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RUNNING HEAD: CRT AND THE 2016 ELECTION

Cognitive Reflection and the 2016 US Presidential Election

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Abstract

We present a large exploratory study (N = 15,001) investigating the relationship between cognitive reflection and political affiliation, ideology, and voting in the 2016 Presidential Election. We find that Trump voters are less reflective than Clinton voters or third-party voters. However, much (although not all) of this difference was driven by *Democrats* who chose Trump. Among Republicans, conversely, Clinton and Trump voters were similar whereas third-party voters were more reflective. Furthermore, although Democrats/liberals were somewhat more reflective than Republicans/conservatives overall, political moderates and non-voters were least reflective whereas Libertarians were most reflective. Thus, beyond the previously theorized correlation between analytic thinking and liberalism, these data suggest three additional consequences of reflectiveness (or lack thereof) for political cognition: 1) Facilitating political apathy versus engagement, 2) Supporting the adoption of orthodoxy versus heterodoxy, and 3) Drawing individuals toward candidates who share their cognitive style, and towards policy proposals which are intuitively compelling.

Key Words: political ideology; 2016 election; cognitive reflection; intuition; dual process theory

> *That experience taught me a few things. One is to listen to your gut, no matter how good something sounds on paper.*
>
> - Donald Trump (1987; p. 58)

Many have claimed that one of the core cognitive differences between conservatives and liberals – at least in the Western context – is that conservatives tend to rely more on their intuitions and gut feelings than liberals (Deppe et al., 2015; Eidelman, Crandall, Goodman, & Blanchar, 2012; Haidt, 2012; Jost, 2017; Jost, Glaser, Kruglanski, & Sulloway, 2003; Talhelm et al., 2015). However, support for this claim is often indirect, and data showing a negative correlation between conservative political ideology and behavioral measures of analytic thinking is equivocal (e.g. Kahan, 2013). As a consequence, the impact of individual differences in reliance on intuitive versus analytic thinking for political *behavior* in any particular context or at any particular time is unclear. Here, we shed new light on political cognition by focusing on the 2016 U. S. Presidential Election, and systematically investigating the correlation between individual differences in analytic thinking and political behavior (voting), political party affiliation, and political ideology in a largescale exploratory analysis. Our findings indicate that the distinction between intuitive and analytic thinking have complex implications for political behavior and ideology.

Dual-process theory

A core claim about human cognitive architecture is that we are capable of generating two different types of cognitive outputs (Evans, 2008; Evans & Stanovich, 2013; Kahneman, 2011; Stanovich, 2005): One that emerges from automatic intuitive responses ("Type 1") and one that emerges from deliberative or analytic thinking processes ("Type 2"). This "dual-process" distinction has had wide-reaching implications for psychological science. Dual-process theories

have been applied to reasoning (Evans, 1989; Sloman, 1996; Stanovich & West, 2000), decision-making (Barbey & Sloman, 2007; Kahneman & Frederick, 2005; D. G. Rand, 2016), social cognition (Chaiken & Trope, 1999; Epstein, Pacini, Denes-Raj, & Heier, 1996), cognitive development (Barrouillet, 2011; Klaczynski, 2001), evolutionary game theory (Bear & Rand, 2016; Jagau & van Veelen, 2017; D. Rand, Tomlin, Bear, Ludvig, & Cohen, 2017), and clinical disorder (Beevers, 2005; Pyszczynski, Greenberg, & Solomon, 1999), among others (see Evans, 2008 for a review).

An important consequence of the distinction between intuitive and deliberative processes is that, at least to some extent, analytic reasoning is *discretionary*. That is, some responses come to mind automatically (which serve as defaults) and one may or may not reason analytically about these initial intuitive outputs (Pennycook, Fugelsang, & Koehler, 2015; Pennycook, 2017). Consider, for example, the following (now famous) bat and ball problem from the Cognitive Reflection Test (CRT; Frederick, 2005):

A bat and ball cost $1.10 in total. The bat costs $1.00 more than the ball.

How much does the ball cost?

The response that comes to mind intuitively for most people on this problem is ’10 cents’, which is the modal response (Campitelli & Gerrans, 2014; Pennycook, Cheyne, Koehler, & Fugelsang, 2016). Naturally, however, ’10 cents’ is not the correct answer (if the ball costed 10 cents, the bat would have to cost $1.10 and they would cost $1.20 in total).

The bat and ball problem is of particular interest because accuracy tends to be quite low (usually around 30%, depending on the sample; Frederick, 2005) even though only basic arithmetic is required to recognize that 10 cents is incorrect. To answer the problem correctly, one must reflect on an intuitively appealing response – an analytic process that is evidently not

particularly common (Stanovich, 2005). It is for this reason that problems of this nature – specifically, those that cue an incorrect intuitive response – are thought to reflect (to some important degree) the propensity or willingness to engage analytic thinking (Pennycook, Fugelsang, & Koehler, 2015; Pennycook & Ross, 2016; Toplak, West, & Stanovich, 2011). This propensity to think analytically – sometimes referred to as analytic cognitive style (Pennycook, Cheyne, Seli, Koehler, & Fugelsang, 2012) – is distinct from (although functionally related to) the *capacity* to think analytically (i.e., intelligence or cognitive ability) (Stanovich, 2009; Stanovich & West, 2000; Stanovich, 2012), although both factors are important for the analytic thinking that is required to overcome intuitions.[1] Indeed, recent research has shown that variation in analytic thinking, as measured by performance on the CRT, correlates with a wide range of psychological factors, such as religious belief (Pennycook et al., 2012; Pennycook, Ross, Koehler, & Fugelsang, 2016; Shenhav, Rand, & Greene, 2012), various epistemically suspect beliefs (Browne, Thomson, Rockloff, & Pennycook, 2015; Gervais, 2015; Pennycook, Cheyne, Barr, Koehler, & Fugelsang, 2015; Shtulman & Mccallum, 2005; Swami, Voracek, Stieger, Tran, & Furnham, 2014), and moral judgments, values, and behavior (Arechar, Kraft-Todd, & Rand, 2017, Paxton, Ungar, & Greene, 2012; Pennycook, Cheyne, Barr, Koehler, & Fugelsang, 2014; Royzman, Landy, & Goodwin, 2014; Royzman, Landy, & Leeman, 2015), among others (see Pennycook, Fugelsang, et al., 2015 for a review). Thus, individual differences in analytic cognitive style bridges together a wide range of psychological factors and evidences a broad dual-process view of human cognition.

Political ideology and analytic thinking

[1] Throughout, we use "analytic thinking" to broadly encompass both analytic cognitive style and cognitive ability.

Political ideology represents an area of particular contention in the context of individual differences in analytic thinking, both theoretically and empirically. As a strong contrast to the perspective offered above, Kahan (2013) has argued that the primary role of analytic thinking is not to *inform* beliefs, behaviors, ideologies, but rather to *reinforce* them (see also: Haidt, 2012; Haidt, 2001). That is, individuals typically reason more like lawyers (who use reasoning to convince others – and themselves – that they are correct) than philosophers (who use reason to get closer to the truth). Under this account, one should not expect analytic thinking to have a *directional* effect on political ideology such that one group is more analytic than the other. Rather, analytic thinking is used to engage in motivated reasoning and to protect one's identity when challenged, such that more analytic individuals are expected to be more polarized (Kahan et al., 2012; Kahan, Peters, Dawson, & Slovic, 2017).

There are, in contrast, a suite of theories that *do* predict ideological differences in analytic thinking. Talhelm et al. (2015), for example, argue that liberals should be more analytic because they come from a more individualistic culture that is less focused on social bonds (which are facilitated by intuitive or holistic thinking). Jost (2017) argues that conservatism emerges from a need to manage threat and, in support of this contention, provides evidence from a series of meta-analyses that find liberals are more tolerant of uncertainty, less dogmatic, less cognitively rigid, have less need for order, and (more generally) are more disposed toward reflective thought (see also, Hibbing, Smith, & Alford, 2014; Jost et al., 2003). Finally, Eidelman et al. (2012) argue that the conservative emphasis on personal responsibility, acceptance of hierarchy, and preference for the status quo is facilitated by reliance on intuition instead of reason. Support for these theories would be undermined by a lack of correlation between political ideology and CRT performance. This is particularly the case given that the CRT is a behavioral measure of analytic

thinking and is therefore more externally valid than the self-report measures that are typically used in this research (for example, individuals who are intuitive often claim that they are analytic; (G. Pennycook, Ross, Koehler, & Fugelsang, 2017)

The empirical evidence for a negative association between analytic thinking and conservative political ideology is just as contentious as the theories surrounding the association. Indeed, the first study that reported a small negative correlation (r = -.16) between conservative political ideology and CRT performance (among Americans) failed to replicate this finding in a second study using a more international sample (Pennycook et al., 2012). Subsequently, Iyer, Koleva, Graham, Ditto, & Haidt (2012) found, based on a single self-identification item, that liberals scored higher on the CRT than conservatives (but that Libertarians scored the highest) in a large sample of American individuals (N = 9721) who signed up to participate in a psychology study on YourMorals.org. However, Kahan (2013) found that Republicans actually scored *higher* than Democrats using a large (N = 1,750) representative panel of Americans from YouGov, but did not find a significant correlation with overall conservatism (using a likert scale). Piazza and Sousa (2013) also failed to find a significant correlation between cognitive reflection and conservative political ideology. Moreover, a recent meta-analysis found that conservatives and liberals were just as prone to partisan bias in motivated reasoning experiments (Ditto et al., 2018).

More recent studies suggest that the distinction between social and economic political ideology is crucial: Whereas social conservatism is defined by opposition toward issues that pertain to social change (e.g., abortion, gay marriage, etc.), economic conservatism pertains to support for the free market and capitalism. More recent studies found that analytic thinking often correlates with social but not economic conservatism (Deppe et al., 2015; Pennycook et al.,

2014; Saribay & Yilmaz, 2017; but see Sterling, Jost, & Pennycook, 2016), including in a Turkish sample (Yilmaz & Saribay, 2016). Moreover, reliance on intuition is particularly strongly associated with conservative moral values (Deppe et al., 2015; Pennycook et al., 2014; Yilmaz & Saribay, 2017a), which pertain to social conservative issues.

Current study

As summarized above, there is a great deal of contention surrounding the common claim that conservatives are more intuitive and less analytic than liberals in the United States. Moreover, the overwhelming majority of past work has focused on political ideology and attitudes, whereas to our knowledge only one study (Kahan, 2013) reported differences based on party affiliation (showing the opposite result as would be expected, with Republicans relying *less* on intuition than Democrats). Even more importantly, no previous work has investigated the potential role of analytic thinking in political *behavior*. To this end, we report a large aggregate analysis of 15,001 participants from 19 studies completed since the 2016 US Presidential Election (specifically, between December 2016 and November 2017; all on Mechanical Turk).[2] Along with the CRT, participants in every study completed a suite of political measures, including party affiliation, political ideology, and an identification of who they voted for (or if they voted) in the 2016 election. This large sample allowed us not only to compare liberals and conservatives on various measures, but to investigate the interaction between political party affiliation and political behavior.

Method

Participants

[2] All but two of these studies have not been previously published (Pennycook, Cannon, & Rand, 2018), although 7 of the unpublished studies are also included in 2 working papers that are available online (Pennycook & Rand, 2018; Pennycook & Rand, 2017a, 2017b). None of the present analyses are reported in these papers.

Across the 19 studies, we only retained participants for which CRT and voting behavior data was available. This left us with 16,650 participants. However, there were 1,619 participants who completed more than one study[3] (based on their MTurk ID) and we only retained the first instance. A further 30 participants were removed because they did not enter a valid MTurk ID. The final sample therefore consisted of 15,001 participants (56.3% female; M_{age} = 35.3, SD_{age} = 11.3).

Materials

There were a variety of measures included across the 19 studies; here we focus solely on the measures of interest (and which were present in all 19 studies). The original purpose of each study was to investigate various factors relating to fake and real news (Pennycook, Cannon, & Rand, 2018; Pennycook & Rand, 2018; Pennycook & Rand, 2017a, 2017b) – as a consequence, participants always read and rated the accuracy of (and/or willingness to share) news article headlines (which varied from study to study) prior to completing the measures of present interest. Measures were administered via Qualtrics survey software, and in the order that they are outlined here.

Cognitive Reflection Test. We used a 7-item Cognitive Reflection Test (CRT): The original 3-item CRT (Frederick, 2005), but reworded slightly (the mathematical structure was maintained; Shenhav et al., 2012; Shenhav, Rand, & Greene, 2017) and a less math-focused version from Thomson and Oppenheimer (2016). The CRT has been shown to predict a number of factors even after taking numeracy (Pennycook, Fugelsang, et al., 2015; Pennycook & Ross, 2016) or cognitive ability (Shenhav et al., 2012; Toplak, West, & Stanovich, 2014; Toplak et al., 2011) into account, although performance reflects both cognitive ability and cognitive style (i.e.,

[3] Individuals who completed earlier studies were generally excluded from subsequent studies, but this exclusion was sometimes relaxed for various reasons.

"analytic thinking", broadly). Recent research indicates that prior exposure to the CRT does not undermine its predictive validity (Bialek & Pennycook, 2017). The two versions were strongly correlated, $r(14999) = .50$, and the full 7-item CRT had acceptable reliability, Cronbach's $\alpha = .75$. The results were highly similar when analyzing the two versions of the CRT separately. We scored the CRT based on the number of correct answers as opposed to the number of incorrect intuitive answers (Pennycook, Cheyne, et al., 2016), but the results were highly similar regardless of the scoring strategy.

Demographics and political questions. The political questions of interest were presented following (and on the same page as) standard demographic questions (namely: age, gender, education level, and English proficiency). For education level, participants were asked: "What is the highest level of school you have completed or the highest degree you have received?", and given the following options: "Less than high school degree, High school graduate (high school diploma or equivalent including GED), Some college but no degree, Associate degree in college (2-year), Bachelor's degree in college (4-year), Master's degree, Doctoral degree, Professional degree (JD, MD). For analysis purposes, we created dummy variables for no college degree (less than high school, high school, and some college but no degree) and college degree (associate or bachelor's).

Participants were then asked: "Which of the following best describes your political position?", and given the following options: Democrat, Republican, Independent, Other (specify). This was followed with two political ideology measures (one study did not include these questions): 1) "On social issues I am:" and 2) "On economic issues I am:". Both were followed by a 5-point likert scale with the following options: Strongly Liberal, Somewhat Liberal, Moderate, Somewhat Conservative, Strongly Conservative. Voting behavior was then

measured using the following question: "Who did you vote for in the 2016 Presidential Election? Reminder: This survey is anonymous." The following response options were provided: Hillary Clinton, Donald Trump, Other candidate (such as Jill Stein or Gary Johnson), I did not vote for reasons outside of my control, I did not vote but I could have, and I did not vote out of protest. Finally, participants were asked to choose between Clinton and Trump: "If you absolutely had to choose between only Clinton and Trump, who would you prefer to be the next [current] President of the United States?" (Hillary Clinton, Donald Trump).

Although we did not collect data on ethnicity or income in any of the studies, we were able to obtain this information for a subset of the sample (N = 8,226) by matching MTurk IDs of our participants with ethnicity and income data collected in other large studies.[4] For ethnicity, individuals self-selected from nine options: American Indian / Alaska Native, Black / African American, East Asian American (e.g., China, Japan, Korea), European American / White, Hispanic / Latino, Middle Eastern (e.g., Saudi Arabia, Iran, Persian Gulf), Native Hawaiian or other Pacific Islander, South Asian American (e.g., India, Pakistan, Bangladesh), and Other. For analysis purposes, we created dummy variables for Caucasian, African American, and Hispanic. Household income data (before taxes) was curated from two sources with different response options, so we combined the questions into four categories: Less than $10,000, $10,001-$50,000, $50,001-$100,000, and greater than $100,000. For analyses purposes, dummy variables for the first three income levels were used.

Results

[4] We would like to thank Antonio Alonso Arechar and Robb Willer for providing us with additional data.

A demographic breakdown for the full range of voting responses can be found in Table 1. Means and standard deviations can be found in the appendix. Data are available at the following link: https://osf.io/kshu7/.

Table 1. *Demographic information and sample size for 2016 US Presidential election voting responses.*

2016 US Presidential Election Vote	*N* (%)	M_{age} (SD)	Female%	College/Postgrad Degree	< $50k Income
Hillary Clinton	5938 (39.6%)	35 (11)	61.5%	71.8%	46.5%
Donald Trump	3757 (25%)	49 (12)	55.3%	62.9%	45%
Other candidate	1832 (12.2%)	34 (10)	48.2%	67%	45.7%
DNV: Reasons outside of control	925 (6.2%)	32 (10)	60.3%	55%	50.9%
DNV: But could have	1764 (11.8%)	32 (10)	51.5%	49%	52.8%
DNV: Out of protest	785 (5.2%)	33 (10)	46.4%	53.1%	54.4%

Political behavior. We first compared mean CRT accuracy across the full range of voting responses (see Figure 1) using a one-way ANOVA. This revealed significant variation in CRT scores, $F(5, 14995) = 40.62$, $MSE = .08$, $p < .001$, $\eta^2 = .013$. This was also true after entering age, gender, and education as covariates, $F(5, 14825^{5}) = 36.78$, $MSE = .08$, $p < .001$, $\eta^2 = .012$. We also entered income and ethnicity as covariates – using the smaller subset of the data for which these measures were available – alongside age, gender, and education; the overall difference remained significant, $F(5, 7863) = 22.61$, $MSE = .08$, $p < .001$, $\eta^2 = .014$. A post-hoc Tukey's honest significant difference (HSD) test comparing CRT scores across the different levels of voting responses (on the full data set without covariates) isolated two homogeneous subsets ($p < .05$) indicated that CRT scores were equivalent among individuals who either voted for Trump or did not vote (for any reason), and that these scores were lower than scores for those who voted for either Clinton or a 3rd-party candidate (who were equivalent). The effect size for this difference (Trump/Non-vote: $M = .46$, $SD = .28$; Clinton/3rd Party: $M = .52$, $SD = .29$) was small,

[5] Changes in degrees of freedom are due to missing data for secondary variables.

d = .23, r = .11, but significant given our large sample size, $p < .001$.[6] As a point of reference, effect sizes of r = .11, .19, and .29 correspond to the 25th, 50th, and 75th percentiles in terms of average effect sizes in individual differences research in psychology (Gignac & Szodorai, 2016).

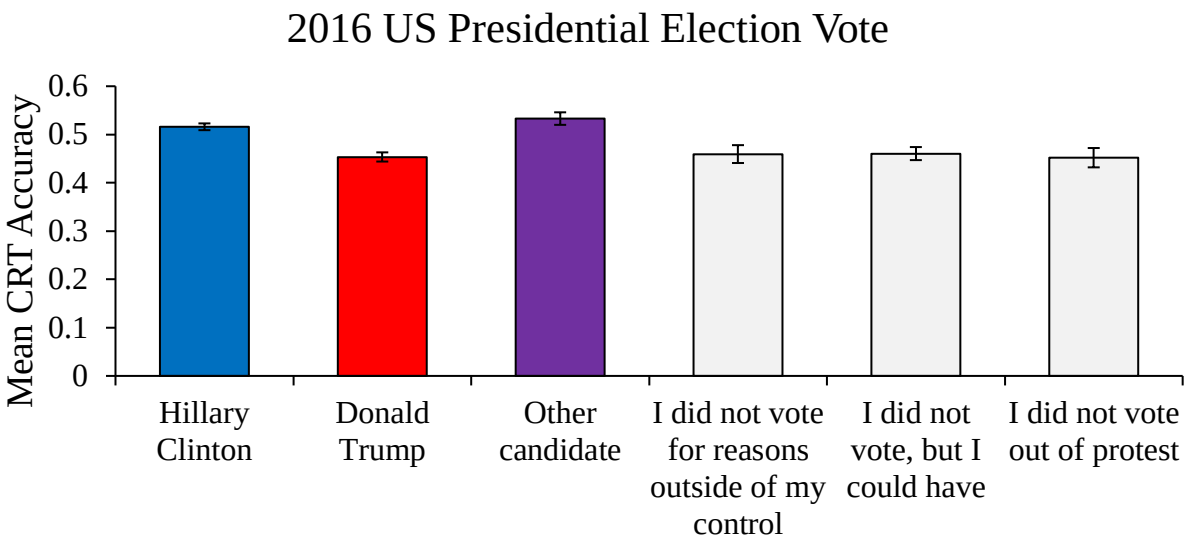


Figure 1. *Mean CRT accuracy (0-1) as a function of post-hoc report of 2016 US Presidential election vote. Error bars represent 95% confidence intervals.*

Political affiliation. In a parallel analysis, we compared CRT scores as a function of party affiliation (Figure 2). This, too, revealed significant variation in CRT scores, $F(3, 14953) = 20.81$, $MSE = .08$, $p < .001$, $\eta^2 = .004$. Again, this maintained after entering age, gender, and education as covariates, $F(3, 14787) = 19.41$, $MSE = .08$, $p < .001$, $\eta^2 = .004$ – as well as in the smaller sample with income and ethnicity entered as additional covariates, $F(3, 7843) = 21.67$, $MSE = .08$, $p < .001$, $\eta^2 = .008$. A Tukey's HSD test found that Republicans scored the lowest, but that the Democrats, Independents, or "Others" did not differ. As with voting behavior, this

[6] The effect size for the difference between Clinton (M = .52, SD = .29) and Trump (M = .45, SD = .28) voters was similar, d = .22, r = .11, $p < .001$.

effect size was small (Republicans: M = .46, SD = .28; Everyone else: M = .50, SD = .29), d = .15, r = .08, but significant given our large sample size, $p < .001$.[7]

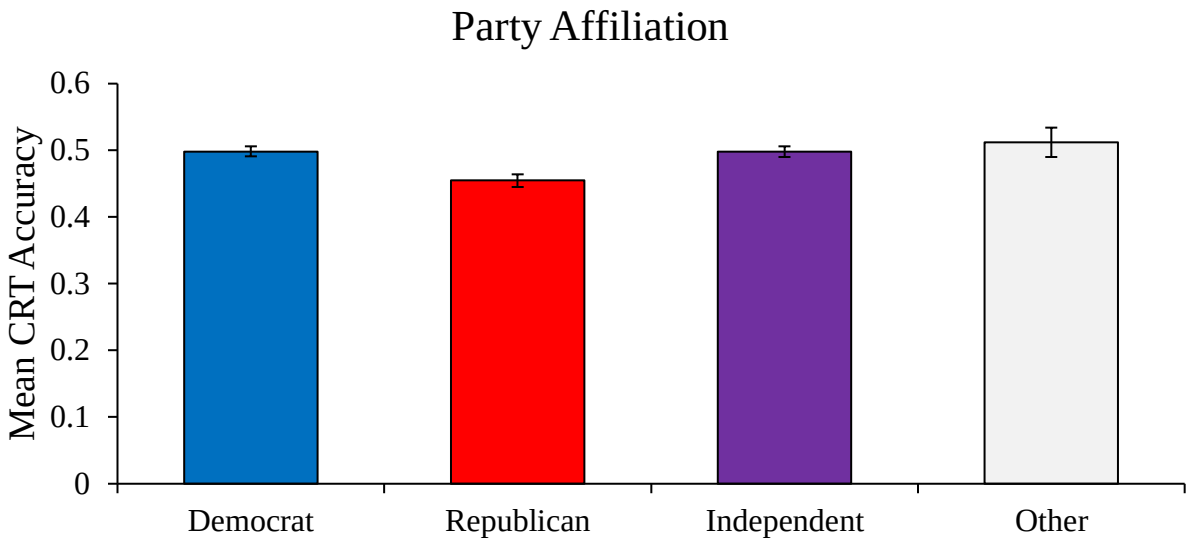


Figure 2. *Mean CRT accuracy (0-1) as a function of party affiliation. Error bars represent 95% confidence intervals.* N_{Dem} *= 6450,* N_{Rep} *= 3788,* N_{Ind} *= 5646,* N_{Other} *= 688.*

Interaction between behavior and affiliation. As evident from Table 2, these analyses are not entirely redundant: Although a strong majority voted along party lines (74.9% of Democrats and 72.3% of Republicans), some Democrats voted for Trump (3.8%) and some Republicans voted for Clinton (5.3%). There are also a considerable number of Independents in the sample. Fortunately, due to our large sample, there are enough individuals in each of these cells to compare CRT scores across the full range of voting behavior and party affiliation (for ease of exposition, we drop those who did not affiliate as Democrat, Republican, *or* Independent, and collapse across the three categories of non-voters). For this analysis, we entered mean CRT accuracy as a dependent variable in a 3 x 4 Univariate ANOVA with party affiliation (Democrat,

[7] The effect size for the difference between Democrats (M = .50, SD = .29) and Republicans (M = .46, SD = .28) was similar, d = .15, r = .07, $p < .001$.

Republican, Independent) and voting behavior (Clinton, Trump, Other, Did not vote) as separate factors. This revealed a significant interaction between party affiliation and voting behavior in CRT performance (see Figure 3), $F(6, 14298) = 8.16$, $MSE = .08$, $p < .001$, $\eta^2 = .003$. The interaction continued to be significant after entering age, gender, and education as covariates, $F(6, 14143) = 9.46$, $MSE = .08$, $p < .001$, $\eta^2 = .004$, as well as with income and ethnicity in the smaller sample, $F(6, 7551) = 3.64$, $MSE = .08$, $p = .001$, $\eta^2 = .003$.

Table 2. *Number of individuals in the data set who voted for Clinton, Trump, Other, or who did not vote as a function of party affiliation.*

	Party Affiliation			
	Democrat	Republican	Independent	Total
Hillary Clinton	4311	179	1312	5802
Donald Trump	216	2455	997	3668
Other candidate	306	249	1091	1646
Did not vote	919	513	1762	3194
Total	5752	3396	5162	14310

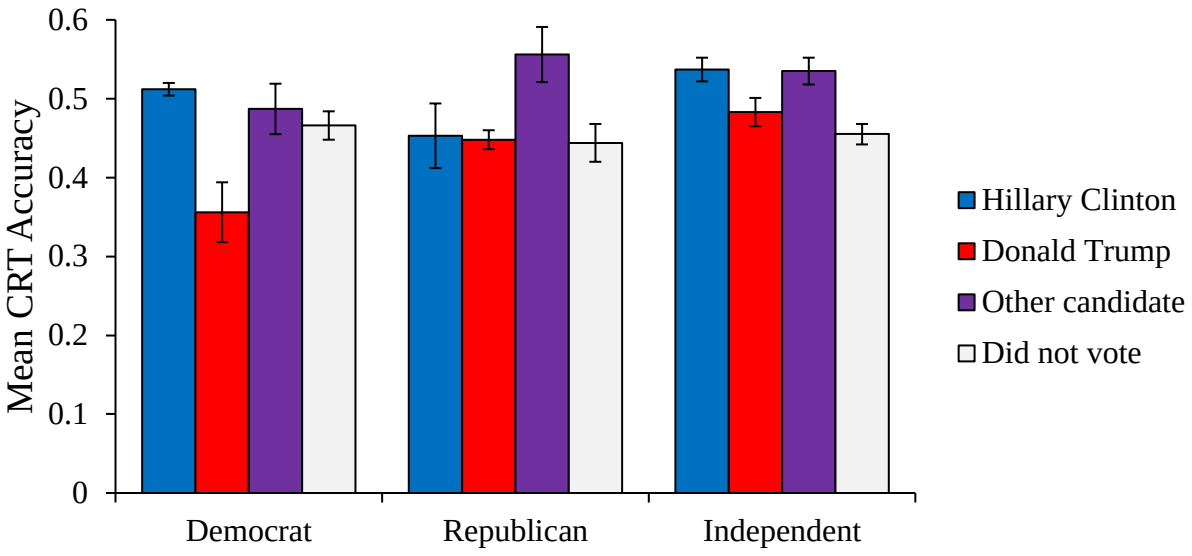


Figure 3. *Mean CRT accuracy (0-1) as a function of the interaction between voting behavior and party affiliation. Error bars represent 95% confidence intervals.*

To further explore this interaction, we compared CRT scores across the four levels of voting behavior separately for each party. In all three cases, there was significant variability in CRT performance as a function of voting behavior, all F's > 11, p's < .001. However, different homogeneous subsets (based on *post hoc* Tukey's HSD tests, $p < .05$) emerged in each case.

For Democrats, there were no differences in CRT performance between those who voted for Clinton, a 3rd-party candidate, or who did not vote, while those who voted for Trump scored significantly lower than the other three groups. Comparing Trump voters with all other voter categories (among Democrats) in a regression with age, gender, and education as controls also produced a significant difference, $r = -.10$, $\beta = -.10$, $p < .001$ (and with ethnicity and income as additional controls in the smaller sample, $r = -.08$, $\beta = -.08$, $p < .001$).

Among Republicans, the pattern was much different. A Tukey's HSD test revealed that Republicans who voted for a 3rd-party candidate scored higher on the CRT than any other group. There were no differences between Clinton voters, Trump voters, and non-voters. Comparing 3rd-party voters with all other voter categories (among Republicans) in a regression with age, gender, and education as controls also produced a significant difference, $r = .10$, $\beta = .10$, $p < .001$ (and with ethnicity and income as additional controls in the smaller sample, $r = .12$, $\beta = .11$, $p < .001$).

Finally, among Independents, there were two homogeneous subsets: 1) Non-voters and Trump voters, who had lower scores, and 2) Clinton and 3rd-party voters, who had higher scores. Comparing Trump and non-voters with Clinton and 3rd-party voters (among Independents) in a regression with age, gender, and education as controls also produced a significant difference, $r = -.12$, $\beta = -.11$, $p < .001$ (and with ethnicity and income as additional controls in the smaller sample, $r = -.09$, $\beta = -.08$, $p < .001$).

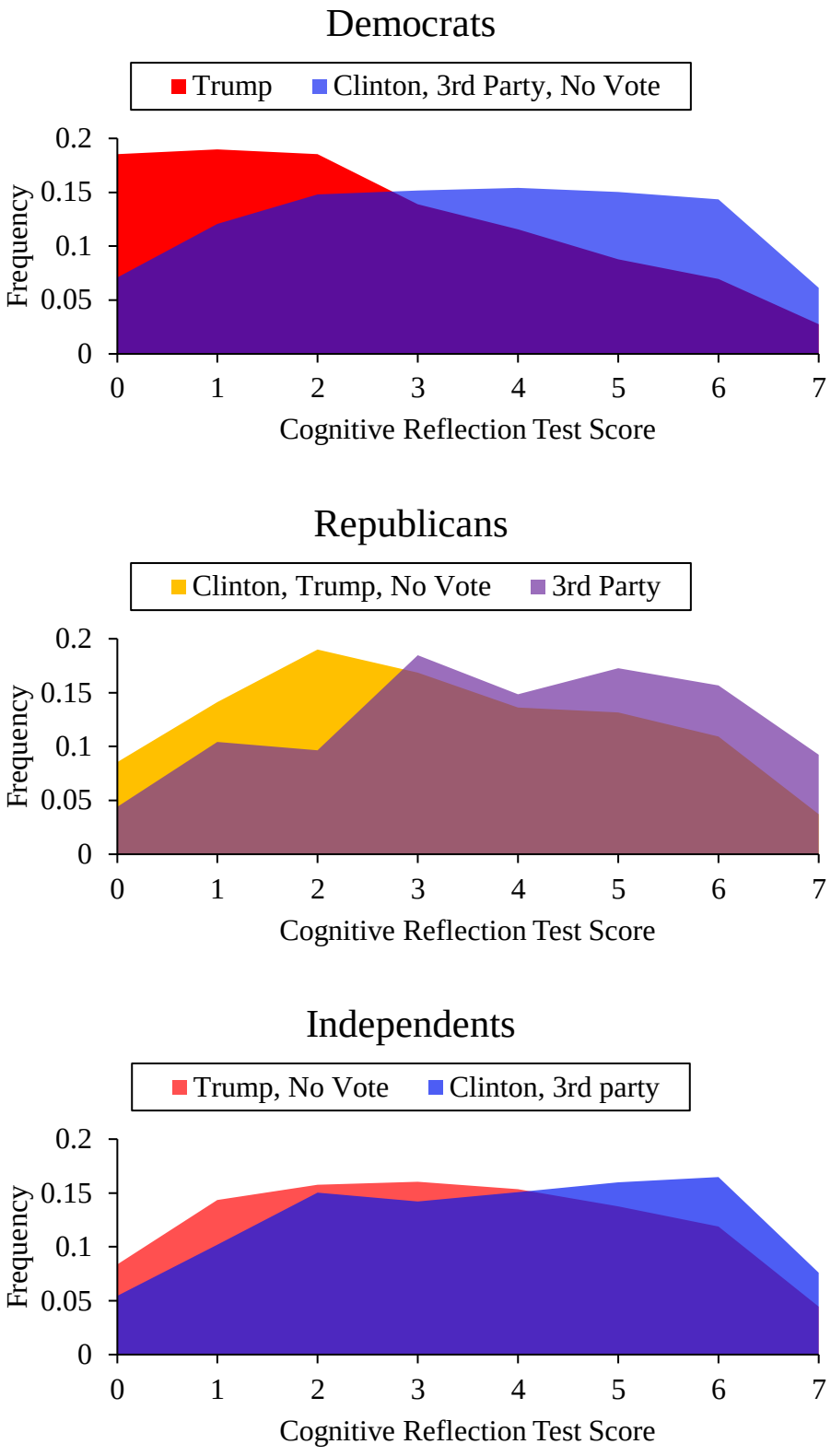


Figure 4. Distribution of CRT scores for each subgroup identified by Tukey's HSD tests.

To give a sense of the magnitude of these differences, the distribution of CRT scores for each distinct group indicated by the Tukey's HSD tests are shown in Figure 4. As can be seen, Democrats who voted for Trump stand out relative to the other groups. For example, Democrats who voted for Trump were 2 to 3 times more likely than the other groups to answer all 7 CRT questions incorrectly, and half as likely as other Democrats to answer 5, 6, or 7 questions correctly. Thus, much of the overall lower CRT scores for Trump relative to Clinton voters can be attributed to the Democrats who voted for Trump. Nonetheless, it should be noted that Democratic affiliated Clinton voters do score higher on the CRT (M = .51) than Republican affiliated Trump voters (M = .45), $t(6764) = 9.08$, SE = .01, $p < .001$, d = .23.

The finding that CRT performance is markedly worse among Democrats who voted for Trump is further emphasized by Figure 5, which compares Democrats who voted for Trump to the aggregation of all other people. As with the other analyses, the differences between Democrats who voted for Trump and everyone else cannot be explained by differences in age, gender, and education – including those variables as covariates in a regression did not appreciably change the estimated difference in mean CRT sores between groups (13.5 percentage points lower mean CRT accuracy without controls, 13.7 percentage points lower mean CRT accuracy including controls). Furthermore, it seems unlikely that Democrats who indicted voting for Trump were merely careless and had meant to select Clinton instead – in addition to voting for Trump, they were also significantly more conservative than those who indicated voting for Clinton (social conservatism: $t(3596) = 14.24$, $p < .001$; economic conservatism: $t(3692) = 10.25$, $p < .001$), and significantly less educated, $\chi^2(7, N = 4521) = 37.33$, $p < .001$ (although as noted above, these demographic differences do not account for the difference in CRT scores observed).

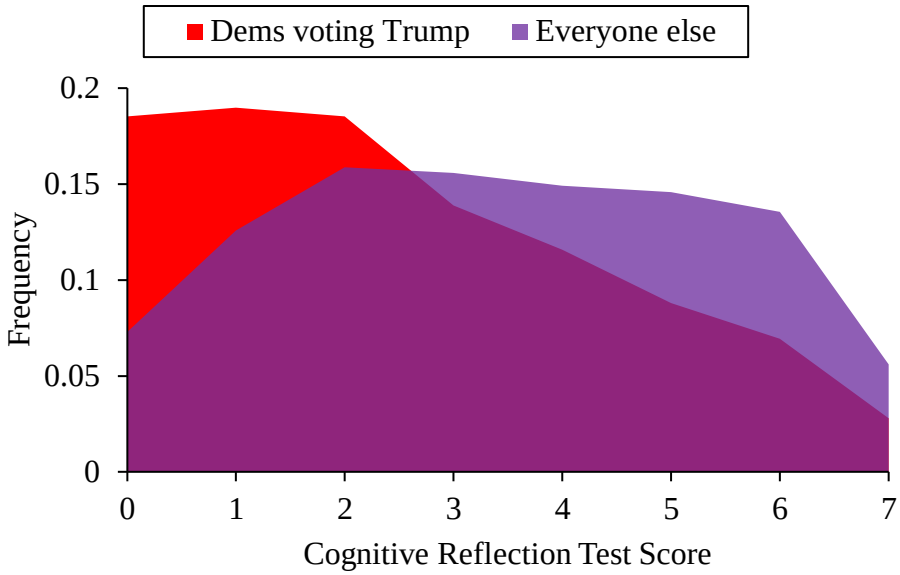


Figure 5. Distribution of CRT scores for Democrats who voted for Trump (red) compared to all other participants (purple).

Political ideology. Next, we turn to associations with political ideology, as measured by separate single-item social and economic conservatism Likert scales. Individuals who had missing data for one or both of the political ideology questions (N = 2,959) were removed from the data, leaving a sample of N = 12,042. First, replicating findings from previous research (Pennycook et al., 2014; Yilmaz & Saribay, 2017b), CRT performance was significantly negatively correlated with social conservatism, $r(12042) = -.15$, $p < .001$, but only trivially correlated with economic conservatism (albeit significantly, due to our large sample size), $r(12042) = -.02$, $p = .031$.

However, these analyses average across important differences in American political ideology – most notably, libertarians who endorse economic conservatism but social liberalism. Indeed, when entering both social and economic conservatism into a multiple regression, the correlation between CRT performance and economic conservatism is significantly *positive*, $\beta =$

.16, $p < .001$; and the correlation between social conservatism and CRT performance becomes more strongly and significantly negative, $\beta = -.26$, $p < .001$.

To illustrate the underlying source of these relationships, we computed a novel analyses of CRT differences as a function of political ideology on social and economic issues. For this, we created four groups of interest (representing 81.5% of the sample): 1) Classic liberals who identify as 'somewhat' or 'strongly' liberal for both social and economic issues ($N = 4020$), 2) Classic conservatives who identify as 'somewhat' or 'strongly' conservatives for both social and economic issues ($N = 2457$), 3) Libertarians who identify as (somewhat/strongly) liberal on social issues but (somewhat/strongly) conservative on economic issues ($N = 1221$), and 4) Individuals who identified as moderate on both social and fiscal issues ($N = 2154$). The remaining group, individuals who identify as fiscally liberal but socially conservative, were not represented in sufficient numbers (just 1.2% of the sample) to justify inclusion as a clear political category (this matches nationally representative data from a 2012 Gallup poll in which only 1% of the American population identified as such; Jones, 2012). This analysis also excludes difficult-to-classify individuals who selected moderate on one but not both types of issues (17% of the sample).

Following the same analysis plan as above, there was significant variability in CRT scores across the four key political categories, $F(4, 9852) = 160.44$, $MSE = .08$, $p < .001$, $\eta^2 = .05$. As evident from Figure 6, consistent moderates scored the lowest and libertarians scored the highest.[8] In parallel with the overall voting behavior and party affiliation analyses presented

[8] We note that the rare category of social conservative/fiscal liberal (N = 146) fall in-between classic liberals and classic conservatives in terms of CRT performance (M = .48, SD = .30), although because of the small sample size they do not significantly differ from either group, p's > .05.

above, liberals scored higher than conservatives. A Tukeys HSD test revealed that all four groups were significantly different from each other, *p*'s < .001.

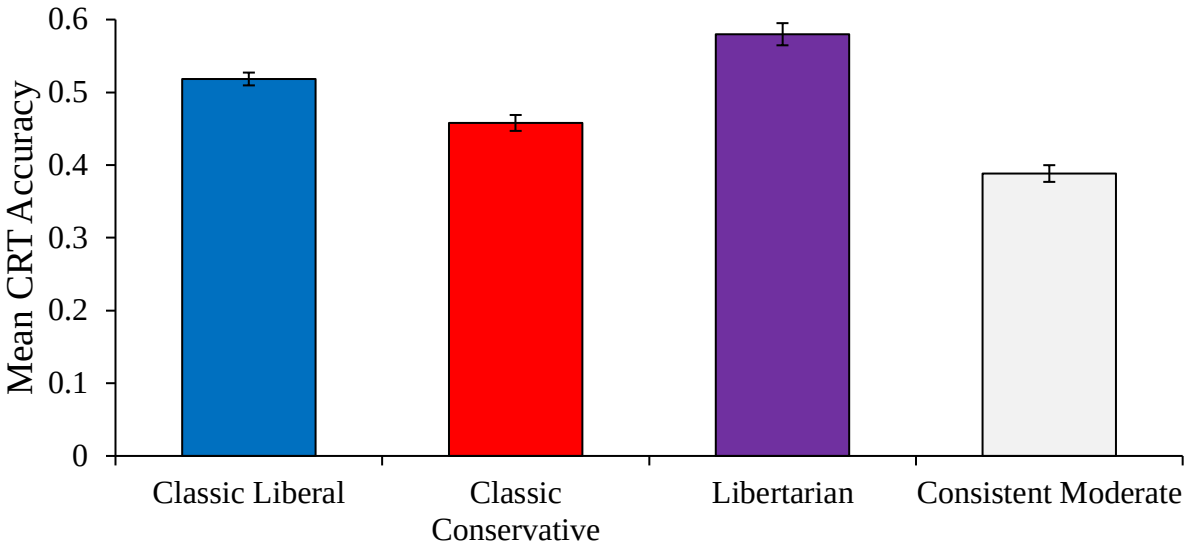


Figure 6. *Mean CRT accuracy (0-1) as a function of ideological category. Consistent moderate (N = 2154) = Individuals who identified as moderate on both social and fiscal issues. Classic conservatives (N = 2457) = Individuals who identify as 'somewhat' or 'strongly' conservatives for both social and economic issues. Classic liberals (N = 4020) = Individuals who identify as 'somewhat' or 'strongly' liberal for both social and economic issues. Libertarians (N = 1221) identify as (somewhat/strongly) liberal on social issues but (somewhat/strongly) conservative on economic issues. Error bars represent 95% confidence intervals.*

In addition to these results on the directional relationship between CRT and political ideology, we also consider the correlation between CRT and ideological *extremity*. This investigation is motivated in part by previous work showing that individuals who are more analytic tend to be more politically polarized on specific issues (e.g, climate change risk; Kahan et al., 2012) – although it should be noted that this line of work does not make clear predictions regarding the relationship between CRT and political extremity since the theory typically takes one's ideology as a given and then stipulates that analytic thinking is used to justify that ideology. As can be seen in Figure 6, we find that politically engaged individuals (be they liberal or conservative) are more analytic than political moderates. To gain further insight into political

extremity, we recoded the social and economic conservatism measures to reflect extremity of position: i.e., those who indicated being "strongly" conservative/liberal were given a 2, those who indicated being "somewhat" conservative/liberal were given a 1, and those who indicated being "moderate" were given a 0. Using this measure, CRT performance was modestly positively correlated with extremity for both social issues, $r(12042) = .14$, $p < .001$, and economic issues, $r(12042) = .08$, $p < .001$. However, as is evident from Figure 7, these correlations with extremity are driven almost entirely by political moderates scoring lower than either those with somewhat or strong ideological commitments, rather than an increase in CRT moving from somewhat liberal/conservative to strongly liberal/conservative. The only increase in CRT performance as a function of political extremity beyond the "moderate" category is the difference between "somewhat" liberals ($M = .50$, $SD = .28$) and "strong" liberals ($M = .53$, $SD = .29$) on social issues, $t(9081) = 5.11$, $SE = .006$, $p < .001$. Thus, on balance, CRT performance appears to be mostly linked to an *absence* of partisanship (i.e. political indifference), rather than to a *presence* of political polarization or strong partisanship in political ideology.

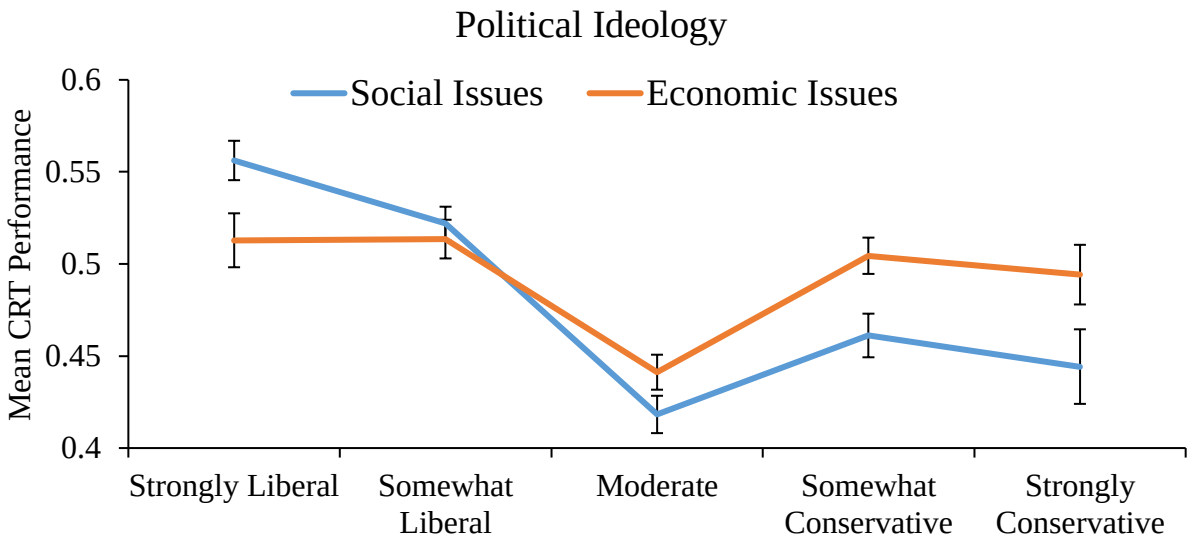


Figure 7. *Mean CRT accuracy (0-1) as a function of strength of political ideology on both social and economic issues. The y-axis has been truncated for readability. Error bars represent 95% confidence intervals.*

Interaction between behavior and ideology. Finally, as a robustness check on the interaction between party affiliation and voting behavior, we completed a parallel analysis to that reported above, but using the four political ideology categories in Figure 6 instead of political party. This revealed a significant interaction between political ideology and voting behavior (Figure 8), $F(9, 9836) = 6.62$, $MSE = .08$, $p < .001$, $\eta^2 = .006$. The interaction remained significant after entering age, gender, and education as covariates, $F(9, 9761) = 7.51$, $MSE = .07$, $p < .001$, $\eta^2 = .007$, and after also entering income and ethnicity in the smaller sample, $F(9, 4723) = 2.54$, $MSE = .08$, $p = .007$, $\eta^2 = .005$. We compared CRT scores between the four levels of voting behavior separately for each ideological category. In all four cases, there was significant variability in CRT performance as a function of voting behavior, all F's > 4.9, p's < .003. Again, however, different homogeneous subsets (based on *post hoc* Tukey's HSD tests, $p < .05$) emerged in each case. The pattern of results based on the Tukey's HSD tests was identical for liberals as it was for Democrats (i.e., there were no differences in CRT performance between those who voted for Clinton, a 3rd-party candidate, or who did not vote, while those who voted for Trump scored significantly lower than the other three groups) and for conservatives as it was for Republicans (i.e., those who voted for a 3rd-party candidate scored higher on the CRT than any other group, which did not differ). The pattern for moderates was the same as it was for Republicans and conservatives: Those who voted for a 3rd-party candidate scored higher than all other groups (which did not differ). Finally, among libertarians, those who did not vote scored the lowest (but they did not significantly differ from Trump voters). Clinton voters scored higher

than non-voters, but not higher than Trump voters and 3rd-party candidate voters scored the highest, but not significantly higher than Clinton voters.

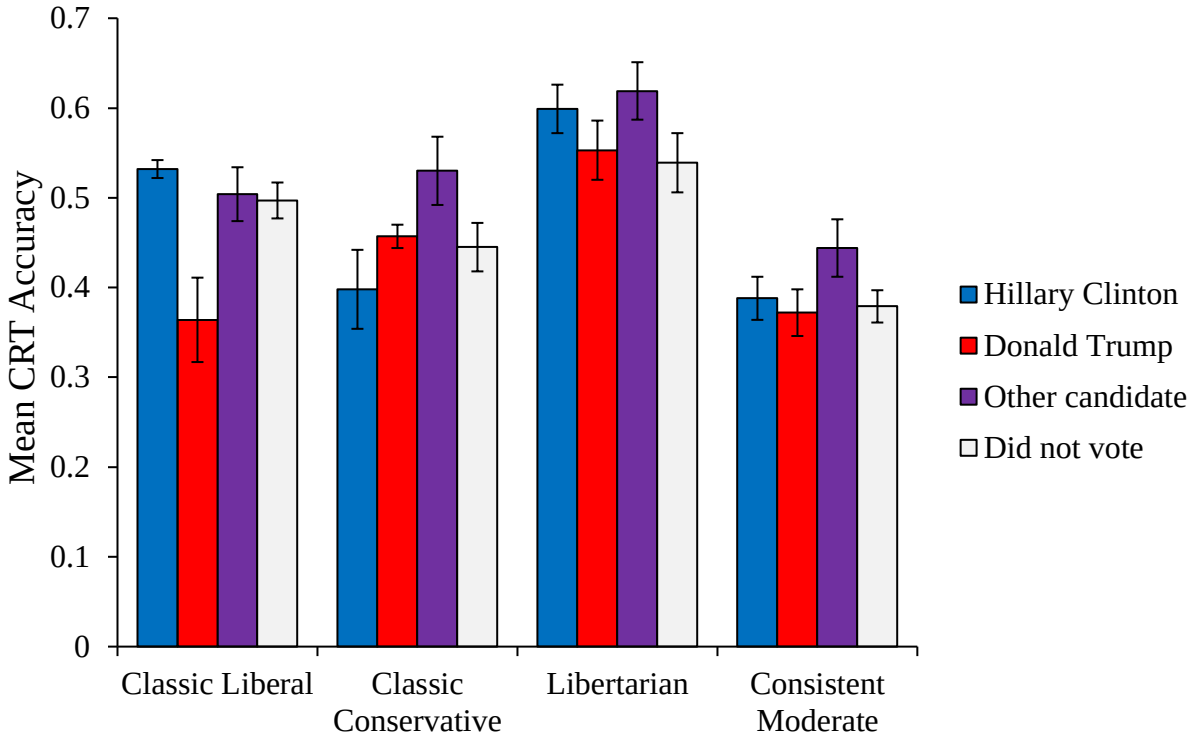


Figure 8. *Mean CRT accuracy (0-1) as a function of the interaction between voting behavior and ideological category. Error bars represent 95% confidence intervals.*

General Discussion

In a sample of 15,001 participants gathered in the year following the 2016 US Presidential Election, we found strong evidence that reliance on intuition is correlated with political affiliation, ideology, and behavior. The pattern of results paints a complex picture which goes beyond the common claim that conservatives are more intuitive and less analytic than liberals.

The largest differences in performance on the CRT emerged when investigating the *interaction* between political opinions and political behavior. Most notably, Trump voters were less analytic overall – and this was particularly true for *Democrats* who voted for Trump.

Although this only represented a small minority (3.8% of Democrats voted for Trump in our sample), these individuals scored substantially lower than the remainder of the sample (see Figure 5). Among Republicans, there was no difference between Clinton and Trump voters, but those who voted for a 3rd-party candidate were the most analytic. As a consequence, although liberals tended to be more analytic than conservatives overall (see Figure 6), Republicans who voted for a 3rd-party candidate scored 20% higher than Democrats who voted for Trump (d = .71; this was the largest difference in the sample based on party affiliation, see Figure 3). Furthermore, individuals who did not vote and/or who are politically "moderate" tended to be particularly intuitive whereas those who hold less mainstream positions – either by identifying as libertarian or voting for a 3rd-party candidate – tended to be particularly analytic.

Theoretical implications

Liberalism vs Conservatism. The present results are consistent with dominant accounts of political cognition – at least as they pertain to the role of analytic thinking in the formation and retention of political attitudes and behavior – but also demonstrate the limitations and incompleteness of these accounts. In particular, we do observe an overall negative correlation between the propensity to think analytically and conservative political ideology: CRT scores were (a) higher among individuals who voted for Clinton relative to those who voted for Trump, (b) higher among Democrats than Republicans (in contrast to Kahan, 2013), and (c) negatively correlated with social (but not economic) conservatism. Moreover, with respect to social issues, "strong" liberals scored higher on the CRT than "somewhat" liberals suggesting a positive association between liberalism and analytic thinking even *among* liberals. These associations align with the predictions of accounts wherein conservatism arises from reliance on intuitive thinking (Eidelman et al., 2012; Jost, 2017; Talhelm et al., 2015).

However, we also observe various exceptions to the overall tendency of liberals to think more analytically than conservatives. For example, the highest CRT subgroup in our affiliation-based analyses were Republicans who voted for 3rd party candidates, and in our ideology-based analyses were libertarians. Thus, it is clearly not the case that being conservative *necessitates* relying on intuitive thinking – the intuitive conservatism account is not the full story. Instead, we propose that there are three additional ways in which analytic thinking may impact political attitudes and behavior: 1) Apathy vs Engagement, 2) Orthodoxy vs Heterodoxy, and 3) Cognitive Match vs Mismatch with Candidate/Platform.

Apathy vs Engagement. Individuals who did not vote (for any reason) scored lower on the CRT than people who voted. Moreover, individuals who identified consistently as politically moderate (i.e., they did not identify as liberal or conservative for either social or economic issues) scored lower than liberals, conservatives, and libertarians. Finally, although political extremity (in the context of social and economic political ideology) was positively correlated with CRT performance, this correlation was primarily driven by low CRT scores among political moderates. These results suggest that one way in which analytic thinking impacts political attitudes and behavior is that thinking analytically undermines political apathy (and facilitates interest and engagement in political issues). This observation resonates somewhat with the claim that highly analytic individuals are more politically polarized because they are better able to reason in a motivated way (Kahan, 2013; Kahan et al., 2017). However, our results suggest that when it comes to overall ideology (as opposed to positions on specific issues), analytic thinking's role may largely be in overcoming political indifference, rather than facilitating extreme political partisanship (see also; Sidanius & Lau, 1989). This observation is also consistent with recent research in which CRT performance was associated with the ability to

discern between fake and real news regardless of whether the news headlines aligned with one's political ideology (Pennycook & Rand, 2018). Future research should investigate this issue using measures of political partisanship that can distinguish between those with strong opinions and those who are intensely partisan.

Orthodoxy vs Heterodoxy. Libertarians and individuals who voted for 3rd-party candidates tended to score higher on the CRT than other groups. These individuals hold what can be viewed as heterodox positions: They have eschewed the two-party dichotomy and took up an alternative position. Thus, akin to accounts of the role of analytic thinking in religious disbelief (Pennycook, Cheyne, Seli, Koehler, & Fugelsang, 2012; Pennycook, Tranel, Warner, & Asp, 2018), one possibility is that individuals who are more analytic are more likely to shift away from whatever political position they emerged with from childhood and adolescence (as has been shown for religious belief, Shenhav et al., 2012). Given that being a 'Democrat' or 'Republican' (or voting for a primary party candidate) is more often the default position (and eschewing these positions presumably relies on analytic thinking), those who hold an alternative stance (or vote in an alternative way) are on average more analytic. Nonetheless, it should be noted that we have no information in the present sample about familial or communal political ideology – rather, we are making inferences assuming a binary Democrat/Republican political default. Longitudinal studies that track changes in political attitudes over time are necessary to firmly evidence this account.

Cognitive Match vs Mismatch with Candidate/Platform. Although the heterodoxy mechanism explains some of our data, it does not explain perhaps our most striking findings: The particularly low CRT scores among Democrats (and liberals) who voted for Trump. However, it should be noted that this observation was in some sense mirrored by the particularly *high* CRT

scores for Republicans (and conservatives) who voted for 3rd parties *instead* of Trump. One possibility, then, is that Trump, and the campaign that he ran, may have been particularly attractive for relatively intuitive individuals and repellent for relatively analytic individuals. We speculate that this may be because one of the most salient features of Trump himself was his reliance on intuition and impulse (as noted in the epigraph) along with an informal communication style (Ahmadian, Azarshahi, & Paulhus, 2017; Jordan & Pennebaker, 2017; Oliver & Rahn, 2016). For example, using text analytic methods, Jordan and Pennebaker (2017) found that Trump uses language that is much more in-the-moment, informal, and narrative (as opposed to formal, logical, and analytical) relative to other Presidents and presidential candidates. Previous work has shown that persuasive appeals are more effective when they are constructed to correspond with the target's personality traits (Hirsh, Kang, & Bodenhausen, 2012; Matz, Kosinski, Nave, & Stillwell, 2017) – a finding that may extend to correspondence in cognitive style between political candidates and voters.

Trump may also have attracted intuitive thinkers (and repelled analytic thinkers) because of his specific policy proposals, many of which had a particularly intuitively or emotionally compelling appeal (as opposed to being built around detail and careful analysis). For example, his proposal to build a several-stories high physical wall along the Mexican border to reduce illegal immigration evokes much more intuitively compelling mental imagery than the border fence favored by homeland security experts (Nixon, 2017). Similarly, his proposal of using tough trade policies to bring manufacturing jobs back to the United States in large numbers likely resonated more at an intuitive level than Clinton's proposal to retrain individuals formerly employed in manufacturing. Future work should examine these possibilities experimentally.

Limitations

There are a number of limitations of the present work that should be made clear. First, our sample is from Mechanical Turk which is not representative of the broader US population. Individuals self-selected into the studies (although none were advertised as being about analytic thinking or political ideology) and presumably are comfortable with online surveys (which may not be true for pockets of the general population). Furthermore, as our data indicate, conservatives are under-represented on Mechanical Turk, and it is possible that conservatives on Mechanical Turk differ from other conservatives in ways that could affect our results. Thus, although previous work has shown Mechanical Turk to be a reliable resource for research on political ideology (Berinsky, Huber, & Lenz, 2012; Buhrmester, Kwang, & Gosling, 2011; Clifford, Jewell, & Waggoner, 2015; Coppock, 2016; Krupnikov & Levine, 2014; Mullinix, Leeper, Druckman, & Freese, 2015), the present results should be replicated using a nationally representative sample, and it should not be assumed that our results generalize to the nation as a whole. Relatedly, our results speak only to the various theories of political ideology in the American context. It is unclear how or if aspects of the present results generalize to other countries. Unfortunately, this is a limitation of the broad literature on CRT and political cognition (with one exception where a Turkish sample was used: Yilmaz & Saribay, 2016b).

Although analytic thinking was measured using a 7-item behavioral (rather than self-report) measure, we did not include a direct measure of just cognitive ability (e.g., numeracy) as a control. As such, the extent to which the *propensity* to think analytically (as opposed to the *ability*) is responsible for the present results is unclear. Indeed, it may be that cognitive ability is a strong predictor of political ideology (Hodson & Busseri, 2012; Onraet et al., 2015; Saribay & Yilmaz, 2017). Further research is necessary to more precisely identify the source of the

associations reported here. Relatedly, we indexed political ideology with single-item measures – full scales may produce a different pattern of results (or, at least, different effect sizes).

A separate issue is that our participants were asked about voting behavior well after the US Presidential Election (for some, close to a year after). Although it is unlikely that one would forget who they voted for, it is possible that some individuals might misreport their voting decision as a result of events that occurred afterward (Stocké & Stark, 2007) or report that they voted when they actually did not (Anderson & Silver, 1986). In addition, one's performance on the CRT at the time that they completed the study may not be the same as it would have been on the day that they voted (although there is evidence that CRT performance is quite stable, including for time periods exceeding a year; Stagnaro, Pennycook, & Rand, 2018).

The present research takes a correlational as opposed to an experimental approach. There is some (albeit limited) experimental evidence that analytic thinking is linked to liberalism. Yilmaz & Saribay (2017b) found that analytic thought training increased liberal-consistent responses to politicized news articles (see also Pennycook & Rand, 2017), but had no effect on political opinions on specific issues or general political ideology (see Deppe et al., 2015; Yilmaz & Saribay, 2016 for additional failures to induce an experimental effect). Further experimental work is required to understand the potential interaction between analytic training, political behavior, and political ideology.

Finally, the present data set emerged from studies with a different focus (namely, fake news; (Pennycook, Cannon, & Rand, 2018; Pennycook & Rand, 2018; Pennycook & Rand, 2017a, 2017b). As such, this should be considered an exploratory study – albeit with a large sample size and substantial statistical power. Given the constantly changing political landscape,

confirmatory research undertaken during future elections would help establish both the validity and generalizability of our results.

Conclusion

It has often been argued that liberals are more analytic and less intuitive than conservatives (Deppe, Gonzalez, & Neiman, 2015; Eidelman, Crandall, Goodman, & Blanchar, 2012; Haidt, 2012; Jost, 2017; Jost, Glaser, Kruglanski, & Sulloway, 2003; Talhelm et al., 2015). In a sample of 15,001 participants, we did find support for this claim. However, our results also provide evidence for three additional mechanisms by which analytic thinking may impact American political attitudes and behavior. First, analytic thinking may be important for encouraging political engagement (and discouraging political apathy). Second, analytic thinking may support the adoption of heterodox political positions and behavior. Third, analytic thinkers may be drawn toward political candidates who (at least by appearance) share a similar cognitive style, and intuitive thinkers might be drawn to policy proposals that have particular intuitive appeal. These observations illuminate new directions for future research on the psychological underpinnings of political ideology, affiliation, and behavior.

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Appendix

2016 US Presidential Election Vote	*N*	M_{CRT}	SD_{CRT}
Hillary Clinton	5938	.516	.298
Donald Trump	3757	.453	.278
Other candidate	1832	.533	.281
DNV: Reasons outside of control	925	.459	.285
DNV: But could have	1764	.460	.281
DNV: Out of protest	785	.452	.278

Party Affiliation	*N*	M_{CRT}	SD_{CRT}
Democrat	5752	.498	.288
Republican	3396	.455	.278
Independent	5162	.498	.285
Other (specify)	647	.512	.283

	Party Affiliation		
	Democrat	Republican	Independent
Hillary Clinton	.512 (.287)	.453 (.301)	.537 (.287)
Donald Trump	.356 (.282)	.448 (.274)	.483 (.284)
Other candidate	.487 (.280)	.556 (.280)	.535 (.282)
Did not vote	.466 (.285)	.444 (.280)	.455 (.280)

Note: CRT means and, in brackets, SD. See Table 2 (main text) for N's.

Political Ideology	*N*	M_{CRT}	SD_{CRT}
Classic Liberal	4020	.518	.285
Classic Conservative	2457	.458	.277
Libertarian	1221	.580	.272
Consistent Moderate	2154	.388	.271

	Political Ideology			
	Classic Liberal	Classic Conservative	Libertarian	Consistent Moderate
Hillary Clinton	2836	387	150	512
Donald Trump	129	267	1688	438
Other candidate	343	285	209	289
Did not vote	712	282	410	915

Note: *N*

	Political Ideology			
	Classic Liberal	Classic Conservative	Libertarian	Consistent Moderate
Hillary Clinton	.532 (.284)	.600 (.265)	.398 (.295)	.388 (.285)
Donald Trump	.364 (.275)	.553 (.267)	.457 (.275)	.372 (.266)
Other candidate	.504 (.278)	.619 (.269)	.530 (.273)	.444 (.264)
Did not vote	.497 (.285)	.539 (.281)	.445 (.274)	.379 (.267

Note: CRT means and, in brackets, SD.

	Strongly Liberal	Somewhat Liberal	Moderate	Somewhat Conservative	Strongly Conservative
Social Issues	2706	3546	2959	2038	793
Economic Issues	1512	2805	3393	3121	1211

Note: *N*.

	Strongly Liberal	Somewhat Liberal	Moderate	Somewhat Conservative	Strongly Conservative
Social Issues	.556 (.284)	.522 (.279)	.418 (.281)	.461 (.272)	.444 (.290)
Economic Issues	.513 (.290)	.514 (.283)	.441 (.282)	.505 (.281)	.494 (.287)

Note: CRT means and, in brackets, SD.