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Brief article

Mind over bias: How is cognitive control related to politically motivated reasoning?

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ABSTRACT

People often favour information aligned with their ideological motives. Can our tendency for directional motivated reasoning be overcome with cognitive control? It remains contested whether cognitive control processes, such as cognitive reflection and inhibitory control, are linked to a greater tendency to engage in politically motivated reasoning, as proposed by the "motivated reflection" hypothesis, or can help people overcome it, as suggested by cognitive science research. In this pre-registered study ($N = 504$ UK participants rating $n = 4963$ news messages), we first provide evidence for motivated reasoning on multiple political and non-political topics. We then investigated the associations of the two cognitive control variables cognitive reflection and inhibitory control with motivated reasoning. We find that associations between cognitive control processes and motivated reasoning are likely small. On political topics specifically, we find that a negative association with cognitive reflection is more likely than a positive association. This finding is contrary to predictions from the popular motivated reflection hypothesis. Results for inhibitory control are inconclusive. We discuss how these findings relate to interdisciplinary literature from cognitive and political psychology.

1. Introduction

Rather than being truth seekers, people often evaluate the veracity of information in line with non-truth seeking motives, and their reasoning is directionally motivated towards desired or identity-protective conclusions (Kahan, 2016; Kunda, 1990). In today's political landscape, it is not just opinions that differ along ideological lines, but also beliefs about factual questions (Rekker & Harteveld, 2022; Van Bavel & Pereira, 2018). Politically motivated reasoning can lead people away from accurate judgments, resulting in polarised (Su, 2022) or misinformed beliefs (Ecker et al., 2022). One key question that remains unanswered is whether cognitive control processes, such as cognitive reflection and inhibitory control, can allow people to better resist politically motivated reasoning, or on the contrary, make them more likely to engage in it (e.g., Tappin, Pennycook, & Rand, 2020b). Two alternative hypotheses have been put forward.

According to the "motivated reflection" hypothesis, people use cognitive control processes to construct reasonable justifications that lead them towards desired conclusions. In other words, they are better at coming up with rational arguments to justify their directional biases (Kahan, 2013; Kahan, Peters, Dawson, & Slovic, 2017). A series of studies provide evidence for this in the political domain where people higher in cognitive sophistication appear more susceptible to motivated reasoning. In one seminal study (Kahan, 2013), participants who scored high on the Cognitive Reflection Test, a measure of the ability to suppress intuitive but incorrect answers in favour of more deliberate reasoning (Frederick, 2005), were also more prone to motivated reasoning when the information they received conflicted with their beliefs about climate change. A similar pattern for higher motivated reasoning on different political issues (e.g., effects of gun control, CO_2 emissions, immigration) was found for participants high in numerical ability (Kahan et al., 2017; Kahan & Peters, 2017; Nurse & Grant, 2020; Sumner, Scofield, Buchanan, Evans, & Shearing, 2023).

However, recent studies have challenged this "motivated reflection" hypothesis. First, the relationship between cognitive control processes and motivated reasoning varies across topics (Strömbäck, Andersson,

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Västfjäll, & Tinghög, 2024), and the aforementioned seminal finding has proven difficult to replicate (Bago, Rand, & Pennycook, 2023; Persson, Andersson, Koppel, Västfjäll, & Tinghög, 2021; Stagnaro, Tappin, & Rand, 2023). Furthermore, when accounting for differences in the prior beliefs between opposing partisans, the "motivated reflection" effect is not well-evidenced (Tappin, Pennycook, & Rand, 2021). In one study, those with higher cognitive reflection were even found to update their beliefs closer to the (rational) Bayesian ideal (Tappin, Pennycook, & Rand, 2020a). After all, could it be that the effect is in the opposite direction, and cognitive control processes are associated with less motivated reasoning?

An alternative hypothesis from cognitive sciences that focuses on specific components of executive functioning, such as cognitive flexibility and inhibitory control (i.e., the ability to inhibit automatic responses; Diamond, 2013) suggests that cognitive control processes should be associated with less ideological and dogmatic thinking (Zmigrod, 2021; Zmigrod, Eisenberg, Bissett, Robbins, & Poldrack, 2021). Neuroscientific evidence offers complementary support of the view that cognitive control processes can mitigate ideological biases (Németh, Vékony, Orosz, Sarnyai, & Zmigrod, 2024; Zmigrod, 2021). Prefrontal brain regions implicated in cognitive control play a crucial role in regulating habitual, impulsive, and affective responses (Mevel et al., 2019; Németh et al., 2024). When judging political content, stronger engagement of these regions, resulting in the ability to override automatic responses, may make people less susceptible to the automatic influences of motivated reasoning (Zmigrod, 2022). Connecting these insights from cognitive psychology and neuroscience to recent developments in the literature on politically motivated reasoning offers a promising interdisciplinary framework to disambiguate the often conflicting findings.

We here test these two alternative hypotheses using a "Fake News Task" to assess motivated reasoning (Thaler, 2024b). Previous work examining the association between cognitive control processes and motivated reasoning has used tasks that are confounded with prior beliefs and provided mixed results (Stagnaro et al., 2023; Tappin et al., 2021). People can favour information aligned with their prior beliefs (e.g., existing beliefs about immigration prevalence), which is consistent with normative models of Bayesian reasoning (Thaler, 2024b). However, people may also favour information aligned with their motives (e.g., information that protects one's identity or advances political aims; Williams, 2023). Prior beliefs and motives are often confounded, but only the latter constitutes motivated reasoning.

To illustrate why the confounding between prior beliefs and motives is problematic, take the example of people rating the Cognitive Reflection Test as more valid after reading a study suggesting that the test shows that people with political views similar to themselves are more reflective (Kahan, 2013). This observation is typically interpreted as motivated reasoning, but it is also fully compatible with "the standard model of rational learning – using Bayes rule, without any directional motives" (Little, 2025). Participants might genuinely believe their political ingroup is more reflective (prior; Tappin et al., 2020b), such that a more valid test should also indicate this, or people might be motivated to believe their ingroup is more reflective to defend their identity or other reasons (motivation; Kahan, 2013). Therefore, while findings using this design might indicate motivated reasoning, they are also consistent with Bayesian updating. People can hold different priors about which groups are more reflective and different beliefs about what a valid test should reveal, leading them to reach different conclusions about the validity of the test when presented with the same evidence, making virtually any pattern of belief updating compatible with both Bayesian updating and motivated reasoning (Coppock, 2023; Little, 2025; Tappin et al., 2020b; Thaler, 2024b).

This also makes it difficult to tell whether participants higher in cognitive control engage in more motivated reasoning or simply follow Bayesian updating to the same extent—or even more closely—than participants low in cognitive control (Little, 2025; Tappin et al., 2020b, 2021). Here, we draw on a task that was specifically developed in response to such concerns and to be immune to such confounding (Thaler, 2024b), adding important evidence to this line of literature. In this task (see Fig. 1), participants provide a median guess about a numerical quantity (e.g., the number of immigrants in the UK). They then receive a news message randomly telling them that the correct answer is "greater" or "less" than what they had guessed, and rate how likely it is that this message is true. "Greater" and "less" news messages are equally likely true in reference to participants' median guesses (prior), and since the messages are randomly assigned, they also have the same likelihood of being true. As the prior and likelihood are fixed in this experimental design, "unbiased" Bayesian agents should not systematically rate some messages as more true than others, irrespective of whether they are aligned with their motives.

In turn, motivated reasoners would act as if they receive an additional signal that puts more weight on favourable news messages (Thaler, 2024b). Thus, systematic differences in the ratings for messages that are aligned vs. conflicting with participants (political) stances more directly reflect motivational influences rather than differences in priors, although this theoretical approach also rests on assumptions, has its limitations, and places demands on participants (see Discussion). Nevertheless, this design provides a much cleaner foundation and a more stringent test of the association between cognitive control processes and politically motivated reasoning, thereby helping to resolve the mixed findings in the existing literature (see Tappin et al., 2020b).

As a measure of cognitive control processes, we use both the Cognitive Reflection Test and the Go / No-Go task. These two tasks allow us to assess the inhibition of automatic responses at different levels. The Cognitive Reflection Test, commonly used in previous research, taps into cognitive control in complex reasoning. The Go / No-Go task, a neurocognitive inhibitory control task, can provide a more fine-grained understanding of which cognitive control processes are linked to motivated reasoning. This is important because how a cognitive variable is measured likely contributes to the mixed findings in the literature (Sultan et al., 2024), and we explicitly address this heterogeneity using two established measures. As we derived the two cognitive control measures from different lines of research and as they might operate at different levels of abstraction, we analyse their associations with motivated reasoning separately. This helps us clarify whether the effects are consistent across different aspects of cognitive control: If the results diverge, it highlights how sensitive findings are to the specific cognitive measures used, but if they converge, this can help us bridge insights from political psychology and cognitive science.

In summary, we investigate how cognitive control processes are associated with motivated reasoning. There are three reasons why we deem our study and its findings as important beyond what is already covered in the literature. First, while the evidence for the motivated reflection hypothesis is mixed at best (e.g., Tappin et al., 2021), the hypothesis continues to receive attention and be referenced widely in research across domains (e.g., Nurse & Grant, 2020; Cassario et al., 2024; Sultan et al., 2024; Bayrak, Boyacioglu, & Yilmaz, 2025). Second, findings of previous studies might be inconclusive because the designs they used to assess motivated reasoning confound prior beliefs with motives, while we draw on recent methodological developments to better isolate motivated reasoning. That is, confounding of prior beliefs and political motives could cut both ways: generating spurious motivated reasoning effects and/or masking "real" effects, particularly when conditioning on third variables like cognitive reflection/intelligence which are likely to covary with both motives and prior beliefs (e.g., Tappin & McKay, 2021). Finally, how cognitive control is measured could also lead to heterogenous findings, and insights from cognitive and political psychology remain to be bridged. In what follows, we will first investigate the overall prevalence of motivated reasoning on different topics among young adults from the UK, and then compare the relative evidence for the following competing cognitive hypotheses:

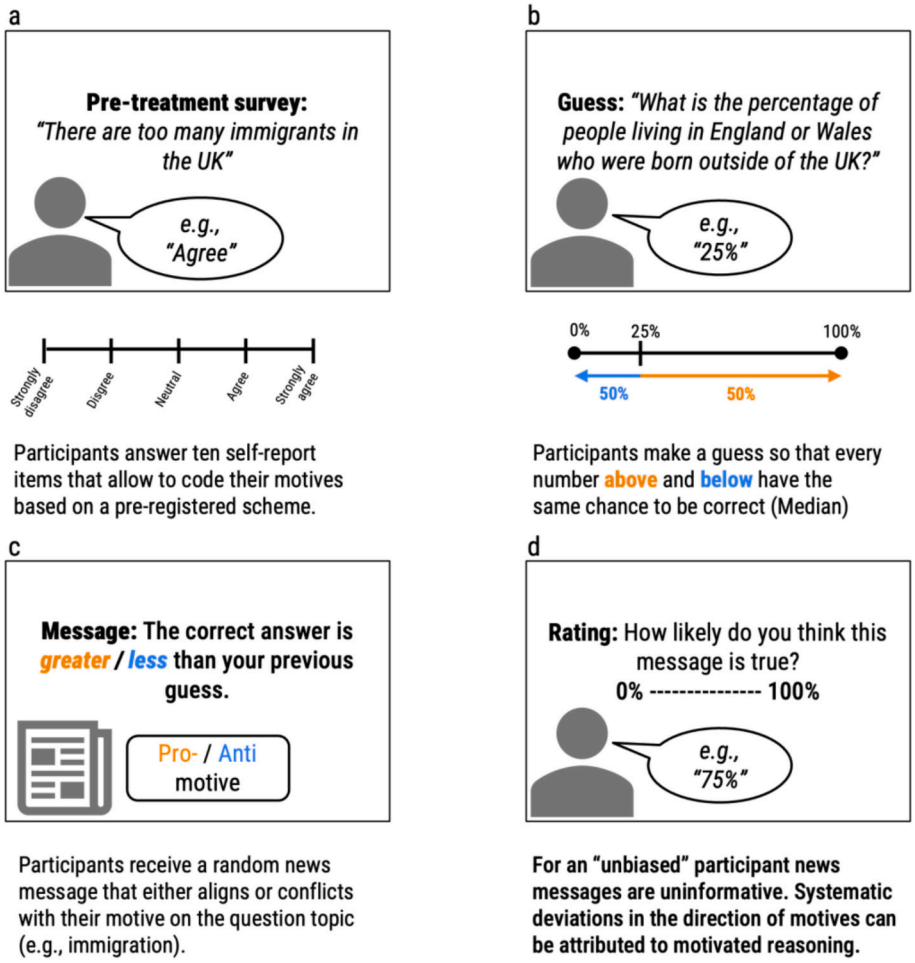

Fig. 1. Schematic display of the Fake News Game.
Note. (a) Participants' motives on different topics are assessed through pretreatment self-report items (e.g., "There are too many immigrants in the UK"). Participants who agree with this item are classified as holding anti-immigration motives and assumed to be more likely to perceive messages indicating higher immigrant numbers as true, as this would allow them to protect their political identity or advocate for their political party's goals (Kahan, 2016; Williams, 2023). (b) In the Fake News Game, for each topic, participants first provide their median guess to a numerical question, i.e., a guess for which they believe that it is equally likely that the correct answer falls above or below. (c) Participants then receive a news message randomly stating that the correct answer is greater or less than their guess. This random assignment serves as the primary experimental manipulation, as it determines whether a message aligns with (Pro), conflicts with (Anti), or is neutral regarding the participant's inferred motives. (d) Finally, participants rate the likelihood of the message being true on a slider from 0 to 100 %. For "unbiased" Bayesian observers the news messages provided no new information. Systematic deviations in ratings between "Pro" and "Anti"-motive messages can thus be attributed to motivated reasoning.

H1a. *Cognitive reflection is associated with more motivated reasoning.*

H1b. *Cognitive reflection is associated with less motivated reasoning.*

H2a. *Inhibitory control is associated with more motivated reasoning.*

H2b. *Inhibitory control is associated with less motivated reasoning.*

2. Methods

2.1. Participants

We recruited $N = 504$ participants from Prolific (https://www.prolific.com/). Participants were from the United Kingdom and stratified across three age groups (18–24, 25–31, and 32–38 yrs.). This decision was guided by two considerations: First, the focus on young people aligns with the scope of the larger research program this study contributes to is concerned with the development of political attitudes in adolescence and youth. Second, we aimed to minimise differences potentially linked to age-related decline in cognitive control, as performance on relevant tasks tends to be more stable within this age range compared to later adulthood (Tervo-Clemmens et al., 2023). We acknowledge the implications of this design choice for the generalisability of our findings in the Discussion section. The sample was further balanced in political ideology (left/right-wing) to ensure a broad distribution of political opinion. The final sample comprised 42.7 % women, with age $M = 28.1$ years ($SD = 6.1$, range: 18–51) and political ideology distributed as 52.6 % left-leaning, 4.6 % moderate, and 42.8 % right-leaning. Detailed demographics are provided in the Supplementary Materials.

2.2. Procedure

Tasks were administered online using Gorilla Experiment Builder (https://www.gorilla.sc). After providing informed consent, participants completed demographic questionnaires, followed by the Cognitive Reflection Test, Go/No-Go Task, and Fake News Game. As preregistered, we excluded two participants who failed an initial attention check. While not pre-registered, four additional participants had to be excluded due to technical issues causing missing or duplicate trials in the main tasks. In line with our pre-registered protocol, we thus

recruited six new participants to maintain a sample size of $N = 504$. This sample size was determined by resource constraints. However, an a-priori power simulation indicated 80 % power to detect medium effects ($\beta = 0.30$) on the logit scale to detect main effects of motivated reasoning (details in pre-registration). The study received ethical approval from the Research Ethics Committee at <blinded>.

2.3. Measures

2.3.1. Cognitive reflection test

Participants completed a 3-item version of the Cognitive Reflection Test (Frederick, 2005), which measures the capacity to inhibit intuitive, but incorrect, in favour of deliberative correct answers. The predictive validity of the Cognitive Reflection Test appears robust to repeated testing (Bialek & Pennycook, 2018), and to have high test-retest reliability (Stagnaro, Pennycook, & Rand, 2018). To further ensure our online sample was not overly familiar with the items, we used a less common set of problems (for items see OSF). We summed the number of correct answers to a score ranging from 0 to 3, with higher scores indicating higher cognitive reflection.

2.3.1.1. Go / No-Go task. We used a fast-paced Go/No-Go task to measure inhibitory control (Wessel, 2018). Participants had to press the spacebar in response to frequent Go stimuli (letters "M" or "P"; 80 % of trials) and withhold responses to infrequent No-Go stimuli (letters "W" or "R"; 20 % of trials), resulting in an automatic tendency to respond that had to be inhibited during No-Go trials. The task comprised two runs with different letter combinations, counterbalanced across participants, with practice trials before each run. Stimuli were presented briefly (250 ms) with a short response window (500 ms) and inter-trial interval (1000 ms; *see* Supplementary Materials). Our main measure of interest was the reverse-coded number of commission errors (false alarms during No-Go trials), with higher scores indicating greater inhibitory control.

2.3.2. Fake news game

We developed a gamified task (*see* Fig. 1) based on a validated experimental paradigm to assess motivated reasoning (Thaler, 2024b).

2.3.2.1. Participant instructions. Participants played the role of "Fake News Detectives". On each round of the game, they first guessed the answer to a factual numerical question. Participants were instructed to guess the answer so that it is as likely that the correct answer is greater than their guess, as it is that the correct answer is less than their guess. (see Fig. 1b). This instruction had the goal to elicit median responses in an accessible way. We provided a concrete example for this guessing strategy and reminded them of this instruction throughout the task (*see* Supplementary Materials). After providing their guess, participants received a news message (Fig. 1c) and should "detect the deception" by indicating how likely it is that this news message is true on a continuous slider from 0 % to 100 % (Fig. 1d). Participants were informed that this news message only tells them whether the correct answer is greater or less than their guess, and that each message randomly either comes from a True News source, which always tells the truth, or from a Fake News source, which never tells the truth.

2.3.2.2. Task procedure. In total, participants played 11 rounds: a practice trial (excluded from analysis), six political trials (questions on climate change, immigration, reconviction of criminals, racial discrimination, gender stereotypes, and adoption by same-sex partners), two trials asking about their performance in the Go / No-Go Task and the current Fake News Game compared to 100 other participants, and two trials with more general topics (questions about grey matter proportion in the brain and tea with milk preferences). The order of trials was randomised, aside from the trial on the performance of the Fake News Game, which was always presented last, to ensure all participants rated the question based on the same amount of knowledge.

2.3.2.3. Motive coding. For each question topic, we coded the motive of participants through a survey administered at the beginning of the study (Fig. 1a). Participants indicated their level of agreement to items such as "*There are too many immigrants in the UK*". In this example, participants who agreed with this statement were coded to hold anti-immigration motives, and in turn to be more likely to endorse messages stating that there are many immigrants in the country, as this would allow them to protect their political identity or to advocate for their political goals (Kahan, 2016; Williams, 2023). We pre-registered and openly share all items and the motive coding scheme.

2.3.2.4. Motivated reasoning. The primary experimental manipulation in the task was the random assignment of news messages telling participants that the correct answer is greater or less than their guess. Through this random assignment, news messages were also randomly aligned (Pro) or against (Anti) the motives of participants. Motivated reasoning was operationalized as systematic differences in the ratings between pro- and anti-motive messages, with higher veracity ratings for pro-motive messages. Importantly, whether a message is True or Fake News is not relevant in the task: The interest it not news discernment (i.e., how accurate participants are in detecting True News), but simply on whether participants rate pro-motive messages as more true than anti-motive messages, averaged over news messages randomly coming from a True News or a Fake News source.

2.3.2.5. Theoretical model of the task. The task is designed to differentiate between the congruence of news messages with prior beliefs from the congruence of news messages with the motives of participants, with only the latter reflecting motivated reasoning. The paradigm does so by setting up a task environment that allows to distinguish between normative Bayesian reasoning from motivated reasoning: As median guesses are elicited, for Bayesian agents the randomly assigned news messages should be equally likely in reference to their prior. Bayesian agents should thus report their prior irrespective of whether a news message is aligned or against their motives, and no systematic differences based on inferred motives should be apparent (for details of the theoretical model, see Thaler, 2024b).

2.3.2.6. Limitations and robustness of the task. The task has been extensively validated (Thaler, 2024b) and used in research across disciplines (e.g., Eyting, 2022; Lois, Tsakas, Yuen, & Riedl, 2024; Thaler, 2024a, 2024b). However, while overcoming limitations of previous tasks, it is also not without limitations. First, participants may find it hard to report median guesses. This could lead to systematic differences between pro- and anti-motive messages even in the absence of motivated reasoning if participants prior belief distributions are skewed and covary with their motives. However, the task appears empirically robust against deviations from the median in participants' guesses (Thaler, 2024b). Participants may also not understand that True News and Fake News have the same probability in this task. While this would shift participants prior belief about the probability of the event True News, it should not differentially shift the prior of the event True News for pro- and anti-motive messages, and systematic differences in ratings can still be attributed to motivated reasoning. We thus use the average treatment effect of pro- vs. anti-motive messages as our primary operationalisation of motivated reasoning.

2.4. Statistical analyses

We fit separate Bayesian ordered beta regression models in R 4.4.1 (R Core Team, 2024) using the ordbetareg package (Version 0.7.2; Kubinec, 2023) for three vignette types (political, performance-related, general)

and three parameter specifications: (1) the main effect of motivated reasoning (Pro-motive > Anti-motive), (2) its interaction with cognitive reflection, and (3) its interaction with inhibitory control. This modelling approach takes the upper and lower bounds of response variables into account, a particularly useful feature shown to be more efficient than common alternatives (e.g., linear probability model) for 0–100 % slider ratings as used in this study (Kubinec, 2023). We used marginaleffects to compute posterior predictions and comparisons on the percentage scale (Arel-Bundock, Greifer, & Heiss, 2024).

In all pre-registered models, motivated reasoning was operationalized as the difference between Pro- and Anti-motive message ratings using a dummy-coded predictor. Our primary inferential estimate of interest was the interaction of the assessed cognitive variables (cognitive reflection, inhibitory control) with motivated reasoning. We also modelled varying intercepts by participant and question topics, and varying slopes for motive by participant and topic.

In secondary analyses (reported in the Supplementary Materials), we investigated whether motivated reasoning increases with motive strength, provide insights from an alternative motive-coding scheme, and on polarisation in the numerical guesses of participants in the factual questions before the news message ratings. We conducted several further post-hoc robustness checks: First, we excluded participants with low accuracy (< 50 %) on the Go/No-Go Task, failing a post-treatment attention check, or reporting being inattentive or dishonest, to ensure that our results are robust against the exclusion of inattentive participants. Next, we investigated whether findings were robust against participants' understanding of the optimal strategy in the Fake News Game. In separate models, we therefore either excluded participants who responded with 50 % on half (five) or more trials of the task, or participants who responded with 50 % in a first practice round. Finally, we ran robustness analyses excluding participants who guessed 0 or 100 as the answer to the factual questions, as this could have led to non-meaningful (impossible or definitively true) news messages. Details about these robustness analyses are presented in the Supplementary materials, with results closely resembling those reported in the main text.

2.5. Open practices

The study was pre-registered at https://osf.io/x6fkm. We openly provide all task materials, raw and cleaned data, and analysis scripts at https://osf.io/uztn7.

2.5.1. Deviations from pre-registered protocol

The preregistered models for performance and general topics faced computational issues (e.g., divergent transitions, max treedepth limits) due to insufficient factor levels and data to estimate the variance components. To address this, we deviated from the preregistration by removing varying intercepts and slopes by question topic and instead modelled question topic as a scaled sum-coded binary fixed effect (−0.5, 0.5). This resolved the issues and improved model robustness.

3. Results

In total, we analysed the ratings of $N = 4963$ news messages (Pro-motive: 41.0 %, anti-motive: 40.2 %, general: 18.8 %), of which $n = 3018$ were for political questions $n = 1008$ for performance questions, and $n = 937$ for general questions. Out of the total $N = 504$ participants, only $n = 14$ participants (i.e. 2.8 % of our sample) responded with 50 % on half (five) or more trials ($n = 4$ on ten trials), which might indicate that they understood the information was non-diagnostic about the veracity of the news. In turn, a large majority of the sample (97.2 %) deviated from 50 % on more than half of trials ($n = 490$).

To establish the presence of the basic motivated reasoning effect, we thus start by presenting results for deviations that were *systematic* in the direction of participants' motives—before examining whether and how this is associated with our cognitive control variables.

3.1. Motivated reasoning on political, performance, and general questions

Models predicting message ratings based on motives converged well (R-hat <1.01 for fixed effects, R-hat <1.05 for random effects). On political topics, participants rated pro-motive messages as more true than anti-motive messages (see Table 1), with an average predicted effect of motivated reasoning of 9.2 % (95 % CI [7.4, 11.1]). This effect is consistent across political topics (*see* Fig. 2) and increases monotonically with the strength of participants' motives (see Supplementary Materials).

For performance topics, the predicted average effect of motivated reasoning was 4.2 % (95 % CI [0.8, 7.6]). The effect was again consistent across the two items (*see* Fig. 2). On general topics, the predicted average effect was 9.4 % (95 % CI [5.7, 13.2]). However, in this case there was a large difference between items: While the effect of motivated reasoning about the proportion of grey matter in the brain was small and not credibly different from 0, the effect was large on a vignette about the prevalence of the preference of tea with milk in the UK (*see* Fig. 2). Overall, these results indicate strong evidence of directional motivated reasoning across topics, with particularly consistent effects on political questions.

3.2. Cognitive variables and motivated reasoning

Models investigating the interaction between cognitive variables and motivated reasoning converged well (R-hat <1.01 for all fixed effects, R-hat <1.05 for all random effects).

On political questions, the interaction between motive and cognitive reflection was negative on average (*see* Table 1 and Fig. 3), although null and very small positive effects also are credible according to the 95 % CI [−0.139, 0.010]. To better contrast the relative evidence for the two competing directional hypotheses even if we can't rule out a null-effect based on the 95 % CI, we then calculated the evidence ratio for the hypothesis that higher cognitive reflection is associated with less, compared to more motivated reasoning.

The evidence ratio is the ratio of the posterior probabilities under each hypothesis, and thus different from Bayes Factors that compare posterior probabilities with the prior probability under the null

Table 1
Parameter estimates from ordered beta regression models.

		95 % CI		Evidence Ratio	
Parameter	Median	LL	UL	β > 0	β < 0
Political Questions					
Motive (Pro > Anti)	0.363	0.258	0.475	Inf	0.000
Motive x Cognitive Reflection	−0.063	−0.139	0.010	0.049	20.333
Motive x Inhibitory Control	0.024	−0.049	0.100	2.714	0.368
Performance Questions					
Motive (Pro > Anti)	0.169	0.025	0.312	90.954	0.011
Motive x Cognitive Reflection	−0.033	−0.180	0.116	0.499	2.005
Motive x Inhibitory Control	−0.075	−0.232	0.075	0.191	5.245
Neutral Questions					
Motive (Pro > Anti)	0.361	0.209	0.517	Inf	0.000
Motive x Cognitive Reflection	−0.097	−0.261	0.060	0.130	7.696
Motive x Inhibitory Control	0.173	0.012	0.329	63.000	0.016

Note. We fit separate ordered beta regression models, each corresponding to a combination of three vignette types (political, performance-related, and general) and three parameter specifications: (1) the main effect of motivated reasoning (Motive (Pro > Anti)), (2) its interaction with cognitive reflection, and (3) its interaction with inhibitory control. All estimates are reported on the logit scale. 95 % CI are equal tail intervals. Evid.Ratio indicates the posterior probability of the direction of an effect compared to its alternative.

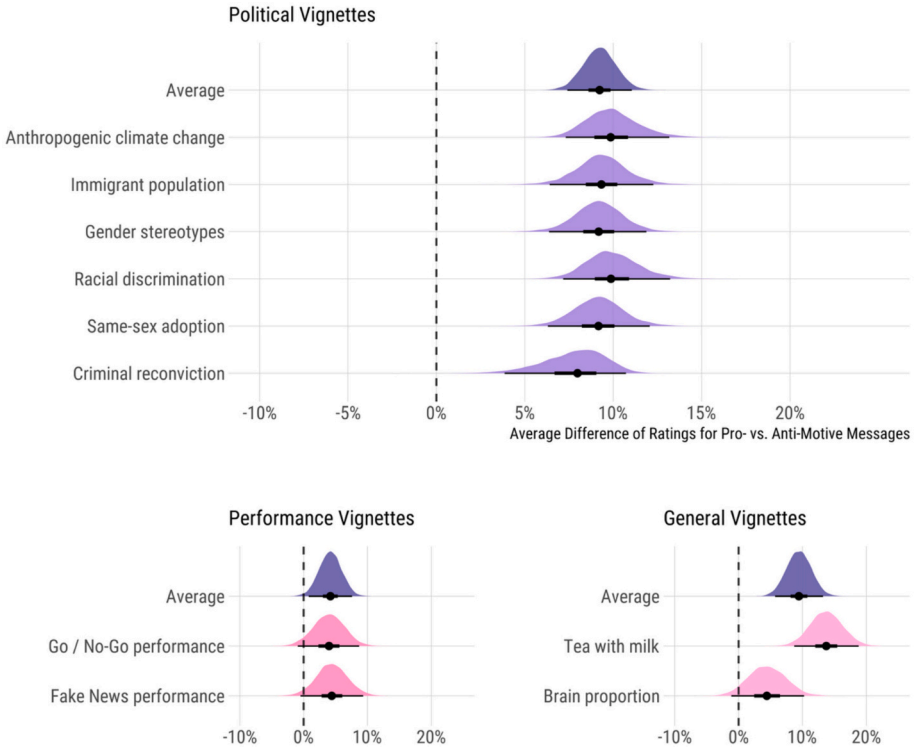

Fig. 2. Motivated reasoning on different topics.
Note. Visualisation of posterior predicted comparisons between ratings of Pro- and Anti-motive messages in percentage. For political topics, differences between topics are modelled with a variance term (motive | topic). For performance and general topics, we modelled a fixed effect interaction between motive and topic. Thick error bars indicate 50 % CIs, thin bars 95 % CIs, dots the median, and slabs the distribution of the posterior draws.

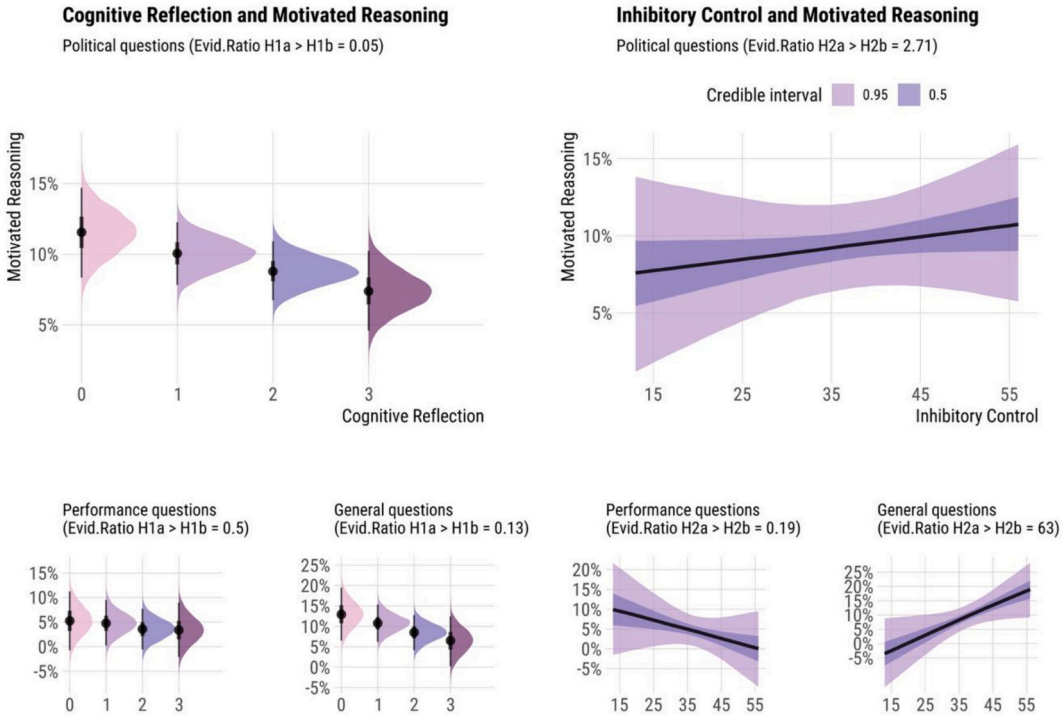

Fig. 3. Cognitive Reflection, Inhibitory Control, and Motivated Reasoning.
Note. Association of cognitive reflection (left) and inhibitory control (right) with motivated reasoning across different question types (political, performance, general).

hypothesis (Makowski, Ben-Shachar, Chen, & Lüdecke, 2019). While providing limited information about the null, the evidence ratio is particularly useful for distinguishing between competing directional hypotheses and is equivalent to a directional Bayes Factor: values above 1 favour a negative association, and values between 0 and 1 favour a positive association. Here, the evidence ratio of 20.33 indicates relative evidence in favour of a negative, rather than a positive ("motivated reflection") association.

To make this finding more intuitive, for participants high in cognitive reflection (i.e., three correct answers on the Cognitive Reflection Test) the predicted effect of politically motivated reasoning was on average 4.2 % (95 % CI [−0.6, 9.2]) smaller than for participants with a low Cognitive Reflection Test score of 0. Effects were smaller but directionally consistent for performance-related and general questions (see Table 1). Overall, based on our model and data, moderate-to-large positive interactions are unlikely, and participants higher in cognitive reflection may engage less in politically motivated reasoning, but small and null effects remain plausible.

The interaction between motive and inhibitory control was positive, but both small negative and small positive effects sizes were credible. The evidence ratio also provided only inconclusive evidence in favour of a positive vs. negative effect direction (Evid. $\text{Ratio}_{\beta>0} = 2.71$). For general questions, the model indicated that participants high in inhibitory control engaged in more motivated reasoning, and here a positive effect was more likely than a negative one (Evid. $\text{Ratio}_{\beta>0} = 63$). In turn, for performance questions, the effect was inconclusive, but negative on average (*see* Table 1). It is thus unclear whether and to what extent inhibitory control is associated with motivated reasoning, and the effect may differ depending on the context of reasoning.

3.3. Follow-up analyses

As the estimates for the interaction effects between the cognitive variables and motivated reasoning on performance and general questions were imprecise, we ran follow-up models across all question types (political, performance, and general) including question type as a sum-coded main effect and its interactions. Interaction coefficients represent the average interaction across all three question types. For cognitive reflection, the interaction across topics was slightly weaker than for just political topics ($\beta_{\text{logit}} = -0.06$, 95 % CI [−0.131, 0.015], Evid. $\text{Ratio}_{\beta<0} = 15.95$). For inhibitory control, the interaction became more positive ($\beta_{\text{logit}} = 0.05$, 95 % CI [−0.019, 0.127], Evid. $\text{Ratio}_{\beta>0} = 12.51$). This pattern suggests results may be sensitive to the specific cognitive control measure used and highlights the overall trends across topics; cognitive reflection is more likely associated with less, and inhibitory control with more motivated reasoning, but interactions remain small, and 95 % CIs include 0.

Finally, in the Supplementary Materials, we provide insights on polarisation based on participants' motives in the numerical guesses on the factual questions and the association with the two cognitive control variables. While our models and data indicated differences in the factual beliefs aligned with the direction of participants' motives (see Supplementary Fig. 5), associations between the extent of polarisation and the two cognitive variables were likely small and not credibly different from null based on the 95 % CIs (see Supplementary Table 5). This suggests that the factual beliefs of young adults in the UK are overall polarised in the direction of their motives. However, the extent of factual belief polarisation appears largely unrelated to cognitive control processes.

4. Discussion

We set out to understand whether cognitive control processes are linked to greater motivated reasoning, as some political psychology theories would suggest, or, on the contrary, to less motivated reasoning as cognitive science theories would suggest. Our results indicate that people engage in directionally motivated reasoning on both political and non-political topics. Turning to the association between cognitive control processes and motivated reasoning, according to our models and data, associations are unlikely to be strong. We find that people high in cognitive reflection on average engaged less in politically motivated reasoning, which is contrary to the prediction from the popular "motivated reflection" hypothesis. Rather than using cognitive reflection processes to construct reasonable justifications for desired conclusions, cognitive reflection may help people to resist automatic and affective response tendencies that underlie motivated reasoning – though caution is required when interpreting the findings, as null- or small positive associations also remain credible. We attempted to bridge findings to a related line of research on ideological thinking from cognitive psychology, and with the Go/No-Go task also used a neurocognitive measure of inhibitory control. However, for inhibitory control, our findings are somewhat conflicting with findings on cognitive reflection, and overall inconclusive.

We developed a novel gamified version of an experimental task originally designed by Thaler (2024b) to assess politically motivated reasoning. Participants take on the role of "Fake News Detectives" to "detect the deception" in news messages randomly telling them that the correct answer on factual questions is either greater or less than what they had previously guessed. The use of this task helped us to better differentiate between Bayesian updating and motivated reasoning, representing a key strength of our study. In this task, the prior and likelihood of the news message are set by design. A Bayesian, from the information they have, cannot infer whether the messages are more likely true or false. Thus, if people were rational Bayesians, there should be no systematic deviations in their veracity ratings. In turn, systematic deviations that are aligned with participants' motives on a given topic more cleanly constitute distorted (non-Bayesian) information processing towards desired or identity-protective conclusions, i.e., motivated reasoning. Our UK-based participants, in line with past studies conducted in the US (Thaler, 2024a; Thaler, 2024b), showed such systematic deviations indicative of motivated reasoning. Specifically, they rated messages that align with their political stances and motives as more likely to be true, than messages going against their political stances.

We then compared the relative evidence for two competing hypotheses on the link between motivated reasoning and cognitive control processes. Contrary to the influential "motivated reflection" hypothesis, our model and data suggest that the relationship between cognitive reflection and motivated reasoning is more likely negative than positive – in other words, those who are more reflective, might even engage in less motivated reasoning. This result is all the more compelling given the clear evidence of motivated reasoning observed with our design. At the first look, this is in line with cognitive science theories that suggest cognitive control processes can mitigate ideological biases (Németh et al., 2024). However, our results are not all that in clear in this interpretation, and a null or very small positive effect remains plausible. Further, with the Go / No-go task, we also used a well-established neuroscientific paradigm to assess the ability to inhibit prepotent and impulsive responses (Wessel, 2018), inspired by cognitive science perspectives. However, for inhibitory control, our analyses yielded inconclusive results, and it remains to be clarified if and how it is linked to motivated reasoning. The diverging findings on cognitive reflection and inhibitory control highlight that it is not just how motivated reasoning is assessed (e.g., Tappin et al., 2020b), but also how cognitive variables are measured that likely accounts for the mixed findings in previous studies (Sultan et al., 2024). This complexity highlights the challenge in bridging the literature on politically motivated reasoning (Kahan, 2016) with cognitive science research on ideological thinking (Zmigrod, 2021).

Recent work has shown that good performance in reaction-time-based cognitive control tasks can be driven by accurate intuitive processing rather than controlled correction of automatic responses (Voudouri, Bago, Borst, & Neys, 2023). While the Cognitive Reflection

Test primarily reflects strategic information processing on a longer timeframe, showcasing the ability to override intuitive responses in favour of more deliberative reasoning, the Go / No-Go task could thus assess speeded information processing (Eisenberg et al., 2019). These two cognitive factors, strategic and speeded information processing, could be differentially linked to motivated reasoning. While strategic and careful information processing could generally be related to more accurate judgments, the role of speeded information processing remains to be clarified. Future research should leverage computational models of decision-making to isolate specific components of the decision process (e.g., Lin, Pennycook, & Rand, 2023), providing insights into how fast, accurate responding interacts with other factors, such as on different topics, to contribute to motivated reasoning. Additionally, employing multiple cognitive tasks to derive latent cognitive factors could provide robust insights into the differential effects of strategic and speeded information processing, as demonstrated in an investigation of the cognitive correlates of ideological attitudes (Zmigrod et al., 2021).

Importantly, as the design of our study focused on the association between cognitive control processes and motivated reasoning irrespective of the mechanisms through which they might be linked, we can't draw the conclusion that it is cognitive reflection – in the sense of overriding intuitive responses – but instead another construct related to cognitive reflection that accounts for the negative association with motivated reasoning. For example, cognitive reflection correlates with numerical and general cognitive ability, and it is unclear to what extent these constructs are separable from the get-go (Otero, Salgado, & Moscoso, 2022). One more problematic limitation could also be that participants high in cognitive reflection show less motivated reasoning merely because they better comprehend the numerical aspects of the motivated reasoning. However, we deem this as unlikely as we provided accessible instructions that do not necessarily require participants to be familiar with the median, and the task was also empirically shown to be robust to various misunderstandings of the instructions (Thaler, 2024b). Still, the task clearly places inherently difficult demands on participants such as handling and answering different probabilities, and it ultimately remains a challenge for future research to provide more mechanistic insights on the link between cognitive control and motivated reasoning.

These investigations can build on the foundations we provide here. The task we used to assess motivated reasoning overcomes limitations of previous study designs that likely contributed to inconclusive findings (for review, see Tappin et al., 2020b). Specifically, the task avoids confounding the influence of prior beliefs with motivated reasoning by having participants judge news messages that directly refer to their own, individually-elicited beliefs. (Thaler, 2024b). Importantly, our design and analysis also allow better generalisation of our effects, as we included a variety of political and non-political topics, in contrast to classical studies that mainly focused on the same climate- and gun-control-related stimuli (Kahan, 2013; Kahan et al., 2017; Kahan & Peters, 2017). However, while our results allow a better generalisation across topics, our sample consisted of young adults from the UK recruited via Prolific. Prolific samples of young adults typically show high response quality, which was important given the length and demands of our tasks (Stagnaro et al., 2024). However, this can come with trade-offs in representativeness, and our findings may not generalise to older samples more representative of the general population, or to other national contexts such as the US where many previous studies were conducted.

Notwithstanding its strengths, it is also important to note that our approach necessitates theoretical assumptions, such as that the Bayesian model is an appropriate normative benchmark, and that motive-correlated deviations from this benchmark in the task constitute motivated reasoning (Little, 2025; Thaler, 2024b; Williams, 2021). These assumptions are required to overcome the observational equivalence between Bayesian updating and motivated reasoning that limits the inferences in past studies. However, they introduce the observational equivalence between being better at understanding the optimal (Bayesian) strategy and being more immune to motivated reasoning. If participants high in cognitive reflection adhere more closely to the Bayesian strategy for reasons other than being more immune to motivated reasoning, this could result in the same observations of "less motivated reasoning" in the absence of actual motivational biases. While we provide robustness analyses that suggest task understanding is not a primary driver of our observed associations and motivated reasoning theoretically parsimonious explanation, we cannot definitely rule out that there might non-motivational alternative explanations for the same findings. Balancing the tradeoffs and strengths of different research designs to assess motivated reasoning will remain a critical challenge for future research. For example, an interesting alternative approach could be directly manipulating different motivations (Bayes, Druckman, Goods, & Molden, 2020), but this approach also has the drawback that it is less indicative about the extent to which real-world beliefs are affected by directional motives (Little, 2025).

In conclusion, we provide novel insights into the link between cognitive control processes and motivated reasoning by synthesising interdisciplinary perspectives. We challenge the influential hypothesis that cognitive control processes are linked to more motivated reasoning, as we find that cognitive reflection is more likely linked to less, rather than more motivated reasoning. Understanding the foundations of motivated reasoning is crucial, as it can drive politically polarised (Su, 2022) and misinformed beliefs (Ecker et al., 2022; Thaler, 2024b). The key question going forward is not whether highly reflective individuals can set aside their ideological biases, but rather which, when and how cognitive factors mitigate or reinforce politically motivated reasoning, and which methodological designs find the best balance between isolating motivated reasoning while providing insights with external validity into how people update their (political) beliefs in the real world.

4.1. Limitations

Several further limitations should be acknowledged. We did not experimentally manipulate cognitive control processes. While other studies have attempted such manipulations (e.g., limiting response time), it remains unclear how such manipulations affect the specific cognitive strategies participants use. For example, time pressure did not have an effect on motivated reasoning, whereas trait measures did (Strömbäck et al., 2024). It remains a challenge for future research to manipulate specific cognitive control processes and investigate the effects on motivated reasoning. Second, measuring motivated reasoning is inherently challenging, as people are typically unaware of the latent motivational influences on their reasoning (e.g., Mercier & Sperber, 2017). This necessitates careful methodological approaches, which inevitably rest on assumptions, and with different designs having distinct strengths and drawbacks (see Little, 2025). For example, while the design we use aims to circumvent the confounding of motives and prior beliefs, it still risks the observational equivalence between being more immune to motivated reasoning and discerning the task's optimal strategy. Robustness analyses suggest that this is not the main driver of the observed associations, but we cannot rule out that non-motivational factors might in part account for our findings. Motivated reasoning effects also depend on how well participants' motives can be inferred. We used self-reported opinions and stances as indices of motives, and this appeared to work well on political topics. Smaller effects for certain topics could also be attributed to these motives being harder to assess, or our items or coding being inadequate. Overall, we think this is only of limited concern for our results, as for most topics effects go in the expected directions. However, our estimates may be considered as lower bounds of motivated reasoning effects. Testing which items or strategies are best to capture motives is an interesting avenue for future research that can build on the analyses and open materials we provide here. Finally, the higher variance observed in motivated reasoning on general and performance questions may be due to the limited number of items per question type. Using more items could enable more systematic

investigation of these effects.

CRediT authorship contribution statement

Olaf Borghi: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Ben M. Tappin:** Writing – review & editing, Methodology, Conceptualization. **Kaat Smets:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Manos Tsakiris:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization.

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Declaration of competing interest

The authors declare no competing interests.

Appendix A. Supplementary data

Supplementary materials to this article can be found online at https://doi.org/10.1016/j.cognition.2025.106373.

Data availability

Data is openly available at https://osf.io/uztn7.

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