Abstract

Liberals and conservatives both express political animosity and favouritism. However, less is known about whether the same or different factors contribute to this phenomenon among liberals and conservatives. We test three different relationships that could emerge between cognitive ability and cognitive reflection, and political group-based attitudes. Analyzing two nationally representative surveys of US Americans (N= 9,035) containing a measure of cognitive ability, we find evidence that compared to people lower in cognitive ability, people higher in cognitive ability express more animosity towards ideologically-discordant groups, and more favouritism towards ideologically-concordant groups. This pattern was particularly pronounced among liberals. We then propose a pre-registered follow-up study using a measure of cognitive reflection to further investigate the relationship between these constructs and attitudes towards ideological groups (N=3,214). Together, these studies will provide a comprehensive test of how cognitive ability and cognitive reflection are related to political group-based attitudes for liberals and conservatives in the United States.

Short Title: Cognitive Ability, Cognitive Reflection, and Attitudes Towards Ideological Groups

Keywords: *Cognitive Ability, Cognitive Reflection, Worldview Conflict, Political Animosity*

Statement of Contribution:

- People high in cognitive ability show more political favouritism
- People high in cognitive ability are less politically tolerant

Words (not including abstract, figures, tables, references per BJSP instructions): 6,998

Cognitive Reflection, Cognitive Ability, and Attitudes Towards Ideological Groups

People express negative attitudes towards political outgroups, while favouring political ingroups (e.g., Iyengar et al., 2019; Finkel et al., 2020; Mosleh et al., 2021). Despite their differences in policies, values, and personalities (e.g., Graham et al., 2009; Sibley & Duckitt, 2008), liberals and conservatives share this tendency to express political animosity and favouritism (Iyengar & Westwood, 2015; Mosleh et al., 2021), although it remains debated whether they express it to the same degree (e.g., Stern & Crawford, 2021; Ganzach & Schul, 2021). This pattern is broadly consistent with the worldview conflict hypothesis, which suggests that both liberals and conservatives dislike ideologically-discordant groups and favour ideologically-concordant groups (Brandt & Crawford, 2020). In short, groups in general are seen either as threatening or supporting one's ideological interests (Brandt et al., 2014; Crawford & Pilanski, 2014; Wetherell et al., 2013; Kossowska et al., 2017; Czarnek et al., 2018), and merely perceiving a group as an ideological ally or opponent is sufficient for the expression of some degree of animosity or favouritism (Crawford & Brandt, 2020; Crawford & Pilanski, 2014; Wetherell et al., 2013).

Most research on political group-based animosity and favouritism has focused on the question of whether conservatives' express animosity more of it than liberals (e.g., Brandt & Crawford, 2020; Ganzach & Schul, 2021; Stern & Crawford, 2021). While an important question, this is not our primary focus. Instead, we start with the premise that both liberals and conservatives express some degree of political group-based animosity and favouritism. We then ask whether cognitive characteristics contribute to animosity and favouritism in the same way for liberals and conservatives, or if cognitive characteristics have different associations with animosity and favoritism depending on people's ideological identities.

We investigate cognitive reflection and cognitive ability because they have been linked with group-based animosity, particularly among conservatives (e.g., Onraet et al., 2015; Blanchar & Sparkman, 2020). Although these cognitive factors may be relevant to liberals' political group-based attitudes too, their influence has yet to be explored. We take up this task and explore how cognitive reflection and cognitive ability shape intergroup attitudes among both liberals and conservatives. We test three perspectives that predict different relationship patterns between cognitive factors, ideology, and political group-based attitudes in two existing nationally representative datasets of US Americans. Then, we propose a pre-registered analysis of a dataset we will be given access to upon in-principal acceptance of this stage 1 registered report.

Cognitive Reflection and Cognitive Ability

Cognitive ability and cognitive reflection are two factors that contribute to people's reasoning. Cognitive ability is an individual's capability to perform higher-order mental tasks such as problem-solving, reasoning, remembering, and understanding (Onraet et al., 2015). Cognitive reflection is understood as the tendency to override an intuitive but incorrect response in favour of deeper processing (Toplak et al., 2011). The distinction between these two definitions is evident in the constructs' measurements. To score highly on measures of cognitive *ability*, people need to possess the skillset necessary to solve difficult problems. In contrast, to score highly on measures of cognitive *reflection*, people need to expend the mental effort to override an intuitive response and engage in deeper consideration of simple problems.

Despite their differences, the two constructs are empirically related (Pennycook et al., 2015), with recent meta-analyses showing correlations of about .5 (Otero et al., 2022). These similarities are also apparent in the construct's measurement. To score highly on measures of

cognitive *reflection*, people must have some degree of quantitative *ability*. Solving any math problem requires some degree of cognitive ability. Thus, quantitative ability is necessary to score highly on a measure that consists of math problems such as the Cognitive Reflection Task (CRT; Frederick, 2005). Similarly, reflecting on one's conclusions and recognizing that an initial conclusion may be incorrect requires the ability to carry out a higher order cognitive task.

Critically for our purposes, both constructs predict intergroup attitudes. High cognitive ability relates to more positive attitudes towards low status outgroups and more negative attitudes towards high status outgroups (Wodtke, 2016; Hodson & Busseri, 2012; Brandt & Crawford, 2016). Likewise, people with lower cognitive reflection and ability express more negative attitudes towards low-status outgroups than people with higher cognitive reflection and ability (Blanchar & Sparkman, 2020).

The relationship between these two cognitive characteristics and intergroup attitudes suggests that they may be useful in understanding attitudes towards ideological groups. However, the relationship between these constructs is not straightforward and the relationship between them and animosity may differ. For instance, people higher in cognitive reflection may be better able to monitor and suppress their group-based attitudes, or alternatively, people higher in cognitive ability may be better able to acquire political information and understand political alliances between groups in society. The ability to recognize ideological alliances and conflicts between groups may lead higher cognitive ability individuals to express more political animosity and favoritism. Therefore, we consider both cognitive reflection *and* cognitive ability in our investigation of the relationship between cognitive characteristics and the intergroup attitudes of liberals and conservatives. We test three perspectives that suggest different patterns of relationship between cognitive factors, ideology, and intergroup attitudes.

Perspective 1: High Cognitive Ability and Reflection Increase Tolerance

Working from the premise that a person who dislikes one outgroup is also likely to dislike other outgroups (e.g., Adorno, 1950; Allport, 1954; Hodson & Busseri, 2012), scholars have identified personality traits and individual differences that predict group-based animosity (e.g., Flynn, 2005; Ekehammer & Akrami, 2003; Sibley & Duckitt, 2008). Cognitive ability and cognitive reflection are two such constructs (Crandall & Eshleman, 2003; Wodtke, 2016; Hodson & Busseri, 2012; Blanchar & Sparkman, 2020). Lower levels of both have been linked to negative attitudes towards outgroups (Wodtke, 2016; Hodson & Buseri, 2012; Blanchar & Sparkman, 2020).

Proposed mechanisms behind the relationship vary, but one argument is that monitoring one's prejudices is a cognitively demanding task (Crandall & Eshleman, 2003). Thus, people with lower levels of cognitive ability have been suggested to express more animosity than those higher in the construct (Crandall & Eshleman, 2003). This hypothesis was put forth prior to the emergence of the cognitive reflection construct (Frederick, 2005). Cognitive reflection is directly linked to the ability to monitor and suppress intuitive but incorrect responses in favour of deliberation (Toplak et al., 2011; Yilmaz & Saribay, 2017; Saribay & Yilmaz, 2017). This suggests that the mechanism put forth by Crandall and Eshleman (2003) should extend to cognitive reflection as well.

Consistent with these ideas, people with lower levels of verbal ability and cognitive reflection express more prejudicial racial attitudes and racial and ethnic stereotypes than people with higher levels of verbal ability and cognitive reflection (e.g., Blanchar & Sparkman, 2020; Wodtke, 2016). Others have uncovered a similar relationship (Hodson & Busseri, 2012), but have suggested a slightly different mechanism. They suggest that higher cognitive ability should

relate to lower intergroup animosity for two reasons (Hodson & Busseri, 2012). First, greater cognitive capacity allows people to better adopt the perspectives of outgroup members. Second, people higher in cognitive ability are less likely to adopt intolerant ideologies. In line with both perspectives, those who are *lower* in cognitive ability and cognitive reflection should express *more* animosity towards groups broadly speaking than people higher in cognitive ability and cognitive reflection, who should be generally tolerant (H1a).

Others have noted that people lower in cognitive ability and cognitive reflection may be drawn to conservative ideologies (e.g., Stankov, 2009; Eidelman et al., 2012). This is because these ideologies are characterized by ideas and policies that condone animosity towards groups and entrench inequality in society (e.g., Jost et al., 2003; Jost, 2006; 2017). Some go as far as to suggest that the relationship between cognitive factors and intergroup attitudes is *mediated* through the adoption of conservative ideologies that condone, and at times encourage such animosity (e.g., Meisenberg, 2015; Hodson & Busseri, 2012). Therefore, this suggests that the effect of cognitive reflection and cognitive ability on intergroup attitudes predicted by H1a, should weaken once ideology is accounted for; liberals on average should be inclined towards tolerance, while conservatives on average should be inclined towards animosity (H1b).

Perspective 2: Cognitive Ability and Reflection Increase Political Animosity and Favoritism among Liberals, but Decrease it Among Conservatives

While it is possible that higher levels of cognitive ability and cognitive reflection lead to tolerance, it is also possible that these cognitive characteristics *differentially* predict political animosity and favoritism depending on respondent's political ideology. This is because both respondent ideology *and* cognitive ability have been shown to contribute to the development of animosity and favouritism towards the same set of target groups. Thus, it is possible that these

constructs exert influence on intergroup attitudes in a way that either reinforces or counteracts the other's influence.

This perspective is derived from studies testing the relationship between ideology and cognitive ability with intergroup attitudes. Research examining the relationship between cognitive ability and attitudes towards diverse, ideologically varied groups suggests that individuals *high* in cognitive ability tend to favour liberal groups. In contrast, these individuals disfavour conservative groups. Individuals *low* in cognitive ability tend to favour conservative groups, while disfavouring liberal groups (Brandt & Crawford, 2016; De Keersmaecker et al., 2020).

The relationship between a person's political ideology and prejudice is also moderated by target group ideology (e.g., Brandt et al., 2014; Brandt, 2017). Specifically, liberals favour groups that are liberal, while disfavouring groups that are conservative. Perhaps unsurprisingly, conservatives display exactly the opposite pattern. They tend to favour groups that are conservative, while disfavouring groups that are liberal (Brandt, 2017).

Taken together, the evidence from this work suggests that high cognitive ability and liberal ideology predict animosity towards similar groups, and low cognitive ability and conservative ideology predict animosity towards similar groups. As such, this framework suggests that a significant three-way interaction effect between respondent's ideology, respondent's cognitive ability, and the ideology of the group being judged might emerge. Specifically, among conservatives, high cognitive ability should lead target group ideology to be *less* predictive of animosity and favouritism than among conservatives with low cognitive ability. This is because high cognitive ability and conservative ideology influence the effect of group ideology on attitudes in opposing directions (i.e., they may cancel each other out). High

cognitive ability is associated with greater animosity towards conservative groups while conservative ideology is associated with greater animosity towards liberal groups. However, for lower cognitive ability conservatives, the opposite pattern should emerge. In this case, low cognitive ability and conservative ideology reinforce the influence of target group ideology on attitudes (H2a), as both low cognitive ability and conservative ideology are associated with higher animosity towards liberal groups (i.e., the effect of target group ideology on attitudes should be stronger among low cognitive ability conservatives than among high cognitive ability conservatives).

Among liberals high in cognitive ability, liberal ideology and high cognitive ability predict animosity towards similar groups, and therefore should reinforce the influence of target group ideology on attitudes. Thus, among high cognitive ability liberals, the effect of target group ideology on political animosity and favouritism should be greater than among liberals lower in cognitive ability. In contrast, when considering liberals low in cognitive ability, ability and ideology should exert competing influences on the effect of target group ideology on attitudes. Liberals lower in cognitive ability should thus express less favouritism towards liberal groups and animosity towards conservative groups than liberals higher in cognitive ability (H2b) (i.e., the effect of target group ideology on attitudes should be stronger among high cognitive ability liberals than among low cognitive ability liberals). In short, H2 predicts that higher cognitive ability and reflection should predict greater political animosity and favouritism among liberals, but less among conservatives.

Perspective #3: Cognitive Ability and Reflection Increase Political Animosity and Favouritism

Both liberals and conservatives express some degree of animosity towards groups that do not share their values (Brandt et al., 2014; Brandt & Crawford, 2020). A critical prerequisite for

value conflict to shape attitudes is that perceivers *recognize* such value conflict to begin with. People higher in cognitive ability and cognitive reflection may be better at recognizing value conflict, especially in the political domain, than those lower in these constructs.

To recognize value conflict, people must first be able to recognize the contours of socio-political debates. Notably, people are typically low in political knowledge (Delli Carpini & Keeter, 1993; 1996) and unable to correctly characterize ideological divides (Converse, 1964; Kinder & Kalmoe, 2017). However, people higher in cognitive ability and cognitive reflection may be better able to acquire the requisite political knowledge to recognize political conflict, and associate groups with ideological positions. Cognitive ability might contribute to political knowledge as the cognitive capacity to process information, store it in memory, and connect it to other information is important for knowledge acquisition (Delli, Carpini, & Keeter, 1996). To acquire political knowledge, individuals must also spend time and energy reflecting on the (sometimes complex) political information they encounter (Delli, Carpini, & Keeter, 1996). Accordingly, people with higher levels of cognitive ability and reflection may be better able to recognize the ideological orientations of groups and link the information with their own ideological interests.

This reasoning is consistent with several different findings. For example, it is consistent with the finding that political extremity is more strongly related to outgroup animosity for people higher in cognitive ability (Ganzach & Schul, 2021). It is also consistent with the finding that the possession of greater cognitive skills and education is correlated with greater attachment to political parties, more political knowledge, and more coherent political ideologies (Albright, 2009; Barabas et al., 2014; Converse, 1964; Delli, Carpini, & Keeter, 1993). Similarly, some work suggests that people higher in cognitive reflection are more likely to reach politically

biased conclusions (e.g., Kahan, 2013). It also aligns with the notion that people higher in cognitive reflection are more likely to recognize ideological divisions and hold strong priors supporting their own side's agenda (Pennycook & Rand, 2019; Tappin et al., 2020; 2021). In other words, people who are more reflective and have greater cognitive ability could be better able to acquire, defend, and rationalize political animosities (e.g., Lick et al., 2018). As such, this perspective suggests that people with higher levels of cognitive ability and reflection should be more likely to possess the knowledge necessary to characterize ideological conflict between politically relevant groups. Thus, this perspective suggests that people higher in cognitive reflection and cognitive ability should be more likely to express animosity towards politically unaligned groups, and favoritism towards politically aligned groups (H3).

The Current Research

We investigate how cognitive ability and cognitive reflection are associated with animosity and favouritsm towards groups among liberals and conservatives using three differing perspectives. The first perspective suggests that individuals higher in cognitive ability and reflection will express less negative intergroup attitudes than those lower in these constructs, but that the relationship should weaken once ideology is accounted for. The second perspective predicts that higher cognitive ability and reflection should predict greater political animosity and favouritism among liberals, but less animosity and favouritism among conservatives. The third perspective predicts that people higher in cognitive ability and cognitive reflection should express more animosity towards ideologically discordant groups and more favouritism towards ideologically concordant groups than people lower in cognitive ability and cognitive reflection.

We first test these perspectives in two nationally representative samples. In the 2012 and 2016 waves of the American National Election Study (ANES), participants completed the

WORDSUM task, a measure of cognitive ability, as well as measures of political ideology and explicit attitudes towards a variety of groups. These groups include political groups (e.g., liberals), religious groups (e.g., Christian Fundamentalists), activist groups (e.g., Feminists), and identity-based groups (e.g., Women). These data were merged with ratings of group ideology (Brandt, 2017; Brandt & Crawford, 2016) collected from separate samples of Americans. This provides us with the necessary information to determine the extent a target group is seen as politically concordant or discordant with the participant. Studies 1 and 2 (the 2012 and 2016 waves of the ANES) are discussed together as they contain many of the same measures and use a similar sampling procedure.

We also propose a pre-registered analysis of the Ideology 2.0 dataset (Schmidt et al., 2022). These data were collected from the Project Implicit website and will only be made available to us if our proposal is accepted as a registered report. We will use the Ideology 2.0 dataset to investigate whether the relationship uncovered in the ANES with cognitive ability extends to the distinct but related construct of cognitive reflection.

Method: Studies 1 and 2

Our individual level data for Studies 1 and 2 come from the 2012 and 2016 waves of the nationally representative American National Election Study (ANES; 2012: $N = 5{,}783$, $M_{age} = 49.62$, $SD_{age} = 16.85$, 2783 men, 2985 women; 2016: $N = 4{,}122$, $M_{age} = 49.58$, $SD_{age} = 17.58$, 1937 men, 2174 women, 11 other gender identity). The surveys used both face-to-face interviews and computer-assisted questionnaires. We control for survey mode in all reported analyses.

Cognitive ability was measured using the WORDSUM task (Thorndike, 1942), a 10-item vocabulary test. Participants were asked to select which of five words best matched the meaning

of a target word. Mean scores on the measure were rescaled to range from 0 to 1 and were mean centered for analyses. WORDSUM is associated with general intelligence (r = 0.71; Wolfe, 1980) and verbal ability (Kan et al., 2013), and is a commonly used measure of cognitive ability (e.g., Malhotra et al., 2007; Brandt & Crawford, 2016). WORDSUM, is also significantly correlated with conceptually related variables such as years of education, parents' educational attainment, and IQ in childhood (see Wolfe, 1980).

Group-based animosity and favouritism was assessed with feeling thermometer ratings towards 24 groups in American society in 2012, and 21 groups in American society in 2016. These feeling thermometers ranged from 0 (cold/unfavorable) to 100 (warm/favorable). For these analyses, we reverse scored the items such that higher scores indicated more group-based animosity and lower scores indicated group-based favouritism. For ease of communication, we refer to this measure as assessing animosity when describing the results. Scores were then rescaled to range from 0 to 1 for purposes of coefficient interpretation. Supplemental Materials include specific target groups in the 2012 and 2016 waves of the ANES.

Political ideology was measured using a 7-point Likert scale ranging from 1 (Extremely liberal) to 7 (Extremely conservative). Prior to analyses, ideology was rescaled to range from 0 to 1 and was centered at the scale midpoint (i.e., "Moderate; middle of the road"). Participants who reported "don't know" and "haven't thought about it much" were excluded from analyses, but substantive results are identical when they are included.

We control for demographics, including race (contrasts = White v. non-white, Black v. other minority groups, and Hispanic v. other minority groups), gender (dummy coded and mean-centered, male = 1), income, education, and age. Age, education, and income are rescaled to range from 0 to 1 and were mean-centered. Results are reported without control variables in the

Supplemental Materials. Our primary results are consistent regardless of the inclusion of covariates.

Group ideology ratings for the 2012 and 2016 ANES studies come from previous studies that used Amazon's Mechanical Turk participants who resided in the U.S. (2012 groups: Brandt & Crawford, 2016; 2016 groups: Brandt, 2017). In both studies, people rated the groups on several dimensions, including perceived ideology. The perceived ideology measure ranged from 0 to 100 with higher ratings indicating that a group was perceived as more conservative (see Brandt, 2017 and Brandt & Crawford, 2016 for complete study details). Perceived ideology of a group helps us identify the extent groups are seen as consistent or inconsistent with a participant's own ideological orientations (e.g., Brandt, 2017). The intraclass correlation (ICC) of the group ideology rating was 0.99 in both studies, showing a high degree of consensus in perceived ideology (see also Koch et al., 2020). Group ideology ratings for both studies were recoded to range from 0 to 1 and midpoint centered.

Modeling Strategy

We estimated multilevel models with group attitudes nested within participants. We included random intercepts for target group and for participant. Target group ideology was included as a random slope. Our rescaling of variables (to range from 0 to1) means that regression coefficients for the main effects represent the expected change in the dependent variable upon moving from the minimum (0) to the maximum (1) of the respective independent variable. MCMC power analyses conducted in the simr package (Green & MacLeod, 2016) suggest we possess approximately 100% power to detect a small three-way interaction (b = .44) in both the 2012 and 2016 datasets.

Results: Studies 1 and 2

We tested hypotheses 1a-3. The hypotheses, models, and pattern of results they correspond to are in Table 1 below.

Table 1: Hypotheses, Models, and Predicted Pattern of Results for Perspectives 1 - 3.

Hypothesis	Model	Terms of Interest/ Predicted Pattern of Results
H1a: Individuals higher in cognitive ability are more tolerant (without accounting for respondent ideology).	Main effects model. DV: Feeling thermometer ratings towards groups. IVs: Group ideology, cognitive ability, demographic control variables.	1) Cognitive ability: Negative relationship suggesting that higher cognitive ability generally corresponds to less negative attitudes towards groups.
H1b: After accounting for respondent ideology, the effect of cognitive ability on attitudes should reduce in magnitude.	Main effects model. DV: Feeling thermometer ratings towards groups. IVs: Group ideology, cognitive ability, respondent ideology, and demographic control variables.	1) Cognitive ability: Smaller negative relationship compared to model for H1a. 2) Respondent ideology: The variable is recoded such that higher values represent more conservative ideology. Thus, there should be a positive relationship, with more conservative individuals expressing more animosity.
Hypothesis 2a: Among conservatives, higher levels of cognitive ability should predict less political animosity (i.e., the effect of target group ideology on attitudes should be weaker for high cognitive ability conservatives than low cognitive ability conservatives).	Model with a three-way interaction. DV: Feeling thermometer ratings towards groups. IVs: group ideology, respondent ideology, cognitive ability, demographic control variables. Two-way interactions between group ideology and cognitive ability, group ideology and respondent ideology, and respondent ideology and cognitive ability. Three-way interaction between respondent ideology, group ideology, and cognitive ability.	1) Three-way interaction: Negative relationship indicating ability is more predictive of animosity among liberals than conservatives. 2) Simple slopes analysis: the absolute value of the coefficient for group ideology on attitudes should be *smaller* for high cognitive ability conservatives than for lower cognitive ability conservatives. This pattern signals they express *less* political animosity than lower ability conservatives do.

	Simple slopes analysis for the three-way interaction term. Examines the effect of group ideology on political animosity among high and low cognitive ability liberals and conservatives.	
Hypothesis 2b: Among liberals, higher cognitive ability should predict more political animosity towards ideologically discordant grouups. (i.e., the effect of target group ideology on attitudes should be stronger for high cognitive ability liberals than low cognitive ability liberals.)	Same model as H2a. Simple slopes analysis for the three-way interaction term. Examines the effect of group ideology on political animosity among high and low cognitive ability liberals and conservatives.	1) Three-way interaction: Negative relationship indicating ability is more predictive of animosity among liberals than conservatives. 2) Simple slopes analysis: absolute value of the coefficient for group ideology on attitudes should be *larger* among high cognitive ability liberals than among lower cognitive ability liberals. This pattern signals they express *more* political animosity towards ideologically discordant groups than lower ability liberals do.
Hypothesis 3: Among both liberals and conservatives, high cognitive ability should predict greater animosity towards ideologically discordant groups.	Same model as H2 Simple slopes analysis for the three-way interaction term. Examines the effect of target group ideology on animosity across levels of respondent ideology and cognitive ability.	1) Simple slopes analysis: absolute value of the coefficients for group ideology should be *larger* among high cognitive ability liberals *and* conservatives than among low cognitive ability liberals *and* conservatives. This signals that high cognitive ability idealogues express more political group-based animosity than lower cognitive ability ideologues do.

Note: Feeling thermometer ratings towards groups are always recoded such that higher ratings correspond to *higher* levels of animosity and lower ratings correspond to higher levels of favouritism and liking.

The first model fitted to test H1a reveals that although the effect of cognitive ability on animosity is negative in 2012, it is very close to zero and far from statistical or substantive significance. In the 2016 model, the coefficient flips directions, and is again small and nonsignificant. This is inconsistent with the first perspective which suggests that individuals higher in cognitive ability should be generally tolerant.

The main effects from the 2012 and 2016 models that include the main effect of respondent ideology to test H1b reveal that liberals and conservatives are similarly likely to express animosity. This result is inconsistent with the literature that predicts conservatives should be disposed towards animosity, whereas liberals are disposed towards tolerance. Results from the 2012 model are shown in Table 2, while results of the 2016 model are shown in Table 3.

Table 2

Fixed Effects from Main Effects Models in the 2012 ANES Excluding and Including Respondent Ideology

	2012 ANES			
	Without Respondent Ideology		**With Respondent Ideology**	
Variable	b (SE)	β (SE)	b (SE)	β (SE)
Survey Mode	.04*** (.03)	.166*** (.13)	.04*** (.03)	.166*** (.01)
White people / Non-white people	.03*** (.00)	.11*** (.01)	.03*** (.00)	.11*** (.01)
Black people / Other Minority Groups	-.04*** (.01)	-.13*** (.01)	-.04*** (.01)	-.13*** (.02)

Hispanic people/ Other Minority Groups Except Black people	-.04*** (.007)	-.16*** (.02)	-.04*** (.007)	-.16*** (.03)
Gender	02*** (.002)	.09*** (.03)	.02*** (.002)	.09*** (.01)
Income	-.009 (.005)	-.009 (.006)	-.009 (.005)	-.05 (.006)
Age	-.07*** (.01)	-.06*** (.005)	-.07*** (.01)	-.06*** (.006)
Ideology of Group	-.07 (.12)	-.05 (.10)	-.07 (.12)	.05 (.10)
Education	-.02*** (.006)	-.02** (.01)	-.02** (.01)	-.02** (.006)
Cognitive Ability	-.002 (.007)	-.002 (.006)	-.002 (.007)	-.002 (.006)
Ideology of Respondent	-	- -	.001 (.01)	.001 (.005)

Note: These results provide evidence against Perspective 1. Those who are lower in cognitive ability are no more likely to express animosity towards outgroups than those who are higher in cognitive ability. The effect of ability is also not reduced in size by respondent ideology, which also fails to exert a significant effect on tendency to express animosity. *p < .05, **p < .01; ***p < .001. For continuous variables, standardized coefficients represent the expected change in standard deviation units in the dependent variable per one standard deviation unit change in the respective independent variable. For categorical variables, coefficients represent expected standard deviation change in the dependent variable, if a member of a given category.

Table 3

Fixed Effects from Main Effects Models in the 2016 ANES Excluding and Including Respondent Ideology

	2016 ANES	
	Without Respondent Ideology	**With Respondent Ideology**

Variable	b (SE)	β (SE)	b (SE)	β (SE)
Survey Mode	.01**	.04***	.01**	.05**
	(.004)	(.02)	(.004)	(.02)
White people / Non-white	.02***	.07***	.01**	.06**
	(.00)	(.02)	(.00)	(.02)
Black people/ Other Minority Groups	-.006	-.02	.003	.01
	(.01)	(.03)	(.01)	(.03)
Hispanic people/ Other Minority Groups Except Black people	-.03***	-.10***	-.03***	-.10***
	(.008)	(.03)	(.01)	(.04)
Gender	.03***	.11***	.03***	.12***
	(.003)	(.01)	(.004)	(.02)
Income	-.02*	-.02*	-.02*	-.02*
	(.007)	(.008)	(.007)	(.008)
Age	-.03***	-.03***	-.03***	-.03***
	(.01)	(.008)	(.01)	(.008)
Ideology of Group	.03	.03	.04	.04
	(.09)	(.09)	(.10)	(.10)
Education	-.04**	-.03**	-.03*	-.02*
	(.01)	(.008)	(.01)	(.009)
Cognitive Ability	.006	.005	.01	.01
	(.009)	(.007)	(.01)	(.009)
Ideology of Respondent	-	-	-.01	-.01
			(.01)	(.008)

Note: These results provide evidence against Perspective 1. Those who are lower in cognitive ability are no more likely to express animosity than those who are higher in cognitive ability. The effect of ability is also not reduced in size by respondent ideology, which also fails to exert a

significant effect on tendency to express animosity. *p < .05, **p < .01; ***p < .001. For continuous variables, standardized coefficients represent the expected change in standard deviation units in the dependent variable per one standard deviation unit change in the respective independent variable. For categorical variables, coefficients represent expected standard deviation change in the dependent variable if a member of the category.

To replicate previous research (e.g., Brandt et al., 2014) and for the purposes of model building (Gelman & Hill, 2006), we also fit two-way interaction models. These models fitted in the 2012 and 2016 data include the two-way interaction terms between group ideology and participant ideology, participant ideology and cognitive ability, and group ideology and cognitive ability. Results show that participant ideology and cognitive ability significantly interacted with target group ideology. Cognitive ability did not interact with respondent ideology. While these models do not directly relate to the hypotheses posed here, they replicate prior work establishing that liberals and high cognitive ability individuals' express animosity towards conservative groups, and favouritism towards liberal groups (e.g., Brandt & Crawford, 2016; Brandt, 2017). Results of the two-way interaction models are displayed in Table 4.

Table 4

Fixed Effects of Two-Way Interaction Models in the 2012 and 2016 ANES

	2012 ANES		**2016 ANES**	
Variable	b	β	b	β
	(SE)	(SE)	(SE)	(SE)
Survey Mode	.04***	.166**	.01**	.05**
	(.03)	(.01)	(.004)	(.02)
White people / Non-white	.03***	.11***	.01***	.05**
	(.00)	(.01)	(.00)	(.02)
Black people/ Other Minority Groups	-.04***	.11	.003	.01
	(.01)	(.01)	(.01)	(.03)

Hispanic people/ Other Minority Groups Except Black people	-.04***	-.13***	-.03***	-.10**
	(.01)	(.02)	(.01)	(.03)
Gender	.02***	.09***	.03***	.12***
	(.00)	(.01)	(.00)	(.01)
Income	-.009	-.009	-.02*	-.02*
	(.01)	(.1)	(.01)	(.01)
Age	-.07***	-.06***	-.03***	-.03***
	(.01)	(.005)	(.01)	(.01)
Ideology of Group	-.03	-.06	.06	.03
	(.12)	(.10)	(.10)	(.10)
Education	-.02***	-.02***	-.03*	-.02*
	(.006)	(.006)	(.01)	(.008)
Cognitive Ability	-.005	.001	.003	.003
	(.01)	(.006)	(.01)	(.009)
Ideology of Respondent	.02	-.002	.05***	.06***
	(.01)	(.006)	(.01)	(.008)
Ideology of Group*Ideology of Respondent	-1.42***	-.28***	-1.42***	-.36***
	(.02)	(.004)	(.02)	(.006)
Cognitive Ability*Ideology of Respondent	-.02	-.005	-.02	-.006
	(.02)	(.005)	(.03)	(.008)
Cognitive Ability*Ideology of Group	.23***	.04***	.25***	.06***
	(.02)	(.004)	(.03)	(.006)

Note: These models do not directly pertain to the hypotheses we present here, but they do replicate prior work regarding the associations between ideology and animosity, and cognitive ability and animosity. *p < .05; **p < .01; ***p < .001. Standardized coefficients for continuous variables represent expected standard deviation change in dependent variable per one standard deviation unit change in the respective independent variable. Standardized coefficients for categorical variables represent expected standard deviation change in the dependent variable if a member of the respective category.

These estimates, however, are all qualified by a significant three-way interaction between participant ideology, target ideology, and cognitive ability in our final model. This interaction is key for testing Perspectives 2 and 3. Breaking down the key three-way interaction, we find that the two-way interaction between group ideology and cognitive ability is significant among liberals in both studies (2012: b = .69, SE = .04, β = .13, p < .001; 2016: b = .58, SE = .05, β = .13, p < .001) and only significant for conservatives in the 2012 study (2012: b = -.21, SE = .05, β = -.04, p < .001; 2016: b = .01, SE = .05, β = .002, p = .84). The interaction pattern is displayed in Figure 1 and the simple slopes are shown in Table 6. In Study 1 (2012), both liberals and conservatives scoring higher in cognitive ability displayed greater animosity towards ideologically-discordant groups, and more favouritism towards ideologically-concordant groups. These relationships are noticeably weaker among conservatives, but still present. In the 2016 dataset, the results are largely similar, with the exception that conservatives higher and lower in cognitive ability did not differ with respect to political animosity and favouritism. The three-way interaction term is negative and significant as predicted by Perspective 2 and Perspective 3; but the overall pattern is most consistent with the predictions generated by Perspective 3. This perspective suggests that people with greater cognitive ability and tendencies to notice ideological conflict should express more group-based animosity and favouritism than people lower in cognitive ability. We find clear support for this idea among liberals in both studies and among conservatives in Study 1 (2012).

Table 5
Fixed Effects of Three-Way Interaction Models in the 2012 and 2016 ANES

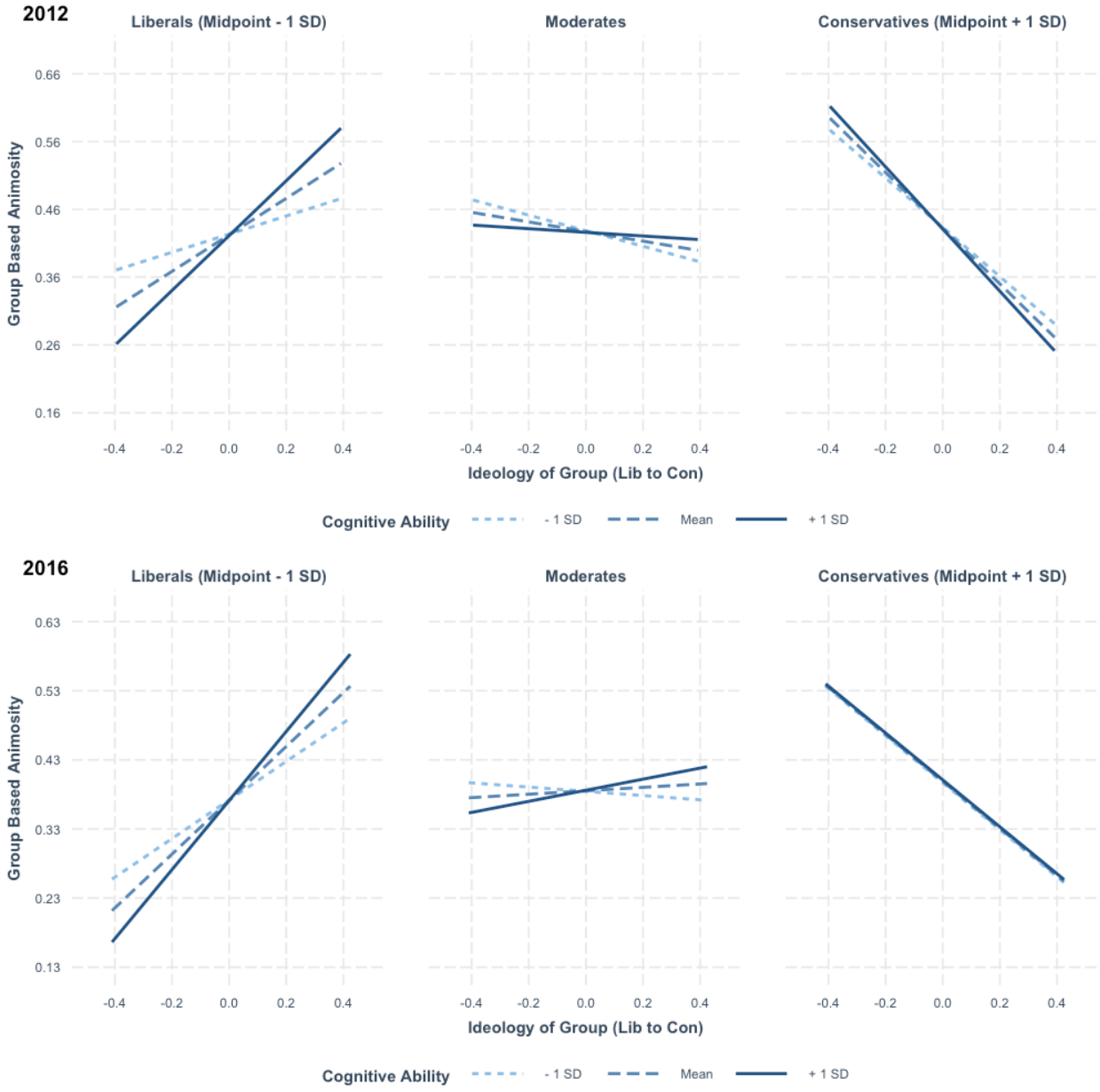
	2012 ANES		**2016 ANES**	
Variable	b (SE)	β (SE)	b (SE)	β (SE)

Survey Mode	.04***	.17***	.01***	.05**
	(.00)	(.01)	(.00)	(.02)
White people / Non-White	.03***	.11**	.01**	.05**
	(.00)	(.01)	(.004)	(.02)
Black people / Other Minority	-.04***	-.13***	.00	.01
Groups	(.01)	(.02)	(.01)	(.03)
Hispanic/ Other Minority Groups	-.04***	-.16***	-.03***	-.10**
Except Black people	(.01)	(.03)	(.00)	(.04)
Gender	.02***	.09***	.03***	.12***
	(.00)	(.01)	(.00)	(.02)
Income	-.01	-.009	-.02*	-.02*
	(.01)	(.006)	(.007)	(.008)
Age	-.07***	-.06***	-.03***	-.03***
	(.01)	(.006)	(.007)	(.008)
Ideology of Group	-.03	-.06	.05	.02
	(.13)	(.10)	(.10)	(.8)
Education	-.02***	-.02*	-.03*	-.02*
	(.01)	(.006)	(.01)	(.008)
Cognitive Ability	.00	-.001	.002	.003
	(.01)	(.006)	(.01)	(.009)
Ideology of Respondent	.02**	-.002	.05***	.05***
	(.01)	(.005)	(.007)	(.008)
Ideology of Group* Ideology of	-1.39***	-.27***	-1.36***	-.34***
Respondent	(.02)	(.004)	(.02)	(.005)
Cognitive Ability*Ideology of	.00	-.006	.04	.004
Respondent	(.03)	(.005)	(.04)	(.008)
Cognitive Ability*Ideology of	.24***	.035***	.26***	.05***
Group	(.02)	(.004)	(.03)	(.005)
Ideology of Group* Cognitive	**-1.63*** **	**-.07*** **	**-.88*** **	**-.05*** **
Ability*Ideology of Participant	**(.09)**	**(.004)**	**(.10)**	**(.006)**

Note: The outcome variable is feelings about the target group. Higher scores indicate more negative feelings. Higher scores for both ideology of group and ideology of participant indicate more conservative ideology. The three-way interaction between group ideology, cognitive ability, and ideology of the target group is the term of interest. The negative three-way interaction indicates that the two-way interaction between ideology of the target group and cognitive ability is lower for conservative participants compared to liberal participants. * $p < .05$; ** $p < .01$, *** $p < .001$. Standardized coefficients for continuous variables represent expected standard deviation change in dependent variable per one standard deviation unit change in the respective independent variable. Standardized coefficients for categorical variables represent

expected standard deviation change in the dependent variable if a member of the respective category.

Figure 1
Effect of target group ideology on political animosity and favouritism across high and low cognitive ability liberals, conservatives, and moderates.



Note: Figure 1 displays the pattern of interaction uncovered in the 2012 and 2016 waves of the ANES. The Y axis is scaled at ±1 SD of the mean of the DV for both studies (Witt, 2019). Results are largely similar across both waves. Among liberals, individuals higher in cognitive

ability express more animosity towards ideologically-discordant groups and more favouritism towards ideologically-concordant groups. Among conservatives a similar, though weaker pattern emerges in 2012, but not in 2016.

Table 6: Simple Slopes of Group Ideology on Animosity for 2012 and 2016 ANES

	2012 ANES					
	Liberal participants (Midpoint -1 SD)			Conservative participants (Midpoint +1 SD)		
	b	SE	β	b	SE	β
Lower Cognitive Ability (Mean -1 SD)	.12	.13	.11	-.34**	.13	-.29
Higher Cognitive Ability (Mean +1 SD)	.38***	.13	.32	-.44***	.13	-.36
	2016 ANES					
Lower Cognitive Ability (Mean -1 SD)	.30***	.10	.29	-.34***	.10	-.32
Higher Cognitive Ability (Mean +1 SD)	.51***	.10	.49	-.33***	.10	-.31

Note: Simple slopes analysis for the three-way interaction of interest for testing hypotheses 1-3. Results reveal that in line with Hypotheses 2 and 3, among liberals, people high in cognitive ability express more animosity towards ideologically-discordant groups and more favouritism towards ideologically-concordant groups than people low in cognitive ability. In contrast, among conservatives, Hypothesis 3 is supported in the 2012 data, but not in the 2016, data where there is no difference in animosity and favouritism expressed by conservatives high and low in cognitive ability. No coefficients appear in line with the predictions generated by Perspective 2 among conservatives. Overall, results are most consistent with Perspective 3. *** $p < .001$

Discussion: Studies 1 and 2

The results of Studies 1 and 2 provided evidence most consistent with Hypothesis 3 that individuals high in cognitive ability express more political animosity towards ideologically discordant groups and favouritism towards ideologically concordant groups relative to those low in cognitive ability. According to this perspective, individuals who are higher in cognitive ability are better able to recognize ideological conflict and determine which groups align or conflict with their own ideological orientations. Across two independent cross-sections of the ANES,

conducted four years apart, support for this premise was clear among liberals, but mixed among conservatives.

The effects of both participant ideology and cognitive ability were estimated to be near zero and nonsignificant. This means that when examining attitudes towards a wide variety of target groups, conservatives and people lower in cognitive ability were no more likely to express group-based animosity than liberals and people higher in cognitive ability. This is inconsistent with Hypothesis 1. Hypothesis 2 and Hypothesis 3 both predict that among liberals, higher cognitive ability should predict greater group-based animosity and favoritism. This proposition receives empirical support. However, Hypothesis 2 also predicts that among conservatives, higher cognitive ability should lead to target group ideology having a *weaker* effect than among lower cognitive ability conservatives. This pattern did not emerge in either the 2012 or the 2016 studies. In 2012 conservatives higher in cognitive ability express *more* political animosity and favouritism, in line with Hypothesis 3, whereas in 2016 higher cognitive ability conservatives behaved no differently than lower cognitive ability conservatives.

The empirically small difference between the 2012 and 2016 results for conservatives could have emerged for several reasons, including the smaller ANES sample size, the specific set of ideological groups under study, the highly polarized socio-political context in which data were collected, or sampling error.

In our proposed Study 3, we shift from testing cognitive ability to testing cognitive reflection. It is possible that reflection functions similarly to cognitive ability, allowing people to reflect on political information, acquire political knowledge, and develop and defend political group-based animosity and favouritism (consistent with the third perspective). However, cognitive reflection is a distinct construct, and the ability to reflect on one's feelings about

groups has been linked to lower feelings of animosity towards outgroups (e.g., Blanchar & Sparkman, 2020; Crandall & Eshleman, 2003). Thus, it is also possible that consistent with the first perspective, liberals and conservatives who are higher in cognitive reflection are better able to monitor their feelings towards groups, and thus express less group-based animosity. By testing cognitive reflection, we can more fully explore how cognitive factors are associated with political group-based animosity.

Method Proposed Study 3: Ideology 2.0 Dataset

Overview

This study will use a combination of pre-existing data, including a measure of cognitive reflection (Frederick, 2005), from the Ideology 2.0 dataset (Schmidt et al., 2022) and new group ideology ratings collected for this project. Studies 1 and 2 included a widely accepted measure of group-based animosity and favouritism, capturing absolute levels of favouritism and animosity. However, work on political animosity (e.g., Iyengar et al., 2015; Finkel et al., 2019; Mosleh et al., 2021) and prejudice more generally (e.g., Bergh & Brandt, 2022; Graziano et al., 2007; Greenwald et al., 1998) often focuses on attitudes towards politically unaligned groups *relative* to politically aligned groups. The Ideology 2.0 dataset contains measures of relative, rather than absolute, political group-based animosity and favouritism, helping us extend our exploration to a new measure of group-based attitudes. The proposed study thus allows us to build on our previous studies in two important ways. First, we examine the relationship between cognitive *reflection* and political group-based animosity and favouritism. Second, we examine the relationship between cognitive reflection and *relative* political group-based animosity and favouritism. As participants in the Ideology 2.0 dataset rate a different set of groups than

participants in the ANES datasets, we will complement the Ideology 2.0 dataset with new group ideology ratings collected for this project.

The Ideology 2.0 Dataset

The Ideology 2.0 dataset (Schmidt et al., 2022) was collected from the Project Implicit website. In late 2022, the proprietors of the dataset released a call for registered reports. Upon in-principle acceptance of a Stage 1 registered report, we will be given access to the confirmatory dataset to complete our pre-registered analyses. We can pre-register this study without having access to the data we will use to test our hypotheses. See the Supplemental Materials for a detailed discussion of the Ideology 2.0 data collection procedure and the Project Implicit team's call for registered reports.

Not all measures included in the Ideology 2.0 study are relevant to our specific research question, and thus won't be used (e.g., Big 5 personality traits). With respect to our dependent variable, we will only analyze *explicit* political group-based attitudes from the dataset, rather than implicit attitudes because the key mechanisms, such as the ability to monitor gut feelings towards targets (e.g., Hodson & Busseri, 2012; Crandall & Eshleman, 2003), are only relevant for explicit attitudes. Other variables of interest are CRT measures, participants' ideology, and demographics.

We will include participants (N = 3,214) who had U.S. citizenship and resided in the U.S. at the time of data collection and completed at least one item on the cognitive reflection test and at least one explicit measure of group attitudes. The Ideology 2.0 data collection was designed so that data are missing completely at random by design. We estimate the missing data from this planned missingness design using multiple imputation (see Enders, 2017). Simulation studies

show that multiple imputation methods are preferred when datasets have very high levels of missingness, as the Ideology 2.0 dataset does, if missingness on auxiliary variables is not too high (e.g., Madley-Dowd et al., 2019).

Group-Based Animosity or Favouritism

Participants expressed a preference for one of two targets included in a randomly assigned pair (e.g., liberals and conservatives, all targets given in the Supplemental Materials). The scale endpoints ranged from -3, indicating a preference for the second target in the pair (denoted target y), to 3, indicating a preference for the first target in a pair (denoted target x). This measure is rescaled to range from 0 to 1 in all analyses to facilitate the interpretation of regression coefficients.

Cognitive Reflection Test

Cognitive Reflection was measured using the three-item version of the Cognitive Reflection Test (Frederick, 2005). Participants were randomly assigned to complete between 0 and 3 items of this measure. We will only include participants who were assigned to at least 1 cognitive reflection item in our analysis. No participants completed the entire measure, but due to the study's planned missingness design, we can impute missing CRT responses for participants who completed at least one item on the measure. About one-third of participants completed each of the three items on the CRT. The measure captures cognitive reflection by asking participants questions that have easily accessible but incorrect answers. The measure is a validated and robust measure of reflective thinking (Bialek & Pennycook, 2018; Pennycook, 2015).

Political Ideology

Political ideology was measured by asking all participants, "What is your political identity?" (1- Strongly liberal to 7- Strongly conservative). Ideology was rescaled to range from 0 to 1 and midpoint-centered to facilitate interpretation of coefficients and because the midpoint is a meaningful value (i.e., moderate).

Demographics

We will control for age, race/ethnicity, gender, and education in all analyses. Age and education will be rescaled to range from 0 to 1 and mean centered as above. Race/ethnicity will be contrast coded in the same manner as Studies 1 and 2. Income was measured but will not be included in our proposed analyses due to substantial missingness. The demographic information will also be used as auxiliary information to improve the imputation of the missing data (Madley-Dowd et al., 2019). Demographic information is shown in Table 7 below.

Table 7

Ideology2.0 Demographics

Demographics	Anticipated N
Gender = Female	2,151
Gender = Male	1,054
Gender = Missing	9
Race = American Indian or Alaskan Native	25
Race = Black or African American	244
Race = East Asian	66
Race = More than one race – Black/White	45
Race = More than one race – Other	192
Race = Native Hawaiian or Pacific Islander	13

Table 7

Ideology2.0 Demographics

Demographics	Anticipated N
Race = Other or Unknown	120
Race = South Asian	43
Race = White	2,453
Race = Missing	13
Ethnicity = Hispanic or Latino	259
Education = Not a high school graduate	112
Education = High school graduate	193
Education = Some college or Associate's degree	1,477
Education = Bachelor's degree	845
Education = Graduate degree or graduate education	570
Education = Missing	17

Note: Table 7 displays demographic information from the Ideology2.0 dataset. Information is shown for the subset of the sample containing our relevant measures.

Group Ideology Rating Data Collection

To estimate perceptions of each group's ideology, we will use Prolific to recruit a sample of 100 people. Participants will be paid $2 for their participation. We will select Prolific participants who have an approval rating greater than 95, limit the sample to U.S. Americans, residing in the U.S.A., and aim to recruit an approximately equal number of men and women. Each person will rate the perceived political ideology of all 21 relevant target groups on a scale ranging from 0- Extremely liberal to 100- Extremely conservative. These groups correspond to

the 21 politically relevant groups we analyze from the Ideology 2.0 dataset. Groups will be rated and presented in a random order for a total of 100 ratings for each target. This is the number of ratings required for reliable estimates of group ideology according to previous research and is highly reliable (see ICCs in Studies 1 and 2; Brandt, 2017; Brandt & Crawford, 2016). The survey will also contain items relevant to other projects being conducted by our research team to conserve resources. The survey is provided in its entirety on our anonymous OSF page.

Proposed Analyses

To examine the relationship between cognitive reflection and preferences for ideologically-concordant groups over ideologically-discordant groups, we will fit multilevel models based on those in Studies 1 and 2. We will treat preferences (11 group comparisons, which correspond to 21 ratings because one target is included in more than one pair) as nested within participants and our models will include random intercepts for target group pairs and for participants, as well as a random slope for target group ideology. The random intercept for participant accounts for the fact that some participants completed multiple group comparisons. To account for the relative, rather than absolute, measure of the outcome variable in Study 3, we will operationalize ideology of the target group as the *difference* in the ideology ratings between group x (coded to be the group perceived to be more conservative) and group y (coded to be the group perceived to be more liberal). Recoded scores indicate how much more conservative group x is perceived to be than group y. We include a random slope for the group ideology difference ratings for each participant. We also control for the study version (A or B) participants completed (0 = Version A, 1 = Version B).

To test Perspective 1, we first need to transform our dependent variable. Our dependent variable represents the extent to which one group is preferred over the other, with negative scores

indicating more favouritism towards the liberal group, and positive scores indicating more favouritism towards the conservative group. As Perspective 1 is agnostic to target group ideology, we will transform the dependent variable in the set of models conducted to test Perspective 1, such that the dependent variable is the *absolute value* of the difference in group ratings (lower scores = less preference for one group over the other). We will then regress this absolute value measure on group ideology, cognitive reflection, and demographic control variables (analogous to model 1 in Studies 1 and 2). Perspective 1 predicts that the coefficient for cognitive reflection should be negative and significant indicating that those high in cognitive reflection are less likely to prefer some groups over others. However, the magnitude of this coefficient should decrease once respondent ideology is controlled for. The coefficient for respondent ideology (recoded such that higher scores represent greater conservatism) should be positive and significant, indicating that conservatives express greater overall animosity than liberals do.

To test Perspectives 2 and 3, we will use the relative measure of animosity (i.e. not the absolute value) because these perspectives make predictions about the ideology of the target group (higher scores = greater preference to conservative group relative to liberal group). We will estimate models similar to models 2 and 3 from Studies 1 and 2. Our term of interest in testing Perspectives 2 and 3 is the three-way interaction term in the fourth model we fit, as well as its corresponding simple slopes analysis. Perspective 2 suggests that cognitive reflection should *differentially* predict the influence of target group ideology on attitudes among liberals and conservatives. It predicts that high cognitive reflection should be related to a *greater* influence of target group ideology on attitudes among liberals, but a *reduced* influence of target group ideology among conservatives. It predicts the opposite pattern for low cognitive reflection

liberals and conservatives. In contrast, Perspective 3 predicts that high cognitive reflection should relate to *greater* preferences for concordant groups over discordant groups among *both* liberals and conservatives.

Imputation with Multiple Imputation

Missing data will be imputed with the MICE package in R prior to analyses (van Buuren & Groothuis-Oudshoorn, 2011). Predictive Mean Matching will be used to impute the categorical and continuous missing data (Little & Rubin, 1987). This procedure works by matching the means of observed and predicted values in a dataset (Van Buuren, 2007). We will follow current best practice recommendations and conduct 10 imputations with 10 iterations each (Stuart et al., 2006). Relevant demographic predictors and responses to completed items will be used in the imputation process. Nearly all participants completed measures of all the demographic variables we include in this study.

Power Analyses

We conducted power analyses using Monte-Carlo simulations in the simr package (Green & MacLeod, 2016). We based our power analysis on the relationship in the 2016 ANES analysis between cognitive *ability*, target group ideology, and participant ideology (b = -0.88). To err on the side of caution, and because it is possible that the true relationship between cognitive *reflection,* target group ideology, and participant ideology is smaller than that uncovered with respect to cognitive *ability,* we arbitrarily reduced the magnitude of the coefficient of the three-way interaction by 0.2 (b = -0.68). We reduced the number of within-person observations to 11 to match the number of stimuli in the proposed study. We changed the sample size of the

simulated data to match the 3,214 respondents we have available from the Ideology 2.0 dataset. The estimated power is approximately 100% to detect the hypothesized three-way interaction.

Pseudo-Code

Pseudo-code to conduct the proposed analyses in this study is available at the following OSF page https://osf.io/t68z4/?view_only=d49d4f006864411a9592b8e76400eed7.

Anticipated Results

We anticipate that the relationship between cognitive reflection and animosity/favoritism will show the same pattern as the Study 1 and 2 results with respect to cognitive ability. That is, people higher in cognitive reflection should express more political group-based animosity and favouritism, and this finding should be particularly likely to emerge among liberals. However, it is also possible that we will uncover a different pattern of relationship, or nonsignificant results. Some have suggested that the ability to monitor one's gut feelings towards groups could explain why some individuals express less group-based animosity and favouritism than others (e.g., Crandall & Eshleman, 2003). As such, cognitive reflection may display a pattern like that described in Perspective 1 above, as it more directly relates to this ability.

There has also been less evidence of a consistent relationship between cognitive reflection and socio-political attitudes than cognitive ability. Thus, there may not be a significant relationship between cognitive reflection and political group-based attitudes among liberals and conservatives. This uncertainty helps highlight how the proposed study will provide valuable insight into the nature of the relationship between cognitive reflection, intergroup attitudes, and politics. The importance of this contribution has been underscored by recent studies that have

drawn longstanding assumptions about the nature of the relationship between cognitive characteristics and socio-political attitudes into question (e.g., Costello et al., 2023).

Discussion and Conclusion

People around the world express negative attitudes towards political outgroups and relatively positive attitudes towards political ingroups (Finkel et al., 2020; Iyengar et al., 2019; Mosleh et al., 2021; Turner-Zwinkels et al., in press). Liberals and conservatives both display this political group-based animosity and favouritism (Mason, 2018; Iyengar & Westwood, 2015).

Although both liberals and conservatives express some degree of political animosity and favouritism, less is known about whether the same psychological factors contribute to the phenomenon among liberals and conservatives. Previous research has established that at least one factor contributing to the emergence of political animosity and favouritism, i.e., perceived value conflict, is shared between ideological camps (Brandt et al., 2014; Brandt & Crawford, 2019; Czarnek et al., 2019). It remains to be seen whether other constructs that contribute to the development of group-based animosity and favouritism function similarly among liberals and conservatives.

Two cognitive factors that have frequently been linked with negative attitudes towards outgroups among conservatives are cognitive reflection and cognitive ability. People lower in these constructs have been found to express more animosity towards outgroups than those higher in these constructs (e.g., Onraet et al., 2015; Blanchar & Sparkman, 2020). Less is known, however, about how these constructs predict intergroup attitudes among liberals, and how they relate to attitudes towards politically conservative groups among conservatives.

Here, we draw on three perspectives which suggest three different patterns of relationship that could emerge between cognitive reflection, cognitive ability, and attitudes towards politically relevant groups. In Studies 1 and 2, we find evidence that people higher in cognitive ability express more animosity towards ideologically discordant groups, and more favouritism towards ideologically-concordant groups than people lower in cognitive ability. This is most consistent with the third perspective we review and suggests that perhaps people higher in cognitive ability are better able to recognize ideological conflict. Evidence consistent with this notion is strong among liberals, but mixed was among conservatives.

One shortcoming of our first two studies is that we investigate only the role of cognitive ability in predicting intergroup attitudes, and not the related construct of cognitive reflection. We also employ only one specific measure of group attitudes. To overcome these shortcomings, we propose a pre-registered analysis of a proprietary dataset we have yet to gain access to. The dataset contains a large sample, a measure of cognitive reflection, and a different operationalization of group-based attitudes. Results of our planned analyses will help to clarify the relationship between cognitive ability, cognitive reflection, and political animosity and favouritism among liberals and conservatives, while opening the door for future research on the topic.

References

Adorno, T. W., Frenkel-Brunswick, E., Levinson, D.J., & Sanford, R.N. (1950). *The authoritarian personality*, 744-783. Harper and Row.

Albright, J. J. (2009). Does political knowledge erode party attachments? A review of the cognitive mobilization thesis. *Electoral Studies*, *28*(2), 248-260. https://doi.org/10.1016/j.electstud.2009.01.001

Allport, G. W. (1954). The nature of prejudice.

Barabas, J., Jerit, J., Pollock, W., & Rainey, C. (2014). The question (s) of political knowledge. *American Political Science Review*, *108*(4), 840-855. https://doi.org/10.1017/s0003055414000392

Bergh, R., & Brandt, M. J. (2022). Generalized Prejudice: Lessons about social power, ideological conflict, and levels of abstraction. *European Review of Social Psychology*, 1-35. https://doi.org/10.1080/10463283.2022.2040140

Bialek, M., & Pennycook, G. (2018). The cognitive reflection test is robust to multiple exposures. *Behavior Research Methods*, *50*, 1953-1959. https://doi.org/10.3758/s13428-017-0963-x

Blanchar, J. C., & Sparkman, D. J. (2020). Individual differences in miserly thinking predict endorsement of racial/ethnic stereotypes. *Social Cognition*, *38*(5), 405-421. https://doi.org/10.1521/soco.2020.38.5.405

Brandt, M. J., & Crawford, J. T. (2020). Worldview conflict and prejudice. In *Advances in experimental social psychology* (Vol. 61, pp. 1-66). Academic Press. https://doi.org/10.1016/bs.aesp.2019.09.002

Brandt, M. J., Reyna, C., Chambers, J. R., Crawford, J. T., & Wetherell, G. (2014). The ideological-conflict hypothesis: Intolerance among both liberals and conservatives. *Current Directions in Psychological Science*, *23*(1), 27-34. https://doi.org/10.1177/0963721413510932

Brandt, M. J. (2017). Predicting ideological prejudice. *Psychological Science*, *28*(6), 713-722. https://doi.org/10.1177/0956797617693004

Brandt, M. J., & Crawford, J. T. (2019). Studying a heterogeneous array of target groups can help us understand prejudice. *Current Directions in Psychological Science*, *28*(3), 292-298. https://doi.org/10.1177/0963721419830382

Brandt, M. J., & Crawford, J. T. (2016). Answering unresolved questions about the relationship between cognitive ability and prejudice. *Social Psychological and Personality Science*, *7*(8), 884-892. https://doi.org/10.1177/1948550616660592

Brandt, M. J., Wetherell, G., & Crawford, J. T. (2016). Moralization and intolerance of ideological outgroups. In *The social psychology of morality* (pp. 239-256). Routledge. https://doi.org/10.4324/9781315644189-14

Carpini, M. X. D., & Keeter, S. (1993). Measuring political knowledge: Putting first things first. *American Journal of Political Science*, 1179-1206. https://doi.org/10.2307/2111549

Carpini, M. X. D., & Keeter, S. (1996). *What Americans know about politics and why it matters*. Yale University Press.

Chambers, J. R., Schlenker, B. R., & Collisson, B. (2013). Ideology and prejudice: The role of value conflicts. *Psychological Science*, *24*(2), 140-149. https://doi.org/10.1177/0956797612447820

Converse, P. E. (1964). The nature of belief systems in mass publics. In David Apter (Ed.), *Ideology and Discontent*. New York: Free Press.

Costello, T. H., Bowes, S. M., Baldwin, M. W., Malka, A., & Tasimi, A. (2022). Revisiting the rigidity-of-the-right hypothesis: A meta-analytic review. *Journal of Personality and Social Psychology*. https://doi.org/10.1037/pspp0000446

Crandall, C. S., & Eshleman, A. (2003). A justification-suppression model of the expression and experience of prejudice. *Psychological Bulletin*, *129*(3), 414. https://doi.org/10.1037/0033-2909.129.3.414

Crawford, J. T., & Pilanski, J. M. (2014). Political intolerance, right and left. *Political Psychology*, *35*(6), 841-851. https://doi.org/10.1111/j.1467-9221.2012.00926.x

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*(4), 807-823. https://doi.org/10.1002/ejsp.2548

De Keersmaecker, J., Bostyn, D. H., Van Hiel, A., & Roets, A. (2021). Disliked but free to speak: Cognitive ability is related to supporting freedom of speech for groups across the ideological spectrum. *Social Psychological and Personality Science*, *12*(1), 34-41. https://doi.org/10.1177/1948550619896168

Dhont, K., & Hodson, G. (2014). Does lower cognitive ability predict greater prejudice?. *Current Directions in Psychological Science*, *23*(6), 454-459. https://doi.org/10.1177/0963721414549750

Eidelman, S., Crandall, C. S., Goodman, J. A., & Blanchar, J. C. (2012). Low-effort thought promotes political conservatism. *Personality and Social Psychology Bulletin*, *38*(6), 808-820. https://doi.org/10.1177/0146167212439213

Ekehammar, B., & Akrami, N. (2003). The relation between personality and prejudice: A variable-and a person-centered approach. *European Journal of Personality*, *17*(6), 449-464. https://doi.org/10.1002/per.494

Enders, C. K. (2017). Multiple imputation as a flexible tool for missing data handling in clinical research. *Behaviour Research and Therapy*, *98*, 4-18. https://doi.org/10.1016/j.brat.2016.11.008

Finkel, E. J., Bail, C. A., Cikara, M., Ditto, P. H., Iyengar, S., Klar, S., ... & Druckman, J. N. (2020). Political sectarianism in America. *Science*, *370*(6516), 533-536. https://doi.org/10.1126/science.abe1715

Flynn, F. J. (2005). Having an open mind: the impact of openness to experience on interracial attitudes and impression formation. *Journal of Personality and Social Psychology*, *88*(5), 816. https://doi.org/10.1037/0022-3514.88.5.816

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, *19*(4), 25-42. https://doi.org/10.1257/089533005775196732

Ganzach, Y., & Schul, Y. (2021). Partisan ideological attitudes: Liberals are tolerant; the intelligent are intolerant. *Journal of Personality and Social Psychology*, *120*(6), 1551. https://doi.org/10.1037/pspi0000324

Gelman, A., & Hill, J. (2006). *Data analysis using regression and multilevel/hierarchical models*. Cambridge university press.

Graham, J., Haidt, J., & Nosek, B. A. (2009). Liberals and conservatives rely on different sets of moral foundations. *Journal of Personality and Social Psychology*, *96*(5), 1029. https://doi.org/10.1037/a0015141

Graziano, W. G., Bruce, J., Sheese, B. E., & Tobin, R. M. (2007). Attraction, personality, and prejudice: liking none of the people most of the time. *Journal of Personality and Social Psychology*, *93*(4), 565. https://doi.org/10.1037/0022-3514.93.4.565

Green, P., & MacLeod, C. J. (2016). SIMR: An R package for power analysis of generalized linear mixed models by simulation. *Methods in Ecology and Evolution*, *7*(4), 493-498. https://doi.org/10.1111/2041-210x.12504

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: the implicit association test. *Journal of Personality and Social Psychology*, *74*(6), 1464. https://doi.org/10.1037/0022-3514.74.6.1464

Hodson, G., & Busseri, M. A. (2012). Bright minds and dark attitudes: Lower cognitive ability predicts greater prejudice through right-wing ideology and low intergroup contact. *Psychological Science*, *23*(2), 187-195. https://doi.org/10.1177/0956797611421206

Iyengar, S., Lelkes, Y., Levendusky, M., Malhotra, N., & Westwood, S. J. (2019). The origins and consequences of affective polarization in the United States. *Annual Review of Political Science*, *22*, 129-146. https://doi.org/10.1146/annurev-polisci-051117-073034

Iyengar, S., & Westwood, S. J. (2015). Fear and loathing across party lines: New evidence on group polarization. *American Journal of Political Science*, *59*(3), 690-707. https://doi.org/10.1111/ajps.12152

Jost, J. T., Glaser, J., Kruglanski, A. W., & Sulloway, F. J. (2003). Political conservatism as motivated social cognition. *Psychological Bulletin*, *129*(3), 339. https://doi.org/10.1037/0033-2909.129.3.339

Jost, J. T. (2006). The end of the end of ideology. *American Psychologist*, *61*(7), 651. https://doi.org/10.1037/0003-066x.61.7.651

Jost, J. T. (2017). Ideological asymmetries and the essence of political psychology. *Political Psychology*, *38*(2), 167-208. https://doi.org/10.1111/pops.12407

Kahan, D. M. (2013). Ideology, motivated reasoning, and cognitive reflection. *Judgment and Decision Making*, *8*(4), 407-424. https://doi.org/10.1017/s1930297500005271

Kahneman, D., & Frederick, S. (2002). Representativeness revisited: Attribute substitution in intuitive judgment. *Heuristics and biases: The psychology of intuitive judgment*, *49*(49-81), 74. https://doi.org/10.1017/cbo9780511808098.004

Kan, K.-J., Wicherts, J. M., Dolan, C. V., & van der Maas, H. L. (2013). On the nature and nurture of intelligence and specific cognitive abilities: The more heritable, the more culture dependent. *Psychological Science*, *24*, 2420–2428. https://doi.org/10.1177/0956797613493292

Kinder, D. R., & Kalmoe, N. P. (2017). *Neither liberal nor conservative: Ideological innocence in the American public*. University of Chicago Press.

Kingston, P. W., Hubbard, R., Lapp, B., Schroeder, P., & Wilson, J. (2003). Why education matters. *Sociology of Education*, 53-70. https://doi.org/10.2307/3090261

Koch, A., Imhoff, R., Unkelbach, C., Nicolas, G., Fiske, S., Terache, J., ... & Yzerbyt, V. (2020). Groups' warmth is a personal matter: Understanding consensus on stereotype dimensions reconciles adversarial models of social evaluation. *Journal of Experimental Social Psychology*, *89*, 103995. https://doi.org/10.1016/j.jesp.2020.103995

Kossowska, M., Czernatowicz-Kukuczka, A., & Sekerdej, M. (2017). Many faces of dogmatism: Prejudice as a way of protecting certainty against value violators among dogmatic

believers and atheists. *British Journal of Psychology*, *108*(1), 127-147. https://doi.org/10.1111/bjop.12186

Lick, D. J., Alter, A. L., & Freeman, J. B. (2018). Superior pattern detectors efficiently learn, activate, apply, and update social stereotypes. Journal of Experimental Psychology: General, 147 (2), 209–227. https://psycnet.apa.org/doi/10.1037/xge0000349

Little, R. J., & Rubin, D. B. (1989). The analysis of social science data with missing values. *Sociological Methods & Research*, *18*(2-3), 292-326. https://doi.org/10.1177/0049124189018002004

Madley-Dowd, P., Hughes, R., Tilling, K., & Heron, J. (2019). The proportion of missing data should not be used to guide decisions on multiple imputation. *Journal of Clinical Epidemiology*, *110*, 63-73. https://doi.org/10.1016/j.jclinepi.2019.02.016

Malhotra, N., Krosnick, J. A., & Haertel, E. (2007). The psychometric properties of the GSS Wordsum vocabulary test. *GSS Methodological Report*, *11*, 1-63.

Mason, L. (2018). *Uncivil agreement: How politics becameß our identity*. University of Chicago Press.

Meisenberg, G. (2015). Verbal ability as a predictor of political preferences in the United States, 1974–2012. *Intelligence*, *50*, 135-143. https://doi.org/10.1016/j.intell.2015.03.004

Mistler, S. A., & Enders, C. K. (2012). Planned missing data designs for developmental research.

Mosleh, M., Martel, C., Eckles, D., & Rand, D. G. (2021). Shared partisanship dramatically increases social tie formation in a Twitter field experiment. *Proceedings of the National Academy of Sciences*, *118*(7), e2022761118. https://doi.org/10.31234/osf.io/ykh5t

Onraet, E., Van Hiel, A., Dhont, K., Hodson, G., Schittekatte, M., & De Pauw, S. (2015). The association of cognitive ability with right–wing ideological attitudes and prejudice: A

meta–analytic review. *European Journal of Personality*, *29*(6), 599-621. https://doi.org/10.1002/per.2027

Otero, I., Salgado, J. F., & Moscoso, S. (2022). Cognitive reflection, cognitive intelligence, and cognitive abilities: A meta-analysis. *Intelligence*, *90*, 101614. https://doi.org/10.1016/j.intell.2021.101614

Pennycook, G., Fugelsang, J. A., & Koehler, D. J. (2015). Everyday consequences of analytic thinking. *Current Directions in Psychological Science*, *24*(6), 425-432. https://doi.org/10.1177/0963721415604610

Pennycook, G., & Rand, D. G. (2019). Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition*, *188*, 39-50. https://doi.org/10.1016/j.cognition.2018.06.011

Saribay, S. A., & Yilmaz, O. (2017). Analytic cognitive style and cognitive ability differentially predict religiosity and social conservatism. *Personality and Individual Differences*, *114*, 24-29. https://doi.org/10.1016/j.paid.2017.03.056

Schmidt, K., Stevens, A., Szabelska, A., Graham, J., Hawkins, C.B., & Nosek, B. A. (2022). The Ideology 2.0 Dataset. https://osf.io/2483h/.

Sibley, C. G., & Duckitt, J. (2008). Personality and prejudice: A meta-analysis and theoretical review. *Personality and Social Psychology Review*, *12*(3), 248-279. https://doi.org/10.1177/1088868308319226

Stankov, L. (2009). Conservatism and cognitive ability. *Intelligence*, *37*(3), 294-304. https://doi.org/10.1016/j.intell.2008.12.007

Stern, C., & Crawford, J. T. (2021). Ideological conflict and prejudice: An adversarial collaboration examining correlates and ideological (a) symmetries. *Social Psychological and Personality Science*, *12*(1), 42-53. https://doi.org/10.1177/1948550620904275

Stuart, E. A., Azur, M., Frangakis, C., & Leaf, P. (2009). Multiple imputation with large data sets: a case study of the Children's Mental Health Initiative. *American Journal of Epidemiology*, *169*(9), 1133-1139. https://doi.org/10.1093/aje/kwp026

Tappin, B. M., Pennycook, G., & Rand, D. G. (2020). Bayesian or biased? Analytic thinking and political belief updating. *Cognition*, *204*, 104375. https://doi.org/10.1016/j.cognition.2020.104375

Tappin, B. M., Pennycook, G., & Rand, D. G. (2021). Rethinking the link between cognitive sophistication and politically motivated reasoning. *Journal of Experimental Psychology: General*, *150*(6), 1095. https://doi.org/10.1037/xge0000974

Thorndike, R. L. (1942). Two screening tests of verbal intelligence. *Journal of Applied Psychology*, *26*, 128–135. https://doi.org/10.1037/h0060053

Toplak, M. E., West, R. F., & Stanovich, K. E. (2014). Rational thinking and cognitive sophistication: Development, cognitive abilities, and thinking dispositions. *Developmental Psychology*, *50*(4), 1037. https://doi.org/10.1037/a0034910

Turner-Zwinkels, F. M., van Noord, J., Kesberg, R., García-Sánchez, E., Brandt, M. J., Kuppens, T., ... & Turner-Zwinkels, T. (2023). Affective Polarization and Political Belief Systems: The Role of Political Identity and the Content and Structure of Political Beliefs. *Personality and Social Psychology Bulletin*, 01461672231183935.

Van Buuren, S., & Groothuis-Oudshoorn, K. (2011). mice: Multivariate imputation by chained equations in R. *Journal of Statistical Software*, *45*, 1-67. https://doi.org/10.18637/jss.v045.i03

Van Buuren, S. (2007). Multiple imputation of discrete and continuous data by fully conditional specification. *Statistical Methods in Medical Research*, *16*(3), 219-242. https://doi.org/10.1177/0962280206074463

Wetherell, G. A., Brandt, M. J., & Reyna, C. (2013). Discrimination across the ideological divide: The role of value violations and abstract values in discrimination by liberals and conservatives. *Social Psychological and Personality Science*, *4*(6), 658-667. https://doi.org/10.1177/1948550613476096

Witt, J. K. (2019). Graph construction: An empirical investigation on setting the range of the y-axis. *Meta-Psychology*, *3*. https://doi.org/10.15626/mp.2018.895

Wodtke, G. T. (2016). Are smart people less racist? Verbal ability, anti-black prejudice, and the principle-policy paradox. *Social Problems*, *63*(1), 21-45. https://doi.org/10.1093/socpro/spv028

Wolfle, L. M. (1980). The enduring effects of education on verbal skills. *Sociology of Education*, *53*, 104–114. https://doi.org/10.2307/2112492

Yilmaz, O., & Saribay, S. A. (2017). Analytic thought training promotes liberalism on contextualized (but not stable) political opinions. *Social Psychological and Personality Science*, *8*(7), 789-795. https://doi.org/10.1177/1948550616687092