Analytic cognitive style and cognitive ability differentially predict religiosity and social conservatism☆

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A B S T R A C T

Motivated by the dual-process model of the mind, recent research has tested the relationship between cognitive variables and sociopolitical attitudes. There are reasons to believe that religiosity and conservatism may be differentially predicted by analytic cognitive style (ACS) and cognitive ability (CA), respectively. We collected data with three ACS measures, two CA measures, and separate measures of social and economic conservatism. ACS uniquely predicted religiosity and CA uniquely predicted social and general, but not economic, conservatism, controlling for demographic variables. Further research and theorizing are needed to establish the potentially closer coupling between ACS and religiosity and CA and conservatism.

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1. Introduction

"It is the heart which perceives God and not the reason. That is what faith is: God perceived by the heart, not by the reason."

[–Blaise Pascal]

"The intellectual debility of contemporary conservatism is indicated by its silence on all important matters."

[–Christopher Lasch]

Individuals differ in a host of cognitive variables and these differences may be associated with sociopolitical attitudes. Following a key meta-analysis by Jost, Glaser, Kruglanski, and Sulloway (2003), there has been a surge of interest in explaining differences in ideological attitudes with reference to differences in cognitive style. Across many cultures, a more rigid, closed-minded, and dogmatic cognitive style, has been found to be associated with conservatism (Jost et al., 2003; Jost, Sterling, & Stern, 2017).

The dual-process model of the mind can explain such results. Accordingly, the human mind functions with the help of two types of mental processes: The evolutionarily older Type 1 supports rapid, automatic information processing and outputs intuitive judgments whereas Type 2 supports slower, systematic information processing and outputs reflective judgments (Evans & Stanovich, 2013). Analytic thought is a signature of Type 2 activation and involves critically examining Type 1 intuitions and effortfully overriding them in favor of more rational responses (Stanovich, 2011). The tendency to use analytic thought—analytic cognitive style (ACS)—has been empirically linked to liberalism (Yilmaz & Saribay, 2017) and intuitive cognitive style to conservatism (e.g., Eidelman, Crandall, Goodman, & Blanchar, 2012).

Similar attempts have been directed at understanding individual differences in religiosity. For instance, Pennycook and colleagues (Pennycook, Cheyne, Seli, Koehler, & Fugelsang, 2012) showed that ACS, controlling for a host of variables including cognitive ability (CA) and political ideology, predicted both religiosity and paranormal beliefs negatively. Other research has demonstrated the same negative ACS-religiosity relationship experimentally (Gervais & Norenzayan, 2012; Shenhav, Rand, & Greene, 2012; Yilmaz, Karadöller, & Sofuoglu, 2016), although conflicting findings also exist (Sanchez et al., 2017; Yonker, Edman, Cresswell, & Barrett, 2016).

1.1. Cognitive style and cognitive ability

In testing the relationship between cognitive style and sociopolitical attitudes, it is important to control for CA, because intelligence and social conservatism are negatively related (Hodson & Busseri, 2012; Onraet et al., 2015). Intelligence also appears to be negatively, albeit weakly, related to religiosity (Zuckerman, Silberman, & Hall, 2013).

One reason for this relationship is that more intelligent individuals are more likely to adopt an ACS (Frederick, 2005; see Zuckerman et al., 2013, p. 341).

1.2. Differential relations of religiosity and conservatism with cognitive variables

In many societies religiosity is aligned with conservatism (Piurko, Schwartz, & Davidov, 2011) and CA and ACS are correlated. However, CA and ACS might differentially predict conservatism and religiosity, respectively. First, despite their metaphysical nature, the key concepts that support religious beliefs (e.g., god, angels, and commandments such as "thy shall not steal") may be more concrete and less complicated than those of politics (e.g., wealth distribution, democracy, checks and balances): "religion is deeply anthropomorphic, religious beliefs are inspired by the world around us, [and] religion follows our often simple intuitions about the world" (Frey, 2009, p. 237). Second, religious practices may be more visible and frequent (e.g., weekly Church attendance) than political actions (e.g., voting, protests). Third, fear of god and punishment in hell does not appear to have political counterparts that are equally emotionally charged and instilled in childhood in a way that retains relevance in adulthood (i.e., even if a child acquired the fear of punishment by Donald Trump or Hillary Clinton, it will most probably be irrelevant in adulthood because politicians change but the concept of god will presumably retain the same essence). Such factors may contribute to the increased prominence of religion, relative to politics, in early socialization, making religious beliefs more strongly embedded in Type 1 processes (see Norenzayan, 2013; Norenzayan & Gervais, 2013). In fact, socialization (especially by parents) and exposure to credibility-enhancing displays (i.e., "walking the walk"; Henrich, 2009) by community members appears to be the most potent source of future attitudes and beliefs (Lanman & Buhrmester, 2017). Thus, whichever belief system is most easily translated to concrete behavior, in this case religion, should feature more prominently in early socialization and consequently have an advantage in cultural transmission via being more firmly installed in Type 1 processes. The socialization literature offers some support for this idea. For instance, transmission is more likely on "issues with a strong moral and/or affective component" (Jennings, Stoker, & Bowers, 2009, p. 787) and these issues tend to feature religion prominently (e.g., abortion, prayer in schools) as "religion is emotional" (Thagard, 2005).

Furthermore, human cognitive architecture may be particularly suited to belief in supernatural agency (Barrett, 2004). Children have been labelled "intuitive theists" (Kelemen, 2004) and this inclination may continue into adulthood, possibly even for self-defined non-believers (cf. Gervais & Najle, 2015). Critically, adult non-believers respond as if they believe in supernatural agency under processing constraints, that is, when Type 2 processes are hampered (Järnefelt, Canfield, & Kelemen, 2015). Activating Type 2 reflection is also known to reduce religious conviction (Gervais & Norenzayan, 2012; Shenhav et al., 2012; Yilmaz et al., 2016). Based on similar considerations, Gervais and Najle (2015, p. 334) have suggested that "intelligence may influence religiosity (e.g., Zuckerman et al., 2013) primarily through its effects on cognitive style, and be wholly independent of—or perhaps enhance—the influence of cultural learning" (for similar statements, see also Ashton & Lee, 2014; Morgan, Wood, & Caldwell-Harris, 2017). Finally, evidence has begun to emerge that when both CA and ACS are measured, it is the latter that is predictive of religiosity (see Pennycook, 2014, for a review; Pennycook, Ross, Koehler, & Fugelsang, 2016, for a meta-analysis; but see Razmyar & Reeve, 2013).

In contrast, political reasoning may require more time to develop both because children lack the "cognitive competence" to process policy issues and because they "are virtually segregated from the places where politics is enacted or even discussed" (Sapiro, 2004, p. 16). Consequently, political preferences may be relatively less deeply rooted in Type 1 processes. Liberal arguments in particular may tend to be more complex

and abstract (e.g., Cichocka, Bilewicz, Jost, Marrouch, & Witkowska, 2016) and processing them may require a certain level of CA. Westen (2008) made this point by stating that U.S. Democrats have "an irrational emotional commitment to rationality" (p. 15). Thus, relative to the tendency to override intuitions, it may rather be *the cognitive capacity for rational thought* that predicts a liberal political orientation.

While ACS and conservatism—especially social rather than economic (e.g., Deppe et al., 2015; Yilmaz & Saribay, 2016, 2017)—are negatively related, this may be due to the ACS-CA relationship and CA may be a stronger predictor of political orientation than ACS. Some studies have failed to observe the ACS-conservatism link (e.g., Kahan, 2013; Landy, 2016), perhaps for this reason. The CA-conservatism link, on the other hand, has been established in many studies (see Onraet et al., 2015, for a meta-analysis). Most compellingly, childhood intelligence prospectively predicts adulthood liberalism (Schoon, Cheng, Gale, Batty, & Deary, 2010). CA and political attitudes are both heritable and the former may mediate genetic influences on the latter (Oskarsson et al., 2015).[1] However, not many studies on the CA-conservatism link have controlled for the related constructs of ACS and religiosity (see Heaven, Ciarrochi, & Leeson, 2011, for a negative intelligence-conservatism link controlling for religiosity).

In sum, consistent with theorizing regarding ACS and CA (Toplak, West, & Stanovich, 2011), ACS should be more relevant when there are strong intuitions in a given domain. Religion may be a more prominent source of intuitions than politics is. Thus, religiosity should be more closely coupled with (weak) ACS than CA; and conservatism with (low) CA than ACS. The extant literature has focused on either religiosity or conservatism exclusively. Since these are related (e.g., Hirsh, Walberg, & Peterson, 2013), we aimed to provide evidence controlling for religiosity when predicting conservatism and vice versa.

1.3. The present research

We simultaneously examined religiosity and conservatism on the one hand and cognitive style and cognitive ability on the other and tested the prediction that ACS would uniquely predict religiosity (a replication of Pennycook et al., 2012) and CA would uniquely predict conservatism. We employed separate measures of social and economic attitudes, as well as alternative measures of ACS and CA.

2. Method

2.1. Participants

Since replication should ideally exceed the original sample size (Simonsohn, Nelson, & Simmons, 2014) we aimed to recruit a sample that was at least 1.5 times as large as Pennycook et al.'s (2012). Considering potential data loss, 523 Amazon Mechanical Turk workers participated in exchange for money.[2] Participants who did not complete the survey and those with an IP outside of the U.S.A. were excluded, resulting in 426 participants (mean age = 38.67, SD = 13.81, 235 female, 160 male, 1 unreported). There were 225 Christians (52.8%), 59 Agnostics (13.8%), 37 Atheists (8.7%), 9 Buddhists (2.1%), 8 Jews (1.9%), 5 Pagans (1.2%), 3 Muslims (0.7%), 30 "others" (7%), and 50 unreported (11.7%).

2.2. Materials and procedure

Participants were directed to an online survey that was implemented using PsyToolkit (Stoet, 2010, 2017) and took approximately 25 min to complete. The order of the measures and the order of the items

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Table 1
Correlations among the variables.

Variables	ACS	CA	Polit. orient.	Social conserv.	Econ. conserv.	R_b	R_e	Gender	Age	Educat.
ACS	1									
CA	0.420**	1								
Polit. orient.	−0.116*	−0.163**	1							
Social conserv.	−0.147**	−0.107*	0.711**	1						
Econ. conserv.	−0.081	−0.048	0.738**	0.689**	1					
R_b	−0.262**	−0.103*	0.396**	0.569**	0.360**	1				
R_e	−0.178**	−0.092	0.393**	0.567**	0.345**	0.737**	1			
Gender	−0.101*	0.048	0.006	0.017	−0.027	0.132**	0.086	1		
Age	0.000	0.311**	0.042	0.279**	0.114*	0.110*	0.127*	0.019	1	
Education	0.249**	0.218**	−0.122*	−0.119*	−0.102*	−0.119*	−0.064	0.031	0.015	1
Income	0.113*	0.026	0.103*	0.090	0.136**	−0.045	−0.013	−0.049	0.117*	0.359**

Notes. N's range from 376 to 422 due to occasional missing data. For gender, 0 = male, 1 = female. Polit. orient. = political orientation (general); social conserv. = social conservatism; econ. conserv. = economic conservatism; R_b = religious belief; R_e = religious engagement.
  * $p < 0.05$ (two-tailed).
 ** $p < 0.01$ (two-tailed).

within each measure were randomized, except for the demographic items, which always appeared at the end of the survey in fixed order. See Supplementary materials (SM) for all measures.

2.2.1. ACS

We used three measures. The CRT (Frederick, 2005) includes three questions each with an intuitive (but wrong) answer. The correct answer can be produced using high-effort thought.

BRC problems (De Neys & Glumicic, 2008) are structured similarly. They present base rate information together with stereotypic content. Analytic thought facilitates the ability to override the misleading stereotypic information and take into account the base rate in producing the correct answer.

CRT-2 (Thomson & Oppenheimer, 2016) was developed to overcome some limitations of the CRT.

Responses were coded as correct/incorrect, averaged into a single measure of ACS (Cronbach's α = 0.76), and converted to percent of maximum possible (POMP) scores (Cohen, Cohen, Aiken, & West, 1999). Higher scores indicated stronger ACS.

2.2.2. Cognitive ability

We used two measures. WordSum (Huang & Hauser, 1998) is a vocabulary test in which participants are asked to pick a word, from a set of five, that comes closest in meaning to a target word. Participants were given 10 such sets and they could also choose "don't know/prefer not to say."

Base rate neutral problems (De Neys & Glumicic, 2008) are similar to BRC problems but lack the misleading stereotypical information and thus, measure the ability to use probability information.

Responses were coded as correct/incorrect, averaged, and converted to POMP scores (Cronbach's α = 0.77). Higher scores indicated greater CA.

2.2.3. Conservatism

Participants indicated their political (i.e., general), social, and economic orientations on a rating scale from 0 (extremely liberal) to 10 (extremely conservative), with the option to respond with "don't know/prefer not to say." In addition, participants indicated their attitudes toward 12 social[3] (Cronbach's α = 0.83) and economic (Cronbach's α = 0.62) issues (Everett, 2013) by rating how positive or negative they feel about each on a feeling thermometer (0 = negative, 100 = positive). Responses were converted to POMP scores and averaged into two composite variables representing social (social orientation and Everett's social conservatism subscale; Cronbach's α = 0.87) and economic conservatism (economic orientation and Everett's

economic conservatism subscale; Cronbach's α = 0.72). The general political orientation question was analyzed separately. In all cases, higher scores indicated greater conservatism.

2.2.4. Religiosity

We used the same religiosity measures as Pennycook et al. (2012). Three religious engagement (R_e) questions measured frequency of engaging in religious practices (Cronbach's α = 0.85). Six religious belief (R_b) items measured the extent of belief in religious concepts (Cronbach's α = 0.94). Both scales had a separate "don't know/prefer not to say" response option. All responses were converted to POMP scores and averaged separately. Higher scores indicated higher belief and engagement.

2.2.5. Demographics

Participants indicated their education level, income, gender (0 = male, 1 = female), and age (in years). Education and income were converted into POMP scores.

3. Results

Table 1 depicts the correlations among the variables, which were in line with the literature. To examine unique relationships, we conducted a series of hierarchical multiple regression analyses. As in Pennycook et al. (2012), in predicting R_b, we controlled for demographics (age, gender, education, and income) and general political orientation in the first step, R_e in the second step, and entered CA and ACS as the main predictors in the third step (Table 2). Gender, age, and political orientation

Table 2
Hierarchical multiple regression: standardized regression coefficients predicting R_b with ACS controlling for gender, age, education, income, general political orientation, R_e, and CA.

Religious belief				
	Step 1	Step 2	Step 3	Adjusted R^2
Demographics				0.172***
Gender	0.114*	0.070*	0.056	
Age	0.102*	0.018	0.014	
Education	−0.054	−0.053	−0.026	
Income	−0.072	−0.026	−0.022	
Political orientation	0.382***	0.115**	0.114**	
Control variables				0.544***
R_e		0.671***	0.653***	
Cognitive measures				0.557***
CA			0.016	
ACS			−0.134**	

  * $p < 0.05$.
 ** $p < 0.01$.
*** $p < 0.001$.

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[3] The original scale had one item for "religion." To not artificially inflate the overlap between social conservatism and religiosity, we excluded this item while calculating the social conservatism scale. However, including it did not change any of the results.

Table 3
Hierarchical multiple regression: standardized regression coefficients predicting social conservatism CA controlling for gender, age, education, income, R_b, R_e, and ACS.

Social conservatism				
	Step 1	Step 2	Step 3	Adjusted R^2
Demographics				0.098***
Gender	0.023	−0.041	−0.034	
Age	0.269***	0.189***	0.222***	
Education	−0.174**	−0.113**	−0.095*	
Income	0.115*	0.119**	0.108*	
Control variables				0.440***
R_b		0.301***	0.299***	
R_e		0.340***	0.336***	
Cognitive measures				0.445***
ACS			0.032	
CA			−0.104*	

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

were significant independent predictors in step 1. In step 2, R_e made a significant independent contribution while gender and political orientation remained significant. In step 3, ACS, but not CA, made a further significant independent contribution, and only political orientation and R_e remained significant. These results directly replicate Pennycook et al.'s (2012) finding that ACS predicted R_b independently of demographics, political orientation, R_e, and CA.

In predicting social conservatism, we controlled for demographics in step 1, R_b and R_e in step 2, and entered CA and ACS in step 3 (Table 3). Age, education, and income were significant independent predictors in step 1. In step 2, both R_b and R_e made a significant independent contribution while age, education, and income remained significant. In step 3, CA, but not ACS, made a further significant independent contribution, and all of the significant predictors in step 2 remained significant. These results demonstrate that lower CA predicted social conservatism independently of demographics, R_b, R_e, and ACS.

The same analyses were run to predict general political orientation (Table 4). Education and income were significant independent predictors in step 1. In step 2, both R_b and R_e made a significant independent contribution while education and income remained significant. In step 3, CA, but not ACS, made a further significant independent contribution, and all of the significant predictors in step 2 remained significant. Thus, lower CA predicted political orientation independently of demographics, R_b, R_e, and ACS.

The same analyses were run with economic conservatism as the outcome. Neither ACS ($\beta = 0.004$, $p = 0.944$) nor CA ($\beta = 0.003$, $p = 0.963$) had a significant effect in the final model.

Table 4
Hierarchical multiple regression: standardized regression coefficients predicting political orientation with CA controlling for gender, age, education, income, R_b, R_e, and ACS.

General political orientation				
	Step 1	Step 2	Step 3	Adjusted R^2
Demographics				0.028**
Gender	0.030	−0.015	−0.003	
Age	0.024	−0.032	0.010	
Education	−0.175**	−0.133**	−0.113*	
Income	0.161**	0.165**	0.150**	
Control variables				0.195***
R_b		0.203**	0.204**	
R_e		0.249***	0.242***	
Cognitive measures				0.203***
ACS			0.056	
CA			−0.133*	

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

4. Discussion

We provided evidence that ACS uniquely predicted R_b while CA uniquely predicted social (but not economic) conservatism and general political orientation. While the effect sizes may appear to be small, one must keep in mind that several variables that explained a non-negligible amount of outcome variance were controlled for in all our analyses.

These findings dovetail with, but also extend, recent others (Hodson & Busseri, 2012; Pennycook et al., 2012). We believe they can be interpreted in light of the differences between religious versus political socialization. Specifically, general qualities of religious belief systems appear to have evolved to support their firm place in individual minds and their potency in guiding behavior. Especially with early socialization, religious belief is installed in intuitive Type 1 processes and is then overridden primarily with the help of reflective Type 2 processes, when factors such as secular/scientific education (Glaeser & Sacerdote, 2008) or exposure to religious hypocrisy (Bengtson, Putney, & Harris, 2013) enable or compel the individual to rely on ACS. Political socialization may be delayed due to the increased complexity and abstractness of political issues. Consequently, in adulthood, one's political position may be influenced more by the extent to which one possesses cognitive capacity to process complex arguments, rather than one's tendency to override intuitions.

4.1. Limitations and future directions

The generalizability of our findings may be questioned on several grounds. For instance, the degree of alignment between religiosity and conservatism is subject to variation within and across cultures based on several factors (Malka, 2014). Such variation may affect empirical patterns of their relations with CA and ACS or their greater alignment may simply make it more difficult to disentangle their separate relations with CA and ACS. Also, across cultures, the same policy preferences may relate in opposite directions to cognitive variables (see Oskarsson et al., 2015). Thus, future research should test individual and societal moderators of these relationships.

Relying on alternative ways to capture variation in religiosity may also lead to divergent conclusions. For instance, distinguishing between religiosity, spirituality, and fundamentalism (see Saroglou, 2010) may prove to be important in that it may really be the latter which is related to ACS. Furthermore, the profiles of subgroups of believers and non-believers may be quite varied (Lindeman & Lipsanen, 2016). The same point can be made for conservatism, as the particular measure of conservatism used has been shown to moderate the CA-conservatism relationship (Onraet et al., 2015) and as the present findings clearly show the importance of distinguishing between social and economic conservatism. Thus, future research should employ alternative measures of ideological constructs, as well as to test samples beyond U.S. American mTurkers and Christians.

Finally, it may be verbal, rather than non-verbal, ability that is related to political orientation (Ludeke, Rasmussen, & DeYoung, 2017; Onraet et al., 2015) and self-administered ability measures may underestimate the magnitude of the CA-ideology relationship (Ludeke et al., 2017). Thus, including a broader set of (and professionally administered) ability measures should prove fruitful.

4.2. Conclusion

Our primary contribution has been to show that when both CA and ACS (on the cognitive side) and religiosity and social and economic conservatism (on the sociopolitical side) are simultaneously taken into account, it is possible to observe differential relations between these variables. Religion and politics play important roles in the lives of many individuals and yet they may be related differently to cognitive variables, as our findings show. A full-fledged analysis of how the potential differences between religious and political socialization may lead to

these findings is beyond the current scope and may be particularly difficult because religious and political socialization and discourse are closely intertwined (Ammann, 2014). Religious belief and political orientation are both genetically influenced and those influences themselves may overlap (Friesen & Ksiazkiewicz, 2015), leading some researchers to conceptualize them as components of one overarching construct (Ludeke, Johnson, & Bouchard, 2013). However, we have suggested that, religion may have an edge in terms of taking root in Type 1 processes. Consequently, religious disbelief will require the tendency to rely on Type 2 reflection whereas political liberals may hinge upon the ability to reason through complicated abstract propositions. We hope these suggestions will serve as a starting point for further theorizing and that these intriguing results contribute to the growing interest in this topic.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx. doi.org/10.1016/j.paid.2017.03.056.

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