



## The relation between different types of religiosity and analytic cognitive style



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### ABSTRACT

Analytic cognitive style (ACS) has usually been found to be negatively correlated with religiosity. Several recent studies, however, challenged this finding claiming, for example, that the presumed association is an artifact of the order of presentation of the ACS and religiosity measures or that ACS might be differently related to different types of religiosity. Furthermore, almost all data in this field of research come from Western Christian samples. We, therefore, investigated whether ACS is related to four types of religiosity (intrinsic, extrinsic, quest, and general religious belief) and whether this relation stems from an order effect in three different studies with four different non-western samples (total  $n = 1329$ ). The results reveal that there is no order effect and that ACS is negatively correlated to intrinsic/extrinsic religiosity and general religious belief, corroborating initial findings. Additionally, we found a positive correlation between ACS and quest religiosity. The results point to the importance of distinguishing different types of religiosity in religiosity-cognitive style studies.

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The dual-process model of the mind originally proposed to account for thinking dispositions in reasoning and problem solving, is currently being evaluated as a plausible explanation of beliefs and attitudes in a much broader domain (see Pennycook, Fugelsang, & Koehler, 2015). Dual-process theories generally argue that our minds operate on the basis of two types of processes. Type 1 processes are mostly those that are intuitive, automatic and low-effort while Type 2 processes are mostly analytic, controlled and requiring high effort (Evans & Stanovich, 2013). These thinking styles have been shown to be associated with acceptance of evolutionary theory (Gervais, 2015), understanding the nature of science (Shtulman & McCallum, 2014), less moral sensitivity (Pennycook, Cheyne, Barr, Koehler, & Fugelsang, 2014; Royzman, Landy, & Goodwin, 2014), and less conservative political attitudes (Iyer, Koleva, Graham, Ditto, & Haidt, 2012; Saribay & Yilmaz, 2017; Yilmaz & Saribay, 2016, 2017a, 2017b).

A large literature indicates that the tendency to think analytically (as measured by the Cognitive Reflection Test; CRT) is also negatively related to religious belief (Gervais & Norenzayan, 2012; Pennycook, Cheyne, Seli, Koehler, & Fugelsang, 2012; Shenhav, Rand, & Greene, 2012). However, a recent study argued that the CRT-religious belief relationship originates from a kind of order effect (Finley, Tang, & Schmeichel, 2015). That is, it is only found when analytic thinking is measured

first. In other words, it is argued that CRT primes analytic thinking, which in turn leads to a decrease in religious belief when it is measured before the religiosity measure; however, there is, in fact, no relationship between trait religiosity and trait analytic thinking ability (Finley et al., 2015).<sup>1</sup> Pennycook, Ross, Koehler, and Fugelsang (2016) further tested this order effect argument and have shown a modest significant relation with American university students by measuring religious beliefs and analytical thinking in separate sessions. At the same time, they showed that atheists and agnostics were more reflective/analytic than religious believers.

In addition to these correlational findings, a number of studies found that activating analytic thinking experimentally has the effect of reducing religious belief (Gervais & Norenzayan, 2012; Shenhav et al., 2012; Yilmaz, Karadöller, & Sofuoglu, 2016), though there are other studies that failed to find an effect (Sanchez, Sundermeier, Gray, & Calin-Jageman, 2017) and another study that found the opposite effect (Yonker, Edman, Cresswell, & Barrett, 2016). Sanchez et al. (2017) could not replicate the original findings of Gervais and Norenzayan (2012, Study 2) in a high-powered study. Yonker et al. (2016) found in separate studies that the activation of analytical thinking either increased or did not influence intrinsic religiosity. There was also no effect of the analytic thinking manipulation on other measures of religiosity (i.e., another religious belief scale, and belief in supernatural agents).

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<sup>1</sup> Religiosity was initially taken as a fixed character trait in the previous literature, but then it was seen that it can be manipulated and changed (see Shariff, Cohen, & Norenzayan, 2008). The same applies for ACS.

Intrinsic religiosity is not seen as a general religious belief in the literature but as a sign of religious motivation (Hathaway & Pargament, 1990). Yonker et al. (2016) argue that there should not be a negative relationship between intrinsic religiosity and analytical thinking in contrast to the findings of Gervais and Norenzayan (2012) since intrinsic religiosity is positively associated with self-control (McCullough & Willoughby, 2009), which is necessary to suppress intuitions and to think in a high effort mode. Accordingly, Yonker et al. (2016) expected that intrinsic religiosity will be positively related to analytic cognitive style. Thus, they suggest that individual differences in religiosity are important and there might be different relationships between different religiosity measures and the tendency to think analytically. However, it is not clear in this work whether the methods used to prime analytical thinking actually worked. Likewise, some analytical thinking tasks were solved in the experimental group but no parallel manipulation was given to the neutral group. In any case, a number of methods used to activate analytic thinking seem ineffective. For example, of the three manipulation methods used by Gervais and Norenzayan (2012), visual priming was found to be ineffective by Sanchez et al. (2017) and Deppe et al. (2015). While the scrambled sentence task worked in Yılmaz et al. (2016) on religious belief, replicating Gervais and Norenzayan's (2012) findings, the same method did not work in another study investigating morality (Yılmaz & Bahçekapılı, 2015a, Study 1 science priming; Study 3 analytic thinking priming). Similarly, while Shenhav et al. (2012) showed that a reflective or intuitive mindset had an effect on religious beliefs, the priming method did not work in a study conducted on Turkish university students (Yılmaz & Sarıbay, 2016, Study 3A). In any case, the fact that there is no neutral group in the Shenhav et al.'s (2012) study makes it impossible to conclude whether it is the intuitive mindset that is increasing religious belief or the reflective mindset that is decreasing it. Likewise, Gervais and Norenzayan's (2012) difficult-to-read font was not replicated in a high-powered study (Meyer et al., 2015), or in a work done on Turkish university students (Yılmaz & Sarıbay, 2016, Study 3B). There is, therefore, a general problem in the literature on priming analytical thinking. Thus, a correlational demonstration of a relation between analytic thinking and religiosity might provide a more secure rationale for future experimental studies (see also Pennycook, Tranel, Warner, & Asp, 2017 for a similar argument).

Moreover, almost all the data on the relation of analytical thought and religiosity come from American or online MTurk participants (see for a meta-analysis Pennycook et al., 2016). Therefore, whether analytical thinking is related to religious belief in non-western samples, whether this relationship is due to an order effect as Finley et al. (2015) claimed, and whether this relationship will differ according to different religiosity types (intrinsic, extrinsic, quest, general religious belief) are not clear.

Therefore, in the present study, we first examined whether religious belief would show a differential relationship with analytic thinking by giving CRT before and after the religiosity measure in two separate samples (Study 1). In Study 2, we examined the possibility of a positive relationship with intrinsic religiosity as Yonker et al. alleged, and examined the separate relationship of intrinsic, extrinsic, and quest religiosity with CRT. In Study 3, we replicated the findings of Study 2 by measuring intrinsic religiosity with a different measure.

## 1. Study 1

### 1.1. Sample 1

#### 1.1.1. Methods

A total of 217 participants took part in the study (Mean age = 27.31,  $SD = 9.41$ , 170 women). Eighteen identified themselves as atheists, 32 as believing in God without being affiliated with an organized religion, 179 as Muslim and three did not respond.

Since the sample was selected from an adult population outside college, the age range is relatively large. Participants were contacted by a group of research assistants randomly on the streets of Istanbul. The participants were given paper and pencil forms, and they completed the forms at their own pace, and then returned them to the researcher in a maximum of 1 h on the street.

Participants first solved the CRT questions. CRT (Frederick, 2005) is a measurement tool commonly used in the literature to measure analytic cognitive style, an independent construct from general cognitive ability (Frederick, 2005; Pennycook et al., 2012; Sarıbay & Yılmaz, 2017; Toplak, West, & Stanovich, 2011). The test consists of three questions that measure analytical or intuitive thinking styles. Each question has a correct (analytic) and an intuitive (incorrect) answer. For example, the correct answer to the question "A bat and a ball cost \$ 1.10 in total. The bat costs \$ 1.00 more than the ball. How much does the ball cost?" is 5 cents. It requires suppressing an automatic and intuitive answer (10 cents). The correct responses given to the three questions were summed and a CRT total score was generated.

They then filled in the Turkish version of the Intuitive Religious Belief Scale (IRS) (Yılmaz et al., 2016) developed by Gervais and Norenzayan (2012). This scale is a general religious belief measure and is a 5-point (1 = strongly disagree, 5 = strongly agree) Likert-type measure (sample items: "I believe in God"; "When I am in trouble, I find myself wanting to ask God for help"). They then responded to a demographic form that included a one-item religiosity question (1 = not at all religious to 7 = highly religious) and a one-item political orientation question (1 = left wing to 7 = right wing), since it is known that political orientation is related to both religiosity and analytic thinking tendency (see Sarıbay & Yılmaz, 2017). A single item religiosity measure has also its use in psychological research (e.g., Piazza & Sousa, 2014; Yılmaz & Bahçekapılı, 2015a) for a more direct measure of religiosity, and it has predictive value. We also asked perceived socio-economic status (SES) of the participants by asking them their current SES on a 5-point scale (1 = low SES, 5 = high SES).

### 1.1.2. Results and discussion

The results revealed that CRT was negatively correlated with IRS ( $r = -0.147$ ,  $p = 0.031$ ), religiosity ( $r = -0.180$ ,  $p = 0.007$ ), and political orientation ( $r = -0.155$ ,  $p = 0.022$ ). However, when we conducted a hierarchical regression analysis and controlled for gender (0 = male, 1 = female), age (in years), SES (1 = low, 5 = high), and political orientation (1 = left, 7 = right) in step 1, CRT did not significantly predict neither IRS ( $\beta = -0.060$ ,  $p = 0.388$ ), nor religiosity ( $\beta = -0.065$ ,  $p = 0.302$ ), in step 2. Thus, the results might suggest that although there is a significant relation, the results are not robust. However, it must be noted that it is not conceptually clear whether these demographic variables should be treated as artifacts, or possible reasons which account for the certain amount of variance on the outcome variables (see also Yılmaz & Sarıbay, 2017b footnote 2). In other words, although it is a general approach to examine the effect of the independent variable by eliminating the variances accounted by the demographic variables associated with the dependent variable in the general psychology literature, this approach may be problematic in a theoretical sense. More specifically, the demographic variables, whose variances are eliminated, are generally seen as methodological artifacts. However, they actually explain a certain variance on the dependent variable and should be considered as one of the possible causes of the change on the dependent variable. Thus, the disappearance of the effect after controlling participants' demographics should not mean that there is not, in fact, a relationship. Thus, Yonker et al.'s (2016) findings must be evaluated with this caution since they controlled for all demographics in all the analyses, and found no significant effect of the analytic thinking manipulation.

In another sample, we investigated the same relation by exposing participants to the religious belief measure before CRT.

## 1.2. Sample 2

### 1.2.1. Method

A total of 361 participants took part in the study (Mean age = 21.58,  $SD = 4.28$ , 288 women). Twenty-six identified themselves as atheists, 39 as believing in God without being affiliated with an organized religion, 283 as Muslim and five did not respond.

The same measures as in the first study were used except that in this study participants responded to demographics and IRS and then the CRT. Participants in this study are a less diverse sample in terms of age since they are mostly undergraduate students. To reach the participants, a group of research assistants was asked to collect random questionnaires from people at and around Dogus University (Istanbul).

### 1.2.2. Results and discussion

The results revealed that CRT was negatively correlated with IRS ( $r = -0.139$ ,  $p = 0.017$ ), and religiosity ( $r = -0.125$ ,  $p = 0.031$ ), but not with political orientation ( $r = -0.069$ ,  $p = 0.242$ ). As in Study 1, when we conducted a hierarchical regression analysis and controlled for the same variables in step 1, CRT did not significantly predict neither IRS ( $\beta = -0.095$ ,  $p = 0.097$ ), nor religiosity ( $\beta = -0.081$ ,  $p = 0.130$ ), in step 2. Thus, the results replicate the findings in sample 1 and suggest that the relation between CRT and religious belief cannot be explained by an order effect as Finley et al. (2015) claimed since the correlations remained constant in two samples. In contrast, our findings support Pennycook et al.'s (2016) findings. However, when demographics were taken into account, CRT is not still a significant predictor of religious belief, revealing the fragile nature of the relation. However, it should be noted that there are more participants in Sample 2 than Sample 1, thus, future studies should use sample sizes closer to each other to draw stronger conclusions.

Apart from that, Yonker et al. (2016) suggested that there is more than one type of religiosity and analytic cognitive style might be differentially correlated with different types of religiosity. More specifically, they suggested that intrinsic religiosity might be positively correlated with analytic thinking tendency. In the next two studies, we investigated the relation between different types of religiosity (including intrinsic religiosity) and CRT.

## 2. Study 2

### 2.1. Method

A total of 584 participants took part in the study (Mean age = 27.41,  $SD = 10.82$ , 350 women). Thirty-one identified themselves as atheists, 68 as believing in God without being affiliated with an organized religion, 450 as Muslim and four did not respond.

The procedure of this study is the same as the first sample in the first study except for the order of the presentation of the scales. In addition, Intrinsic Religiosity (IR) and Extrinsic Religiosity (ER) scale, originally used by Allport and Ross (1967) and revised by Tiliopoulos, Bikker, Coxon, and Hawkin (2007), was used to measure religiosity. Six items are used to measure Extrinsic Religiosity (sample items: "I go to church mostly to spend time with my friends"; "What religion offers me most is comfort in times of trouble and sorrow") and eight items to measure Intrinsic religiosity (sample items: "I enjoy reading about my religion", "My whole approach to life is based on my religion") on a 5-point scale (1 = strongly disagree, 5 = strongly agree). Internal consistency coefficients of the scales are satisfactory (Intrinsic Cronbach alpha = 0.81; Extrinsic Cronbach alpha = 0.75). While intrinsic religiosity argues that a person's religiosity originates from some internal motivation, extrinsic religiosity argues that the person's religiosity is caused by external sources such as material gain. Therefore, people with intrinsic motivation are thought to internalize their religious beliefs, while people with extrinsic motivation are considered to be religious due to

issues such as reputational concerns or social desirability (Allport & Ross, 1967).

We also used the Turkish translation of the six-item Quest Scale on a 5-point scale (1 = strongly disagree, 5 = strongly agree), developed by Batson and Ventis (1982) in order to better understand the relation of analytical thinking to different religious orientations (sample items: "My life experiences have led me to rethink my religious convictions"; "As I grow and change, I expect my religion also grow and change"). The Quest scale is another dimension of religiosity. It is described as resisting absolute answers to religion and being open to existential uncertainty (Batson & Schoenrade, 1991). Questioning religious rules and teachings, and experiencing changes in beliefs and having an open-minded motivation to experience religion are some of the features of quest religiosity. An item has been discarded due to low item-total correlation. The internal consistency coefficient of the scale is satisfactory (Quest Cronbach alpha = 0.73). After responding to these scales, participants filled out the CRT and a demographic form used in the first study. In this study CRT always came after the religiosity scales.

### 2.2. Results and discussion

The results revealed that CRT was negatively correlated with IR ( $r = -0.138$ ,  $p = 0.004$ ), ER ( $r = -0.134$ ,  $p = 0.003$ ), one item religiosity ( $r = -0.138$ ,  $p = 0.002$ ), and political orientation ( $r = -0.103$ ,  $p = 0.022$ ). However, CRT was positively correlated with Quest religiosity ( $r = 0.132$ ,  $p = 0.004$ ). As in Study 1, we conducted a hierarchical regression analysis and controlled for the same variables in step 1. The results showed that CRT significantly (and negatively) predicted IR ( $\beta = -0.104$ ,  $p = 0.013$ ), marginally predicted ER ( $\beta = -0.079$ ,  $p = 0.068$ ) and religiosity ( $\beta = -0.074$ ,  $p = 0.061$ ), and significantly (and positively) predicted Quest religiosity ( $\beta = 0.124$ ,  $p = 0.007$ ), in step 2. Thus, the results extend the findings in Study 1 and suggest that the relation between CRT and religious belief depends on the type of the religiosity. More general forms of religiosity (intrinsic, extrinsic and religiosity as a trait) are negatively related to analytic cognitive style, whereas quest religiosity is positively related. However, it should be noted that quest religiosity includes statements about questioning, rethinking, and belief change, which are the characteristics strongly related to analytic thinking tendency. Thus, it can be thought that this dimension of religiosity measures a sort of need for cognition in religious issues rather than religiosity per se.

Although the results clearly showed that intrinsic/extrinsic and general religiosity are negatively correlated with analytic cognitive style, Allport and Ross's (1967) original scale has been criticized numerous times (e.g., Kirkpatrick & Hood, 1990). Although we used a revised version of that (Tiliopoulos et al., 2007), we wanted to replicate the findings with a different intrinsic religiosity measure in Study 3, which is also the one Yonker et al. (2016) used in their research.

## 3. Study 3

### 3.1. Method

A total of 167 participants took part in the study (Mean age = 27.57,  $SD = 10.63$ , 94 women). Three identified themselves as atheists, eight as believing in God without being affiliated with an organized religion, 138 as Muslim and seven did not respond.

The procedure of this study was the same as the previous research except that the Intrinsic Religiosity Scale developed by Hoge (1972) and translated by Yılmaz and Bahçekapili (2015b) into Turkish was used to measure religiosity. It is comprised of 10 items on a 4-point scale (1 = Definitely wrong, 4 = Definitely right). However, since the last two questions were specifically designed for religious people, only the first eight items were used in both Yılmaz and Bahçekapili's (2015b) and the current study (sample items: "My faith involves all of my life"; "One should seek God's guidance when making every

important decision"). The reliability of the scale is satisfactory (Cronbach alpha = 0.84). In this study, the CRT was given before the Intrinsic Religiosity Scale to see whether the results would differ from those in Study 2. Thus, the participants first filled the CRT, then the religiosity scale, and finally the demographic form.

### 3.2. Results and discussion

The results revealed that CRT was negatively correlated with IRS ( $r = -0.288, p = 0.001$ ), religiosity ( $r = -0.203, p = 0.013$ ), and political orientation ( $r = -0.161, p = 0.049$ ). As in the previous study, when we conducted a hierarchical regression analysis and controlled for the same variables in step 1, CRT significantly predicted intrinsic religiosity ( $\beta = -0.224, p = 0.008$ ), but not religiosity ( $\beta = -0.099, p = 0.194$ ), in step 2. Thus, the results replicate the findings in Study 2 by showing the negative relation between intrinsic religiosity and CRT. In addition, considering that CRT was given last in Study 2 and first in Study 3, the results of these two studies combined might be seen as replicating the lack of an order effect demonstrated in Study 1. However, the use of two different intrinsic religiosity measures in Studies 2 and 3 can be seen as a limitation in drawing this conclusion.

In contrast to Yonker et al.'s (2016) findings, there is a consistent pattern of negative relationship between intrinsic religiosity and analytic cognitive style, even when controlling for the demographics. However, Study 2 demonstrated that quest religiosity is positively correlated with analytic cognitive style, even when the demographics were controlled for. Thus, religiosity type might be an important moderator on the relation between analytic cognitive style and religious belief.

## 4. General discussion

For the first time in this research, the relationship between different types of religiosity and analytic cognitive style has been systematically investigated in a non-Western sample. In parallel with the caution urged by Finley et al. (2015), we also examined whether a measurement artifact exists by presenting the CRT before and after the religious belief measures. The results showed that, consistent with Pennycook et al. (2016), the presentation of CRT before or after had no effect but that the relationship between religious beliefs and CRT could change on the basis of different types of religiosity.

In the first study, the Intuitive Religious Belief scale used by Gervais and Norenzayan (2012) was used in two separate samples and found to show a significant negative correlation with CRT. In the second study, Intrinsic, Extrinsic and Quest religiosity types were measured and it was found that CRT showed a significant negative correlation between intrinsic and extrinsic religiosity and it showed a positive correlation with Quest. In the last study, the findings regarding intrinsic religiosity were replicated with another intrinsic religiosity measure. In all studies, one item trait religiosity question was negatively related with CRT.

These results are consistent with some findings in the literature, while inconsistent with some others. For example, Pennycook et al.'s (2016) findings also indicate that there is no measurement error. On the other hand, they are incompatible with Yonker et al.'s (2016) study, which states that there may be a positive relationship between intrinsic religiosity and analytical thinking, as it is incompatible with Finley et al. (2015). In this study, two studies have found a negative and significant relationship between intrinsic religiosity and CRT. However, the most interesting point of this research is the finding that people who are high in quest religiosity have high scores in analytical thinking. This finding has been reported for the first time in this research to the best of our knowledge. The results, therefore, emphasize the importance of individual differences when examining religious belief and analytical thinking.

The findings we present here also contribute to the diversity of sampling in the field. All of the previous findings we know of in the literature are based on data collected from American university students or

from online MTurk participants, which are WEIRD (Western, Educated, Industrialized, Rich, and Democratic) samples (Henrich, Heine, & Norenzayan, 2010). Thus, using both student and adult samples in a society with a Muslim majority, this research contributes to the study of the cognitive style-religious belief relationship, and at the same time shows that different types of religiosity may have different types of association with thinking styles.

However, as can be seen from the correlation coefficients, the relationship between CRT and religious belief is significant but has a low-to-moderate effect size. This effect size might explain why some experimental studies report null findings. Although Gervais and Norenzayan (2012) show in four different studies that analytical thinking activation leads to a small decline in religious belief, Sanchez et al. (2017) could not replicate the biggest effect found by Gervais and Norenzayan (2012). There is another finding indicating that the priming method used by Gervais and Norenzayan (2012) to prime analytic thinking does not work (Deppe et al., 2015). The direct replication of Gervais and Norenzayan's (2012) other priming study using the scrambled sentence task was achieved by Yilmaz et al. (2016) with Turkish university students. However, Deppe et al. (2015) also argue that the scrambled sentence method does not work either, and Yilmaz and Bahçekapılı (2015a) found that activating analytic thinking using this method did not influence moral sensitivity. One further method to prime analytical thinking used by Gervais and Norenzayan (2012) is also the paradigm of the difficult-to-read font. However, this method has also been shown to not work in a high-powered study (Meyer et al., 2015). Hence, there is no single manipulation method in the literature that is known to reliably activate analytic thinking. Likewise, Yonker et al. (2016) also attempted to prime analytical thinking, using tasks that are generally used to measure analytic thinking rather than to manipulate it, and reporting that they could not find any effect. In another study, Shenhav et al. (2012) reported differences in religiosity between two groups that were either led to think intuitively or reflectively. It is not clear, however, whether the intuitive thinking manipulation increased religious belief, or the reflective thinking manipulation reduced it since the study did not include a proper control group. Therefore, a high-powered replication of this study is in order.

The inability of some studies to find an effect may be due to the fact that there is no powerful method to manipulate analytical thinking and that the relationship has actually a small effect size. Analytical thinking priming methods used in the literature, usually short and weak, include look at "The Thinker" for 30 s (Gervais & Norenzayan, 2012), recall past memories regarding reflective or intuitive thinking (Shenhav et al., 2012), solving scrambled sentences (Gervais & Norenzayan, 2012; Yilmaz et al., 2016) and trying to read faint writing (Gervais & Norenzayan, 2012). Yilmaz and Sarıbay (2016, Study 3A and 3B) failed to activate analytical thinking of Turkish university students by using the faint writing paradigm used by Gervais and Norenzayan (2012) and the thought prime method used by Shenhav et al. (2012). In a later study, they gave a 10-minute training to activate the analytic thinking of the participants and this time managed to find an effect (Yilmaz & Sarıbay, 2017a, 2017c). Therefore, a strong manipulation technique similar to the one used by Yilmaz and Sarıbay (2017a) should be used to replicate the relationship between religious belief and cognitive style in a high-powered study, since the relationship in question appears to be a weak one. At the same time, the relevance of analytic thinking with different types of religiosity should be experimentally examined in order to clearly demonstrate the cause-and-effect relationship. In parallel with the present findings, it can be predicted that quest religiosity will increase as a result of analytical thinking prime, while other kinds of religiosity will decrease.

Another possibility is that the boundary conditions under which manipulations of analytical thinking work have not yet been determined. A similar ambiguity exists in the literature regarding religious priming studies. Some researchers report that they cannot find an effect in high-powered studies (Gomes & McCullough, 2015). However, Sasaki

et al. (2013) showed that religious priming works differently in humans with different variants of the dopamine D4 receptor (DRD4) gene. Hence, similar boundary conditions can exist for analytical thinking primes.

## 5. Limitations and future directions

Another type of religiosity that was not considered in the present study is religious fundamentalism. This type of religiosity can be thought of as being closed-minded and defending beliefs blindly, and thus a highly negative correlation between analytic thinking and religious fundamentalism might be expected. Future studies on investigating the relation between cognitive style and religious orientation should also consider religious fundamentalism.

It has to be noted, however, that the CRT used in this study and the majority of previous studies has some limitations. For example, it is has been criticized because of having become familiar to most participants (Haigh, 2016; Stieger & Reips, 2016) and being based on numeracy (Sinayev & Peters, 2015). Although familiarity might not be an issue in Turkish samples, the possibility that the CRT measures numeracy skills in particular and not high-effort thinking, in general, might be a limitation of this study. Although it is shown that there are negative correlations between other measures of analytic thinking and religious beliefs (Pennycook et al., 2016; Saribay & Yılmaz, 2017), the possibility that different cognitive style measures may be related to different types of religiosity should be considered (cf. Yılmaz & Saribay, 2017b).

## 6. Conclusion

In summary, we evaluated the possibility of an order effect regarding analytic thinking and religiosity as per Finley et al. (2015), and of a positive relation between analytic thinking and intrinsic religiosity as per Yonker et al. (2016). The results revealed that the relation between cognitive style and religiosity does not depend on the order in which these variables are measured and that both general religiosity and intrinsic/extrinsic religiosity are negatively related to analytic thinking. Extending previous research, we showed in this study that quest religiosity is positively related to analytical thinking. Although these relationships are statistically significant, they have small effect sizes, so that researchers who want to experimentally investigate this relationship need to use powerful analytical thinking manipulations in high-powered studies. In addition, experimental studies should take into account individual differences in religiosity since different types of religious orientations might be differently related to analytic thinking as cautioned by Yonker et al. (2016) and demonstrated by the present study.

In conclusion, these results point to the explanatory power of the dual process model in understanding religious belief. In addition, they lend support to the idea that quest religiosity has cognitive underpinnings separate from other types of religiosity. Thus, future studies need to explore possible cognitive mechanisms (e.g., need for cognition, actively open-minded thinking, etc.) of quest religiosity to further test the scope of the dual process model.

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