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Science and religion around the world: compatibility between belief systems predicts increased well-being

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ABSTRACT

Previous research, conducted mainly in Western societies, indicates that religious/spiritual (R/S) and pro-science belief systems each relate positively to believer well-being, but are perceived as being highly incompatible with each other. This perception would presumably undermine one's ability to benefit fully from both systems, leading to the research questions examined here: does the perceived incompatibility between religion and science vary cross-culturally, and is this level of incompatibility itself related to group member well-being? Our data set included 55,230 participants from 54 countries, organized for analytical purposes into 13 global regions and 11 belief groups. We found that perceived incompatibility between R/S and pro-science beliefs was indeed characteristic of the West but was not the norm cross-culturally. We also found that higher levels of belief system compatibility related positively to well-being, and especially to the strength of positive associations between well-being and each type of belief system. That is, in regions and belief groups that perceived higher compatibility, well-being's positive relationships with R/S and pro-science beliefs were both also higher. We speculate about compatibility's potential causal effects on these relationships, noting that as compatibility increases, so does the possibility of benefiting from one system without forgoing the benefits of the other.

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A large body of evidence now suggests that people who hold religious/spiritual (R/S) beliefs tend to experience higher levels of well-being (i.e., physical and mental health) than people who lack such beliefs (Diener et al., 2011; Hoozeveen et al., 2023; Koenig, 2015; McCullough et al., 2000; Price & Launay, 2020; Stavrova et al., 2013). A smaller but growing number of studies suggest a similar relationship between pro-science beliefs and well-being (Aghababaei, 2016; Aghababaei et al., 2016; Farias et al., 2013; Preston et al., 2023; Stavrova et al., 2016). Although the precise reasons why each of these belief systems relate positively to well-being are yet to be conclusively identified, there is considerable evidence to suggest that these relationships do in fact exist, at least in the Western societies in which most of these studies have been conducted. We know much less about how widespread these relationships are cross-culturally, and the extent to which they can be replicated across different regions of the world and different varieties of R/S belief systems.

We also know little about the relative strengths of pro-science and R/S beliefs as positive predictors of well-being—especially when compared within the same study—and whether their relationships

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with well-being tend to be additive/synergistic (i.e., each explaining unique variance in well-being) or mutually exclusive (i.e., competing to explain the same variance in well-being). Given that the “additive/synergistic” expectation seems at least plausible, one could reasonably also expect that people who subscribed to both types of belief systems, as opposed to just one or the other, would experience higher well-being. Despite these possible advantages, however, subscription to both may be hindered by the perception that scientific and R/S belief systems are in conflict with one another. This perception of conflict does appear to be widespread in Western societies (Ecklund & Park, 2009; Evans & Evans, 2008; Leicht et al., 2022), but this is another topic on which we lack cross-cultural data, and much less is known about the prevalence of this perception on a more global scale.

To investigate these research questions, we used data collected as part of a larger study, which focuses primarily on relationships between belief systems and individual well-being cross-culturally. This larger study, which will be presented in a separate publication (Price et al., *in preparation*), was designed to test well-being’s relationship with R/S and science as distinct belief systems, and not with their perceived compatibility. However, this compatibility might also be a relevant predictor, and our data can be used to examine this relevance in a fairly straightforward manner.

Predictions and research questions

The current study involved a mixture of confirmatory and exploratory approaches. Informed by prior research (cited above), we could hypothesize—in Western societies at least—positive relationships between well-being and each type of belief system, and high perceived incompatibility between the two systems. A lack of global comparative studies, however, made it less clear whether the same relationships should be expected in non-Western cultures. Similarly, when testing for relations between belief system compatibility and well-being, we did not have strong expectations about what we would find. It did seem reasonable to expect that relations between belief system compatibility and well-being would be positive, based on prior findings (again, cited above) suggesting that each type of belief system relates positively to well-being. Considering these findings, it also seemed plausible that in groups with higher belief system compatibility, it would be more possible for each system to relate positively to well-being, without diminishing the other system’s ability to do the same. Nevertheless—although we did have specific hypotheses in mind for Western countries (or more precisely, for study populations that were more similar to those used in most previous research)—our cross-cultural investigations of well-being and belief system compatibility should be considered as largely exploratory, rather than as attempts to test specific directional predictions.

To investigate these research questions, we analysed our cross-cultural data to test for hypothesized correlations between: (1) R/S beliefs and well-being, (2) pro-science beliefs and well-being, (3) belief system compatibility and well-being, (4) belief system compatibility and well-being’s relationship to R/S beliefs, and (5) belief system compatibility and well-being’s relationship to pro-science beliefs. Further, to examine these hypotheses from a more comprehensive cross-cultural perspective, we tested each of them among two different kinds of cross-cultural groupings: the global region in which participants lived, and the belief system with which they affiliated.

Methods

Participants

All data analyzed below are available at <https://osf.io/aqsp4/>. Data were collected between December 2021 and August 2022 via an online cross-sectional survey created with Qualtrics software. Qualtrics also oversaw both data collection—providing access to at least 1,000 participants in each of 54 countries (listed in Table 1)—as well as translation of the survey from English into 38 other languages, assigning professional translators and back-translators for each of the relevant languages. The survey was carefully checked and piloted, and back translations were scrutinized and adjustments made

Table 1. The 13 global regions and their 54 constituent countries, with descriptive statistics.

	Global regions and constituent countries	<i>n</i>	BHP <i>M</i>	BSci <i>M</i>	Well-being <i>M</i>	BHP-BSci compatibility ¹		BHP-Well-being association ¹		BSci-Well-being association ¹	
						<i>r</i>	<i>z</i>	<i>r</i>	<i>z</i>	<i>r</i>	<i>z</i>
(1)	Australia & New Zealand	2007	2.91	3.56	3.42	-.20***	-.20	.31***	.32	.14***	.14
1	Australia	1002	2.88	3.56	3.42	-.14***	-.14	.27***	.28	.17***	.17
2	New Zealand	1005	2.95	3.56	3.42	-.26***	-.27	.34***	.35	.10**	.10
(2)	Eastern Asia	5138	3.05	3.62	3.40	.00	.00	.31***	.32	.32***	.33
3	China	1005	2.96	3.92	3.84	-.18***	-.18	.08*	.08	.55***	.62
4	Hong Kong	1004	3.36	3.71	3.40	.22***	.22	.54***	.59	.26***	.27
5	Japan	1012	2.63	3.43	3.10	-.06	-.06	.31***	.32	.21***	.21
6	South Korea	1106	3.05	3.45	3.33	-.09**	-.09	.34***	.35	.13***	.13
7	Taiwan	1011	3.24	3.62	3.36	.03	.03	.44***	.47	.20***	.20
(3)	Eastern Europe	7231	3.12	3.70	3.55	-.04***	-.04	.30***	.31	.21***	.21
8	Bulgaria	1020	3.29	3.76	3.66	.01	.01	.29***	.30	.23***	.23
9	Czech	1006	2.89	3.52	3.33	-.07*	-.07	.16***	.16	.16***	.16
10	Hungary	1008	3.08	3.57	3.40	-.01	-.01	.31***	.32	.23***	.23
11	Poland	1081	3.02	3.77	3.44	-.04	-.04	.31***	.32	.21***	.21
12	Romania	1077	3.33	3.73	3.68	-.07*	-.07	.40***	.42	.18***	.18
13	Russia	1032	3.03	3.73	3.73	-.10**	-.10	.22***	.22	.22***	.22
14	Ukraine	1007	3.17	3.84	3.59	-.09**	-.09	.35***	.37	.15***	.15
(4)	Latin America & Caribbean	7221	3.29	3.69	3.82	-.14***	-.14	.38***	.40	.12***	.12
15	Argentina	1075	2.97	3.83	3.67	-.24***	-.24	.34***	.35	.07*	.07
16	Brazil	1036	3.72	3.82	3.90	-.02	-.02	.48***	.52	.12***	.12
17	Chile	1040	3.05	3.75	3.66	-.21***	-.21	.40***	.42	.08**	.08
18	Colombia	1000	3.44	3.58	4.04	-.16***	-.16	.36***	.38	.12***	.12
19	Ecuador	1005	3.34	3.47	3.75	-.07*	-.07	.39***	.41	.16***	.16
20	Mexico	1020	3.19	3.74	3.88	-.14***	-.14	.32***	.33	.22***	.22
21	Peru	1045	3.30	3.62	3.87	-.09**	-.09	.28***	.29	.14***	.14
(5)	Northern Africa	—	—	—	—	—	—	—	—	—	—
22	Egypt	1029	3.69	3.90	3.71	.25***	.26	.37***	.39	.29***	.30
(6)	Northern America	2050	3.14	3.60	3.52	-.27***	-.28	.30***	.31	.11***	.11
23	Canada	1002	2.89	3.70	3.49	-.33***	-.33	.24***	.24	.09**	.09
24	United States	1048	3.39	3.51	3.56	-.19***	-.19	.37***	.39	.14***	.14
(7)	Northern Europe	6079	2.73	3.59	3.31	-.27***	-.28	.24***	.24	.09***	.09
25	Denmark	1004	2.65	3.58	3.32	-.36***	-.38	.23***	.23	.02	.02
26	Finland	1031	2.68	3.47	3.16	-.29***	-.30	.23***	.23	.10***	.10
27	Ireland	1006	2.96	3.76	3.44	-.23***	-.23	.27***	.28	.08*	.08
28	Norway	1001	2.66	3.54	3.23	-.32***	-.33	.23***	.22	.05	.05
29	Sweden	1008	2.64	3.58	3.45	-.30***	-.31	.18***	.18	.13***	.13
30	United Kingdom	1029	2.80	3.62	3.27	-.18***	-.18	.31***	.32	.10**	.10
(8)	South-eastern Asia	6112	3.58	3.67	3.86	.12***	.12	.37***	.39	.40***	.42
31	Indonesia	1043	3.96	3.90	4.06	.32***	.33	.43***	.46	.38***	.40
32	Malaysia	1002	4.00	3.64	3.93	.08**	.08	.48***	.52	.15***	.15
33	Philippines	1003	3.68	3.64	3.80	.29***	.30	.58***	.66	.43***	.46
34	Singapore	1007	3.57	3.43	3.56	.16***	.16	.48***	.52	.32***	.33
35	Thailand	1041	3.28	3.61	3.77	.10**	.10	.38***	.40	.52***	.58
36	Vietnam	1016	3.02	3.82	4.01	-.11***	-.11	.09**	.09	.46***	.50
(9)	Southern Asia	—	—	—	—	—	—	—	—	—	—
37	India	1007	3.73	3.84	3.93	.28***	.29	.57***	.65	.41***	.44
(10)	Southern Europe	4172	2.93	3.78	3.48	-.22***	-.22	.31***	.32	.13***	.13
38	Greece	1046	2.92	3.72	3.44	-.30***	-.31	.31***	.32	.13***	.13
39	Italy	1063	2.91	3.75	3.32	-.16***	-.16	.37***	.39	.06*	.06
40	Portugal	1018	3.21	3.85	3.61	-.19***	-.19	.29***	.30	.09**	.09
41	Spain	1045	2.70	3.82	3.57	-.27***	-.28	.25***	.26	.19***	.19

(Continued)

Table 1. Continued.

	Global regions and constituent countries	<i>n</i>	BHP <i>M</i>	BSci <i>M</i>	Well-being <i>M</i>	BHP-BSci compatibility ¹		BHP-Well-being association ¹		BSci-Well-being association ¹	
						<i>r</i>	<i>z</i>	<i>r</i>	<i>z</i>	<i>r</i>	<i>z</i>
(11)	Sub-Saharan Africa	3035	3.96	3.57	4.10	-.02	-.02	.39***	.41	.18***	.18
42	Kenya	1004	4.10	3.54	4.26	-.04	-.04	.42***	.45	.15***	.15
43	Nigeria	1005	3.93	3.72	4.32	.01	.01	.41***	.44	.16***	.16
44	South Africa	1026	3.85	3.46	3.72	-.04	-.04	.37***	.39	.14***	.14
(12)	Western Asia	4041	3.49	3.74	3.75	.04**	.04	.45***	.48	.27***	.28
45	Israel	1008	3.09	3.59	3.59	-.22***	-.22	.36***	.38	.17***	.17
46	Saudi Arabia	1000	3.69	3.67	3.88	.28***	.29	.46***	.50	.36***	.38
47	Turkey	1013	3.45	4.04	3.73	.09**	.09	.52***	.58	.31***	.32
48	United Arab Emirates	1020	3.71	3.66	3.81	.17***	.17	.44***	.47	.30***	.31
(13)	Western Europe	6108	2.93	3.39	3.40	-.13***	-.13	.25***	.26	.16***	.16
49	Austria	1008	2.94	3.35	3.36	-.14***	-.14	.23***	.23	.13***	.13
50	Belgium	1001	2.94	3.45	3.27	-.14***	-.14	.27***	.28	.19***	.19
51	France	1050	2.87	3.47	3.52	-.03	-.03	.29***	.30	.22***	.22
52	Germany	1039	2.88	3.38	3.38	-.10**	-.10	.28***	.29	.16***	.16
53	Netherlands	1005	2.92	3.40	3.41	-.19***	-.19	.21***	.21	.12***	.12
54	Switzerland	1005	3.03	3.33	3.44	-.16***	-.16	.23***	.22	.12***	.12

Note: * $p < .05$, ** $p < .01$, *** $p < .001$. ¹Pearson's r and Fisher's z are both shown; the latter was used in most analyses. BHP = belief in a higher plan, BSci = pro-science beliefs. Region names follow UN designations.

where necessary, prior to implementation. The total N was 55,230, of which 49.2% described themselves as female, 50.2% as male, and 0.6% as other/decline to state. Participants indicated their age in years by selecting one of 13 age categories, ranging from “18-24” to “80 or above”; the mean response for the 13 categories was 3.83 (SD 2.61), representing a mean age of late 30s.

The first part of the survey involved a series of scale variables, presented in random order, related to well-being and worldviews. The second part focused on demographic variables, including R/S group affiliation, also presented in random order. Variables relevant to the present study are described in more detail below. Participants took an average of 15 and a half minutes (15:30) to complete the survey ($M = 930$ seconds, $SD = 2,269$).

Several precautions were taken to maximize data quality, including all of Qualtrics' standard quality control protocols, such as excluding participants who finished the survey too quickly or too slowly (<200 s or >24 h), or whose free text responses indicated a lack of seriousness or reliability (e.g., if they entered a meaningless string of keyboard characters). We also introduced two additional quality-control measures of our own, by excluding participants who (1) failed either of two attention check questions in which they had to choose the correct numerical response (out of five choices) to a question such as “Which number is greater than 50?”, or (2) reported a country of residence that differed from Qualtrics' intended survey location. This latter precaution helped avoid potential discrepancies between one's location while taking the survey and one's actual country of residence (e.g., if an Argentinian participant took the survey while on vacation in Chile, they would have been excluded).

Variables and units of analyses

As noted above, data were collected as part of a larger study, focused mainly on testing predictions about relationships between beliefs and well-being at the individual level. These predictions were designed to test the theory that cross-culturally, R/S beliefs serve a motivational function by promoting optimism and sense of purpose in life among R/S believers. We refer to this as the “biocultural adaptive motivational system” (BAMS) theory of R/S beliefs (Price et al., [in preparation](#)). According to BAMS, R/S beliefs encourage optimism and sense of purpose because they universally entail “belief in a higher plan” (BHP), that is, the belief that one's own life is following the plan of

some kind of higher power(s), and that this plan will ultimately serve the best interests of the believer. Our decisions about which variables to measure, and how to measure them, were influenced by the fact that the main purpose of the larger study was to test this BAMS theory. These decisions were also guided by our need to measure variables using simple, non-idiomatic language that would translate easily and clearly from English into 38 other languages. All scale variables were measured on a 1–5 Likert scale from “strongly disagree” to “strongly agree” and are presented fully in the Appendix. Below we explain the logic and measurement of these variables.

Belief in a higher plan (BHP)

As noted above, BHP is the belief that one’s life is following a plan, devised by some higher power(s), to serve one’s own long-term interests. Our own pilot testing, as well as our reading of the cross-cultural religiosity literature, suggested that BHP would be an important aspect of not just all major world religions, but also of the more informal spirituality exhibited by many people who are unaffiliated with any organized religion (i.e., the “spiritual but not religious” [Fuller, 2001]). Because our study focused on the psychological core (or common underlying characteristics) of religiosity and spirituality cross-culturally, and not on the behaviors or beliefs of any particular religious or spiritual tradition, BHP served as a relatively universal measure of general R/S beliefs cross-culturally. BHP was the mean of an original 6-item scale variable ($\alpha = .91$), composed of items like “I believe that events in my life are following a higher plan (that is, a plan made by a religious or spiritual power or powers)” and “When something bad happens to me, I often believe it’s part of a higher plan that will be good for me in the long term.”

Well-being

We conceptualized well-being as the composite of (1) optimism, defined as a dispositional tendency to have positive expectations about one’s own future (Carver et al., 2010), and (2) sense of purpose in life, defined as the perception that one’s efforts in life are directed towards important overarching goals and ambitions (Steger et al., 2006). Large literatures document the positive relationships between physical/mental health and both dispositional optimism (Carver et al., 2010; Conversano et al., 2010; Jacobs et al., 2021; Koga et al., 2022; Lee et al., 2019; Peterson, 2006; Taylor, 1989) and sense of purpose (Hill & Turiano, 2014; Lewis, 2020; McKnight & Kashdan, 2009; Schaefer et al., 2013). Our measure of optimism consisted of the three optimism items (e.g., “In uncertain times, I usually expect the best”) from the Revised Life Orientation Test (LOT-R; Scheier et al., 1994), the most widely-used and well-validated measure of dispositional optimism. Our measure of sense of purpose consisted of the three “purpose” items (e.g., “My life has a clear sense of purpose”) from another widely used measure, the Presence of Meaning Scale (Steger et al., 2006). These two psychological constructs are complementary not just because both are core components of *psychological* well-being, but because they are widely regarded as serving the same adaptive function, with consequences for *physical* well-being as well: both optimism (Carver & Scheier, 2014; Sharot, 2011) and sense of purpose (Lewis, 2020; McKnight & Kashdan, 2009; Scheier et al., 2006; Steger, 2013) are typically seen as motivational mechanisms, inspiring individual striving in the pursuit of adaptive goals (and thus increasing the probability of goal achievement). Combining both three-item measures into one variable made sense not only in light of this functional similarity, but also from the perspective of principal component analysis: the six items produced just one component with an Eigenvalue > 1.0 , explaining 52% of the total variance, with each item’s factor loading being at least .60. Well-being was the mean of these six items ($\alpha = .81$).

Pro-science beliefs (BSci)

We considered using an already-published measure of pro-science beliefs, such as that from Farias et al. (2013) or Kitchens and Phillips (2021). However, both of these scales include some items that require participants to choose between pro-science and R/S beliefs in a zero-sum way (e.g., “The scientific method is the only reliable path to knowledge” in Farias et al., 2013), which could bias responses towards

overstating the incompatibility of pro-science and R/S beliefs. In addition, the Kitchens and Phillips (2021) scale is intended to pair with an analogous measure of R/S beliefs which describes religious or spiritual power in agentic terms, as “God (or gods),” reducing their applicability to R/S belief systems such as Buddhism and some kinds of informal spirituality. We therefore created an original “pro-science beliefs” (BSci) scale, designed to be maximally universal, and minimally likely to presuppose or imply science/religion incompatibility. BSci was composed of items like “I am a strong believer in the power of science to reveal the truth about the world” and “I have LESS respect for science than most people do in my society” (reverse-coded). BSci was the mean of these six items ($\alpha = .82$).

Belief group affiliation

To report their affiliation, participants were first asked “Do you believe in some kind of religious/spiritual power or powers?”. The 7,577 (13.7%; all percentages given in this paragraph are out of the study’s total N of 55,230) who chose “unsure” were grouped into a single category. The 15,610 (28.3%) who chose “no” were sub-categorized according to a follow-up question asking whether they self-identified as “atheist” ($n = 7,630$, 13.8%) or not ($n = 7,980$, 14.4%). The 32,043 (58.0%) who chose “yes” were then asked to choose one of the following as their sole or primary affiliation: (1) Christian ($n = 17,228$, 31.2%), (2) Muslim ($n = 5,990$, 10.8%), (3) Buddhist ($n = 2,181$, 3.9%), (4) Folk, indigenous, or traditional ($n = 960$, 1.7%), (5) Hindu ($n = 853$, 1.5%), (6) Jewish ($n = 515$, 0.9%), (7) Taoist ($n = 269$, 0.5%), (8) Other religious/spiritual beliefs ($n = 1,851$, 3.4%), or (9) “I am unsure how to describe my religious/spiritual beliefs” ($n = 2,196$, 4.0%). Choices 1–7 were included because, according to the latest available figures from the Pew Research Center (Hackett et al., 2012), each of these R/S affiliations could plausibly constitute at least 5% of the population in at least one of the study’s 54 countries. Choices 8–9 were included to account for adherents to all other R/S belief systems, including “informally spiritual” people who did not identify as being affiliated with any organized religion. To simplify the analysis, the relatively small number of Taoists were added to the “other religious/spiritual beliefs” category, leaving eight possible R/S group affiliations. Some religions included further drill-down choices, so participants could indicate a more specific affiliation or denomination (e.g., Shia versus Sunni Muslim). However, again to avoid complicating the current analyses, we will here be considering only these eight broad R/S group affiliations. Combined with the one “unsure” and two “no” categories (“no” and atheist, and “no” but not atheist), we had a total of 11 belief groups.

Global region

Although our sample of 54 countries was globally diverse, with six continents represented, all global regions were not equally represented (e.g., there were seven countries from eastern Europe, but only one from southern Asia). Global proximity entails increased likelihood of sociocultural non-independence (that is, countries may tend to share similar variable values just because of geographical proximity, rather than because of any more fundamental shared underlying characteristics), so unequal regional representation increased the risk of country-level analyses producing misleading results. The effect would be one of overweighting apparent associations from countries that occur in clusters. To mitigate this risk, we used the same method as Moon et al. (2022): we grouped the 54 countries into 13 global regions, in accordance with United Nations “sub-region” designations (United Nations, 2023; all terminology used here to describe these regions is consistent with the labels used by the UN). Although grouping of the 54 countries into 13 more statistically independent regions reduced our N , it permitted an analysis that was more reliable inferentially, and also more comparable to our analysis at the belief group level, which involved a similar scale of grouping ($N = 11$).

BHP-BSci compatibility

We measured compatibility between R/S and pro-science belief systems by looking at the association between BHP and BSci within each global region or belief group. A stronger positive relationship between BHP and BSci within region X, for example, indicates higher compatibility: individuals in region X who were higher in BHP also tended to be higher in BSci. To measure

this relationship, we took the Pearson's r between BHP and BSci and converted it to Fisher's z . This conversion was made because the distribution of r becomes skewed at large values and thus more likely to violate the assumptions of parametric analysis. We then used these z scores for most analyses, comparing z scores across regions and belief groups.

BHP-Well-being association and BSci-Well-being association

These variables indicate well-being's associations with BHP and BSci respectively, within each region or belief group. We measured these associations in the same way as belief system compatibility above: we took the Pearson's r between BHP-Well-being and BSci-Well-being respectively, converted them to Fisher's z , and used these z values in subsequent analyses.

The study was approved by the College of Health, Medicine and Life Sciences Research Ethics Committee at Brunel University London (reference 26025-A-May/2022- 39620-1).

Results

All reported p values are two-tailed. Our first task was to confirm the expectation that BHP would be higher among participants who claimed an R/S group affiliation. BHP among the 58.0% of participants who responded "yes" to "Do you believe in some kind of religious/spiritual power or powers?" ($M = 3.64$, $SD = 0.83$), compared to that among the 13.7% who responded "unsure" ($M = 2.93$, $SD = 0.80$), was significantly higher ($t[39,618] = 67.53$, $p < .001$). BHP among the unsure, in turn, compared to that among the 28.3% who responded "no" ($M = 2.42$, $SD = 1.00$), was again significantly higher ($t[23,185] = 38.85$, $p < .001$). BHP means for all 11 belief groups are compared in Figure 1.

Table 1 lists the 13 global regions and their constituent countries, along with descriptive statistics at both the regional and country levels. BHP-BSci compatibility scores at the regional level confirm that, as expected, BHP and BSci tend to be significantly negatively related in the Western societies on which most research has focused, including northern America ($r[2,048] = -.27$), northern Europe ($r[6,077] = -.27$), western Europe ($r[6,106] = -.13$), Australia and New Zealand ($r[2,005] = -.20$), and southern Europe ($r[4,170] = -.22$), with all p values $< .001$. Out of the six Asian or African regions, however, the BHP-BSci relationship was non-significant in two cases (sub-Saharan Africa and eastern Asia, both p values $\geq .222$), and significantly positive in four cases, ranging from $r(4,039) = .04$ in western Asia to $r(1,005) = .28$ in southern Asia, with all p values $\leq .005$.

Table 2 shows descriptive statistics for all continuous study variables, at the levels of both the global region (below the diagonal) and the belief group (above the diagonal). For descriptive purposes, Table 2 presents all 15 intercorrelations at each level. As noted above, however, only five correlations at each level were relevant to the predictions and research questions of the current study.

The five pairs of correlations testing our main hypotheses are illustrated in Figures 2a-b–6a-b. In evaluating their significance, we employed Bonferroni-adjusted p values to account for the fact that we ran ten correlations. Standard Bonferroni corrections (which, here, would be $\alpha = .05/10 = .005$) address Type I errors (false rejections of the null hypothesis), but they also increase Type II error rates which reduces power in detecting genuine associations. Thus, a "sequential" Bonferroni technique can be applied, which eliminates Type I errors as in the normal Bonferroni method, but which also controls for increased Type II error rates (Rice, 1989). Each test is checked for significance under new significance thresholds given by $p_i \leq \alpha / (1 + k - i)$, in which all p values are ranked in ascending order (p_1, p_2, \dots, p_i) for k tests, so the adjustment thus gives a different critical p -value for each test. All correlations reported below remained significant under their corrected Bonferroni-adjusted p value, except the one noted as marginally significant (note that none of the relationships identified as significant would change under the standard Bonferroni method either).

The first correlation of interest is between BHP and well-being, and is significantly positive among both belief groups (Figure 2a; $r[9] = .90$, $p < .001$) and global regions (Figure 2b; $r[11] = .94$, $p < .001$). Second is the correlation between BSci and well-being, which is comparatively

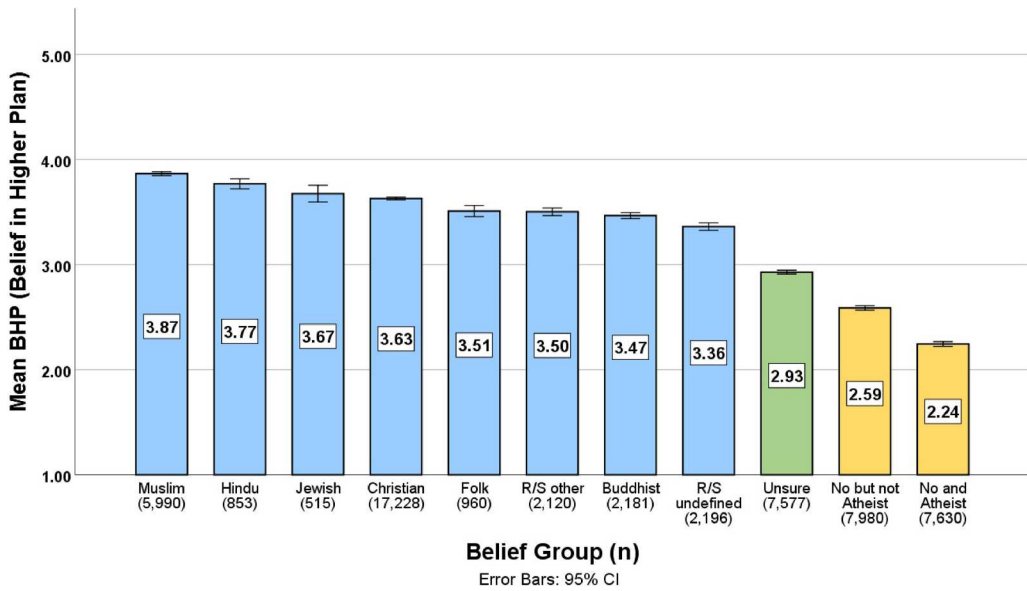


Figure 1. Mean BHP (Belief in a Higher Plan) among 11 belief groups. Each group's mean BHP is presented within their bar, and each group's n is presented below their name. Participants were asked "Do you believe in some kind of religious/spiritual power or powers?", and could answer "yes" (represented by blue bars), "unsure" (green bar) or "no" (yellow bars). "Yes" responders self-categorized further into specific R/S groups ("R/S undefined" denotes "I am unsure how to describe my religious/spiritual beliefs"). "No" responders self-categorized further based on whether they identified as "atheist" or not.

weak, being non-significantly negative among belief groups (Figure 3a; $r[9] = -.17, p = .618$) and non-significantly positive among regions (Figure 3b; $r[11] = .39, p = .194$). Tests of the third, fourth, and fifth hypotheses indicate that, as belief system compatibility (as measured by z scores) gets higher, so does:

1. Well-being, at the levels of both the belief group (Figure 4a; $r[9] = .89, p < .001$) and region (Figure 4b; $r[11] = .61, p = .026$); this latter correlation was marginally significant, just shy of the sequential Bonferroni-adjusted threshold of $p < .017$ ($\alpha / [1 + k - i] = .05 / [1 + 10 - 8] = .05 / 3$, as the 8th highest ranked p value among our hypothesis tests).
2. The positive relationship between BHP and well-being (as measured by z scores), at the levels of both the belief group (Figure 5a; $r[9] = .92, p < .001$) and region (Figure 5b; $r[11] = .74, p = .004$).

Table 2. Intercorrelations and descriptive statistics for global regions and belief groups.

	(1)	(2)	(3)	(4)	(5)	(6)	<i>M</i>	<i>SD</i>	<i>N</i>
(1) BHP	–	–.39	.90***	.91***	.84**	.54	3.32	0.52	11
(2) BSci	.46	–	–.17	–.08	–.12	.18	3.63	0.12	11
(3) Well-being	.94***	.39	–	.89***	.88***	.70*	3.64	0.20	11
(4) BHP-BSci compatibility	.76**	.61*	.61*	–	.92***	.79**	0.05	0.22	11
(5) BHP-Well-being association	.75**	.59*	.76**	.74**	–	.77**	0.38	0.15	11
(6) BSci-Well-being association	.59*	.48	.46	.90***	.68*	–	0.27	0.12	11
<i>M</i>	3.27	3.67	3.63	–0.05	0.37	0.22	–	–	–
<i>SD</i>	0.38	0.13	0.24	0.19	0.11	0.12	–	–	–
<i>N</i>	13	13	13	13	13	13	–	–	–

* $p < .05$. ** $p < .01$. *** $p < .001$. Statistics for the 11 belief groups are above the diagonal, and statistics for the 13 global regions are below the diagonal. BHP = belief in a higher plan, BSci = pro-science beliefs.

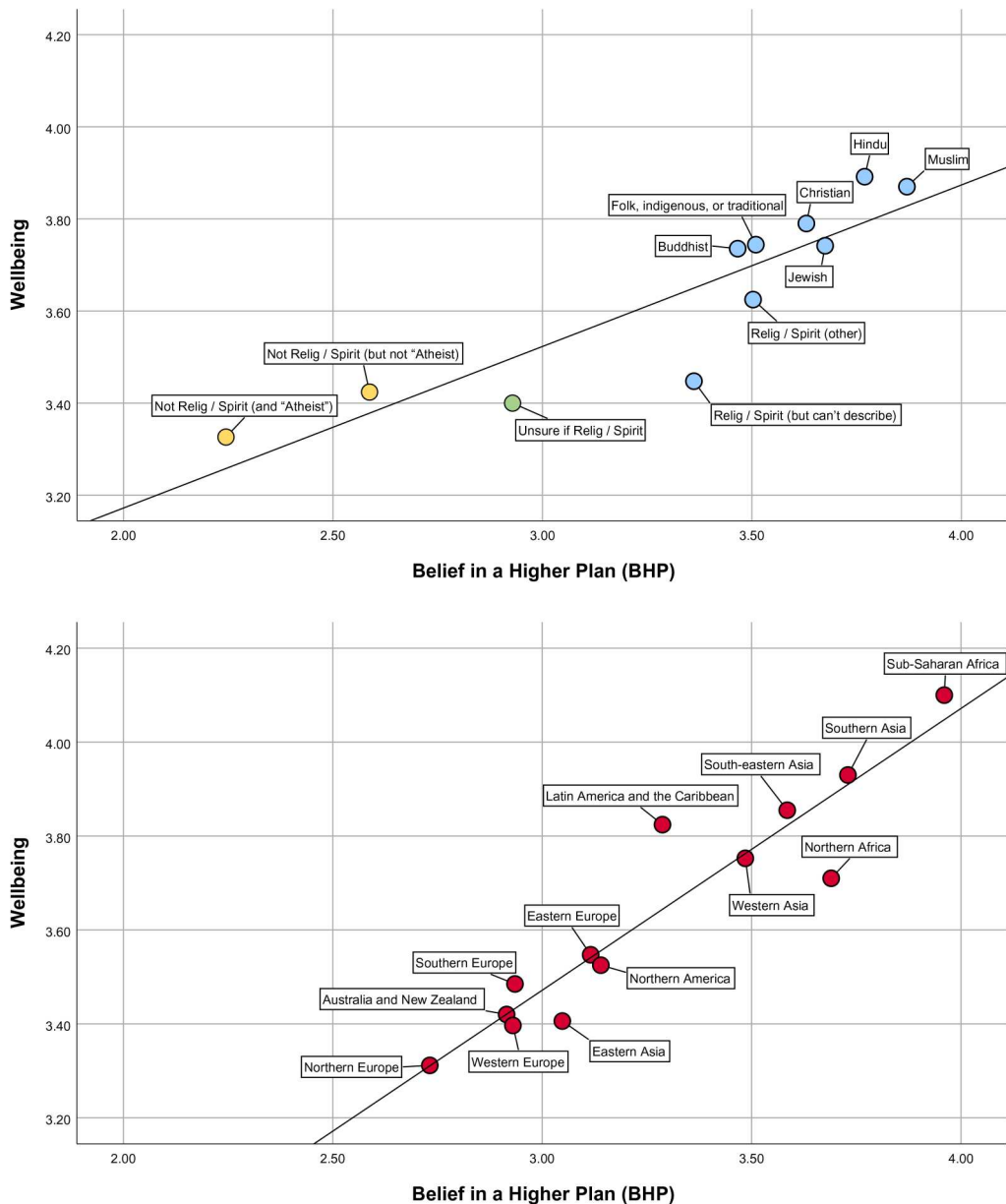


Figure 2. (a) and (b) **Correlation between belief in a higher plan and well-being.** Points represent mean values for belief groups on top ($r[9] = .90, p < .001$), and global regions on the bottom ($r[11] = .94, p < .001$). **Notes** for Figures 2a, b through 6a, b. Scatterplots include linear fit line and are presented in pairs, to show how the same two variables relate among belief groups (figure a, above) and global regions (figure b, below). Belief group data point colors are consistent with Figure 1, with blue indicating "yes" responses to "Do you believe in some kind of religious/spiritual power or powers?", green indicating "unsure," and yellow indicating "no." Scales are consistent across scatterplot axes, with x-axis scales ranging from 2 to 4 (BHP and BSci) or $-.40$ to $.60$ (belief system compatibility), and y-axis scales ranging from 3.2 to 4.2 (well-being) or $.00$ to $.80$ (associations between BHP-well-being and BSci-well-being). The belief group label "Relig / Spirit (but can't describe)" indicates "I am unsure how to describe my religious/spiritual beliefs." To account for multiple testing, a sequential Bonferroni correction was applied to p values; all significant correlations remained significant following this adjustment, except one which fell to marginal significance (Figure 4b).

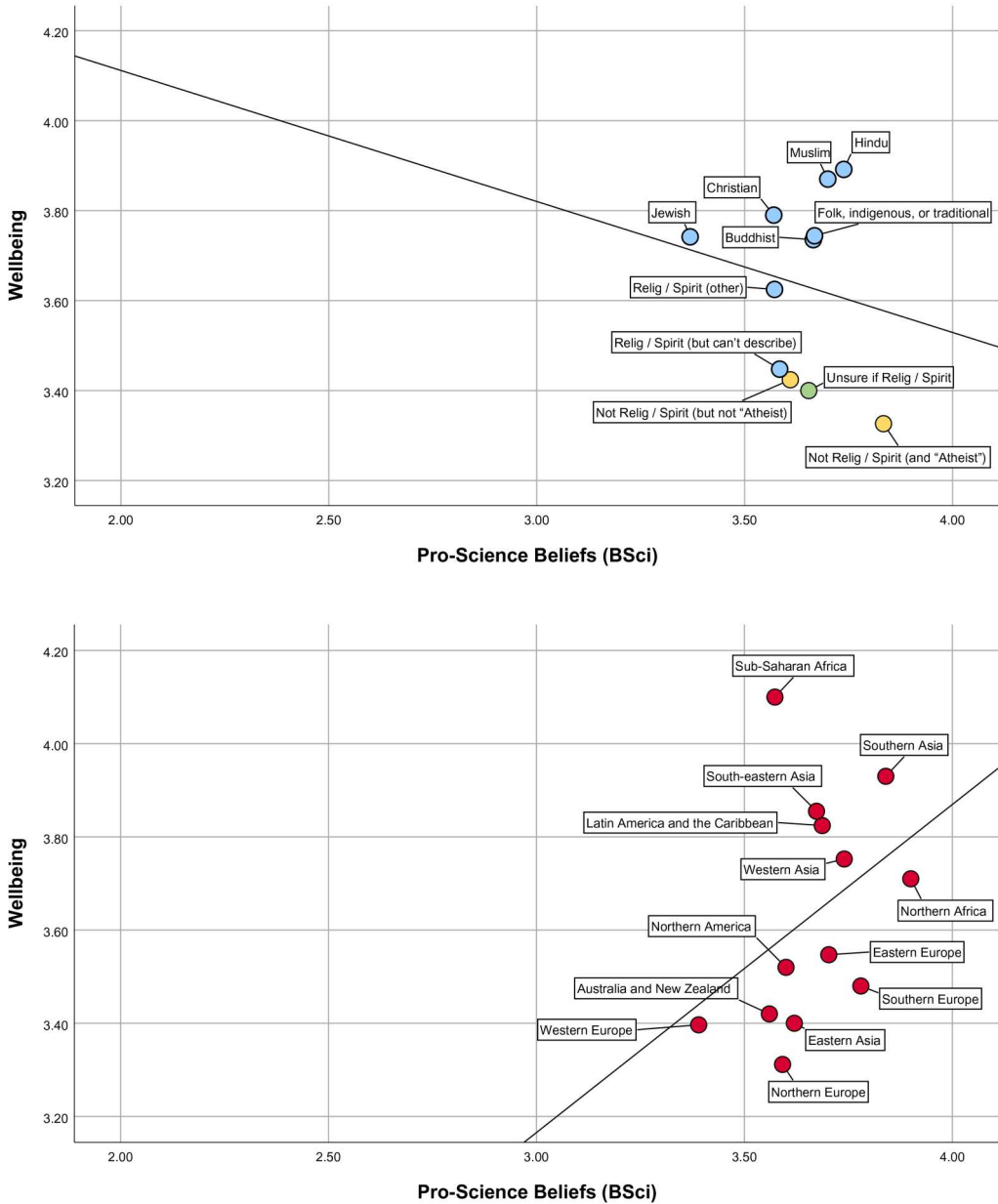


Figure 3. (a) and (b). **Correlation between pro-science beliefs and well-being.** Points represent mean values for belief groups on top ($r[9] = -.17, p = .618$), and global regions on the bottom ($r[11] = .39, p = .194$).

3. The positive relationship between BSci and well-being (as measured by z scores), at the levels of both the belief group (Figure 6a; $r[9] = .79, p = .004$) and region (Figure 6b; $r[11] = .90, p < .001$).

In the next stage of our analysis, we examined the relationships between well-being and each of the two belief systems in more detail. For reasons noted above, most of our analyses treated the 54 countries not as independent observations but as members of 13 regions. To test the *combined* effects of BHP and BSci on well-being, however, we analysed all countries independently, as

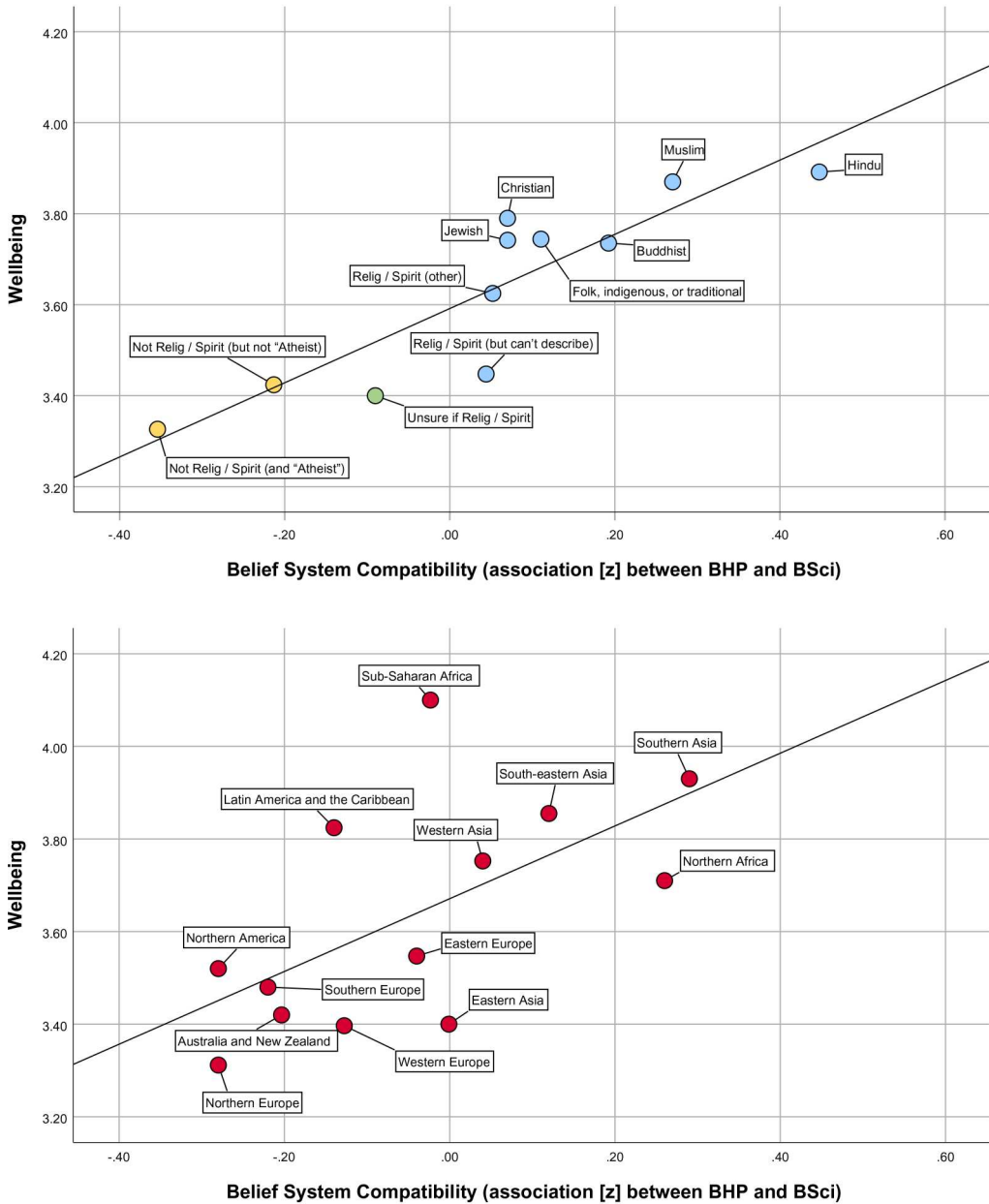


Figure 4. (a) and (b) **Correlation between belief system compatibility and mean well-being.** Belief groups on top ($r[9] = .89$, $p < .001$), global regions on the bottom ($r[11] = .61$, $p = .026$; Bonferroni-corrected p threshold = .017).

the larger N was better suited for multivariate analyses. Multiple linear regression (Table 3) indicated that BHP and BSci together explained 66% of the variance in country-level well-being ($R^2_{\text{adj}} = .66$, $F[2, 51] = 52.71$, $p < .001$), with significant unique variance explained by both BHP ($\beta = .72$, $p < .001$) and BSci ($\beta = .26$, $p = .003$). Country-level zero-order correlations between well-being and each belief system were also significantly positive, but not equally so: the Pearson's r for BHP and well-being ($r[52] = .78$, $p < .001$) was significantly higher than it was for BSci and Well-being ($r[52] = .44$, $p < .001$; Fisher's r to z transformation for dependent samples, $z = 3.00$, $p < .001$).

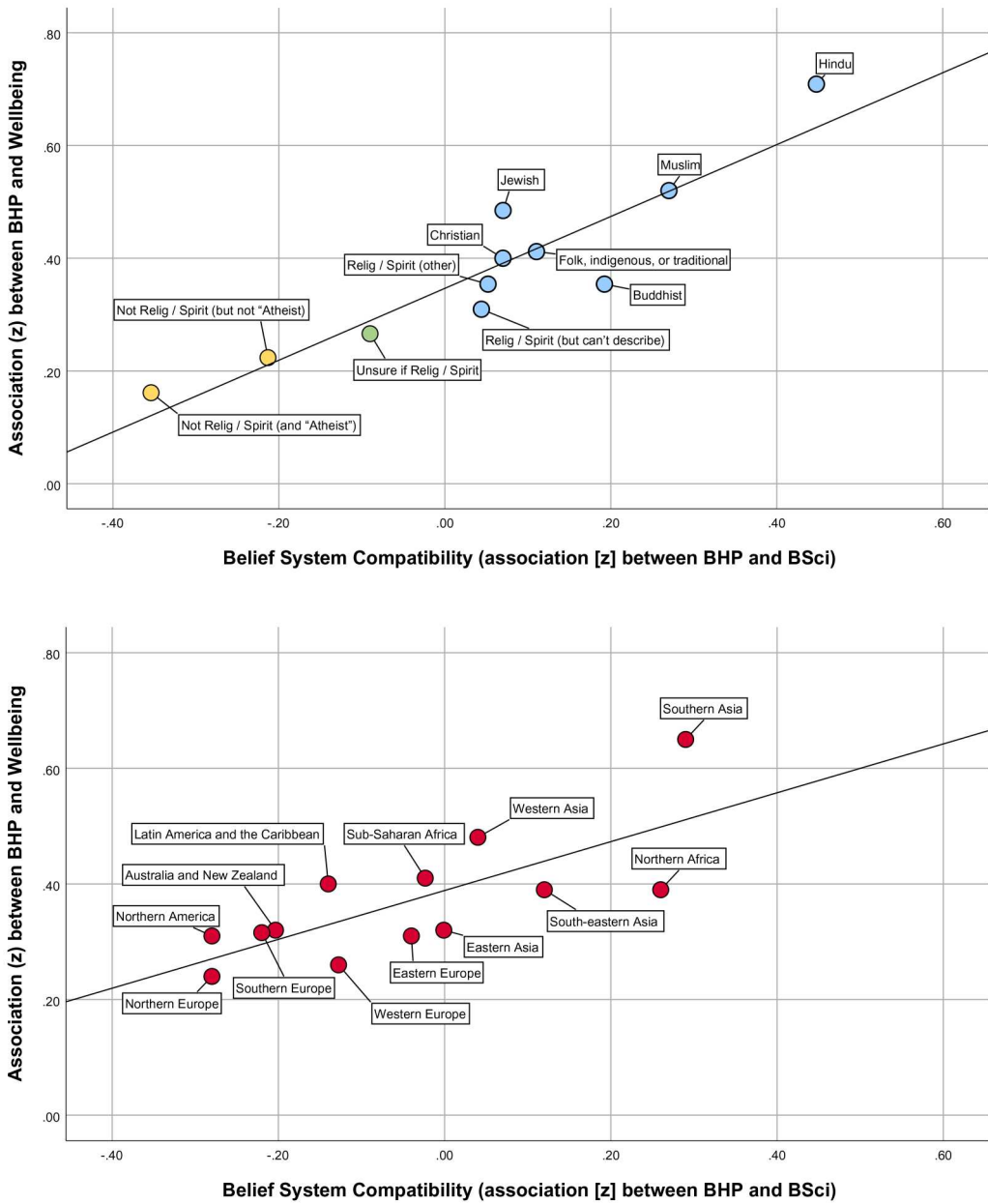


Figure 5. (a) and (b) **Correlation between belief system compatibility and BHP-well-being association.** Belief groups on top ($r[9] = .92, p < .001$), global regions on the bottom ($r[11] = .74, p = .004$).

Finally, the distribution of points in Figures 4a, 5a, and 6a suggests that belief group compatibility scores are lower among the three “no” or “unsure” R/S belief groups (represented by yellow and green points) than among the eight “yes” R/S belief groups (blue points). A t -test confirmed this difference: belief group compatibility Fisher’s z scores for “no/unsure” groups ($M = -.22, SD = .13$), compared to “yes” groups ($M = .16, SD = .14$), were significantly lower ($t[9] = 3.99, p = .003$).

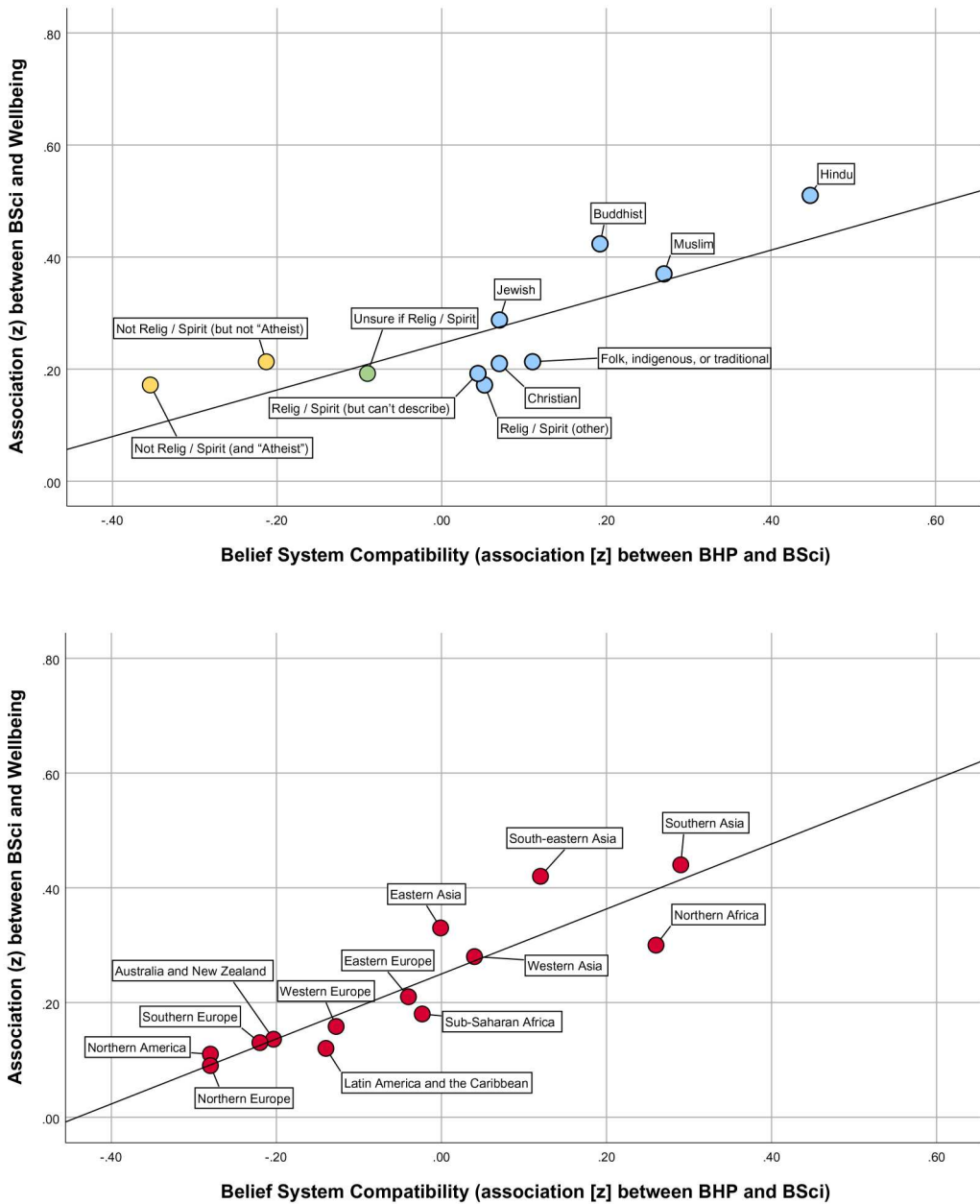


Figure 6. (a) and (b) **Correlation between belief system compatibility and BSci-well-being association.** Belief groups on top ($r[9] = .79, p = .004$), global regions on the bottom ($r[11] = .90, p < .001$).

Table 3. Linear regression of Well-being on BHP and BSci ($N = 54$ countries).

Predictor	β	t	p	Correlations			Tolerance
				Zero-order	Partial	Part	
BHP	.72	8.67	<.001	.78	.77	.69	.94
BSci	.26	3.18	.003	.44	.41	.25	.94

Note: Total $R = .82$, $R^2\text{-adj} = .66$, $F(2, 51) = 52.71$, $p < .001$. BHP = belief in a higher plan, BSci = pro-science beliefs.

Discussion

As noted earlier, research conducted mainly in Western cultures has indicated a positive relationship between well-being and both religious/spiritual (R/S) beliefs (Diener et al., 2011; Hoozeveen et al., 2023; Koenig, 2015; McCullough et al., 2000; Price & Launay, 2020; Stavrova et al., 2013) and pro-science beliefs (Aghababaei, 2016; Aghababaei et al., 2016; Farias et al., 2013; Preston et al., 2023; Stavrova et al., 2016). One goal of our study was to test whether these relationships hold cross-culturally. Our analysis of 55,230 participants, drawn from 54 countries and divided into 13 global regions and 11 belief groups, produced strong support for a positive association between well-being and R/S beliefs among all three social configurations (country, region, and belief group). Support for a positive relationship between well-being and pro-science beliefs was more mixed: this relationship was significantly positive at the country level, non-significantly positive at the regional level, and non-significantly negative at the belief group level. These latter two non-significant results should not be construed as evidence against the view that pro-science beliefs and well-being are often positively related, however, especially given our small sample sizes for the correlations among regions and belief groups. Further, although our analysis focused hardly at all on relationships between belief systems and well-being at the individual level, even a cursory glance at Table 1 makes clear that among individuals (from which these data and the correlations presented are derived), relationships between well-being and each type of belief system are significantly positive in the overwhelming majority of the 54 countries included in our study. In-depth analyses of such individual-level relationships require multilevel modelling techniques and, as noted above, will be examined in greater detail in a forthcoming publication (Price et al., [in preparation](#)).

Our study also sought to confirm the expectation of perceived belief system incompatibility in Western cultures (Ecklund & Park, 2009; Evans & Evans, 2008; Leicht et al., 2022), and to investigate the extent of such incompatibility from a cross-cultural perspective. Our results indicated that perceived incompatibility between R/S and pro-science belief systems is indeed typical of Western societies, but atypical of societies that have less often been the focus of research, especially those in Asia and Africa. We also found that perceived belief system incompatibility, when considered at the level of the belief group as opposed to the global region, is significantly higher among people who lack R/S beliefs than among those who hold them. In other words, this incompatibility exists more as the result of people who are low in R/S beliefs being high in pro-science beliefs, as opposed to people who are high in R/S beliefs being low in pro-science beliefs. Similar results are reported by Leicht et al. (2022), who found that UK and Canadian participants who were less religious perceived a greater degree of conflict between religion and science.

The primary focus of our study was not just to test whether existing expectations generalize across the globe, however, but to explore the extent to which belief system compatibility is itself related to well-being among both global regions and belief groups. Of the six correlations we ran to investigate this issue, five remained significant after correcting for multiple inference testing and one remained marginally so. Among both regions and groups, belief system compatibility (i.e., the degree of positive association between R/S and pro-science beliefs) tended to relate positively to general well-being, and in particular to the strength of the positive associations between well-being and each type of belief system. That is, in regions and belief groups characterized by higher belief system compatibility, positive relationships between well-being and R/S beliefs, and between well-being and pro-science beliefs, were also higher.

We should reiterate that analyses involving belief system compatibility were both exploratory and correlational. Post-hoc explanations for correlational findings should be considered with a reasonable degree of caution and scepticism. With this caveat in mind, we can at least speculate about why increased belief system compatibility is associated with stronger positive relationships between well-being and each type of belief system. The simplest and most plausible explanation may be that higher perceived zero-sum competition between science and R/S would tend to lower the potential net benefits that could be gleaned from each belief system. That is, the more

one perceives that accepting benefits from one belief system must entail forfeiting those from the other, the more difficult it becomes for one to benefit fully from either system, and to thus benefit cumulatively or synergistically from both. An analogy could be made with a food that is delicious but unhealthy. If your favorite food were discovered to be so unhealthy that you were advised to quit eating it, this news might reduce your ability to continue enjoying that food. It might also, however, dampen your enthusiasm for prioritizing health. You might consider, for example, that the health benefits of quitting were worth less to you than remaining able to enjoy the food. Whatever your conclusion, the more you perceived zero-sum competition between these two sources of benefit (the food and good health), the lower each source's net value would seem to you: the benefits of eating the food would now seem reduced by the costs of not quitting, and vice versa.

What about the possible advantages of pessimism?

As noted above, our data were collected in a larger study, testing an evolutionary theory of R/S which sees dispositional optimism—that is, how optimistic one usually feels about one's own future—as serving a motivational function that promotes well-being. Our emphasis on optimism has raised the question of whether the potential adaptiveness of pessimism should be given similar consideration. After all, in many ancestral situations—for example, in deciding whether to take a journey that, realistically, you would probably not survive—pessimism could have easily been the more adaptive strategy. This is an important point, and one of us has published on the advantages of pessimism and negativity under certain circumstances (Johnson & Tierney, 2018), and of optimism and overconfidence under others (Johnson, 2004; Johnson et al., 2006; Johnson & Fowler, 2011). Either can be adaptive in the right context or domain.

Some confusion on this issue may result from optimism being conceptualized in at least two different ways. Most importantly, psychologists often distinguish between “state” and “trait” optimism. State optimism is more temporary, and related to one's specific mood or situation, whereas trait optimism is a more stable aspect of personality, and a measure of how optimistic one usually feels about one's future (Kluemper et al., 2009; Malouff & Schutte, 2017). When trait optimism is not being contrasted directly (and required to rhyme) with state optimism, it is usually referred to as “dispositional” optimism. Whereas the adaptiveness of state optimism (versus state pessimism) should indeed be highly situation-dependent, this is less true of dispositional optimism, which has far more frequently been found to have important positive links to long-term physical/mental health (Carver et al., 2010; Conversano et al., 2010; Jacobs et al., 2021; Koga et al., 2022; Lee et al., 2019; Peterson, 2006; Taylor, 1989).

Ultimately, we focused on dispositional optimism because of evidence suggesting that compared to other types of optimism or pessimism, dispositional optimism was probably especially adaptive, on average, in ancestral human populations. One key piece of evidence is that human nature seems to be characterized by an “optimism bias” (Dricu et al., 2020; Monzani et al., 2021; Sharot, 2011), which leads people to overestimate the chances of good things, and underestimate the chances of bad things, happening to them. This bias seems relatively stable across situational domains (i.e., more trait-like than state-like [Baranski et al., 2021]), and also across cultures: based on samples from 142 countries, Gallagher et al. (2013) found that individuals in 141 of these countries (all but Japan) expected, on average, that their life satisfaction would be higher in the future than it was in the present. Similarly, Baranski et al. (2021) found that in all 61 countries included in their study, dispositional optimism scores were above the neutral midpoint (i.e., biased towards optimism). Tendencies similar to the optimism bias have also been observed in the forms of positive illusions (Taylor & Brown, 1988) and overconfidence (Johnson & Fowler, 2011). All such tendencies likely have a similar evolutionary explanation: the more people believe that a positive outcome is possible, the harder they strive to achieve it, which increases the chances of it actually occurring. As noted by Taylor and Brown (1988, p. 199), “a chief value of these illusions may be that they can create self-fulfilling prophecies.” This idea—that the optimism bias evolved to serve a

motivational function—is consistent with the tendency of behavioral scientists to regard optimism as a motivational mechanism (Carver & Scheier, 2014; Sharot, 2011). Thus, it could be adaptive for both psychological and physical well-being.

Indeed, additional evidence for this motivational function is provided by behavioral studies, which have associated dispositional optimism with increased striving and success across a variety of domains. Dispositional optimists seem relatively motivated to pursue healthy behaviors, such as exercise and abstinence from smoking (Boehm et al., 2013; Carver & Scheier, 2014; Ryu et al., 2023). They also seem advantaged in social domains: their persistence in building and maintaining social ties seems to explain why they have relatively satisfying relationships (Assad et al., 2007; Srivastava et al., 2006; Parise et al., 2017) and large social networks (Andersson, 2012). Dispositional optimism seems to also pay off in competitions for status and resources, in arenas such as entrepreneurial (Ben Fatma et al., 2024; Crane & Crane, 2007; Lindblom et al., 2020), athletic (Ortín-Montero et al., 2018; Santana et al., 2023), and professional (Puri & Robinson, 2007; Segerstrom, 2007). Optimism appears to be motivating across domains not just because optimists expect their striving to pay off, but because they are less deterred by the prospect and experience of negative outcomes. They are more likely to perceive that they can prevent negative outcomes (Conversano et al., 2010), more resilient to the stress of such outcomes (Solberg Nes et al., 2006), and more likely to perceive such outcomes as ultimately advantageous opportunities for learning and growth (Lechner et al., 2006).

Limitations

Several limitations to the above study have already been noted: the analysis was largely exploratory, results were only correlational, and our main units of analysis (regions and belief groups) were both small in number. We mitigated the risk of non-independent observations by consolidating the 54 countries into 13 global regions. However, at one point in our analysis we also opted to accept this risk, in order to conduct a multiple regression analysis that would reveal how much unique variance in well-being, across all 54 countries, was explained by each of the two belief systems. We have no reason to believe that geographical clustering would necessarily undermine that particular insight. Important questions remain—such as the relationships between key variables at the individual level and from a multilevel perspective, and the precise characteristics of R/S and pro-science belief systems that may explain their positive relationships with well-being—which offer several avenues for future work, some of which will be explored in a separate publication (Price et al., *in preparation*).

Another limitation involved our use of an online sample, procured by Qualtrics. Although we did not impose many explicit participation criteria—beyond requiring participants to be 18 or older, and instructing Qualtrics to aim for equal gender ratios—this sampling technique entails some built-in biases. Most notably, it requires literate participants who are willing and able to complete an online study, and incentivized mainly, we presume, by the payment they received for doing so. We do not harbour any specific concerns about how sampling bias may have influenced our findings. However, all interpretations of these data should keep in mind that samples are not necessarily nationally representative, and only include residents who were inclined to participate in a paid online study.

Conclusion

We hope our study will stimulate increased consideration of belief system compatibility as a predictor, and possible cause, of enhanced well-being. If causation could be demonstrated, then the perceived incompatibility between R/S and pro-science belief systems would become not just a matter of academic or cultural debate, but an issue with important repercussions for psychological well-being and, therefore, public health. In order to maximize the well-being of individuals and societies, one might want to consider ways to promote belief system compatibility within social groups. Even with good evidence for such causation, however, incompatibility-reduction efforts would probably

still seem objectionable to many people, perhaps especially to the most “extremist” proponents of each belief system (i.e., the most anti-R/S and pro-science, and the most pro-R/S and anti-science). Extremists might be more likely to interpret “reduced incompatibility” as “enforced compromise,” and less likely to see any value in compromising with the other side. To reduce the likelihood of such conflict, incompatibility-reduction efforts should avoid prescribing compromises that both sides do not perceive as advantageous. If creationists and evolutionists were forced to cooperatively author a biology textbook, for example, which required each side to defer to the other side 50% of the time, the resulting textbook would probably be regarded by both sides as wholly unacceptable.

Although incompatibility-reduction efforts would involve many challenges, our results indicate that this perceived incompatibility prevails chiefly in Western societies, especially among people who are lower in R/S beliefs. This perception, then, is not inevitable in all societies or typical in any global cross-cultural sense. Indeed, these findings suggest we may have much to learn about how different belief systems are better able to operate alongside each other, across cultures and belief groups (notably among Hindus and Muslims, and residents of Asian countries). None of this is to say, of course, that the conflicts that have actually occurred between R/S and pro-science belief systems have been illusory or trivial. Some of these conflicts remain as heated as ever in certain contemporary contexts, and have for decades proven exceedingly difficult to overcome. Nevertheless, results presented above suggest that the goal of resolving them is both achievable and worthwhile: such conflicts are not the norm across cultures, and their absence is associated with measurable benefits for the well-being of both individuals and societies.

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Disclosure statement

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Appendix

Full scale variables (English versions)

All responses were on a 1–5 Likert scale from “strongly disagree” to “strongly agree.” Scales are original except where otherwise noted. Asterisked items were reverse-coded.

Belief in a higher plan (BHP)

1. I believe that events in my life are following a higher plan (that is, a plan made by a religious or spiritual power or powers).
2. When something bad happens to me, I often believe it's part of a higher plan that will be good for me in the long term.
3. When I experience something good, it suggests that my life is following a higher plan that is for the best in the long term.
4. According to the higher plan, sometimes I must miss a good opportunity today, in order to experience an even better opportunity in the future.
5. When something fortunate happens to me, I often feel like life is following a higher plan that will be good for me in the long term.
6. I do NOT believe that my own life is following a higher plan.*

Pro-science beliefs (BSci)

1. I am a strong believer in the power of science to reveal the truth about the world.
2. I believe in the power of science MORE than most people do in my society.
3. I am certain that science has enormous power to reveal the truth about the world.
4. I have great respect for science and see it as absolutely essential to the success of my society.
5. I have LESS respect for science than most people do in my society.*
6. I have some doubts about the ability of science to reveal the truth about the world.*

Well-being

1. In uncertain times, I usually expect the best.
2. I'm always optimistic about my future.
3. Overall, I expect more good things to happen to me than bad.
4. My life has a clear sense of purpose.
5. I have discovered a satisfying life purpose.
6. My life has NO clear purpose.*

Note: Items 1–3 are from the LOT-R (Scheier et al., 1994), and items 4–6 are from the Presence of Meaning Scale (Steger et al., 2006).
