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Do Social Constraints Inhibit Analytical Atheism? Cognitive Style and Religiosity in Turkey

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Abstract

Recent studies claim that having an analytical cognitive style is correlated with reduced religiosity in western populations. However, in cultural contexts where social norms constrain behavior, such cognitive characteristics may have reduced influence on behaviors and beliefs. We labeled this the 'constraining environments hypothesis.' In a sample of 246 Muslims in Turkey, the hypothesis was supported for gender. Females face social pressure to be religious. Unlike their male counterparts, they were more religious, less analytical, and their analytical scores were uncorrelated with religiosity. We had predicted an analogous effect for the comparison between monolingual and bilingual students, since English-proficient students are exposed to a wider social environment. The bilingual students were less religious than the monolingual students, yet they were also less analytical. Thus, being analytical was not the path to lower religiosity for the bilingual students. Cognitive styles need to be studied along with social norms in a variety of cultures, to understand religion-cognition relationships.

Keywords

cognitive style – religiosity – Turkey – gender – westernization

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1 Introduction

Within the cognitive science of religion, a persistent line of research explores how different cognitive styles relate to differences in religious belief. Studies in North America and Europe reliably show that degree of religious belief aligns with processing styles, such that people who tend to engage intuitive processing are also more religious and those predisposed to use analytical modes of grappling with information report being less religious (Aarnio & Lindeman, 2005; Gervais & Norenzayan, 2012; Pennycook, Cheyne, Seli, Koehler, & Fugelsang, 2012; Shenhav, Rand, & Greene, 2017).

The predominant explanation for these associations is that individuals with analytical cognitive styles are more attuned to the dissonance between supernatural beliefs and naturalistic understandings of the material world (Pennycook et al., 2012; Pennycook, Cheyne, Barr, Koehler, & Fugelsang, 2014). Theorists also suggest that religious beliefs are aligned with intuitive cognitive styles because supernatural beliefs are supported by cognitive defaults such as dualism (Bering, 2006), anthropomorphism (Epley, Waytz, & Cacioppo, 2007), teleology (Kelemen, 2004), and agency detection (Barrett, 2004). On this view, belief in a personal god is akin to the initial impressions that people who rely on intuitive processing tend to trust (Morewedge & Kahneman, 2010; Thompson, Prowse Turner, & Pennycook, 2011).

Despite important work unpacking this relationship, there are still significant open questions. In this paper we investigate the role of social constraints on the emergence of this association, reporting an empirical study of the association of cognitive styles with religiosity among Turkish university students. By attending to cultural constraints and affordances we contextualize the religion-cognition interaction within its social environment.

1.1 *A Diversity of Cognitive Styles*

Dual process theory is a conceptually messy terrain. Early conceptions of the difference between reflective (analytic) and intuitive processing styles tended to conflate this distinction with various other conceptual dichotomies, such as: implicit/explicit, automatic/controlled, heuristic/analytical, non-conscious/conscious. But, as Evans and Stanovich (2013) persuasively argued, these characteristics do not neatly align. Following their lead, we understand reflective and intuitive processes as mutually exclusive cognitive types that differ on the basis of working memory and mental simulation. In contrast, many of the other distinctions between cognitive styles, such as that between holistic and analytical processing (e.g., Buchtel & Norenzayan, 2009), can vary on a continuum and be influenced by cultural context such that both modes of

processing engage reflective thought (e.g., Norenzayan, Choi, & Nisbett, 2002). We understand these varying processes as thinking dispositions or cognitive modes. Understanding this difference between processing modes and cognitive types is crucial when trying to ~~understanding~~ these processes in relation to religious belief (Morgan, 2016).

For example, intuitive answers on the Cognitive Reflection Task (CRT, Fredrick, 2005), the prevailing measure of one's tendency to use reflective or intuitive processing, reliably correlates with endorsing conventional beliefs in God (Pennycook et al., 2012; 2014; Shenhav et al., 2012; 2017). A recent meta-analysis found this association, and the reverse connection between reflective processing and nonbelief is modest (r = –.18) but reliable (Pennycook, Ross, Koehler, & Fugelsang, 2016). If researchers deploy other tests of cognitive style, a similar pattern seems to emerge.

Atheists have lower scores on a test of magical ideation than either Christians or Buddhists (Caldwell-Harris, Wilson, LoTempio, & Beit-Hallahmi, 2011). Using Baron-Cohen's (2003) distinction between systemizing and empathizing (systemizing refers to the use of abstract methods for acquiring information and making inferences while empathizing relies on more social strategies), Caldwell-Harris (2012) argued that these different modes of processing information helped to explain the cognitive profile of atheists vs. theists. A U.K. study supported this explanation with evidence that including systemizing/empathizing in analyses explained the religiosity gender gap (Rosenkrantz & Charlton, 2013). Other studies have found that aspects of autism spectrum disorders reliably correlate with lower levels of religiosity (Caldwell-Harris, Murphy, Velazquez, & McNamara, 2011; Norenzayan, Gervais, & Trzesniewski, 2012).

It may be tempting to group these findings all together as proof that religious belief is associated with intuitive, holistic, and social modes of thinking, while nonbelief is associated with abstract, analytical, and reflective thought. But, as noted above, thinking dispositions are distinct from the reflective/intuitive dichotomy captured by the CRT. This is especially important to keep in mind, because different social contexts will impact these varying cognitive styles in different ways.

1.2 *Advantages of a Cultural Perspective*

Recent work has helpfully extended this field of research beyond Western, Educated, Industrialized, Rich, and Democratic (WEIRD) contexts (Henrich, Heine, and Norenzayan, 2010). Yilmaz and colleagues (2016) showed that priming analytical thought predicted religious disbelief among a sample in Turkey (see also Yilmaz & Saribay, 2017). Nevertheless, the overwhelming majority of evidence for this association still comes from North American students

or internet samples. This is an especially significant limitation because a recent cross-cultural study by Gervais and colleagues (2018) calls the generality of this association into question, suggesting that it only obtains in certain cultural contexts – the USA, Australia, and Singapore in their sample. In contrast, Stagnaro, et al. (2019) showed that the relationship between reflective thought and nonbelief holds in the UK and in India, further supporting its cross-cultural generality. Clearly there is more cross-cultural work to be done in order to establish where and why this association obtains.

One important consideration is that cognitive and personality styles are known to be weak influences on beliefs and behavior in constraining environments (Mischel, 1977). Cultures vary in how freely individuals are able to enact their personal choices in different situations – a distinction termed tightness or looseness (Gelfand et al., 2011; 2017; Triandis, 1995). Tight cultures constrain activities through strong social norms and a low tolerance for deviant behaviors, while loose cultures are more lenient towards aberrant behaviors (Gelfand, et al., 2011). Our hypothesis is that individual differences of any type will influence behavioral outcomes less in tight cultures; the culture we study here, Turkey, is cited as a tight culture by Gelfand, 2018. In particular, we suggest that cognitive styles will influence religiosity less strongly in a constraining environment where religiosity is normative and deviation is stigmatized. We refer to this prediction as the constraining environment hypothesis.

1.3 *Religiosity in Turkey*

Beginning with the modernization movement in Turkey at the start of the last century, secularism in Turkey has focused on state control of religion. The Kemalist regime wanted to restrict the power wielded by religious leaders in political and cultural affairs, limiting the realm of Islam to matters of belief and worship. As part of this on-going attempt to control religion, the government operates public Islamic schools, provides Islamic instruction in public schools, and pays the salaries of the imams in mosques (Kuru, 2009).

Nevertheless, decades of a secular government have not created the option of being nonreligious, other than for wealthy, urban, cultural elites. Atheism remains highly stigmatized. In interviews with young adults questioning their religious upbringing many said they were afraid to share their doubts with others, outside of anonymous online discussion boards, citing the 1993 Sivas massacre[1] as reason to be cautious (Şimşek & Caldwell-Harris, 2015).

1 In Sivas, the prominent atheist writer, Aziz Nesin, and non-Sunni Muslim intellectuals, were fire-bombed by angry nationalist and religious groups. Many in the hotel were burned alive while police stood by.

During the last two decades in North America and Europe, a growing proportion of young adults have embraced irreligion. A parallel change has occurred among young urban Turks, but it is a decrease in religious observances, while continuing to identify as religious (Yapıcı, 2015). For example, performing of daily prayers is reported by only a third of Turkish young adults, according to Yapıcı's (2015) meta-analysis of diverse studies over the last three decades. Similarly, not praying was the strongest associate of low religiosity in Sönmez' (2012) sample of university youth. Yet approximately 90% of youth in Yapıcı's (2015) meta-analysis still endorsed the statement *I have faith in the presence of God*. These statistics match demographic surveys finding that more than 90% of respondents in Turkey report a strong faith in God with 99% identifying as Muslim. Fewer than 6% of university students in Istanbul identified as non-religious (Sönmez, 2012).

These high rates of religious identification but low rates of participation suggest that young adults in Turkey, including those in urban centers, have grown up in an environment that provides less freedom for religious self-expression than is typical in North ~~American~~ and Europe. According to the constraining environments hypothesis, cognitive styles will thus be only weakly associated with religiosity in Turkey, especially for certain groups.

1.4 *The Role of Gender*

In every country surveyed, and on almost every index used, women are substantially more religious than men (Trzebiatowska & Bruce, 2012; Keysar & Navarro-Rivera, 2013). Many explanations have been proposed, including women's social disempowerment and their greater affiliative drive, which itself may be grounded in both biology and socialization (Beit-Hallahmi, 2014). Women have also been characterized as more intuitive thinkers (Baron-Cohen, 2003). Women typically have fewer financial and material resources than men, and have less access to positions of power. Deprivation and low-status creates "openness to supernaturalist consoling messages and often leads members of oppressed groups to imaginary compensation and magical acts" (Beit-Hallahmi, 2014, p. 95). Beit-Hallahmi (2014, p. 95) notes: "women in all cultures suffer from predatory male sexuality … religion offers a shelter from the male mode of defining and controlling sexuality … religion sacralizes maternity, which is another shelter from male advances." A compatible view from evolutionary psychology is that religious women have an advantage in mate attraction and retention, as men expect religious women to be more faithful to marriage vows (Irons, 2001; Moon, Krems, & Coehn, 2018).

We are not promoting the view that religiosity is oppressive for women. The choice to be religious can be a positive step to secure benefits. Women's

socialization to be affiliative may make it costly to forego the benefits of religious affiliation, which typically includes mechanisms for in-group sharing of resources and forming alliances (Irons, 2001). Hunter (2010) argues that low religiosity and atheism are a luxury of those who have resources and few social obligations. Women have fewer resources and more social obligations, which constrains their ability to choose a nonreligious life path even if they would otherwise be inclined to do so.

As is the case globally, Turkish women are more religious than men (Yapıcı, 2015). However, among university students, gender differences are weak (Sönmez, 2012) or in some studies, absent (Cirhinlioğlu, 2006; 2010). The capacity for female university students to express the same levels of nonbelief as their male peers likely occurs due to their prestigious position within academia in Turkey (Cirhinlioğlu & Özdikmenli-Demir, 2012; Hökelekli, 2010). Yet even among students, females report more external locus of control, which cooccurs with fatalism and religious belief (Cirhinlioğlu & Özdikmenli-Demir, 2012). In other words, even educated women in Turkey experience a constraining environment. Environmental pressures (i.e. to obtain access to resources and allies) mean that women's personality and cognitive style will bear less influence on their religiosity, compared to the same dynamic among men.

1.5 *The Role of Westernization*

Turkey is widely regarded as a developing country, and less oriented toward individualism than other European cultures (Aycicegi-Dinn & Caldwell-Harris, 2013; Cirhinlioglu & Özdikmenli-Demir, 2012). Nevertheless, with its geographic proximity to Europe and strategic position on trade-routes between Central Asia and Europe, Turkey has a long history of exchanging ideas with western cultures. Kemalist policies, beginning in the early 20th century, advocated for European individualistic values, including the freedom to choose a religion, and freedom of personal expression. For convenience we will use the phrase 'westernization' to refer to a continuum of exposure to European culture, although we note Turkish scholars' discomfort with the term (e.g., Kagitcibasi, 2005).

The embrace of western values is not equally spread across Turkey. Urban, educated, and wealthy segments of the population are the most likely to endorse the values of choice and expression, while more rural groups resist these norms (Sevinç et al., 2015). For example, Paker's (2005) interviews with university students about their attitudes towards religion and modernization found three groups. One group, the most modern and westernized, had negative attitudes toward tradition and religion, valued reason and science, and viewed

modernity and tradition as opposites. A second group was able to combine modern life and religion/tradition without seeing them as in contradiction, while a third group most strongly affirmed religion and tradition (and rejected science, modernity, etc.).

Proficiency in speaking English is correlated with being raised in a household that embraces (or at least accepts) western values. Most Turkish students study English as a foreign language in high school, but some students pursue intensive English exposure via overseas travel and study, enrolling in private high school where English is the medium of instruction, or taking a year-long "English preparation year" before beginning university (Ayçiçeği-Dinn, Sisman, & Caldwell-Harris, 2015).

The growing role of English in public life in Turkey is controversial and widely debated. Dogancay-Aktuna (1998, p. 37) notes that English "is used as a link language for international business and for tourism while also providing a code which symbolizes modernization and elitism to the educated middle classes and those in the upper strata of the socioeconomic ladder." This is supported by Selvi's (2011) finding that interviews for high paying jobs within Turkey were carried out either partially or entirely in English. English knowledge in Turkey is ~~both~~ a skill ~~in~~ some cases a signal of leaning towards modernity and western values. Based on this, proficient English skills are a sign of having the goal of a career interacting with western cultures, and a sign of a family having the resources (and socio-economic status) to encourage such language training in children.

The constraining environments hypothesis, therefore, predicts that those with English proficiency will be (a) less religious than their peers and (b) the association between cognitive style and religiosity will be present among the Turkish-English bilinguals, but weak or absent among participants who lack English proficiency.

2 Method

To frame our predictions in the strongest terms, we hypothesize that lower levels of religiosity will be associated with high scores on the CRT, Autism Spectrum Quotient, and a preference for Rational (as opposed to Experiential) thought processes, but that these relationships will obtain mostly for men (as opposed to women) and for English speakers (in contrast to monolingual Turkish speakers). We view a failure to support these hypotheses to be as equally interesting as a confirmation.

2.1 *Materials and Procedure*

All materials were translated into Turkish by a professional translator, and independently verified by two colleagues fluent in Turkish and English, with the exception of the Religious Orientation Scale (which already existed in Turkish, see below).

2.1.1 The Religious Orientation Scale (ROS)

This scale measures intrinsic and extrinsic religiosity (Allport & Ross, 1967). Intrinsic religiosity refers to religion being valued in and of itself, while extrinsic religiosity refers to using religion to satisfy personal needs and achieve social goals (Cohen, 2015). The ROS can be used as a continuous measure of degree of religiosity by summing the intrinsic and extrinsic scores (Donahue & Nielsen, 2005; Hood, 1970). Determining if extrinsic and intrinsic modes of being religious correlated differently with cognitive style has not been previously examined. Following factor analyses of many samples in the 1990s, consensus emerged that the ROS extrinsic sub-scale itself measures two slightly different orientations (see discussion in Sönmez, 2012). Extrinsic-Social portrays religion as means to foster social connectedness, while Extrinsic-Personal emphasizes how religion helps believers feel in control secure and protected.

We used the Turkish translation by Cirhinlioğlu (2006; Cirhinlioğlu and Özdikmenli-Demir, 2012). Cirhinliogğlu altered items referring to Christianity by replacing them with neutral wording (e.g., *church* was changed to *house of worship*) and included four items concerning Islamic religious practices. Factor analysis of this translation support three factors corresponding to the same three orientations of intrinsic, extrinsic-social, and extrinsic personal (Sönmez, 2012). Cronbach's alpha computed on our ROS data revealed good internal reliability for the three subscales, intrinsic subscale a = .89, extrinsic personal = .86, extrinsic social = 84.

2.1.2 Cognitive Reflection Test (CRT)

This three-item measure, created by Frederick (2005), has been widely used as a performance measure of reflective versus intuitive processing. The test consists of three questions with intuitive, but incorrect answers. For example: 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? The intuitive answer is 10 cents. People who resist this attractive response can reason out the correct answer of 5 cents. Recent analyses of the CRT have noted that the CRT correlates with math ability (see Browne et al., 2014), but it remains a widely accepted measure of cognitive miserliness, i.e. a tendency to avoid reflective thought (see Toplak, West, & Stanovich, 2011). This is the most prevalent measure in the literature on

religiosity and cognitive style. Participants' number of correct answers (0 to 3) is their reflective score.

2.1.3 Rational-Experiential Inventory-40 item (REI-40)

This 40-item self-report assesses individual preferences for processing information (Pacini & Epstein, 1999). The scale captures two cognitive styles: a rational style that favors analysis and logic, and an experiential style that relies on emotional responses and intuition. Each style is divided into the sub-components of ability and engagement. For example, an item coded as Rational Ability is *I have a logical mind*, as compared to *I often go by my instincts when deciding on a course of action*, which is Experiential Engagement (Pacini & Epstein, 1999, p. 976). This scale has strong reliability, with Cronbach s alphas of .90 and .87 for the Rational and Experiential scales respectively (Pacini & Epstein, 1999, p. 975).

2.1.4 Autism-Spectrum Quotient (AQ)

Similar to the CRT, and REI, high scores on the AQ have been found to be inversely correlated with religiosity (Caldwell-Harris, et al., 2011; Norenzayan, et al., 2012). The Autism-Spectrum Quotient measure consists of 50 Likert statements that define a continuum from individuals with Autism through neurotypicals (Baron-Cohen, et al., 2001). This scale covers five domains: social skills, communication skills, imagination, attention to detail, and tolerance of change. Although our team did our own translation of the AQ in 2009, a Turkish translation of the AQ was validated in a study which reported that parents of autistic children had elevated AQ scores compared to parents of typically developing children (Kose, Bora, Erermiş, Özbaran, Bildik, & Aydın, 2013). This is a typical finding, indicating that questions are sensitive to the broader autism phenotype for Turks residing in Turkey.

2.1.5 English Proficiency

Categorizing students as having had substantial English exposure was done using a short oral interview based on a prior study of English foreign language learning of students attending public and private universities in Istanbul (Ayçiçeği-Dinn, et al., 2015). The interview included three questions: Did you take an intensive year of English preparation before beginning either high school or university? Are you enrolled in English-medium instruction? Have you studied or visited abroad where you were required to use English on a daily basis? Students who self-identified as having good English proficiency and who responded affirmatively to at least two of these questions were included in the bilingual group. The few students who reported minimal English exposure but

who were bilingual in some other language were excluded from the study. The bilingual participants had most frequently acquired English as a foreign language in classes beginning in middle school. Bilingual participants rated their English ability on a scale of 1 to 10 (10 = native speaker ability). The average rating was 6.7 (SD = 1.1, range 4–9), which is considered to be proficient ~~excellent~~.

2.2 *Participants*

Participants were 264 students recruited from psychology and philosophy classrooms at Istanbul University. Students volunteered or received psychology course credit. Females comprised 85% of the sample, and most (96%) were between ages 17 and 24 (with 6 students over age 30). A majority of participants were psychology majors (47%). Other frequent majors were philosophy (25% of total sample), sociology (6%), dentistry (5%), educational science (2%), and modern languages/literature (2%).

3 Results

We began by analyzing the background and demographic variables of field-of-study, gender and bilingualism, and examined inter-correlations among variables. As a broad overview, to allow comparisons with western studies of religiosity and cognitive styles, we note that 90% of females and 76% of males agreed with the item, *I have often had a strong sense of God's presence.* This is a high degree of religiosity compared to current reports of university students in North Americ~~a~~n and Europe (Twenge, et al., 2015). Only 5% of females in our sample, but 21% of males, responded 'strongly disagree' to this item. Bilinguals were less religious than monolinguals, with 13% of bilinguals choosing 'strongly disagree' or this item, compared to 5% of monolinguals.

3.1 *Group Differences*

We tested for gender differences in religious orientation and the cognitive style and personal-choice variables. To minimize the number of statistical tests conducted, we included both gender and bilingual/monolingual group as independent factors in a series of 2 × 2 MANOVAs (see Table 1). One of these MANOVAs used the three ROS subscales as the dependent measures, since the three subscales are typically correlated (see Table 2). Three similar 2 × 2 MANOVAs were also run with the subscales of the Rational-Experiential Inventory. The number of intuitive and correct answers on the CRT was measured with a non-parametric test. These results are summarized in Table 1.

TABLE 1 Group differences in religious orientation and cognitive style measures

	Religious orientation			REI: Rational		REI: Experiential		CRT		AQ
	Intrinsic	Extr: Social	Extr: Per	Ability	Engage	Ability	Engage	Intuitive	Reflective	Tot
Female (224)	3.3	2.5	3.8	3.5	3.6	3.5	3.1	1.9	0.6	18.7
Male (40)	3.0	2.5	3.2	3.8	3.7	3.4	3.0	1.6	1.1	18.6
	*	n.s.	***	*	n.s.	n.s.	n.s.	n.s.	**	n.s.
Mono (211)	3.4	2.6	3.8	3.5	3.5	3.5	3.1	1.8	0.8	19.0
Bil (53)	2.9	2.1	3.3	3.6	3.6	3.5	3.0	2.0	0.4	17.5
	*	**	***	n.s.	n.s.	n.s.	n.s.	n.s.	**	n.s.

Table Notes: * $p < .05$, ** $p < .01$, *** $p < .001$, n.s. – no statistically significant difference.
All values are the group mean and all tests are for group differences. See text for detailed explanation of statistical tests used.

3.1.1 Gender Differences

Females in our sample were more religious than males. Following significant main effects of gender in the multivariate analysis, gender differences were found for Extrinsic Personal Orientation, $F(1,260) = 13.3$, $p < .001$, $\eta^2 = .05$, and for Intrinsic Orientation, $F(1,260) = 4.8$, $p = .03$, $\eta^2 = .02$.

Females reported lower Rational Ability, $F(1,260) = 7.2$, $p = .01$, $\eta^2 = .03$ (see summaries in Table 1). CRT analytical answers were lower for females, compared to males, as determined by the Kruskal-Wallis one-way analysis of variance by ranks. The chi-square for number of analytical answers $\chi^2 = 6.2$, $df = 1$, $p = .01$; but the chi-square for number of intuitive answers was $\chi^2 = 3.2$, $df = 1$, $p = .08$. Scores on the Autism Quotient did not vary by gender, $F < 1$.

3.1.2 Bilingual Group Differences

Bilingual participants (meaning, those proficient in English) were less religious than monolingual participants. Main effects of bilingual/monolingual group were obtained for all three religious orientations, but especially for the Extrinsic Personal Orientation, with $F(1,260) = 9.8$, $p = .002$, $\eta^2 = .04$; the main effect for Extrinsic Social Orientation was $F(1,260) = 6.9$, $p = .01$, $\eta^2 = .03$; the main effect for Intrinsic Orientation was $F(1,260) = 5.8$, $p < .02$, $\eta^2 = 0.02$.

The number of analytical answers on the CRT was higher for the monolingual group, than the bilingual group as tested with the Kruskal-Wallis; $\chi^2 = 7.0$, $df = 1$, $p = .01$. A larger proportion of the monolinguals were pursuing

quantitative majors, which may have boosted their CRT accuracy, thus possibly obscuring the 'reflection' aspect of the CRT.

Scores on the Autism Quotient did not vary by bilingualism, $F(1, 260) = 1.4$, $p = 0.24$, or any of the REI sub-dimensions.

3.2 *Correlations*

To prepare for multiple regression, we analyzed the intercorrelations between our variables on the basis of our groups. Gender differences are depicted in Figure 1; with $r = -0.37$, $p < .05$ for males, and $r = -0.06$, n.s. for females. This is consistent with the hypothesis that the negative association between analytical style and religiosity would be present for males but not females.

Religiosity was negatively associated with CRT analytical scores for bilingual participants, $r = -0.41$, $p < .01$, and the comparable r value for monolingual participants was non-significant, $r = -0.15$. However, the correlation of $r = -.41$ for bilinguals was being carried by the 9 male bilinguals; the correlation drops to $r = -.19$ for the 44 bilingual females (the correlation for the 9 male bilinguals was a surprising and obviously unreliable $r = -0.75$). Given the small number of bilingual men in our study, we conducted the following correlations among three non-overlapping groups: all males, bilingual females and monolingual females (see Table 2).

For males, correlations between religiosity and both the CRT and Rational Ability were moderate. Among females, the relationship between cognitive style and religiosity tended to be weak: $r = -0.19$ with CRT analytical scores (bilingual females) and $r = 0.18$ for CRT intuitive score (monolingual females). We compared the r values using the Fisher r-to-z transformation; the z value indicated significantly different correlation coefficients for Rational Ability. The small sample size of males resulted in other differences being not reliable.

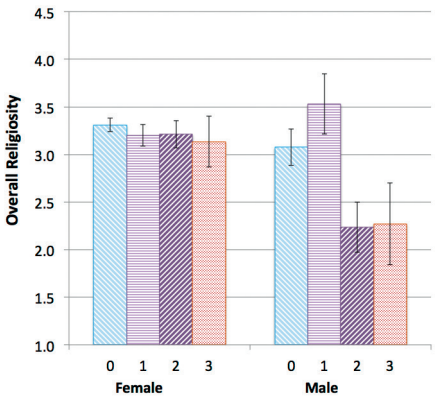

FIGURE 1
Gender differences in the association between religiosity and reflective processing
NOTES: RELIGIOSITY IS MEASURED BY AVERAGE AGREEMENT WITH ROS ITEMS. REFLECTIVE PROCESSING INDICATED BY NUMBER OF CORRECT ANSWERS ON THE CRT.

TABLE 2 Correlations between total ROS scores (religiosity) and cognitive style variables by group

	All males (n=40)	Bilingual females (n=44)	Monoling females (n=180)	Gender differences
CRT: Intuitive	0.39**	0.01	0.18*	n.s.
CRT: Analytical	−0.37**	−0.19	−0.11	n.s.
Rational ability	−0.43**	−0.10	−0.05	z=2.3**
Rational engagement	−0.30	−0.14	−0.10	
Experiential ability	0.29	0.07	0.09	
Experiential engagement	0.20	0.13	0.16*	n.s.
Autism quotient	0.11	0.09	0.07	

Table notes. ** = $p < .02$; * $p < .05$

TABLE 3 Stepwise multiple regression predicting religiosity from group and cognitive style variables

	β	R^2	ΔR^2	F	p
Bilingualism	−0.47	0.056	0.056	15.57	0.000
CRT intuitive	0.14	0.095	0.039	11.10	0.001
Exp. Eng.	0.17	0.116	0.022	6.42	0.012
Rat. Eng.	−0.18	0.129	0.013	3.89	0.050
Gender	0.28	0.145	0.016	4.81	0.029

Notes: Experiential Engagement (*Exp. Eng.*) *and Rational Engagement* (*Rat. Eng.*) *both from the* REI.

3.3 *Multiple Regression Analyses*

Table 3 shows the model summary for stepwise regressions conducted on the ROS total score using the full sample. Predictors were the four variables that were significantly associated with religiosity in pairwise correlations (Table 2), together with gender and bilingualism as binary variables. Bilingualism was the strongest predictor, accounting for 5.6% of the variability in religiosity, with the three cognitive style variables each explaining only a small amount (4% to 1%) of additional variability. Even after including all of the cognitive

style variables, gender still increased the r^2 value, indicating that cognitive style mediates only some of the gender difference in religiosity.

In exploratory analyses, multiple regressions were conducted separately on males and females. For males, only CRT intuitive scores were significant, explaining 15% of the variance. For females, 9.7% of the variance was explained by three separate predictors: bilingualism (r^2 = 5.3), Experiential Engagement (r^2 = 2.3), and CRT intuitive scores (r^2 = 2.1). Comparing the two multiple regression analyses demonstrates that cognitive style facilitates religiosity more strongly in males than in females; while English bilingualism (which we believe is a proxy for exposures to western ideologies) is a relatively strong route to low religiosity in females. The low number of male bilinguals in this sample precluded conclusions about the effect of bilingualism in males.

4 Discussion

4.1 *Religiosity and Cognitive Styles*

Our constraining environments hypothesis predicted that cognitive styles will have a weaker (or absent) association with religiosity when the social environment tightly constrains religious choices. For the case of Turkish university students, we hypothesized that the religiosity / cognitive styles association would be strongest for two subgroups possessing relative freedom to distance themselves from religious commitments. The two groups are males and students who have high exposure to western values, as indexed by English language proficiency (referred to as the bilingual students). Our results support the constraining environments hypothesis for gender, but not bilingualism.

4.2 *Gender*

Consistent with prior research (Beit-Hallahmi, 2014; Willard & Norenzayan, 2013), males were less religious than females, less intuitive and more analytically oriented. Our new finding was that the strength of association between cognitive style and religiosity was stronger for males than for females. This supports the constraining environments hypothesis. Women's social disempowerment in Turkey may reduce their ability to gravitate to a level of religiosity that matches their cognitive style.

While tentative, our exploratory multiple regression revealed some additional gender differences. For males, intuitive CRT scores were the only measure associated with religiosity, accounting for 15% of the variance. For females, around 10% of the variance in religiosity was spread across bilingualism (the strongest predictor), Experiential Engagement, and CRT intuitive scores. The

relative weakness of the CRT as a predictor may be due to reduced range, since only 16% of females had either 2 or 3 correct answers on the CRT, compared to 35% of males. Also, the CRT is sensitive to quantitative ability (Campitelli & Gerrans, 2014). Fifty-percent of female STEM students had 2 or 3 correct answers on the CRT, the same proportion as male STEM students. Thus, being in a quantitative field of study may guard females against mistakes on tricky math problems. Yet their math abilities and the CRT scores that accompany their STEM majors were not associated with a decrease in religiosity; STEM and non-STEM women had similar religiosity scores.

4.3 *Exposure to English and Westernization*

Prior to beginning this study, we were well aware of the associations in the popular press in Turkey between using English, westernization, and secularity (Dogancay-Aktuna, 1998; Selvi, 2011). We correctly anticipated that the bilingual respondents would be the least religious group in the sample, but our prediction that the association between reflective processing and religious non-belief would be stronger for bilingual students than the monolingual students was incorrect. Bilingual students may less religious because of family financial security and/or exposure to secular content in English material, but within our sample analytical style and religiosity were unrelated among the English-proficient students.

The bilingual students were *less* analytical than monolingual students, less likely to be male, and less likely to be in quantitative disciplines. This last finding is consistent with the idea that students with a relative strength in verbal skills will be those who pursue foreign language proficiency. While learning and thinking in another language could stimulate analytical thinking (e.g. Keysar, Hayakawa, & An, 2012), this did not obtain in the current sample. One explanation is that students attempt to match their intellectual strengths with a career path. Before entering university, middle-school and high-school students who believe themselves to be more skilled in the language arts compared to math/science may decide to specialize in the English language, anticipating a future in the global business world, tourism, or English teaching/translation (see discussion in Ayçiçeği-Dinn, et al., 2015).

Future work will need to disentangle the myriad connections among English proficiency, westernization, individualism and secularity. A causal explanation for the English-secularity association is that students are exposed to secular ideas from contact with English speakers, via overseas travel, and from content in English-language materials. A non-causal explanation is that the association arises indirectly, because parents who encourage/support English proficiency are often part of the global business world, financially secure and thus have

the luxury of foregoing religious commitments (as described in Hunter, 2010; Norris and Inglehart, 2012).

4.4 *Autism and Religiosity*

In North American samples, the Autism Quotient (AQ) and related scales such as the Broad Autism Phenotype (BAP) have been reported to correlate negatively with religiousness (Caldwell-Harris et al., 2011; Norenzayan, et al., 2012). However, in the current sample of Turkish university students, the AQ is uncorrelated with religiosity (see Tables 1 and 2); a new finding in the literature on cognitive correlates of religiosity. This suggests a provocative hypothesis: AQ-religiosity correlations may depend on a specific manner of being nonreligious, one that is present in WEIRD cultures but absent in non-WEIRD cultures. This manner is marked by individualism, cultural emphasis on solitary achievements, and preference for analytical pursuits and hobbies. Persons who have these traits in western cultures are frequently nonreligious (Caldwell-Harris, 2012; Hunter, 2010), perhaps reacting to religious traditions that evolved to support ingroup cohesion, family obligations, and deference to authority (Norris and Inglehart, 2012). Turkish culture retains a focus on collectivism, responsibility towards family, and respect for authority (Aycicegi-Dinn & Caldwell-Harris, 2013; Kagitcibasi, 2005). We suggest that variation in these traits, as assessed by the AQ, may simply be orthogonal to religiosity in Turkey, which can involve little interpersonal contact during Salat and plenty of structure. In other words, Turkey likely has different routes to irreligiosity, such as valuing technological change, secular governing systems and science (Caldwell-Harris, 2014).

However, note that among Turkish males, the Social Skills subscale of the AQ (akin to the Aloof Personality scale in the BAP), correlated with religiosity at $r = -0.22$. Although this is not a statistically reliable correlation due to the small sample size for males, it is in the expected direction. The analogous correlation for females was $r = 0.02$. This difference, although provisional and awaiting replication/extension, is consistent with the view that male university students in Turkey are closer to endorsing WEIRD norms than females. Future work can seek to understand the cultural contexts in which the AQ and related measures correlate with religiosity.

4.5 *Analytical Cognitive Style*

As research on religiosity and cognitive style continues to expand into cross-cultural contexts, it is necessary to keep constraints on individual expression in mind. Theorists have proposed that analytical style prompts detecting conflicts between supernatural religious beliefs and the natural world (Pennycook et al.,

2014). This mechanism remains to be thoroughly investigated in cross-cultural contexts. How do Turkish females – and of course women globally – respond to conflict-inducing stimuli, relative to males? More than males, females may inhabit environments with fewer such stimuli, as could occur if girls and women are sanctioned against joking about religion or discussing their skeptical concerns with friends. It may be that social expectations to be religious prohibit the analysis that could prompt questioning of religious teachings. This may be generally true of both men and women in traditional cultures where religious belief is a highly sanctioned norm. In those constraining contexts, we would predict that the associations between cognitive style, along with other individual differences, and religiosity are likely to be weak or non-existent.

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