy.

We found that right-wing ideology compared to its left-wing equivalent was associated with increased inaccuracy ($b=9.67$, $SE=0.91$, $t(982.38)=10.66$, $p<0.001$); in other words, beliefs about facts among people espousing right-wing ideology departed more greatly from the actuality than the beliefs held by adherents of the left. The details of the model are presented in Table 2.

In addition to this, we examined whether the effects of ideology were uniform across all the questions and found that there was some heterogeneity between the items. Specifically, we compared (i) the model with per-item random intercept with (ii) a model with an additional per-item random slope of ideology. This revealed that the latter model showed better fit. Crucially, although there was a degree of heterogeneity in the effects of political ideology on the accuracy of factual beliefs depending on the item being responded to, the overall main effect of ideology prevailed. In sum, despite ideology being more strongly related to inaccuracy in beliefs about some facts rather than others, overall, right-wing ideology was associated with a greater departure from the truth. Even though taking such an approach (i.e., modelling effects for each item instead of averaging them) is a “harsher” test for the generalizability of our theory, this approach has recently been recommended as it is rather unlikely that the effects of the independent variables are the same across all the items (Yarkoni, 2020). Given this heterogeneity between the items, the models presented in the following sections account for per-item random slopes of ideology. The model details are presented in Table 2⁸. Details of random slope analysis is presented in Sect. 7 in Supplementary materials.

⁶ Because there were only three studies, we could not add study number random effects (Stegmueller, 2013). Apart from model describe in text we fit more complicated one which had worse fit (see Supplementary Materials Section S8). We used R (R Core Team, 2017) and RStudio (RStudio, 2016) with the lmer (Bates et al., 2015), lmerTest (Kuznetsova et al., 2017), tidyverse (Wickham, 2017), emmeans (Lenth, 2019), effects (Fox & Weisberg, 2018), multcomp (Hothorn et al., 2008), ggeffects (Lüdtke, 2018a), and sjPlot (Lüdtke, 2018b) packages to clean, analyze, and present the data.

⁷ We also checked the models with economic beliefs as a predictor (controlling for ideological beliefs); it transpired that economic beliefs fail to produce the main effects (see the main effect reported in Table 2). Furthermore, adding random slope of economic beliefs, the models did not converge. Nevertheless, we control for the economic beliefs (fixed effect) across all the reported models.

⁸ The distribution of the accuracy scores proved to be rather skewed (with the majority of the responses being somewhat close to the truth, and a smaller percentage deviating very much from the actual facts). Thus, we repeated the analysis using log-transformed scores and found that the effects were similar across the models. One exception worth noting was that the interaction between ideology and AOT was $p=0.07$ (however, it was significant in the model that also took into consideration the difference in time periods i.e. pre vs. during the pandemic). The details are presented in Supplementary Section S8.

The role of open-minded thinking style.

Next, we examined whether an open-minded thinking style moderates the relationship between ideology and the accuracy of factual beliefs by including the interaction between ideology and AOT in the model (we also included a per-item random slope for AOT). It is worth noting here that the analysis was run using the data from Studies 2 and 3 only, as AOT was not measured in Study 1.

The analysis revealed that, overall, higher levels of AOT were related to more accurate factual beliefs. Importantly, we also found a significant 2-way interaction between ideology and AOT. At low levels (-1SD) of AOT, right- (vs. left-wing) ideology was related to a greater degree of inaccuracy in assessments ($b = 10.17$, $SE = 2.87$, 95%CI [4.54, 15.80]). However, at higher levels (+1SD) levels of AOT, the effects of political ideology were non-significant ($b = 4.69$, $SE = 2.79$, 95%CI [-0.77, 10.20]); the differences in the effects of ideology at low and high levels of AOT were significant ($b = 5.48$, $SE = 2.07$, $z = 2.64$, $p = 0.008$). These effects are shown in Fig. 1, and the details of the models are presented Table 2.

The effects of ideology on factual accuracy before and during the pandemic.

Next, we examined whether the effects of ideology were the same or different on comparing the period preceding the COVID-19 pandemic with the time in which the pandemic was prevalent. We added the interaction between ideology and the contex-

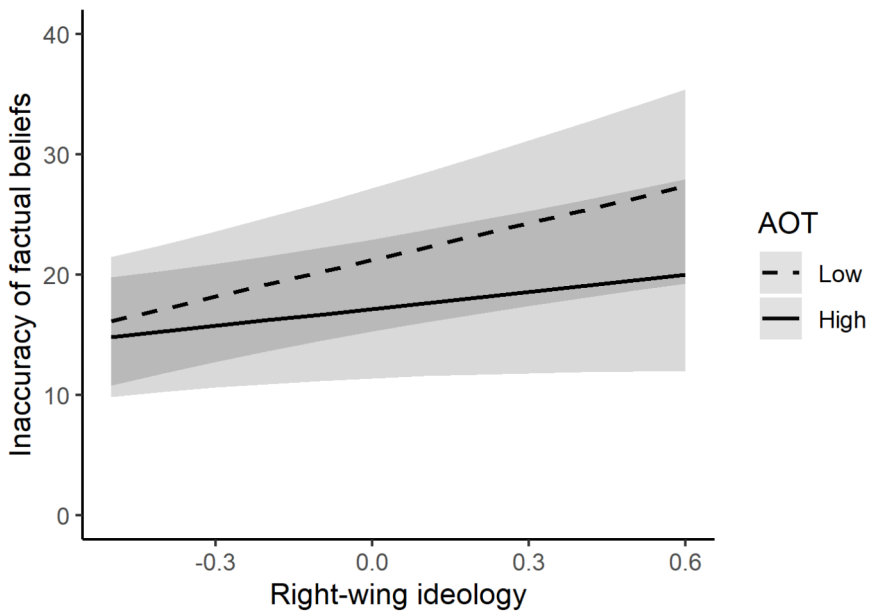


Fig. 1 The effects of the political ideology on inaccuracy of factual beliefs at low and high levels of AOT

Table 1 Items regarding factual beliefs used in Studies 1–3

Study1	Study2	Study3	Item	Correct answer for question used in analysis
x	x	x	What percentage of people living in Poland are of foreign origin? (R)	0.92%
x	x	x	What percentage of Poles are unemployed? (L)	3.2%
x	x	x	What percentage of Poles are over 60? (R)	22.5%
x	x	x	What percentage of the energy used in Poland comes from renewable sources? (L)	11%
x	x	x	What percentage of money collected by the Great Orchestra of Christmas Charity is allocated to medical equipment every year? (R)	96.5%
x	x	x	What percentage of babies have been vaccinated in Poland in the last 5 years? (L)	92.73%
x	x	x	What percentage of Polish society are LGBT? (L)	5.4%
	x	x	What percentage of all people who died in Auschwitz were Jews? (R)	91%
	x	x	What percentage of seats in the Parliament did Solidarity win in the 1989 election? (L)	34.78%
	x	x	What percentage of seats in the Senate did Solidarity win in the 1989 election? (L)	99%

Note: R – facts congenial to right-wing beliefs; L – facts congenial to left-wing beliefs
 Correct answers were based on information from the official resources and are presented in Supplementary Materials (Sect. 1)

tual effects of the pandemic threat (0=pre-COVID-19 pandemic for Study 1 and 2; 1=during the COVID-19 pandemic for Study 3) to the model.

The analysis revealed that there was no significant main effect of the pandemic on factual accuracy, i.e., people on average were similarly accurate (or inaccurate, as the case may be) in their assessments before and at the outset of the pandemic. Still, we found that the interaction between ideology and the differing periods (pre vs. during the pandemic) was marginally significant, i.e., the effects of ideology were slightly different in pre-pandemic times as compared to the effects during the pandemic. To

be more specific, although right-wing ideology was related to more inaccurate fact assessments both before ($b=8.83$, $SE=2.83$, 95%CI [3.28, 14.4]) and during the pandemic ($b=12.09$, $SE=2.96$, 95%CI [6.29, 17.9]), the effects of ideology on accuracy seem to be slightly stronger during the pandemic conditions compared to beforehand ($b=3.26$, $SE=1.83$, $z=1.78$, $p=0.075$). These effects are shown in Fig. 2. The details of the analysis are shown in Table 2.

The joint effects of ideology and AOT before and during the pandemic.

Finally, we investigated whether the protective role of an open-minded thinking style in the relationship between right-wing ideology and the accuracy of one's factual beliefs was affected by threat conditions (i.e., pre- vs. mid-pandemic). In order to achieve this, we added a 3-way interaction between ideology, AOT, and pre vs. mid-pandemic times. This was carried out for Studies 2 and 3 only, as Study 1 did not gather AOT scores. The analysis revealed that this interaction was non-significant, suggesting that displaying a higher AOT plays a protective role in reducing the inaccuracy of beliefs about facts for right-wing adherents (who otherwise, if their AOT was lower, would be more likely to assert beliefs that are much at variance with the facts). The details of the model are presented in Table 2.

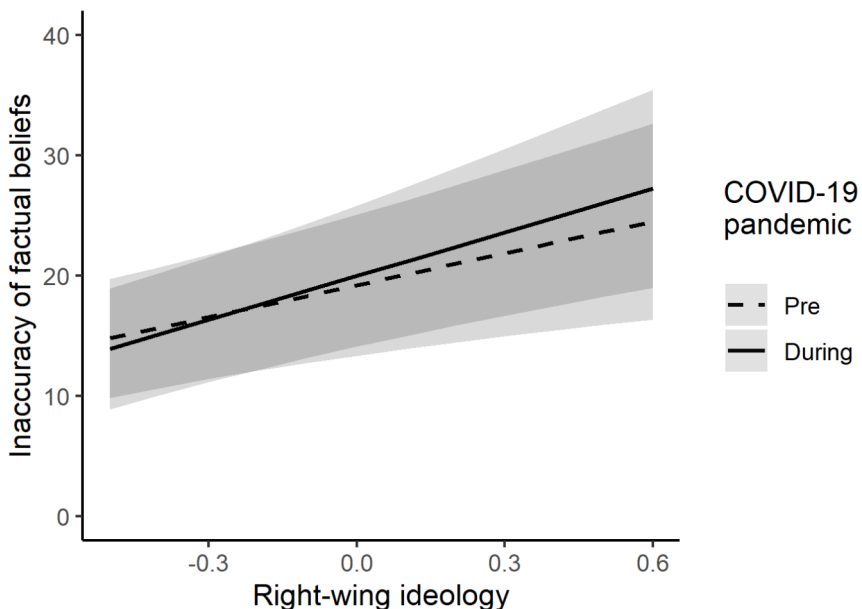


Fig. 2 The effects of the political ideology on inaccuracy of factual beliefs before and during pandemic

Table 2 Model summaries for the integrated analysis of misperception

Predictors	Model 1			Model 2			Model 3			Model 4			Model 5		
	Ideology (random intercept)			Ideology (random slopes)			Ideology x AOT			Ideology x pandemic			Ideology x AOT x pandemic		
	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>
(Intercept)	18.38	2.98	<0.001	18.38	2.98	<0.001	19.39	2.96	<0.001	19.28	2.99	<0.001	19.20	2.96	<0.001
Study 2	1.77	0.63	0.005	1.78	0.63	0.005									
Study 3	1.68	0.56	0.003	1.69	0.56	0.003	0.46	0.54	0.392						
Age	1.95	1.00	0.050	1.94	0.99	0.051	0.77	1.09	0.484	2.19	0.99	0.027	0.82	1.10	0.456
Gender (women)	-2.02	0.46	<0.001	-2.02	0.46	<0.001	-1.88	0.53	<0.001	-1.96	0.46	<0.001	-1.87	0.53	<0.001
Gender (other)	-0.16	6.94	0.981	-0.23	6.94	0.974	-1.11	6.72	0.869	0.80	6.97	0.909	-0.43	6.72	0.949
Education	-6.17	0.82	<0.001	-6.14	0.82	<0.001	-5.17	1.01	<0.001	-4.97	0.77	<0.001	-4.96	1.03	<0.001
Ideology (cultural beliefs)	9.67	0.91	<0.001	9.90	2.75	<0.001	7.43	2.63	0.005	8.83	2.83	0.002	5.63	2.89	0.051
Economic beliefs	-0.40	1.32	0.764	-0.41	1.32	0.756	-1.06	1.55	0.491	-0.76	1.32	0.563	-1.36	1.55	0.380
Confidence	-12.90	0.75	<0.001	-12.76	0.74	<0.001	-13.83	0.89	<0.001	-12.91	0.74	<0.001	-13.85	0.89	<0.001
AOT							-12.71	2.87	<0.001				-14.84	3.45	<0.001
Ideology x AOT							-17.12	6.48	0.008				-24.81	9.98	0.013
COVID-19 [During]										0.76	0.45	0.092	0.70	0.59	0.235
Ideology x COVID-19 [During]										3.26	1.83	0.075	3.33	2.32	0.151
AOT x COVID-19 [During]													4.25	3.55	0.231
Ideology x AOT x COVID-19 [During]													11.93	13.19	0.366
Random Effects															
σ^2	229.65			225.30			250.50			225.26			250.52		
τ_{00}	22.16 _{subject}			22.59 _{subject}			16.62 _{subject}			22.86 _{subject}			16.37 _{subject}		
	86.69 _{item}			86.79 _{item}			85.20 _{item}			88.13 _{item}			85.21 _{item}		
τ_{11}				66.99 _{item-Ideology}			55.79 _{item-Ideology}			66.76 _{item-Ideology}			55.82 _{item-Ideology}		
							47.96 _{item-AOT}			0.59 _{item}			47.98 _{item-AOT}		
ρ_{01}				0.61 _{item}			0.59 _{item-Ideology}						0.59 _{item-Ideology}		
							-0.16 _{item-AOT}						-0.16 _{item-AOT}		

Table 2 (continued)

	Model 1 Ideology (random intercept)	Model 2 Ideology (random slopes)	Model 3 Ideology x AOT	Model 4 Ideology x pandemic	Model 5 Ideology x AOT x pandemic
N	1022 _{subject} 10 _{item} 9009	1022 _{subject} 10 _{item} 9009	681 _{subject} 10 _{item} 6622	1022 _{subject} 10 _{item} 9009	681 _{subject} 10 _{item} 6622
Marginal R ² / Conditional R ²	0.068 / 0.367	0.068 / 0.380	0.080 / 0.355	0.067 / 0.382	0.081 / 0.355

Note: We use the term ideology or right/left wing beliefs referring to cultural beliefs. The higher the score, the more right-wing the beliefs

General Discussion

Across three studies, we show that right-wing adherents were less accurate than left-wing participants in assessing facts congenial to both, left- and right-wing beliefs. We also show that open-minded thinking style mitigates inaccuracy in factual beliefs among right- (but not left-) leaning participants.

Although, in general, we found support for the ideology asymmetry hypothesis (Jost, 2017), we also showed that a more nuanced, context-sensitive investigation is pivotal to understanding the extent to which rightists and leftists differ in their accuracy of factual beliefs. Specifically, we found an overall main effect of ideology on the accuracy of factual beliefs, although there was some degree of heterogeneity in this effect, depending on the item being considered by participants. So, while generally speaking, those on the right were comparatively less accurate in their assessments, they deviated further from the truth when assessing certain facts rather than others. An item-by-item analysis would appear to be insufficient for us to fully understand these effects since all the facts broached in the studies pertain to ‘hot’ topics (congenial to left- and right-wing beliefs) in the current political discourse of Poland (e.g., LGBTQ+rights, immigration, environmental protections, animal rights, the European Union, and modern Polish political and social history). By using facts that are both politically timely and fiercely debated in Poland, we assumed right-wingers would be more induced to create various forms of “identity self-defense”. Apparently, despite being policy-relevant and correlated with other items used in these studies, two of the items (both congenial to left-wing beliefs) in the assessments (namely, “What percentage of Polish society are LGBT?” and “What percentage of seats in the Senate did Solidarity win in the 1989 election?”) were not dissimilar in terms of their responses among right- and left-wing adherents. It is an intriguing effect, indicative of the importance of being systematic in the investigation of item-by-item variation in the relationship between political ideology and the inaccuracy of fact assessment. This approach also allows us to directly test the ideological asymmetry hypotheses. This is because one of the claims is that ideological symmetry can only be observed in circumstances where participants are asked to evaluate information that favors their political affinities (politically-congenial information) or challenges those affinities (politically-uncongenial information) (Baron & Jost, 2019).

Moreover, what is worthy of notice here is that we also found that active open-minded thinking may act as a buffer against inaccurate beliefs, and thus mitigate identity protective cognition. Clearly, this is an important finding in that it contributes to the on-going discussion around the necessity to mitigate misperception in general, and among those with right-wing affinities in particular. Threat conditions notwithstanding, it was found that the protective effects of AOT held firm as evidenced by controlling the time period during which the studies were performed, i.e., pre- and mid-pandemic. We expected that the threat would cause the participants’ ideological identity to become more salient and therefore would drive misperception. In line with expectations, the effect of right-wing ideology on factual beliefs was more pronounced.

The question arises, however, whether it is actually AOT itself (and not ideology) which is the primary factor here. It is worth noting that although right-wingers

are higher in AOT than left-wingers, we control for these differences by including the main effects while testing the interaction: ideology \times AOT. A future study could manipulate the moderator (AOT) to test whether a high AOT score does indeed reduce inaccuracy among right - but not left-wingers. This is entirely feasible as AOT is considered a thinking style, operating in a similar mode to accuracy motivation, which can be categorized as a disposition but also as a situationally-manipulated mindset. What is more, we assumed that high AOT acts as a buffer against inaccuracy more among those who have a tendency to be inaccurate (i.e., right-wingers), rather than among those who are more accurate in their factual beliefs (i.e., left-wingers). For future research, it would be ideal to have a control group (e.g., non-political identifiers) to test if AOT acts as a buffer against inaccuracy solely for those on the right, or else for those on the left, but to a lesser extent. In addition, to test if AOT could also modify the effects of left-wing ideology and (in)accuracy, it would be important to determine the contexts that are conducive to left-wing adherents becoming more biased in their assessments than their right-wing counterparts (e.g., scientific facts about the relationship between IQ and genes or GMO). This test would enable us to understand whether the effects of AOT on the link between ideology and (in)accuracy is typical only for right-wingers or depends on the pre-existing ideological beliefs bias, or their degree of extremity.

The finding that active open-minded thinking style moderates the link between ideology and fact assessment means that AOT is a significant factor that mitigates misperception among those on the right, but not those on the left. This is a finding of some importance, leading us to consider the idea that interventions eliciting this open-minded mode of thinking might potentially be effective in reducing cognitive bias. This might be performed via the induction of accuracy motivation, priming respondents to engage in this thinking style, or by evoking the desire to be more informed before making an estimate or prediction. Perhaps interventions that are directed at encouraging people to be more thoughtful and attentive to information already acquired may further improve their estimation performance.

Our results also contribute to the ongoing discussion about the role of the open-minded thinking style and political polarization. Although some studies have found no effects brought about by an active open-minded thinking style when it comes to judging the quality of evidence (Eichmeier & Stenhouse, 2019), others have revealed that this thinking style can, in fact, amplify ideological polarization (Kahan & Corbin, 2016; cf. Baron, 2017). Crucially, however, these studies focused only on one highly controversial topic, namely global warming, in which conservatives are more predisposed to reject the scientific consensus position than liberals are. In contrast, we examined a wider spectrum of issues representing the gamut of contemporary political debates in Poland, focusing on topics congenial to left- as well as right-wing beliefs. The sheer number of topics used in the studies also serves to increase the precision of results and their reliability. This is one of the possible reasons why our findings revealed the role of an open thinking style in bridging (as opposed to amplifying) ideological gaps. This finding is in line with the very definition of an active open-minded thinking style (e.g., Baron, 2019).

Our studies were conducted in a European country, and thus extend the currently relevant knowledge, which until now has almost solely been based on studies con-

ducted in the US. We think that these results could be generalized to contexts other than a Polish/European one as they reveal that right-(vs. left) wingers are less accurate in factual beliefs congenial to both those on the left and the right. Nevertheless, the context naturally matters a great deal; hence, the stimuli used to trigger responses from the participants are very much context-specific, and cannot be transposed over to studies conducted in dissimilar socio-political contexts.

The studies have some limitations, the most obvious one being related to the selection of items which were inherent to the very particular political context in which the study was conducted. Thus, on the one hand, our studies are ecologically valid, i.e., they refer to topics congenial to left- and right-wing beliefs, being under discussion at the time of the study; on the other hand, alternative topic areas, including non-political ones, should be taken into account to fully understand the accuracy of factual beliefs. We also believe that further research might investigate the role of accuracy motivation more closely by adding manipulation, or other measures (e.g., analytical thinking, need for cognition or openness to experience), in order to validate the current findings. Although we gauged the participants' level of political knowledge, we did not directly measure how much individuals seek out and process divergent (i.e., counter-attitudinal) information on these topics; thus, we cannot be certain as to the reason for the impact of AOT on the relationship between ideology and factual beliefs. This should be the subject of further investigation.

To summarize, in these studies, by focusing on the boundary conditions of the accuracy of policy-relevant facts assessment, our results substantially augment the debate on the ideological sources of misperception in the political domain. Our hypothesis that right-wing ideology is related to lower accuracy in assessments of social key realities found considerable support in the data. Nevertheless, we believe that the results would need to be replicated in other societies that are differently ideologically constituted, and which are characterized by dissimilar degrees of polarization and/or partisanship.

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Code Availability Code is available in OSF at <https://osf.io/d8yba/>.

Declarations

Conflicts of interest/Competing interests Authors declare no conflict of interest to declare that are relevant to the content of this article.

References

- Baron, J. (2019). Actively open-minded thinking in politics. *Cognition*, 188, 8–18. <https://doi.org/10.1016/j.cognition.2018.10.004>
- Baron, J. (2017). Comment on Kahan and Corbin: Can polarization increase with actively open-minded thinking? *Research & Politics*, 4(1), 2053168016688122. <https://doi.org/10.1177/2053168016688122>
- Baron, J., & Jost, J. T. (2019). False Equivalence: Are Liberals and Conservatives in the United States Equally Biased? *Perspectives on Psychological Science*, 14, 292–303. <https://doi.org/10.1177/1745691618788876>
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software*, 67. <https://doi.org/10.18637/jss.v067.i01>
- Burke, B., Kosloff, S., & Landau, M. (2013). Death goes to the polls: A meta-analysis of mortality salience effects on political attitudes. *Political Psychology*, 34, 183–200
- Czarnek, G., Dragon, P., Szwed, P., & Wojciszke, B. (2017). Kwestionariusz przekonań politycznych: Własności psychometryczne [Political Beliefs Questionnaire: Psychometrical properties]. *Psychologia Społeczna*, 41, 205–222
- Czarnek, G., Szwed, P., & Kossowska, M. (2019). Right- and left-wing prejudice toward dissimilar groups in cultural and economic domains. *European Journal of Social Psychology*, 49, 807–823. <https://doi.org/10.1002/ejsp.2548>
- 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, 273–291. <https://doi.org/10.1177/1745691617746796>
- Eichmeier, A., & Stenhouse, N. (2019). Differences that don't make much difference: Party asymmetry in open-minded cognitive styles has little relationship to information processing behavior. *Research & Politics*, 6(3), 2053168019872045. <https://doi.org/10.1177/2053168019872045>
- Feldman, S., & Johnston, C. (2014). Understanding Political Ideology. *Political Psychology*, 35, 337–358. <https://doi.org/10.1111/pops.12055>
- Fox, J., & Weisberg, S. (2018). Visualizing Fit and Lack of Fit in Complex Regression Models with Predictor Effect Plots and Partial Residuals. *Journal of Statistical Software*, 87(9), 1–27. <https://doi.org/10.18637/jss.v087.i09>
- Guay, B., & Johnston, C. D. (2022). Ideological Asymmetries and the Determinants of Politically Motivated Reasoning. *American Journal of Political Science*, 66, 2, 285–301. <https://doi.org/10.1111/ajps.12624>
- Haran, U., Ritov, I., & Mellers, B. A. (2013). The Role of Actively Open-Minded Thinking in Information Acquisition, Accuracy, and Calibration. *Judgment and Decision Making*, 8, 188–201
- Hart, P., & Nisbet, E. (2012). Boomerang effects in science communication: How motivated reasoning and identity cues amplify opinion polarization about climate mitigation policies. *Communication Research*, 39, 701–723. doi:<https://doi.org/10.1177/0093650211416646>
- Hibbing, J., Smith, K., & Alford, J. (2014). Negativity bias and political preferences: A response to commentators. *Behavioral and Brain Sciences*, 37, 333–350. DOI:<https://doi.org/10.1017/S0140525X1300280X>
- Hothorn, T., Bretz, F., & Westfall, P. (2008). Simultaneous Inference in General Parametric Models. *Biometrical Journal*, 50, 346–363. <https://doi.org/10.1002/bimj.200810425>
- Jost, J. T. (2017). Ideological Asymmetries and the Essence of Political Psychology. *Political Psychology*, 38, 167–208. doi:<https://doi.org/10.1111/pops.12407>
- Jost, J. T., van der Linden, S., Panagopoulos, C., & Hardin, C. D. (2018). Ideological asymmetries in conformity, desire for shared reality, and the spread of misinformation. *Current Opinion in Psychology*, 23, 77–83. <https://doi.org/10.1016/j.copsyc.2018.01.003>
- Kahan, D. (2017). Misconceptions, Misinformation, and the Logic of Identity-Protective Cognition. Cultural Cognition Project Working Paper Series No. 164
- Kahan, D. M., & Corbin, J. (2017). Reply to Baron. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2898954>
- Kahan, D. M., & Corbin, J. C. (2016). A note on the perverse effects of actively open-minded thinking on climate-change polarization. *Research & Politics*, 3(4), 2053168016676705. <https://doi.org/10.1177/2053168016676705>

- Kossowska, M., & Hiel, A. V. (2003). The relationship between need for closure and conservative beliefs in Eastern and Eastern Europe. *Political Psychology*, 24, 501–518. <https://doi.org/10.1111/0162-895X.00338>
- Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, 108, 480–498. <https://doi.org/10.1037/0033-2909.108.3.480>
- Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest Package: Tests in Linear Mixed Effects Models. *Journal of Statistical Software*, 82. <https://doi.org/10.18637/jss.v082.i13>
- Lenth, R. (2019). emmeans: Estimated Marginal Means, aka Least-Squares Means. R package version 1.3.2. <https://CRAN.R-project.org/package=emmeans>
- Lord, C. G., Ross, L., & Lepper, M. R. (1979). Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology*, 37, 2098–2109. <https://doi.org/10.1037/0022-3514.37.11.2098>
- Lüdtke, D. (2018a). ggeffects: Tidy Data Frames of Marginal Effects from Regression Models. *Journal of Open Source Software*, 3, 772. <https://doi.org/10.21105/joss.00772>
- Lüdtke, D. (2018b). sjPlot—Data Visualization for Statistics in Social Science. <https://doi.org/10.5281/ZENODO.1308157>
- Pennycook, G., Fugelsang, J., & Koehler, D. (2015). Everyday consequences of analytic thinking. *Current Directions in Psychological Science*, 24, 425–432. doi:<https://doi.org/10.1177/0963721415604610>
- Pennycook, G., McPhetres, J., Zhang, Y., Lu, J., & Rand, D. (2020). Fighting COVID-19 misinformation on social media: Experimental evidence for a scalable accuracy-nudge intervention. *Psychological Science*, 31, 770–780. doi:<https://doi.org/10.1177/0956797620939054>
- Petty, R. E., & Cacioppo, J. T. (1986). The Elaboration Likelihood Model of Persuasion. In R. E. Petty & J. T. Cacioppo (Eds.), *Communication and Persuasion: Central and Peripheral Routes to Attitude Change* (pp. 1–24). Springer. https://doi.org/10.1007/978-1-4612-4964-1_1
- Price, E., Ottati, V., Wilson, C., & Kim, S. (2015). Open-minded cognition. *Personality and Social Psychology Bulletin*, 41, 1488–1504. doi:<https://doi.org/10.1177/0146167215600528>
- R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>
- RStudio Team, & RStudio (2016). *RStudio: Integrated Development for R*. Boston, MA: Inc. <http://www.rstudio.com/>
- Ruggeri, K., Večkalov, B., Bojanić, L., Andersen, T. L., Ashcroft-Jones, S., Ayacaxli, N. ... Folke, T. (2021). The general fault in our fault lines. *Nature Human Behaviour*, 1–11
- Stegmüller, D. (2013). How Many Countries for Multilevel Modeling? A Comparison of Frequentist and Bayesian Approaches? *American Journal of Political Science*, 57, 748–761. <https://doi.org/10.1111/ajps.12001>
- Stenhouse, N., Myers, T. A., Vraga, E. K., Kotcher, J. E., Beall, L., & Maibach, E. W. (2018). The potential role of actively open-minded thinking in preventing motivated reasoning about controversial science. *Journal of Environmental Psychology*, 57, 17–24
- Svedholm, A. M., & Lindeman, M. (2013). The separate roles of the reflective mind and involuntary inhibitory control in gatekeeping paranormal beliefs and the underlying intuitive confusions. *British Journal of Psychology*, 104, 303–319. <https://doi.org/10.1111/j.2044-8295.2012.02118.x>
- Swami, V., Voracek, M., Stieger, S., Tran, U. S., & Furnham, A. (2014). Analytic thinking reduces belief in conspiracy theories. *Cognition*, 133(3), 572–585. <https://doi.org/10.1016/j.cognition.2014.08.006>
- Thompson, E. P., Roman, R. J., Moskowitz, G. B., Chaiken, S., & Bargh, J. A. (1994). Accuracy motivation attenuates covert priming: The systematic reprocessing of social information. *Journal of Personality and Social Psychology*, 66, 474–489. <https://doi.org/10.1037/0022-3514.66.3.474>
- van Bavel, J., & Pereira, A. (2018). The Partisan Brain: An Identity-Based Model of Political Belief. *Trends in Cognitive Sciences*, 22, 213–224. DOI <https://doi.org/10.1016/j.tics.2018.01.004>
- Wickham, H. (2017). tidyverse: Easily Install and Load the ‘Tidyverse’. R package version 1.2.1. <https://CRAN.R-project.org/package=tidyverse>
- Yarkoni, T. (2020). The generalizability crisis. *Behavioral and Brain Sciences*, 45, 1–37. doi:<https://doi.org/10.1017/S0140525X20001685>
- Zmigrod, L., Eisenberg, I., Bisset, P., Robbins, T., & Poldrack, R. (2021). The cognitive and perceptual correlates of ideological attitudes: a data-driven approach. *Philosophical Transactions of the Royal Society*, B3762020042420200424 <https://doi.org/10.1098/rstb.2020.0424>

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