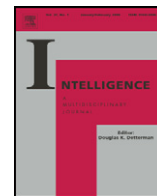


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Intelligence



The relationship between intelligence and multiple domains of religious belief: Evidence from a large adult US sample

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ABSTRACT

High levels of religiosity have been linked to lower levels of intelligence in a number of recent studies. These results have generated both controversy and theoretical interest. Here in a large sample of US adults we address several issues that restricted the generalizability of these previous results. We measured six dimensions of religiosity (rather than just one or two), along with a multi-scale instrument to assess general intelligence. We also controlled for the influence of the personality trait openness on facets of religious belief and practice. The results indicated that lower intelligence is most strongly associated with higher levels of fundamentalism, but also modestly predicts central components of religiosity such as a sense of religious identification and private religious practice. Secondly, we found that a higher level of openness – often assumed to lead to lower religiosity – is weakly associated with reduced fundamentalism but with increased religious mindfulness, private religious practice, religious support, and spirituality. These new results provide a framework for understanding the links between reasoning and faith.

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1. Introduction

Religious belief has long been acknowledged as an important feature of human society (Dennett, 2006; Frazer, 1922). Individuals differ markedly in their levels of religious belief (Koenig, McGue, Krueger, & Bouchard, 2005; Smith, Marsden, Hout, & Kim, 2010), and general intelligence has been proposed as a candidate to explain at least part of this variation. Previous research exploring this hypothesis has found that religious belief and intelligence are negatively correlated (Kana-zawa, 2010; Lynn, Harvey, & Nyborg, 2009; Nyborg, 2009). Importantly, however, religion is known to reflect multiple components (Hill & Hood, 1999; Kendler et al., 2003), although studies to date have typically addressed religion as a unidimensional construct. In the present study, we report

on the links of intelligence to religion in a large sample of US adults, utilizing a multidimensional assessment of religious belief and measures not only of general intelligence, but of a trait linked to both intelligence and religion (and thus a potential confounding variable): Openness to experience.

2. Associations between intelligence and religious belief

The earliest suggestions of a link between religious belief and cognitive ability took scientific status as a proxy for intelligence, and examined the religious beliefs of scientists, finding lower levels of religious belief in this population (Leuba, 1916). More recently, Larson and Witham (1997) replicated this earlier work finding that approximately 40% of 1000 scientists disbelieved in or doubted the existence of God (compared to only 7% in the general population). This effect is even stronger among “elite” scientists (Larson & Witham, 1998; see Ecklund & Park, 2009, for broadly similar results).

Associations between intelligence and religious belief are not limited to scientists. Bertsch and Pesta (2009) observed that high IQ was a predictor of high religious questioning

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and low sectarianism (believing one's religion is the only path to God) in a sample of 278 undergraduate students. Lynn et al. (2009), using 137 nation-level estimates of both intelligence and religiosity, observed a substantial correlation between general intelligence and atheism ($r = .60$). Nyborg (2009) reported similar results for a large cohort of adolescents; atheists scored 3.82 IQ points higher than individuals holding liberal religious persuasions and 5.89 IQ points higher than individuals holding more dogmatic religious attitudes. Pesta, McDaniel, and Bertsch (2010) report that state-level estimates of intelligence negatively associate ($r = -.55$) with a latent factor of religious belief (derived from 7 items, including "My holy book is literally true" and "Mine is the one true faith"). Finally, Kanazawa (2010) used two large samples, the National Longitudinal Study of Adolescent Health and the General Social Survey, to show that intelligence had a significant negative association with religiosity ($\beta = -.18$; $\beta = -.06$, for the two samples respectively).

3. Limitations of previous research

Studies to date, while striking, have a number of limitations. Firstly, most have assessed religion unidimensionally (e.g. Kanazawa, 2010), were limited to small sample sizes (e.g. Bertsch & Pesta, 2009), or aggregated data (Lynn et al., 2009; Pesta et al., 2010). Nyborg (2009) distinguished between "Liberal" and "Dogmatic" believers, but factor analyses suggest that religiosity consists of at least six factors (Kendler et al., 2003). This raises the possibility that intelligence may be differentially linked to each of these domains. Secondly, studies of young adults' and adolescents' religious beliefs (e.g. Bertsch & Pesta, 2009; Kanazawa, 2010) may reflect parental beliefs more than the result of personal-level reasoning and inquiry (Eaves, Hatemi, Prom-Womley, & Murrelle, 2008). Thirdly, it should be noted that some of the national IQ scores used by Lynn et al. (2009) have been questioned on the basis that they appear to have been inaccurately reported from the original studies in which they were recorded (Mackintosh, 2006). Finally, the personality trait openness to experience is associated with both religious belief (Saroglou, 2010) and general intelligence (Wainwright, Wright, Luciano, Geffen, & Martin, 2008). No study to date has examined the relationship between intelligence and religious beliefs while controlling for openness. This point is of particular interest in light of findings, discussed above, that scientists are less religious: While they score highly on intelligence tests, they also tend to report higher openness scores (Feist, 1998). Thus, in part, the relationship between excellence in science and a lack of religious faith may reflect openness or other traits (Rushton, 1997) rather than intelligence.

4. The current study

The current study sought to address each of these limitations. We utilized a large sample of mature US adults contacted by the MacArthur Foundation Survey of Midlife Development in the United States (MIDUS; Kendler, Thornton, Gilman, & Kessler, 2000; Kessler, Gilman, Thornton, & Kendler, 2004). These individuals were assessed on a battery of religious and spiritual questions which addressed a wide range of religious practices, beliefs and behaviors, as well as

a broad general cognitive ability test battery and a measure of trait openness. We utilized measures of the religious domains of mindfulness (increased perceived thoughtfulness due to beliefs), spirituality (the importance of spirituality in one's life), religious support (the belief that religion provides strength and guidance), religious identification (the importance of religion and religious community in one's life), private religious practice (how often one reads scripture, prays, or meditates), and fundamentalism (strict adherence to a religious doctrine).

We predicted that intelligence would relate to fundamentalism (Nyborg, 2009), as well as religious identification and private religious practice (Kanazawa, 2010). By contrast, we predicted no significant association between intelligence and spiritual components of religion (including mindfulness). Finally, in line with the results of Saroglou (2010), we expected that openness would associate positively with spiritual components of religion, and negatively with fundamentalism, religious identification, and private religious practice.

5. Methods

5.1. Participants

Phenotypic data were available for 2307 individuals assessed for religiosity, cognitive ability/intelligence, and openness. These were 1035 males (mean age = 48.49; SD = 12.35), 1262 females (mean age = 47.87; SD = 12.54), and 10 individuals (mean age = 43.30; SD = 7.79) who did not report their sex. By race, 92.3% of the sample was comprised of White individuals, 3.4% of Black individuals, 1.3% of Native American/Eskimo individuals, 0.5% of Asian individuals, and 2.5% of individuals who reported their race as "other". We excluded individuals reporting non-Christian denominations (<100 individuals); as such, all participants identified themselves as belonging to a Christian religion, with the exception of 3.2% who self-reported as atheist or agnostic, and a further 11.4% who reported "no religious preference".

5.2. Measures

5.2.1. Religiosity

Mindfulness was measured with 9 items using 5-point Likert scales. An example item is as follows: "Because of your religion or spirituality, do you try to be a better listener?". Spirituality was measured with 2 items using 4-point Likert scales. An example item is: "How spiritual are you?". Religious support was measured with 6 items using 4-point Likert scales. An example item is: "I look to God for strength, support, and guidance". Religious identification was measured with 7 items using 4-point Likert scales. An example item is: "How closely do you identify with being a member of your religious group?". Private religious practice was measured with 3 items using 6-point Likert scales. An example item is: "How often do you pray in private?". Fundamentalism was measured with 2 items using 4-point and 5-point Likert scales, respectively. An example item is: "The Bible is the actual word of God". All scales were created as the summed score of the items with higher scale scores reflecting increased attitudes

on the respective domain, e.g. high fundamentalism scores reflect more fundamentalist beliefs.

5.2.2. Openness

Openness was measured with respondents using 4-point Likert scales to indicate the degree to which each adjective on the questionnaire described them (Lachman & Weaver, 1997). The scale score was calculated by obtaining the average of the ratings for each of the following items: *creative, imaginative, intelligent, curious, broadminded, sophisticated, and adventurous*.

5.2.3. Intelligence

As a marker of general intelligence, we used a composite measure of five sub-tests. The composite score was calculated as the mean of z-scores for the following sub-tests: word list recall (sum of immediate and delayed tests; Lezak, 1995), working memory span (digits backward; Wechsler, 1997), verbal fluency (assessed by category fluency; Lezak, 1995), inductive reasoning (a measure of fluid intelligence; Salthouse & Prill, 1987), and speed of processing (measured with a backward counting task requiring rapid generation of a non-automatic sequence; Salthouse, 1996). Composites were calculated only for complete cases with scores on all tests. The composite score was standardized to a z-score, with a mean of zero and standard deviation of one.

6. Results

Descriptive statistics and correlation coefficients for each of the variables are presented in Tables 1 and 2. We tested our core hypotheses in a series of linear regression analyses with scores on the 6 religion measures as dependent variables. In each model we included level of education, openness, age, and sex as predictor variables in Step 1, with intelligence added in Step 2. The full results of these analyses are detailed in Table 3.

These analyses indicated that intelligence was significantly and negatively associated with five of the six religion measures, with the largest coefficient on fundamentalism ($\beta = -.13$). Only spirituality did not relate to intelligence. This pattern of relationships did not change when education was omitted: For each of the religion variables, except fundamentalism, the association with intelligence was practically unchanged (all $\Delta\beta \leq .01$). For fundamentalism, however, removing education from the model increased the association with intelligence to $\beta = -.25$ (up from $\beta = -.13$).

Openness had mixed relationships with the religion measures: For mindfulness, spirituality, and religious support,

openness was a significant and positive predictor; however, this relationship was reversed for fundamentalism. Religious identification and private religious practice were not significantly associated with openness. Demographic variables were also significantly associated with the religion measures. Both sex (male = 1, female = 2) and age were positively associated with each of the religion measures with the exception of age on spirituality, and fundamentalism, where a null effect was observed for both age and sex.

7. Discussion

The present study addressed the relationship between intelligence and religion. Extending previous work that used only unidimensional indicators of religious belief, here we utilized six measures of religious belief and practice, and controlled for the personality trait of openness that may have confounded previous findings. The results indicated that intelligence is significantly negatively associated with five of the six measures of religious belief, confirming previous work (Bertsch & Pesta, 2009; Kanazawa, 2010; Lynn et al., 2009; Nyborg, 2009). Certainty about these findings is enhanced by the fact that, in the present study, these relationships to intelligence remained after we controlled for both openness and education, two potentially confounding factors. It should be noted, however, that the effect sizes were small for all associations with intelligence, the largest being the modest intelligence–fundamentalism link ($\beta = -.13$), with all other associations estimated at less than $\beta = -.10$.

The inclusion of openness in our study provided additional information about the origins of the components of religious belief. Openness showed significant positive associations with mindfulness and spirituality, and more modest links to private religious practice and religious support. By contrast, fundamentalism was negatively associated (albeit very modestly) with openness, independent of the negative association of fundamentalism with higher intelligence. These findings are consistent with the results of a meta-analysis by Saroglou (2010), who showed that spirituality is reflected by high openness, while fundamentalism is reflected by a low score on this domain. These results appear to reflect the tendency of high openness individuals to embrace novel and alternative experiences (thus explaining positive associations to spiritual components of religion) and to reject authority and rules (thus reflecting the negative association to fundamentalism; McCrae, 1996).

Both age and sex were significantly positively associated with religious support, religious identification, private religious practice, and to a lesser extent mindfulness; sex, but not age, was significantly associated with spirituality. In addition, level of education was strongly negatively associated with fundamentalism. However, the fact that intelligence remained significantly linked to fundamentalism after controlling for this suggests that the link from intelligence to lower fundamentalism is not mediated by education, but rather represents effects of reasoning ability independent of extended exposure to systematic education.

An important question that arises from these results concerns the mechanism by which increased intelligence relates to religiosity. McCourt, Bouchard, Lykken, Tellegen, and Keyes

Table 1

Means and standard deviations for each of the six measures of religion.

Measure	Mean	SD
Mindfulness	34.02	6.10
Spirituality	6.41	1.56
Religious support	18.51	3.83
Religious identification	19.45	5.61
Private religious practice	9.64	4.28
Fundamentalism	4.89	2.11

Table 2
Correlations among religion, intelligence, openness, and demographic variables.

Measure	Mind	Spirit	Supp	Id	Priv	Fund	IQ	Edu	O	Age
Spirit	.51									
Supp	.50	.65								
Id	.39	.60	.67							
Priv	.46	.64	.70	.69						
Fund	.23	.31	.39	.52	.42					
IQ	-.09	-.05*	-.10	-.14	-.15	-.25				
Edu	-.04	-.03	-.05*	-.09	-.06**	-.34	.41			
O	.23	.13	.06**	-.03	.01	-.12	.13	.20		
Age	.08	.04	.11	.14	.18	.10	-.45	-.15	-.02	
Sex	.15	.16	.17	.13	.18	.05*	-.03	-.10	-.02	-.04

Note: bolded coefficients = $p < .001$; Mind = mindfulness; Spirit = spirituality; Supp = religious support; Id = religious identification; Priv = private religious practice; Fund = fundamentalism; IQ = intelligence; Edu = education; O = openness; sex: male = 1, female = 2; $n = 1851\text{--}2307$.

* $p < .05$.

** $p < .01$.

(1999) suggest that “Intelligence drives attitude formation. That is, when considering social, moral, and political situations, those with greater cognitive skill are able to form more individualistic and open-minded (i.e. antiauthoritarian) attitudes than those of lesser cognitive ability” (p. 987). It is possible, then, that individuals with higher intelligence may come into intellectual conflict with the arguments made by religious scripture and leaders, thus explaining our finding of a negative association between intelligence and religious belief. Alternative explanations of this association, however, should be considered; for example, it is possible that the link from intelligence to religion is not causal (in either direction), but instead reflects a third underlying variable creating a spurious association. Such a variable might be socio-economic status, which may relate to both religion, via its propensity to provide social capital (Graham & Haidt, 2010; Lewis & Bates, under review) that may be limited in areas of scarce resources, and intelligence, via poorer rearing conditions. This possibility seems unlikely, however, in line with the independent effects of intelligence on religious beliefs after controlling for level of education.

One limitation of the current study is our focus on Christian denominations only, which limits the generalizability of our findings to other religious groups. Future studies should collect data from similarly large, representative non-Christian samples.

In addition, the measure of fundamentalism used in the current study used only two items. An expanded fundamentalism scale, perhaps including questions assessing the extent to which individuals behave in line with a literalistic interpretation of scripture, would provide more reliable results. Finally, while the present study measured religious belief on a set of items which were wider than any study of religion and intelligence to date, previous work has identified domains of religious belief that we did not measure. For instance, Kendler et al. (2003) identified factors of “forgiveness”, “unvengefulness”, and “thankfulness”. Future work could use an even broader selection of items to take into account the full range of religious beliefs and values.

In conclusion, our investigation of religion and intelligence in a large sample of US adults had the important strength of assessing religious belief on a wide variety of measures, as well as controlling for the effects of openness, which may have confounded findings in previous work. We observed that intelligence was negatively associated with five of the six measures of religion, and most strongly with fundamentalism, although effect sizes were typically modest. In addition, openness positively predicted the spiritual elements of religion, but was negatively associated with fundamentalism.

Table 3
Hierarchical regression analyses (with standardized beta coefficients) showing effects on the six scales of religion for openness and demographic variables (Step 1) and for intelligence (entered at Step 2).

	Mindfulness ($n = 2251$)		Spirituality ($n = 2268$)		Private practice ($n = 2265$)		Religious support ($n = 2253$)		Religious identification ($n = 2267$)		Fundamentalism ($n = 1834$)	
Step:	1	2	1	2	1	2	1	2	1	2	1	2
Edu	-.06**	-.03	-.03	-.02	-.03	-.01	-.03	-.01	-.05*	-.02	-.33	-.28
O	.25	.25	.14	.14	.07**	.08	.07**	.08	-.02	-.01	-.06**	-.06*
Age	.08	.05*	.04	.02	.12	.09	.12	.09	.13	.10	.05*	.00
Sex	.15	.15	.17	.17	.17	.17	.17	.17	.13	.13	.01	.01
IQ		-.09		-.05		-.06*		-.06*		-.08**		-.13
F	53.47	45.43	28.42	23.49	28.29	23.77	28.29	23.77	22.33	19.99	66.50	58.47
Adj. R ²	.085	.090	.046	.047	.046	.048	.046	.048	.036	.040	.125	.136
ΔAdj. R ²		.005		.002		.002*		.002*		.004**		.011

Note: bolded coefficients = $p < .001$; IQ = intelligence; Edu = education; O = openness; sex: male = 1, female = 2; n refers to the number of participants for whom complete data were available after listwise deletion.

* $p < .05$.

** $p < .01$.

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