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Students in countries with higher levels of religiosity perform lower in science and mathematics

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ABSTRACT

We compared the relation between educational performance scores in the *Programme for International Student Assessment* (PISA) and *Trends in International Mathematics and Science Study* (TIMSS) on the one hand, and religiosity, as measured with the *World Values Survey* and the *European Social Survey*, on the other hand. We found that higher levels of religiosity (at national level) were associated with lower educational performance in science and mathematics (r_s ranging from −0.65 to −0.74). One of the unique contributions of our data set is the ability to examine these trends by sex. Interestingly, even though women reported considerably higher levels of religiosity than men, this gap was not related to sex differences in educational performance. This latter finding constrains conclusions about the possible causal pathways between education, religiosity, and intelligence. Further, the mediating role of human development and time spent on religious education appear to account for the relation between education and religiosity. One possibility is that the relation between education and religiosity at the national level is related to overall levels of economic and human development, including investment in secular education.

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1. Introduction

Psychologists have investigated the relation between religion and intellectual abilities for at least a century, beginning with Leuba's (1916) studies of belief in a personal God and belief in immortality. Zuckerman, Silberman, and Hall's (2013) recent meta-analysis revealed a reliable negative relation between religiosity and intelligence (r ranged between −0.20 to −0.25). Webster and Duffy (2016) reanalyzed these same data and concluded this link "is weaker and less generalizable than believed" (Webster & Duffy, 2016, p. 25) due to correlated variables, such as life-quality. Despite these arguments there is general agreement that the negative relation between religious beliefs and intelligence holds true, but that more precise estimates of the strength of the relation would require a better understanding of related variables. Here we investigated the role of several such variables.

1.1. Variables related to the link between religiosity and IQ

There appear to be a number of variables related to religious beliefs and intelligence, including sex, education, and overall quality of life (Webster & Duffy, 2016). Level of education has been proposed as a mediating variable by a number of researchers (Webster & Duffy, 2016; Meisenberg, Rindermann, Patel, & Woodley, 2012; Hoge, 1974; Reeve & Basalik, 2011). As shown in Fig. 1 (A), Reeve and Basalik (2011), for instance, suggested that individuals with higher IQs might benefit more from higher levels of education, which strengthen rational thinking and enable individuals to develop ways to understand the world without reference to supernatural forces. Meisenberg et al. found that the relation between education and religiosity is moderated by national levels of intelligence, with the relation being positive in lower-performing countries and generally negative in higher performing ones.

It should also be noted that school education can influence performance on measures of intelligence (Ceci, 1991; Cliffordson & Gustafsson, 2008; Lund & Thrane, 1983; Stelzl, Merz, Ehlers, & Remer, 1995), whether or not it influences the underlying fluid intelligence (Ritchie, Bates, & Deary, 2015). National IQs predict national educational performance as measured in the *Programme of International Student Assessment* (PISA) (Lynn & Mikk, 2009), and in the *Trends in International Mathematics and Science Study* (TIMSS) (Lynn & Mikk, 2007). Within-country measures of intelligence and education correlate strongly as well (Deary, Strand, Smith, & Fernandes, 2007). Indeed, intelligence and school performance are closely related concepts. In the current paper, we primarily focus on the relation between national levels of educational performance and religiosity.

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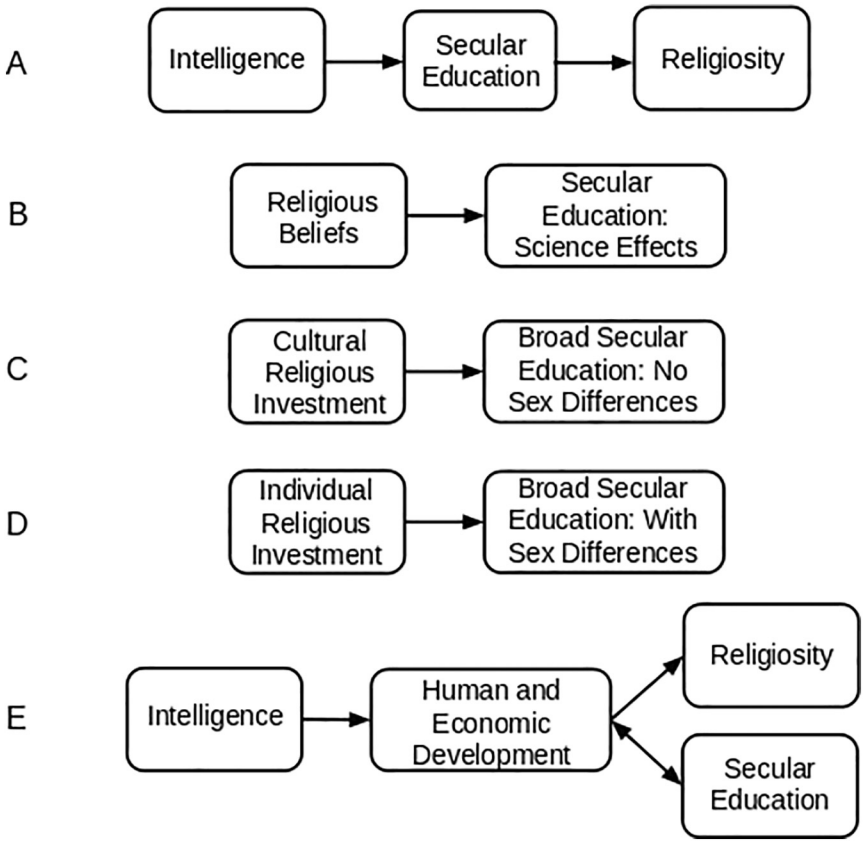

Fig. 1. Schematic depiction of various models of relations between mediating variables. See text for details.

1.2. Hypotheses

Given the previously observed link between intelligence and religiosity, we predict that there is a link between national levels of religiosity and educational performance. We hypothesize, however, that this is not only because of the generally negative but nuanced relation between intelligence and religiosity (Meisenberg et al., 2012). Instead, we suggest that the influence of religion on educational policies might be a factor as well. For example and as represented in Fig. 1 (B), due to the incompatibility between evolution and traditional religious beliefs about the origin of our species, some teachers may be biased in their presentation of the theory of evolution (Athanasiou, Katakos, & Papadopoulou, 2012) or not even support the teaching of evolution at all (Abrie, 2010). Further, in the more general biological domain, the study of abiogenesis (origin of life) and reproduction may conflict with religious beliefs and views on morality. In geoscience, tectonic plate movement may be incompatible with the biblical or quranic accounts of creation, and disbelief about radiometric dating may affect the interpretation of many scientific findings, including those in archaeology and paleontology. In short, a negative effect of religion on teachers and educational policy makers may influence the breadth and strength of educational systems (e.g., conservatively religious school boards may limit the teaching of evolutionary theory, not only in Western countries; Edis, 2009). We call this the "watering down" hypothesis; that is, an indirect effect of religion on the quality of educational outcomes, especially in science.

Apart from the conflict between religious texts and science education, we argue that there is another reason for assuming that religion affects educational policies and outcomes: Investment in learning religious doctrine might have the opportunity cost of less time for secular education (Fig. 1, C). We are not aware of systematic reviews on the relation between levels of religiosity and the effort and time spent on religious teaching (by parents and/or schools). In the context of this lack of empirical data, we propose that religiosity requires time and effort because religious beliefs are based on cultural narratives and rituals which have to be attended to, practised, memorized, and accepted.

In other words, it is not necessarily the *content* of the religious beliefs that might influence educational growth (or lack thereof), but that investment of intellectual abilities that support educational development are *displaced* by other (religious) activities (*displacement hypothesis*). This follows from Cattell's (1987) investment theory, with investment shifting from secular education to religious materials rather than shifts from one secular domain (e.g., mathematics) to another (e.g., literature). This hypothesis might help to explain part of the variation in educational performance broadly (i.e., across academic domains), not just in science literacy.

1.3. Using sex differences to understand the link between religion and intelligence

Previous research has reported that women are more religious than men (for a concise review see Miller & Hoffmann, 1995). This is a reliable sex difference, yet seems not to have received as much attention in psychology as other reliable sex differences.

We do not seek to explain why women are more religious, which is a complex question in and of itself. Proposed explanations range from those related to personality traits (e.g., women are less likely to risk supernatural punishment or miss out on heavenly rewards; Miller & Hoffmann, 1995; Collett & Lizardo, 2009) to sociological (e.g., women might be forced to act religiously through social, economic, or political oppression; for a review of this and other hypothesized sociological factors see Walter & Davie, 1998), although sociological models have been challenged (Miller & Stark, 2002).

If women invest more in religion than do men, then we would predict that sex differences in educational performance should relate to sex differences in religiosity (Fig. 1, D). This could manifest because of individual-level displacement (larger in girls than boys) of intellectual

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