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Conservative Syndrome and the understanding of negative correlations between religiosity and cognitive abilities

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ABSTRACT

We present new data about the correlation between religiosity and cognitive abilities. At the individual level of analysis the correlation is $r = -0.199$ and at the country level of analysis the correlation is $r = -0.420$ with a test of fluid intelligence and $r = -0.536$ with PISA 2015 science scores. These correlations can be reduced by partialling out measures of traditional values, power distance and conservatism/liberalism. They can also be reduced by partialling out economic and political indices. Our findings indicate that it is the broad Conservative Syndrome that correlates negatively with cognitive abilities, and religiosity is only a part of it. Cognitive ability is becoming an increasingly important predictor of social conservatism.

Literature on the relationship between cognitive abilities and religiosity is extensive. A meta-analysis by Zuckerman, Silberman, and Hall (2013) was based on 63 empirical studies from 52 sources. They report that correlations between intelligence and strength of religious beliefs at the individual level range from $r = -0.20$ to $r = -0.25$. Some recent work has also utilized data from large-scale international surveys (see Lynn, Harvey, & Nyborg, 2009; Stoet & Geary, 2017) and reported even higher negative correlations (i.e., above $r = -0.60$), at the country level of analysis. Some of the reported findings have been criticized. Webster and Duffy (2016) claim that intelligence–religiosity individual-level correlation is $r = -0.149$ and country-level correlation, after controlling for key covariates, is almost of the same magnitude ($r = -0.159$).

1. Relevance of country-level data

The major objective of individual differences research, as suggested by its label, is to gain an improved understanding of psychological and behavioral differences among persons. Hofstede's (1980) book popularized the use of countries as the units of analysis in research on organizational culture. In this approach, data collected from individuals are averaged over all members of the group (e.g., country) and the aggregate values are used in multivariate analyses such as factor analysis. It is widely acknowledged that influences operating at the country level may be different from those at the individual level, especially if the former contain variables from different domains – e.g., psychological scales and, say, country-level political measures. Even with the variables from the psychological domain that are aggregated at the country-level researchers are frequently reminded not to commit ecological fallacy.

Another line of research utilizes both individual and aggregate data (see Stankov, 2015). When individual- and aggregate-level variables are drawn from the same data sources and similar outcomes emerge, it may be possible to argue that the underlying causes of individual and country-level differences are similar. However, even then it may happen that correlations at the individual level have different signs from correlations at the between-countries level leading to problems in interpretation (see von Davier, Shin, Khorramdel, & Stankov, 2017).

An example of the use of country-level data is the recent study by Stoet and Geary (2017). They employed PISA and TIMSS aggregate mathematics and science achievement scores as estimates of cognitive performance. Overall, the correlation between achievement and religiosity for over 50 countries included in their samples was $r = -0.71$. One aim of their study was to examine the effects of two country-level measures. First, they assumed that the correlation may be due to variables that are related to both religiosity and cognitive abilities. This reasoning led to the inclusion of the Human Development Index (HDI) in the analyses under the assumption that general human and economic development is responsible for the correlation between cognitive ability and religiosity. Indeed, for the 30 countries that were included in their analysis, partialling out HDI reduced the correlation between religiosity and cognitive performance to non-significant $r = -0.27$. Second, they

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hypothesized that the amount of religious education children receive in a given country may be important because it reduces the amount of time available for secular education. Indeed, the correlation was further reduced to $r = -0.21$, when the estimated time spent on religious activities (TIME) was partialled out after the effect of HDI was removed. Clearly, Stoet and Geary's (2017) study points to the importance of accounting for the confounding country-level variables in explaining the correlation between two aggregate variables.

2. The present study

In this paper we first report findings about the cognitive ability-religiosity correlations based on three religiosity scales and a short measure of fluid intelligence (i.e., number series test). These were employed in both individual- and country-level analyses.

In the second part of the paper, we focus on the role of country-level confounders in explaining the cognitive ability-religiosity relationship. Cognitive abilities were assessed with four measures (number series test and PISA 2015 scores on tests of mathematics, science and reading). As confounders, we included the TIME and HDI measures of Stoet and Geary's (2017). We also envisioned that it may be meaningful to view both religiosity and cognitive ability as components of a broader set of interrelated constructs, including those identified by investigators interested in cross-cultural differences (Hofstede, 1980; Inglehart & Welzel, 2005; Stankov, Lee, & van de Vijver, 2014) and sociological, political and economic processes captured by the GDP, measures of SES and a host of country-level world governance indicators (WGI).

What was labeled "Conservative Syndrome" in Stankov (2009) represents a set of indicators of social conservatism, which is related to both intelligence and religiosity (Stankov, 2017). Our recent work indicates that religiosity itself is an important component of the Conservative Syndrome that may be seen as a reflection of the country's level of death anxiety, which Jost, Kruglanski, Glaser, and Sulloway (2003) have shown to have the highest correlation with conservatism. However, in the earlier Stankov et al. (2014) study, country-level Conservatism/Liberalism was broader (see description in the Method section below). Thus, if country-level factor scores of Conservatism/Liberalism affect the cognitive ability-religiosity correlation it would be appropriate to claim that broadly defined Conservative Syndrome, not religiosity on its own, accounts for the relationship. This would also allow us to link our findings to the broader social-psychological accounts of conservatism advocated by Wilson (1973) and Jost et al. (2003).

3. Aims

In summary, we expect that:

H1. Correlations between religiosity and measures of cognitive abilities will be negative at both individual and country levels of analysis;

H2. At the country-level, since religiosity implies acquiring knowledge about a particular religion, its correlation should be higher with measures of crystallized intelligence captured by PISA 2015 scores than with the number series test;

H3. Partialling out Human Development Index (HDI) and time devoted to religion-related activities (TIME) will reduce the correlation between religiosity and cognitive abilities;

H4. A host of psychological variables used in cross-cultural studies and broad sociological, political and economic indices will show effects on the cognitive abilities–religiosity correlation suggestive of the important role of Conservative Syndrome.

4. Method

4.1. Participants

The data for the present study came from multiple sources. Survey responses to the measures of religiosity and number series test were obtained from 8883 participants from 33 countries. Detailed information about the samples is presented in Saucier et al. (2015). Relevant information is also contained in Stankov (2016, 2017), Stankov and Lee (2014, 2016) and Stankov and Saucier (2015). The rest of the measures were based on open sources (see below).

4.2. Measures

The following measures were used at both individual and country levels of analyses:

1. Number series test. This is a 5 items test whose reliability is 0.81 (see Stankov & Lee, 2014).
2. Religiosity scales:
   a. Duke Religiosity Index. The 5 items are described in Saucier et al. (2015). Example: "How often do you attend church, mosque, temple, or other religious meetings?";
   b. Traditional Religiousness (Alphaism). An 8-item scale from Saucier et al. (2015). This pertains to acceptance of one or more traditional religious sources of authority, such as a religious text or scripture, or a religious figure, institution, or organization; and
   c. Religiosity Axiom. A 5 items scale referring to the acceptance of the existence of a supernatural being and to the beneficial functions of religious practice (see Stankov & Saucier, 2015).

The following measures were used at the country level of analysis only:

3. PISA 2015 mathematics, science and reading achievement scores (OECD, 2016a);
4. TIME and HDI from Stoet and Geary (2017);
5. Psychological constructs from studies of cross-cultural differences (a. and b. are from Inglehart & Welzel, 2005; c. to f. are from Hofstede, 1980):
   a. *Traditional* vs. *secular values*. Traditional values emphasize the importance of religion, deference to authority and traditional family values. Secular values emphasize the opposite;
   b. *Self-expression* vs. *survival values*. Survival values place emphasis on economic and physical security. Self-expression values emphasize the opposite;
   c. *Power distance* reflects the degree to which members of a society agree that power should be stratified and concentrated at higher levels of a government;
   d. *Individualism/collectivism* reflects the degree to which people in a society are integrated into groups;
   e. *Masculinity* vs. *femininity* reflects a preference in society for achievement, heroism, assertiveness and material rewards for success;
   f. *Uncertainty avoidance* is defined as a society's tolerance for ambiguity;
   g. *Conservatism/Liberalism*. Stankov et al.'s (2014) describe it as a factor that "differentiates between countries that have strong spiritual roots, in which people are conscientious, have conservative values, score high on in-group collectivism and humane orientation, and place little emphasis on gender egalitarianism and long-term future orientation." (p. 28). Country-level factor scores from that study are used in the present paper.
6. Sociological, political and economic variables:
   a. Gross Domestic Product (GDP) per capita provided by the International Monetary Fund https://en.wikipedia.org/wiki/List_

Table 1
Individual-level correlations between number series scores and measures of religiosity.

	1	2	3	4	5
1. Number series[a]	1				
2. Religiosity: social axioms[b]	−0.058**	1			
3. Religiosity: social attitude[c]	−0.169**	0.609**	1		
4. Duke religiosity index[c]	−0.185**	0.604**	0.757**	1	
5. Religiosity factor score[d]	−0.199**	0.597**	0.935**	0.831**	1

[a] Stankov and Lee (2014).
[b] Stankov and Saucier (2015).
[c] Stankov and Lee (2016).
[d] Stankov (2016).
** Significant at the 0.001 level.

of_countries_by_GDP_(PPP)_per_capita
b. Economic, social and cultural status (ESCS) from PISA 2015 (OECD, 2016b);
c. Political stability in 2013 (WGI; www.govindicators.org);
d. Government effectiveness (WGI);
e. Rule of law (WGI);
f. Control of corruption (WGI);
g. Regulatory quality (WGI);
h. Voice and accountability (WGI).

5. Results

5.1. Individual-level correlations between religiosity and fluid intelligence

Table 1 presents individual-level correlations between the number series test and measures of religiosity. As expected, all correlations are negative in sign and all are lower than what Zuckerman et al. (2013) reported. Among the three scales of religiosity, the highest correlation with the number series test has the Duke Religiosity Index ($r = -0.185$).

Among the three religiosity scales themselves, the correlations range between $r = 0.604$ and $r = 0.751$ and they did define the same factor in Stankov's (2016) study. Correlation between the factor score based on these three religiosity scales and the number series test is $r = -0.199$ (see row #5 in Table 1). This religiosity factor score was used in the subsequent country level analyses of the present paper.

In evaluating the practically meaningful effect sizes of correlations, we follow the criteria Stankov (2013) employed in his accounts of the predictability gradient hypothesis. Correlation of $|r = 0.20|$ is seen as a threshold to be practically meaningful (i.e., given the logic that the shared variance between two variables should be at least 5%), and any correlation below that value may be treated as being too close to zero shared variance. Therefore, the correlation between religiosity factor scores and the number series test of $r = -0.199$ is on the borderline.

5.2. Country-level correlations between religiosity and fluid and crystallized intelligence

Table 2 presents country-level correlations between the four cognitive measures and religiosity. Several findings need to be highlighted. First, the three components of the PISA 2015 assessments are highly correlated among themselves ($r > 0.90$). Also, the number series test has the highest correlation with PISA mathematics scores, followed by PISA science and PISA reading. This is in agreement with the claim that number series test is a measure of fluid intelligence that is captured more by the mathematics achievement scores than by Science and Reading. Second, in accordance with H1, religiosity correlates negatively with all cognitive ability measures at both individual- and country-levels. Third, correlations between religiosity and cognitive ability measures range from being moderate with the number series test

Table 2
Country-level correlations between religiosity and number series test and PISA 2015 scores in mathematics, science and reading. (Correlations with PISA 2015 scores are based on 23 countries.)

	1.	2.	3.	4.	5.
1. Number series	1				
2. PISA 2015 mathematics	0.566**	1			
3. PISA 2015 science	0.527**	0.981**	1		
4. PISA 2015 reading	0.472*	0.940**	0.964**	1	
5. Religiosity factor score	−0.420*	−0.477*	−0.536**	−0.622**	1

* Significant at the 0.05 level.
** Significant at the 0.001 level.

($r = -0.420$) to moderately high with the PISA reading ($r = -0.622$). Fourth, as hypothesized in H2, PISA reading has higher correlation with religiosity than any other cognitive measure, suggesting that religiosity may be more closely related to crystallized intelligence than it is to fluid intelligence. Overall, it can be concluded that our findings are in general agreement with the expectations.

In the remainder of this paper we focus on only two cognitive ability measures – number series test as a measure of fluid intelligence and PISA science performance, which can be considered as a measure of crystallized intelligence and is sometimes treated as being in competition with religious beliefs (Stoet & Geary, 2017). These measures capture the most salient features of cognitive abilities of importance to us in this paper.

5.3. Confounds of the religiosity-cognitive abilities relationship at the country level

We used partial correlation to examine several country-level measures that may confound the correlations between religiosity and cognitive abilities. The question is, simply: what variables can change the two coefficients indicating religiosity's correlation with the number series test ($r = -0.420$, N = 33 countries) and with PISA Science ($r = -536$, N = 23 countries), which were presented in Table 2. These are referred to as "baseline" correlations in the subsequent analyses.

Setting the baseline correlations between religiosity and cognitive ability measures at the country level is somewhat complicated, however. This is mostly because our data on religiosity are based on 33 countries, but most country-level correlates are from other sources. As a result, the number of countries in common varies across measures. Selection of particular countries for the calculation of partial correlations is most likely to change the above two baseline correlation coefficients. Thus, we re-calculated the baseline correlations for a selection of countries that were included both in our religiosity-number series data set and in the datasets containing only the country-level information. In other words, baseline correlations for each country-level confound differ depending on the availability of country-level correlates. The information in the columns indicating the number of countries and baseline correlation reflect this point.

The main results of Table 3 are presented under the columns of partial correlations, which are calculated by partialling out the variables listed on the left-hand side of that table. Given the differences in country sample sizes and the corresponding differences in significance levels, we have adopted the $r_{diff} = |0.20|$ threshold value again, to evaluate the partialling effect. That is, if the absolute value of the difference between the partial correlation and the baseline correlation is higher than 0.20, we consider the change to be noteworthy and have placed '■' next to the corresponding partial correlation.

5.3.1. Time devoted to religion (TIME) and Human Development Index (HDI)

The first two rows in Table 3 replicate the findings of Stoet and Geary (2017), i.e., partialling out the estimated time devoted to

Table 3
The effects of partialling on the correlation between religiosity and cognitive abilities at the country level.

Partialling variable	Number series test $r_{rel.NS} = -0.420$ (N = 33)				PISA 2015 science $r_{rel.PISA-S} = -0.536$ (N = 23)			
	Baseline corr.		Partial corr.	#	Baseline corr.		Partial corr.	#
Measures suggested by Stoet and Geary (2017)								
TIME devoted to religious activities	−0.319	→	−0.063■	13	−0.617	→	−0.430	12
Human Development Index (HDI)	−0.420	→	−0.078■	33	−0.536	→	−0.171■	23
Psychological measures								
Traditional vs secular/rational values (Inglehart & Welzel, 2005)	−0.470	→	−0.319	23	−0.591	→	−0.331■	16
Survival vs self-expression values (Inglehart & Welzel, 2005)	−0.470	→	−0.593	23	−0.591	→	−0.617	16
Masculinity/femininity (Hofstede, 1980)	−0.436	→	−0.524	24	−0.552	→	−0.532	18
Individualism/collectivism (Hofstede, 1980)	−0.436	→	−0.407	24	−0.552	→	−0.436	18
Power distance (Hofstede, 1980)	−0.436	→	−0.285	24	−0.552	→	−0.342■	18
Uncertainty avoidance (Hofstede, 1980)	−0.436	→	−0.457	24	−0.552	→	−0.632	18
Conservatism/liberalism (Stankov et al., 2014)	−0.382	→	−0.180■	17	−0.481	→	−0.128■	13
Sociological, economic and political measures								
Gross Domestic Product per capita (GDP)	−0.420	→	−0.151■	33	−0.536	→	−0.290■	23
Economic, social and cultural status index (ESCS, OECD, 2016b)	−0.056	→	0.087	21	−0.553	→	−0.335■	23
Political stability (WGI)[a]	−0.420	→	−0.253	33	−0.536	→	−0.360	23
Government effectiveness (WGI)	−0.420	→	−0.217■	33	−0.536	→	−0.331■	23
Rule of law (WGI)	−0.420	→	−0.272	33	−0.536	→	−0.257■	23
Control of corruption (WGI)	−0.420	→	−0.279	33	−0.536	→	−0.316■	23
Regulatory quality (WGI)	−0.420	→	−0.231	33	−0.536	→	−0.365	23
Voice and accountability (WGI)	−0.420	→	−0.353	33	−0.536	→	−0.400	23

Note: Symbol '■' next to the partial correlation indicates that change in the coefficient is $r \geq 0.20$ points different from the corresponding baseline correlation.
[a] WGI = World Governance Indicators for 2013.

religious activities (TIME) reduces the number series and religiosity correlation to near zero. In accordance with H3, removing the effects of the Human Development Index (HDI) leads to a noteworthy reduction in the size of correlation with religiosity for both cognitive measures.

5.3.2. Psychological measures from cross-cultural psychology

The middle section of Table 3 presents the outcome of partialling out the well-known psychological measures from the work on cross-cultural difference. Inglehart's and Welzel's (2005) measure of traditional vs. secular/rational values has noteworthy effects on correlation between religiosity and PISA science, but its effect on the correlation with the number series test did not reach our threshold of being noteworthy. Of the four Hofstede (1980) measures, only power distance has noteworthy effect on religiosity's correlation with PISA science.

We wish to note that both measures showing noteworthy effects on PISA science - traditional vs. secular/rational values and power distance - reflect social conservatism sentiments. One of the aspects of the ideology of conservatism is justification of inequality (Jost et al., 2003), which is obviously captured by the power distance dimension. Stankov (2017) reported that the measure of individualism/collectivism also captured social conservatism, but its partialling effect in the present study was still below the threshold.

The only psychological measure that has noteworthy partialling effects on both number series and PISA science is the conservatism/liberalism dimension from Stankov et al. (2014).

5.3.3. Sociological, economic and political measures

The final set of indices are listed in the bottom section of Table 3. The first two – GDP and PISA 2015 ESCS – are mostly economic in nature. GDP, in particular, behaves in a very similar way to the HDI – i.e., the baseline correlations between religiosity and both cognitive measures are reduced when GDP is partialled out. The PISA 2015 ESCS measure assesses the average socio-economic status (SES) of the PISA participant countries in the 2015 survey and it affects only PISA science performance.

The six World Governance Indices (WGI) are reflections of the overall functioning of the country's government system. In this sense, they are closely related to the GDP and HDI measures. Among these, partialling the government effectiveness measure from both number series and PISA science correlations with religiosity lead to noteworthy effects. In addition, two other indices – rule of law and control of corruption – do exert influence but only with respect to the PISA science correlation.

6. Discussion

Negative correlations between cognitive abilities and religiosity were obtained at both individual and country levels of analysis in the present study, which is in agreement with previous literature. Our results also replicate the findings of Stoet's and Geary's (2017) that TIME (time spent on religious activities) and HDI (human development index) represent significant confounders of the religiosity-ability correlation at the country level.

In our work, religiosity is an important aspect of a broad Conservative Syndrome that has been identified at both individual and country levels (see Stankov, 2017; Stankov et al., 2014). The broadness of this construct is illustrated by the fact that country-level correlations between religiosity and cognitive abilities can be affected by partialling out a set of variables that can also be understood as capturing aspects of conservatism.

Three psychological constructs studied by cross-cultural psychologists affect religiosity-cognitive abilities correlations at the country-level: traditional vs secular/rational values (Inglehart & Welzel, 2005), power distance (Hofstede, 1980) and conservatism/liberalism from Stankov et al. (2014). Social conservatism is primarily a psychological phenomenon, and country-level processes captured by the human development index (HDI), gross domestic product (GDP), and world governance index (WGI) are usually not linked to it in typical studies focusing on individual differences. It is apparent from our findings that sociology, economics and politics have a role to play in the understanding of the nature of the Conservative Syndrome. After all, HDI, GDP and WGI indices reflect system instability that Jost et al.'s (2003) meta-analysis has shown to be among the most important predictors of conservatism in a society. These findings are supportive of our H4 and point to the important role of Conservative Syndrome in the interpretation of the religiosity-cognitive abilities correlation.

Perhaps a somewhat simplistic interpretation of our findings is that people with lower performance scores on cognitive tests also experience

greater difficulties in understanding and coping with the complexities and challenges of life, which in turn leads to resistance to change, acceptance of inequality and less friendly attitude towards out-groups. This interpretation is in agreement with the views of Wilson (1973) and Jost et al. (2003), with Stankov's (2009) results, and with many findings by other students of social conservatism.

The work reported herein and similar work reported by others has limitations. For example, it is obvious that, for our own dataset that included number series test, the choice of countries and individuals from these countries was based on convenience rather than representative samples, and the number of countries is small.

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