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Fear of Death and Supernatural Beliefs: Developing a New Supernatural Belief Scale to Test the Relationship

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Abstract: Fear of death features in both historical and contemporary theories of religion, but the relationship between death anxiety and religious belief is still ambiguous, largely due to the use of inappropriate or imprecise measures. The current studies therefore aimed to develop a valid, targeted measure of respondents' tendency towards religious belief, the 'Supernatural Belief Scale' (SBS), and to use the SBS to examine the relation between death anxiety and religious belief. Results indicate that the SBS shows high reliability and convergent validity and that its relation to death anxiety depends on participants' religious identification: 'religious' participants fear death less the stronger their religious beliefs, whereas 'non-religious' participants are more inclined towards religious belief the more they fear death. These studies contribute a new measurement tool for research on religious belief and provide a starting point for an experimental integration of discrepant research findings. Copyright © 2013 European Association of Personality Psychology

Key words: personality scales and inventories; religion; tests

The aim of the present research is to develop and preliminarily evaluate a brief questionnaire measure of belief in supernatural religious agents, places, and events. The need for such a scale arises primarily out of resurgent interest, from both cognitive and motivational perspectives, in the aetiology and consequences of religion in general, and belief in supernatural entities (e.g. gods) in particular. Although philosophers have long theorized about the relation between religion and human nature (e.g. Durkheim, 1912; Feuerbach, 1846/2004; Hume, 1757/2008; Malinowski, 1948; Marx, 1843/1970), it is only in the past two decades that psychologists and other social scientists have subjected such theories to empirical test. The various research approaches, which include ethnography, field studies, and laboratory-based correlational and experimental research, together make up the nascent 'cognitive science of religion' (CSR; J. L.Barrett, 2007; Lawson, 2000).

Although CSR as a field examines a variety of 'religious' phenomena, researchers have particular interest in the evidently pan-cultural belief in supernatural agents and entities (Boyer, 2001; Pyysiäinen, 2009). Consequently, recent research has frequently focussed on the cognitive and motivational precursors to such beliefs. Examples of the former include the memorability and transmissibility of 'minimally counterintuitive concepts' (e.g. Boyer, 2001), the hypersensitivity of evolved agency detection mechanisms (e.g. Barrett, 2004), and the anthropomorphization of non-human stimuli (e.g. Guthrie, 1993). Examples of the latter include the need to reduce perceived randomness (e.g. Kay, Moscovitch, & Laurin, 2010) and the need to reduce existential anxiety or, more specifically, fear of death (e.g. Jong, Halberstadt, & Bluemke, 2012; Norenzayan & Hansen, 2006; Vail et al., 2010).

Unfortunately, the study of why people believe in supernatural religious entities has been limited in part by the 'hodgepodge nature' (Gorsuch, 1984, p. 234) of existing measures of religiosity, measures that often conflate religious beliefs, values, experiences, and behaviours into a single scale. For example, having compiled over 100 measures of religiosity (Hill & Hood, 1999), Hill (2005) concluded that none of the measures of 'Religious or Spiritual Beliefs and Values' they compiled were straightforward generalizable measures of belief in supernatural agents, places, or events. Instead, several are tailored for very specific audiences (Christian Orthodoxy Scale, Fullerton & Hunsberger, 1982; Love and Guilt Oriented Dimensions of Christian Belief, McConahay & Hough, 1973; The Spiritual Belief Scale, developed for Alcoholic Anonymous; Schaler, 1996), whereas others measure highly diverse aspects of religiosity (Spiritual Belief Inventory; Holland et al., 1998), religious orientation (Religious Fundamentalism Scale; Altemeyer & Hunsberger, 1992), or beliefs about the attributes of a presupposed God (Loving and Controlling God Scale; Benson & Spilka, 1973). Thus, the primary goal of the current research was to develop a measure of supernatural religious beliefs—the 'Supernatural Belief Scale' (SBS)—that is psychometrically valid at least among participants with secular or religious beliefs in the Abrahamic tradition and, in principle, adaptable to a variety of religious and secular contexts.

A second, convergent goal of the research is to use the SBS to shed light on the role of death-related cognitions or emotions in the development and maintenance of religious belief. Despite the popularity, among scholars and lay-people

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alike, of theories linking fear of death to religious belief, even the correlational relationship between these two variables is still uncertain. For example, Harding, Flannelly, Weaver, and Costa (2005) found that both belief in God and an afterlife were negatively correlated with death anxiety, whereas Dezutter, Luyckx, and Hutsebaut (2009) found that literal religious interpretation was positively correlated with death anxiety. Alvarado, Templer, Bresler, and Thomas-Dobson (1995) found no relation between death anxiety and absolute levels of religious conviction but found a negative relation when they examined *relative* religious conviction (i.e. compared with other people's conviction). Cohen et al. (2005) found that fear of death was negatively related to intrinsic religiosity (i.e. internalized religious belief and practice) but positively related to extrinsic religiosity (i.e. religious practice as a means to other ends). So, the evidential state of affairs in this area is in disarray, likely in part due to the design of and divergence in the measures used and the lack of religious diversity in the samples studied. Thus, the current Study 2 replicates the psychometric findings of Study 1 in an independent sample, collects more evidence for SBS's convergent validity, and explores how religious belief is related to fear of death.

STUDY 1: DEVELOPMENT OF THE SUPERNATURAL BELIEF SCALE

The SBS was designed to measure a limited, clearly defined, and core aspect of religiosity: respondents' tendencies to believe in supernatural entities. To be applicable in secular and pluralistic contexts, items in such a scale should reflect cross-culturally recurring supernatural concepts, with minimal inclusion of sectarian doctrines (e.g. Christian doctrine of the Trinity). At the same time, the items must be instantiated in such a way as to be understandable and meaningful in the population under study. To balance these two concerns, we first consulted recent psychological, anthropological, and religious studies monographs on the CSR (Atran, 2002; Barrett, 2004; Bering, 2010; Boyer 2001; Pyysiäinen, 2009; Tremlin, 2006; Whitehouse, 2004; Wilson, 2002), selecting 10 commonly recurring types of supernatural entities and events. The items included one positive and one negative high-order supernatural agent, one positive and one negative lower-level supernatural agent, one positive and one negative afterlife-related place, two neutral afterlife-related entities, and two neutral supernatural events. We then composed 10 statements affirming belief in the existence or occurrence of these entities and events, including additional descriptions and labels (developed in consultation with a religious studies scholar; Dawes, personal communication) to render them meaningful to our present sample. Thus, each item captures both cross-cultural religious supernatural themes (e.g. 'good, personal spiritual beings') refined by culture-specific content (e.g. 'whom we might call angels'), the latter of which could be adapted for different cultural contexts. The final items used in the current studies are displayed in Table 1.

For each statement, respondents are instructed to indicate their agreement or disagreement with each proposition on a 9-point Likert scale, anchored at −4 (Strongly Disagree) and 4 (Strongly Agree). The two ends of the scale are therefore designed to indicate extreme disbelief or atheism (i.e. the negative end of the scale) and confident belief (i.e. the positive end of the scale), respectively, whereas the midpoint of the scale (i.e. 0) implies agnosticism or uncertainty.

Table 1. Items in the Supernatural Beliefs Scale

There exists an all-powerful, all-knowing, loving God.
There exists an evil personal spiritual being, whom we might call the Devil.
There exist good personal spiritual beings, whom we might call angels.
There exist evil, personal spiritual beings, whom we might call demons.
Human beings have immaterial, immortal souls.
There is a spiritual realm besides the physical one.
Some people will go to Heaven when they die.
Some people will go to Hell when they die.
Miracles—divinely caused events that have no natural explanation—can and do happen.
There are individuals who are messengers of God and/or can foresee the future.

While the scale consists of distinct supernatural agents and events (e.g. one may believe in an omnipotent deity but not miracles, in a positive afterlife but not a negative one), we expected the scale to measure respondents' general tendency to believe in existentially significant supernatural entities. Therefore, responses on each SBS item should be accounted for by a single psychological construct in factor analysis. Furthermore, while supernatural belief is not identical to religious self-identification and behaviour, SBS scores were expected to predict such aspects of religiosity. Therefore, we predicted that the SBS scores of self-identified 'religious' respondents would be higher than those of 'non-religious' or 'atheist' respondents and that SBS scores would be positively correlated with other religious behaviours (i.e. religious service attendance) and attitudes (i.e. the extent to which religion is important to participants' identities) commonly included in previous measures of religiosity (Hood et al., 2009).

Pretest

In order to inspect inter-item correlations and to conduct an initial, entirely data-driven exploratory factor analysis (EFA), pretest data were collected from 117 psychology undergraduate students at the University of Otago, New Zealand ($M_{age} = 20.37$, $SD = 5.54$; 64% female; 34% Christian, 6% other religious, 12% atheist/agnostic, 48% 'not religious'). Unless otherwise specified, all analyses in all reported studies were run using SPSS18 (SPSS Inc., Chicago). As expected, all SBS items were positively correlated, rs = .46–.89 (Table 2). An initial analysis of Cronbach's alpha indicated high internal consistency (.96) that is not improved by item elimination. Splitting each SBS item pair resulted in a split-half correlation of $r = .92$. The mean inter-item correlation amounted to $r = .68$, and the corrected item–total correlations ranged from $r = .68$ to .89. We used common factor (principal axis) analysis of the correlation matrix to illuminate the shared variance and to explore the minimum number of factors to be extracted. Both the Kaiser–Meyer–Olkin criterion (.87) as well as Bartlett's test of sphericity, $\chi^2(45) = 1233.97$, $p < .001$, indicated sufficient

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Table 2. Descriptives, inter-item correlations, factor loadings, and communality (pretest)

	M	*SD*	God	Devil	Angels	Demons	Souls	Realm	Heaven	Hell	Miracles	λ	h^2
God	−.13	2.91	—									.90	.81
Devil	−.97	2.78	.84	—								.89	.79
Angels	−.03	2.67	.83	.78	—							.91	.84
Demons	−.77	2.61	.79	.89	.87	—						.89	.80
Souls	.09	2.47	.62	.57	.61	.58	—					.69	.48
Spi. Realm	1.13	2.43	.60	.55	.71	.63	.70	—				.74	.55
Heaven	.15	2.76	.82	.78	.80	.70	.60	.67	—			.88	.77
Hell	−.57	2.71	.75	.84	.71	.79	.62	.56	.81	—		.85	.72
Miracles	1.06	2.39	.63	.57	.68	.57	.46	.61	.65	.59	—	.72	.51
Prophecy	−.74	2.50	.72	.67	.73	.71	.51	.59	.66	.60	.64	.78	.61

Note: $N = 117$.

sample and data quality (Gorsuch, 1983). The scree plot (Figure 1) showed that the eigenvalues (*EV*s) levelled off after a strong first factor, with the subsequent factors having *EV*s < 1 (Cattell, 1966). The first unrotated factor accounted for 72% of the common variance ($EV = 7.16$) and yielded communalities between 48% and 84% of extracted item variance (cf. Table 2).

The Kaiser criterion ($EV > 1$) indicated a one-factor solution, all items loaded significantly on this first factor, and the need for a second factor was not immediately evident from either Velicer's (1976) Minimum Average Partial test or Horn's (1965) parallel analysis (principal axis method; cf. Figure 1), according to which a non-significant second factor would only account for 7% additional variance.

Thus, a bottom-up unconstrained analysis of responses confirmed our presumption of a single underlying construct, a tendency to believe in religious supernatural entities and events. Nevertheless, a complete investigation of the SBS requires a confirmatory factor analysis (CFA), which more rigorously models theoretically derived latent variables and errors. Indeed, the variation in valence among the items (e.g. God versus Devil) suggests at least the existence of a method factor, which can be specified in CFA, but not EFA (Brown, 2006). CFA also enables model testing to establish not only that a one-factor model is a good fit but also that it is the best fit among multiple plausible alternatives.

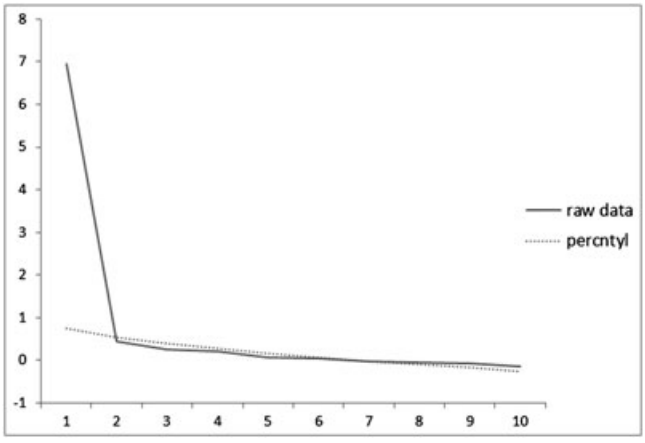

Figure 1. Scree plot (pretest) and equivalent parallel analysis of random variables (principal axis, 1000 iterations, 95-percentile).

Main study: Method

Participants

One hundred and fifty female and 63 male psychology undergraduates ($M_{age} = 20.34$, $SD = 3.73$) participated in this study in exchange for partial course credit.[1] The study was run in conjunction with several other unrelated procedures.

Procedure

Directly after providing informed consent, participants completed a sociodemographic questionnaire, followed by the SBS. Included in the sociodemographic questionnaire were three questions pertaining to participants' religiosity.[2] The first was an open-ended request for participants to state their religion. The second question was, 'How important do you feel religion is to your identity?' to which participants responded on a 9-point scale anchored at −4 (Very unimportant) and 4 (Very important). The third question was, 'How many religious services do you usually attend?' to which participants responded by selecting one of the following: 'Never', 'Few times a year', 'Once a month', 'Every week', or 'More than once a week'. The sociodemographic questionnaire and the SBS were presented on separate sheets. This study was followed by a series of unrelated experiments, after which all participants were debriefed.

Statistical analysis and model evaluation

We used the *R*-software package *lavaan* 0.4–10 (Rosseel, 2011) for structural equation modelling (SEM) of the covariance matrix. Full information maximum likelihood estimation was used for $k = 4$ missing (at random) values (0.18%), and robust maximum likelihood estimation (MLR)

[1]Statistical power was determined mathematically (Kim, 2005) rather than via rules of thumb (Goffin, 2007; Steiger, 2007). This enabled us to obtain *a priori* estimates of the minimum sample size to reject with at least 90% prospective power those models that fail arbitrary minimum standards of model fit (*RMSEA* > .08; *CFI* < .95). To detect misfit with *RMSEA* (or *CFI*), $N_{min} = 145$ (or 96) for the unidimensional model (M1; $df = 35$), $N_{min} = 170$ (75) for the essentially unidimensional models (M4, M5; $df = 27$), and $N_{min} = 178$ (133) for the most psychometrically complex model (M8; $df = 25$). These power analyses indicated that the current sample of $N = 213$ was more than adequate, exceeding even the strictest rules of thumb such as a 20:1 subjects-to-variables ratio (MacCallum, Widaman, Preacher, & Hong, 2001).

[2]The self-report measures of religious identity and religious service attendance were only included for 159 participants.

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was used for model parameters.[3] Model fit was assessed via a number of converging methods. First, absolute goodness-of-fit was assessed, after non-normality was accounted for by MLR. The model is said to fit the data if a χ^2-test fails to reject the null hypothesis (H_0) of perfect prediction (Bentler & Bonett, 1980). Given the dependence of the χ^2-test on sample size, the normed χ^2/df ratio should be as low as possible, ideally to as low as 2 (Tabachnick & Fidell, 2007). Second, competing models were compared with fit indices, which might imply the presence of specification errors (Hu & Bentler, 1999; Jöreskog & Sörbom, 1986).

From the class of absolute fit indices (relative to perfect fit), we examined the standardized root mean square residual (*SRMR*), that is, the degree by which a model can reproduce correlations on average. A model is commonly accepted as indicating acceptable fit when $SRMR \leq .08$ (Hu & Bentler, 1999) and good fit when $SRMR \leq .05$ (Byrne, 1998). Similarly, the residual mean square error approximation (*RMSEA*) should indicate at least fair fit with $RMSEA \leq .08$ or, ideally, close fit with $RMSEA < .05$ (Browne & Cudeck, 1993; MacCallum, Browne, & Sugawara, 1996). Deviation from close fit can be tested with a significance test ('*p*-close'). From the class of relative fit indices, we chose the comparative-fit index (*CFI*) and the Tucker–Lewis index (*TLI*), the latter favouring parsimonious models. Appropriate fit is taken to be *CFI* or $TLI \geq .90$ (Bentler, 1990; Bentler & Bonett, 1980) and good fit when *CFI* or $TLI \geq .95$ (Hu & Bentler, 1999). Finally, non-nested models can be evaluated by Akaike's Information Criterion (*AIC*; Akaike, 1987); the lowest *AIC* value indicates the 'best fit' in terms of parsimony, accuracy, and predictive validity.[4]

Parametrization of models for confirmatory factor analysis

The goal of CFA and goodness-of-fit approaches is to identify the solution that reproduces the observed covariance matrix considerably better than more parsimonious models with fewer factors, but equally or nearly as well as more complex models with more factors. Although we cannot rule out the possibility that untested models would fit better, we compared the eight models we deemed most plausible on the basis of the theory and the EFA results. All models under consideration are depicted in Figure 2.

Ideally, and as suggested by the EFA in the pretest sample, SBS items should form a unidimensional scale in which all shared item variance is explained by one causal factor—supernatural belief—and remaining error variance (Model M1). However, as noted, there is reason to suspect that incorporating an additional 'method' factor would yield a better fit.

Method factors reflect additional indicator covariation resulting from construct-unrelated factors, such as common assessment methods (e.g. questionnaires, observer ratings), content categories, similarly worded test items, or reverse scoring (cf. Barnette, 2000; Brown, 2006; Crawford & Henry, 2004; Knight, Chisholm, Marsh, & Godfrey, 1988; Marsh, 1996; Motl & DiStefano, 2002; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Woods, 2006). The use of pairs of items, including those with opposite valence, provides several obvious candidate method factors, representing negative item content (M2), correlations within each pair of related items (M3), or both (M4 and M5, which are psychometrically equivalent, with the latter modelling the covariance via latent variables).[5]

In lieu of a major content factor plus an orthogonal method factor, multiple content factors might exist (defining a superordinate factor), and we tested three of the most plausible ones here. Two of these test the possibility of two content factors: negative and non-negative items (M6) or agents and non-agents (M7). Finally, one model (M8) reflects five correlated content factors, one for each pair of items. While the content factors might account for the correlated uniqueness of item pairs, the correlations among the five factors might account for the superordinate construct, or overlap of all the items.

Results and discussion

Model evaluation

As displayed in Table 3, all the criteria converged in their assessment of model quality. A strict unidimensional model (M1) did not fit the data nor did the specification of two or five content factors (M6, M7, M8). The unidimensional models incorporating sources of variance (M2–M5) fared better, but only M4 and M5 (cf. Figure 3a, b), which model both a method factor for negative items as well as covariance within each item pair (to reflect the pairwise nature of the facets) provided an acceptable fit to the data. Furthermore, the good fit of M4 was not due to a fully saturated model (only five out of 45 covariances were allowed) nor was fit improved due to relying on modification indices *post hoc*. M4/M5 also reproduced the covariance matrix well; correlations were reproduced to about .03 on average.

These results confirm the hypothesis that the best-fitting model of the SBS is essentially unidimensional (all items load on one major factor); this tentatively accepted measurement model will be cross-validated in an independent sample in Study 2.

Reliability of Supernatural Belief Scale scores

Given that essential tau-equivalence, uncorrelated errors, and strict unidimensionality of the SBS items do not hold,

[3]Robust maximum likelihood (Huber–White sandwich) is similar to the robust Satorra–Bentler scaled χ^2 statistic (MLM; Chou, Bentler, & Satorra, 1991; Curran, West, & Finch, 1996) and asymptotically equivalent to the Yuan–Bentler residual statistic (Yuan & Bentler, 1998). It yields unbiased estimates of parameters, like maximum likelihood estimation does, but differs from typical ML in providing estimates of standard errors and χ^2-based statistics that are robust to non-normal properties. Robust procedures were required, because according to Small's omnibus test, multivariate normality did not hold in our sample, $\chi^2(20) = 647.82$, $p < .0001$. An advantage of MLR over MLM is that it can be used with smaller sample sizes without loss of large-sample properties (Bentler, 2005).

[4]It should be noted that the cut-offs for the fit indices are approximate; overly strict adherence to cut-offs for evaluating model fit is unwarranted (P. Barrett, 2007; Chen, Curran, Bollen, Kirby, & Paxton, 2008; Goffin, 2007; Hopwood & Donnellan, 2010; Jackson, Gillaspy, & Purc-Stephenson, 2009; Marsh, Hau, & Wen, 2004; Steiger, 2000, 2007) because the optimal cut-offs depend on the interplay of model characteristics, type of misspecification, and sample size (Fan & Sivo, 2005; Sivo, Fan, Witta, & Willse, 2006). So, on top of these analyses, model fit was also determined by the relative superiority of competing models.

[5]Errors are permitted to covary when the covariances represent true components, not random error (Brown, 2006; Gerbing & Anderson, 1984; McDonald, 2010; Schweizer, 2012; e.g. Crawford & Henry, 2004, who similarly specified content categories in PANAS mood measures).

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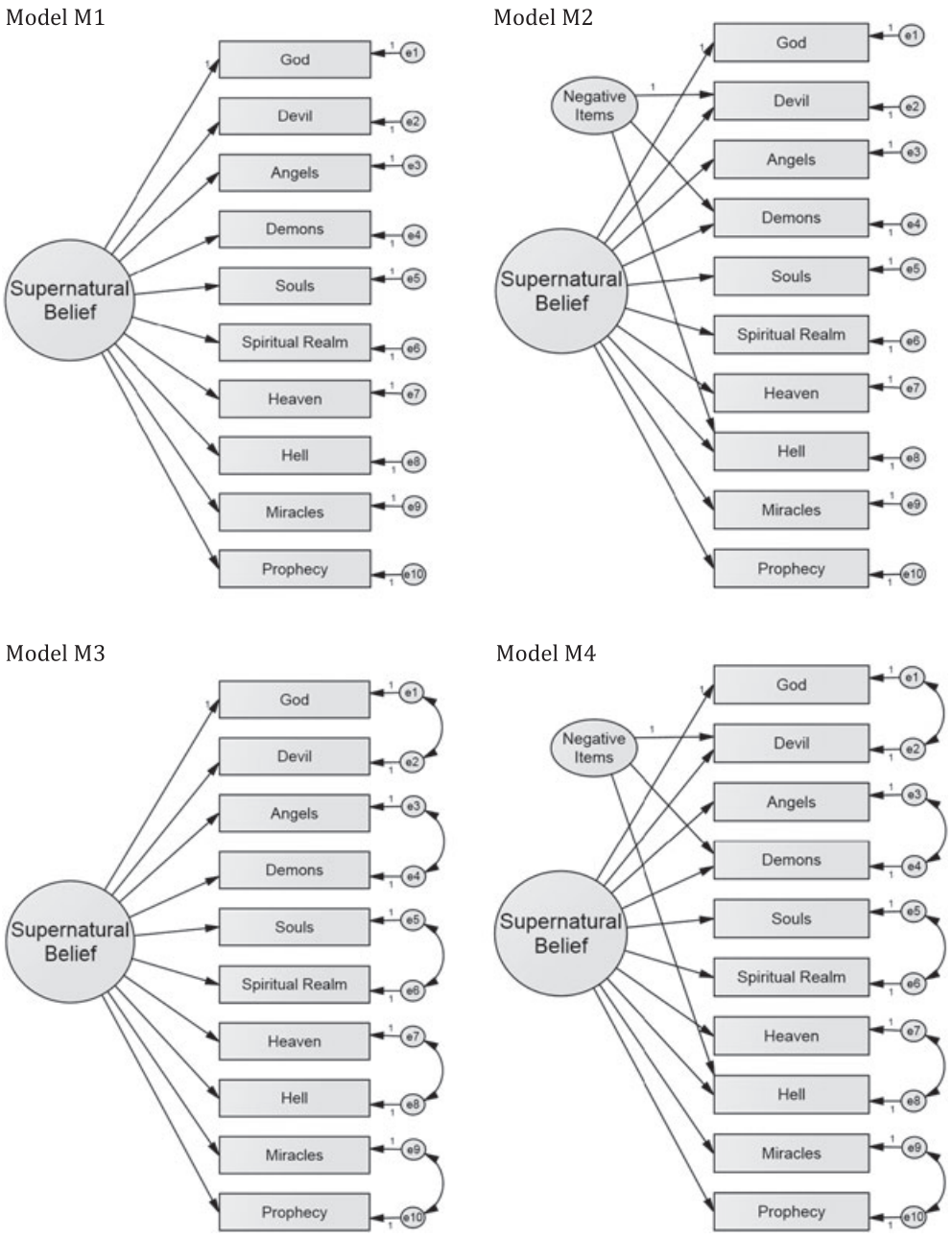

Figure 2. Models considered in confirmatory factor analysis, Studies 1 and 2.

Cronbach's alpha and split-half reliability are inappropriate indicators of SBS internal consistency and of the reliability of the SBS scale sum scores (Bollen, 1989). Instead, SEM-based estimates can indicate how well a latent variable is measured by its indicators (Fornell & Larcker, 1981; Raykov & Shrout, 2002). Following Bacon, Sauer, and Young (1995), the construct reliability of the Supernatural Belief factor was estimated along the optimal linear combination of the standardized regression coefficients, yielding $\Omega_w = .95$. Second, the average amount of variance that could be extracted from the indicators by the Supernatural Belief factor was $AVE = .76$: more than three quarters of the item variance was captured by the focal construct. Overall, the scale composite was reliable, with composite reliability amounting to $\Omega_t = .81$ (Revelle & Zinbarg, 2009).

Convergent validity of Supernatural Belief Scale scores

Although the SBS is designed to measure supernatural beliefs specifically, rather than general 'religiosity', attitudes toward religion, or religious behaviour, it should nevertheless predict such indicators of religiosity, given the central importance of supernatural beliefs in most religious traditions. First, to examine SBS scores as a function of self-identified religious affiliation, we categorized participants into three groups on the basis of their responses on an open-ended question regarding their religion. There were 93 religious participants (91.4% Christian, 3.2% Muslim, 1.1% Buddhist, 1.1% Hindu, 1.1% Spiritual, 2.2% Other), 102 non-religious participants (91.2% None, 6.9% Agnostic, 1% Undecided, 1% 'Free Thinker'), and 18 atheist participants. *t*-tests confirmed that atheists ($M = -2.35$, $SD = 1.45$) scored significantly lower

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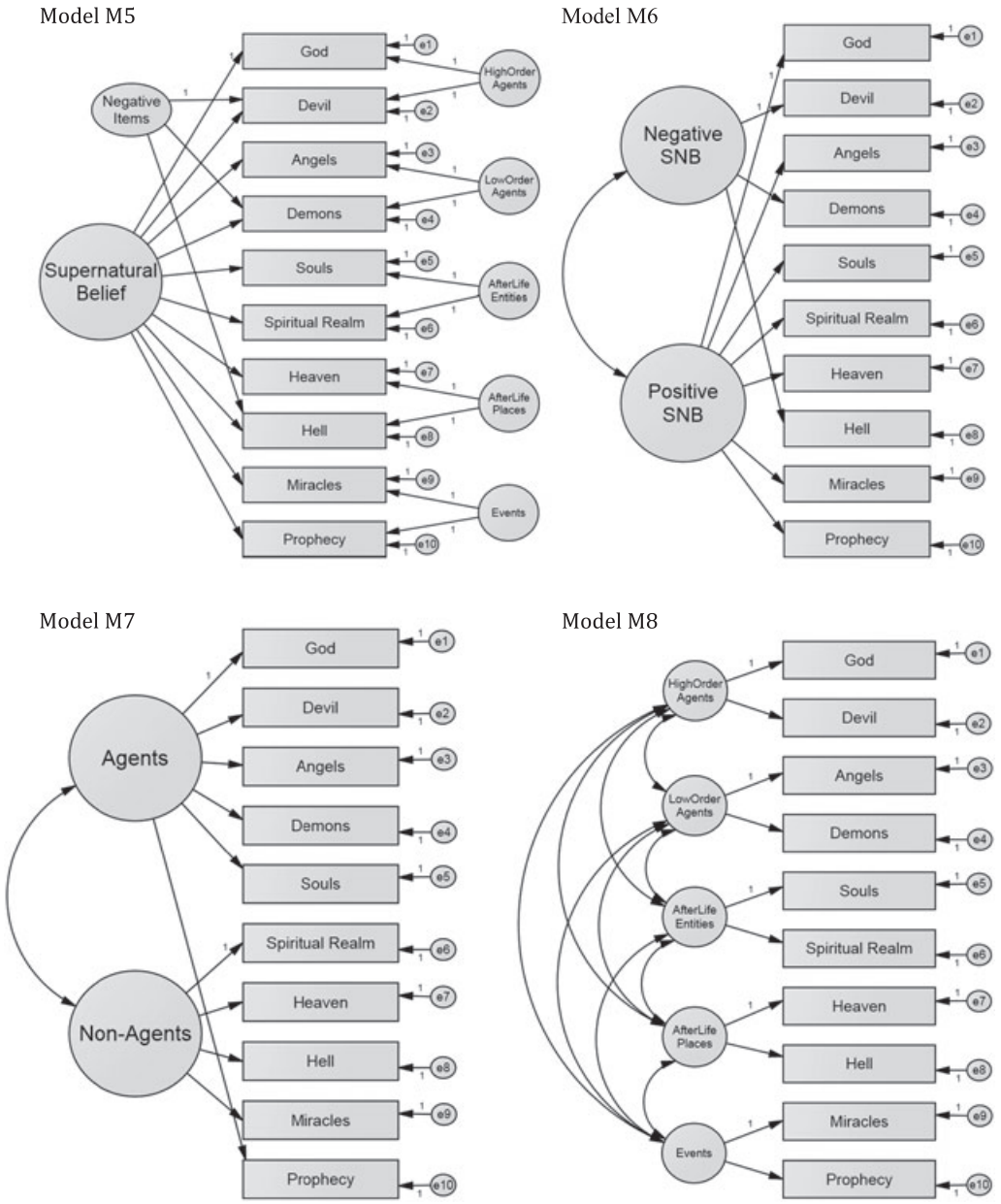

Figure 2. Continued.

on the SBS than did non-religious participants ($M = -1.15$, $SD = 1.62$), $t(118) = -2.94$, $p < .005$; non-religious participants in turn scored significantly lower than did religious participants ($M = 1.51$, $SD = 1.79$), $t(193) = -10.91$, $p < .001$.

Furthermore, SBS scores were positively correlated with self-reported importance of religion to identity ($r = .54$) and religious service attendance (Spearman's $\rho = .60$ and Kendall's $\tau(b) = .49$), $ps < .001$. As these correlations might mostly be due to an offset of one of the two very different groups, we inspected the correlations for religious ($n = 68$) and non-religious people ($n = 91$, including atheists) separately. Religious participants' SBS scores correlated strongly with their religious identity ($r = .62$) and behaviour ($\rho = .66$, $\tau(b) = .50$), $ps < .001$. By contrast, among non-religious participants, SBS scores were unrelated to either identity ($r = .15$) or behaviour ($\rho = .09$, $\tau(b) = .08$), n.s. The latter finding is no surprise, given the lack of meaningful variability in either religious behaviour or identity among non-religious participants.[6]

[6]Arguably, measurement error and secondary factors might affect the meaning of SBS scores. SEM is not only useful to specify a measurement model, but by using structural models, latent relationships can be estimated corrected for measurement error. With single-item criteria, however, measurement error cannot be fully corrected. Still, the estimated correlations between the supernatural belief factor and the religious identity indicator yielded similar outcomes, $r_{corr} = .57$, .67, and .17, for the total sample, the religious participants, and the non-religious people, respectively. Furthermore, estimating rank correlations in SEM is computationally intense, yet the relationships between supernatural belief and religious behaviour were replicated when assuming interval-level data, $r_{corr} = .68$, .64, and .14. By confirming the zero-order correlations, within margins, SEM demonstrates that supernatural belief can be approximated by using SBS sum scores and that the presence of further factors does not detrimentally affect validity. As a caveat, the latent relationships might depend on the measurement model adopted for other cultural contexts.

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Table 3. Model fit of measurement models of the Supernatural Belief Scale (Study 1)

Model type		χ^2	*df*	*p*	χ^2/df	*SRMR*	*CFI*	*TLI*	*RMSEA*	*p*-close	*AIC*
				(n.s.)	(2–3)	(<.05)	(>.95)	(>.95)	(<.05)	(n.s.)	(lower)
Unidimensional											
M1	Unidimensional	215.96	35	<.001	6.17	.061	.834	.786	.156	<.001	8656
Essentially unidimensional											
M2	Unidimensional, method factor (negative items)	152.81	32	<.001	4.78	.051	.889	.844	.133	<.001	8532
M3	Unidimensional, 5 facets (correlated uniqueness)	166.29	30	<.001	5.54	.047	.875	.812	.146	<.001	8562
M4	**Unidimensional, method factor, 5 facets (correlated uniqueness)**	**57.13**	**27**	**<.001**	**2.12**	**.033**	**.972**	**.954**	**.072**	**.042**	**8378**
M5	**Unidimensional, method factor, 5 facets (content factors)**	**57.13**	**27**	**<.001**	**2.12**	**.033**	**.972**	**.954**	**.072**	**.042**	**8378**
Two-dimensional											
M6	Negative items, Others ($r = .87$)	162.77	34	<.001	4.79	.052	.882	.844	.133	<.001	8545
M7	Agents, Others ($r = .98$)	218.72	34	<.001	6.43	.062	.830	.776	.160	<.001	8656
Five-dimensional											
M8	Superagents, Agents, Spiritual Realm, Places, Events	137.78	25	<.001	5.51	.038	.896	.814	.146	<.001	8525

Note: $N = 213$. Values in parentheses refer to criteria for good model fit.
The best-fitting models are written in bold.

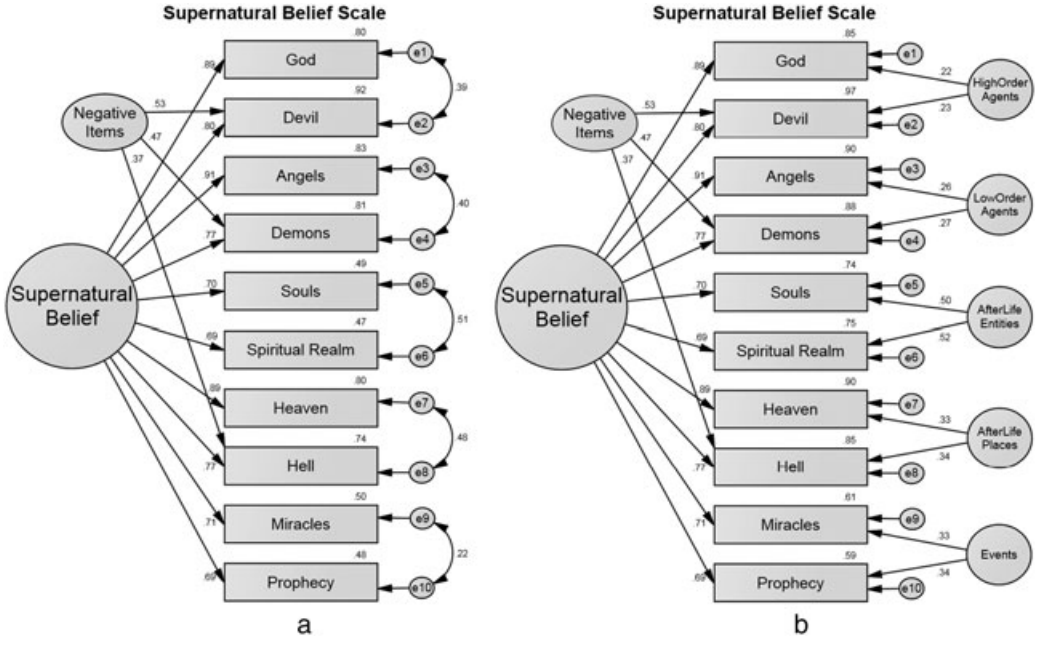

Figure 3. (a) Measurement model (M4) for the Supernatural Beliefs Scale: standardized path coefficients, squared multiple correlations, and standardized error covariances (pooled sample). (b) Measurement model (M5) for the Supernatural Beliefs Scale: standardized path coefficients and squared multiple correlations (pooled sample).

Evaluation of the Supernatural Belief Scale

As suggested by the EFA in the pretest, the SBS appears essentially unidimensional, in that all items load (by design) on one major factor, even if model fit can be improved by considering method variance as well. Furthermore, the SBS composite score is reliable, predominantly driven by the supernatural belief factor, and predicts variance in religious identification and behaviour as expected. Taken together, these results tentatively suggest that the SBS fulfils our aim to assess individuals' tendencies to believe in supernatural entities and events, at least in a Western context.

STUDY 2

In Study 2 we utilized the SBS to examine the enduring yet underdetermined hypothesis that religious belief is related to (and presumably motivated by) fear of death. Fear of death has featured prominently in both historical and contemporary theories of religion. Hume (1757/2008, p. 140), for example,

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lists 'the terrors of death' among the passions that led our ancestors to 'see the first obscure traces of divinity'. More explicitly, according to Freud (1927/1961, p.22), gods 'must exorcise the terrors of nature, they must reconcile men to the cruelty of Fate, particularly as it is shown in death'. Some modern social scientists, particularly in experimental social psychology (e.g. Vail et al., 2010) and anthropology (e.g. Donovan, 1994, 2003), have also proposed that the primary cause and function of religion is the relief of existential anxiety. However, others have been more sceptical, pointing out, for example, that most gods and afterlife beliefs are far from comforting (e.g. Boyer, 2001; Guthrie, 1993). Unfortunately, the matter cannot be settled with existing measures and data.

Depending on the measure of religiosity employed, thinking about death either has no effect on religiosity at all (Burling, 1993), strengthens religious beliefs among religious participants only (Osarchuk & Tatz, 1973; Weisbuch, Seery, & Blascovich, 2005), strengthens religious beliefs among the non-religious only (Willer, 2009), weakens religious beliefs among the non-religious (Weisbuch et al., 2005), or has no effect on the non-religious (Norenzayan & Hansen, 2006). The evidence from correlational studies is almost as equivocal (Donovan, 1994; Hood et al., 2009). Reviewing 137 correlational studies, Donovan (1994) found that 57% showed a negative correlation between religiosity and death anxiety, and 9% showed a positive relationship, while 35% showed no significant relationship or were otherwise inconclusive.

However, a closer look at these mixed results, and particularly the nature of the samples used to obtain them, perhaps reveals a discernible pattern: the relation between religious belief and death anxiety may depend on participants' categorical religious identification. Studying Christians, for example, Harding et al. (2005) found negative correlations between death-related anxiety and the beliefs in God and an afterlife. On the other hand, in a predominantly non-religious sample, Dezutter et al. (2009) found a positive relationship between fear of death and literal interpretations of Christian faith. Relatedly, Cohen et al. (2005) found that while 'intrinsic religiosity' is negatively correlated with fear of death, 'extrinsic religiosity' is positively correlated with fear of death. Arguably, intrinsic religiosity reflects true or genuine faith, whereas extrinsic religiosity reflects socially strategic or utilitarian religious attitudes and behaviours (Allport, 1950). On the basis of such findings Donovan (1994, 2002), in his evaluation of the empirical evidence to date, hypothesized that the statistical relationship between religiosity and death anxiety would be curvilinear in a representative sample, a prediction borne out by some studies (e.g. Leming, 1979–1980; Wink & Scott, 2005).

The aim of Study 2, therefore, was to test the hypothesis that religious identity (i.e. religious versus non-religious) moderates the anxiety–religiosity relationship, with the concept of 'religiosity' defined specifically as 'belief in supernatural concepts' and measured with the SBS. We predicted that death anxiety and SBS scores would be negatively correlated for religious participants but positively correlated for non-religious participants. The study also served the secondary purpose of cross-validating the SBS, demonstrating the predictive validity of the measurement model in a new experimental context, albeit a similar sociocultural one.

Method

Participants

Seventy-two male and 75 female non-psychology students at the University of Otago ($M_{age} = 21.76$, $SD = 3.36$) volunteered for the study in exchange for NZ$12 (approximately US$10) to cover their travel expenses. The study was run in conjunction with several other, unrelated procedures. For the CFA, two missing data points among the SBS ratings (0.14%) were treated as in Study 1.

Materials

Religious supernatural beliefs were measured on the SBS, as described in Study 1 above. Fear of death was measured with the Death Anxiety Questionnaire (DAQ; Conte, Weiner, & Plutchik, 1982), which consists of 15 questions about various aspects of death and dying (e.g. 'Do you worry about dying?'; 'Does the thought bother you that you might lose control of your mind before death?'), to which participants respond on a 3-point scale: 'not at all' (scored 0), 'somewhat' (scored 1), or 'very much' (scored 2). Consistent with previous research, we found the DAQ to be reasonably reliable (Spearman–Brown scale-length corrected split-half reliability = .75). Conte et al. (1982) also showed that the DAQ is also temporally stable (.87) and is significantly correlated with other self-report measures of death-related anxiety (e.g. Death Anxiety Scale, Templer, 1970, $r = .51$; Death Concern Scale, Dickstein, 1972, $r = .58$).

Procedure

Each task was presented on separate sheets of paper in a questionnaire pack including several unrelated studies. The questionnaire pack began with an informed consent form, followed by a sociodemographic questionnaire that included two questions about participants' religiosity. The first simply asked for the participant's religion, which they could indicate by checking 'Christian', 'None', or 'Other'; if they chose 'Other', they were requested to specify what their religion was. The second question was, 'How important do you feel your religious beliefs or lack of religious beliefs are to you?' to which participants responded on a 9-point scale anchored at −4 (Very unimportant) and 4 (Very important). The sociodemographic questionnaire was followed by the SBS, DAQ, and other unrelated questionnaires presented in random order.

Results and discussion

Cross-validation of Supernatural Belief Scale measurement model

Before using the SBS to test our substantive hypotheses, we determined the applicability of the measurement model

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derived in Study 1. An inspection of all eight models confirmed that the new sample was again best explained by M4/5, in which a single content factor is supplemented by a method factor and covariances among item pairs. To cross-validate M5[7] across the two independent samples, we examined measurement invariance between them (Byrne, 2004; Reise, Widaman, & Pugh, 1993; Schmitt & Kuljanin, 2008; Vandenberg & Lance, 2000), which was established by a series of increasingly restrictive, nested models via multi-group confirmatory factor analysis of the means and covariance structure. As seen in Table 4, none of the more restrictive steps resulted in significantly worse fit in comparison with the previous model, indicating that M5's fit was statistically identical across groups (equality of the supposed factor structure). When collapsing across the samples from Studies 1 and 2 to inspect model fit, $\chi^2 = 67.20$ ($p < .001$), $\chi^2/df = 2.49$, *RMSEA* improved considerably in comparison with Study 1, *RMSEA* = .064, not significantly different from .05 (*p*-close = .064). Other fit indices improved likewise, *SRMR* = .029, *CFA* = .978, *TLI* = .963. In sum, the usefulness of the measurement model M4/M5 was confirmed. Figures 3a and 3b show the estimated paths.

Convergent validity of Supernatural Belief Scale scores

As the independent attitudinal religiosity measure for convergent validity was different in Study 2 than in Study 1, convergence would in this case be evidenced by a curvilinear relationship between SBS scores and participants' responses to the question 'How important do you feel your religious beliefs or lack of religious beliefs are to you?' That is, respondents who report strong disbelief *or* belief should report greater importance. To test this hypothesis, importance was regressed on both SBS and squared SBS, entered in separate steps. Results revealed a significant linear term, $b = .35$, $F(1, 144) = 19.67$, $p < .001$, indicating that importance increased overall with religiosity. However, as predicted, squared SBS explained unique variance in importance, *F-change*$(1, 143) = 16.01$, $p < .001$, reflecting greater importance at both ends of the SBS scale.

Supernatural belief and death anxiety

For the substantive analyses, participants were categorized as 'Religious' and 'Non-religious' on the basis of their responses in the sociodemographic form. There were 66 religious (all Christian) participants and 81 non-religious (96% None, 1.2% Agnostic, 1.2% Atheist, 1.2% Uncertain) participants. Average SBS scores were higher for religious participants ($M = 1.53$, $SD = 1.79$) than for non-religious participants ($M = -1.65$, $SD = 1.78$), $t(145) = 10.70$, $p < .001$. Average DAQ scores did not differ significantly between groups, $t(145) = 1.84$, *n.s.*

To test the hypothesized relation between categorical religiosity (i.e. religious versus non-religious), death anxiety, and supernatural belief, categorical religiosity (coded +1 and −1), mean-centred DAQ scores, and their interaction were used

[7]M4 and M5 are psychometrically equivalent at the configural invariance level, although they yield slightly different χ^2-values and degrees of freedom at the more restrictive levels. The conclusions about measurement invariance do not differ between M4 and M5.

Table 4. Measurement invariance: model fit of multi-group confirmatory factor analysis (MGCFA) of the Supernatural Belief Scale (Study 2)

MGCFA comparison (no.)	Equal loadings	Equal intercepts	Equal residuals	Equal means	*df*	χ^2	Δdf	$\Delta\chi^2$	*P* (n.s.)	*CFI* (> .95)	*RMSEA* (<.05)	*BIC* (lower)
1 Configural invariance	—	—	—	—	54	103.01***	—	—	—	.975	.071	14 532
2 Weak/metric invariance	×	—	—	—	65	110.57***	11	6.04	.871	.976	.062	14 475
3 Strong/scalar invariance	×	×	—	—	68	115.88***	14	9.58	.792	.975	.063	14 460
4 Strict invariance	×	×	×	—	78	124.93***	24	22.35	.558	.976	.058	14 423
5 Mean invariance	×	×	—	×	75	121.25***	21	14.08	.866	.977	.059	14 424
6 Full invariance	×	×	×	×	85	130.36***	31	27.10	.667	.977	.054	14 387

Note: $N = 360$. Values in parentheses refer to criteria for good model fit.
***$p < .001$.

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to predict SBS score in a multiple regression. As expected, DAQ scores were not by themselves predictive of SBS scores; only the interaction between DAQ and self-reported religious identity was significant, $b = -2.29$, $t = -3.84$, $p < .001$. To examine the nature of this interaction, we ran Pearson correlations between DAQ and SBS for religious and non-religious participants separately. SBS scores were negatively correlated with DAQ scores for religious participants, $r = -.33$, $p < .01$, and positively correlated with DAQ scores for non-religious participants, $r = .29$, $p < .01$ That is, among participants who self-identify as religious, lesser fear of death is associated with stronger supernatural beliefs; among participants who self-identify as non-religious, *greater* fear of death is associated with stronger supernatural beliefs.

These results are consistent with our proposed integration of the empirical evidence on the relationship between fear of death and religious belief. Furthermore, they suggest a way forward in further research on the causal relationship between death-related anxiety and religious belief. For example, these correlational findings are consistent with the oft-proposed notion that death-related anxiety motivates religious belief, which in turn serves to alleviate such anxiety. In this view, non-believers who are more afraid of death become more open to or less sceptical of religious belief, and believers experience decreased death anxiety the more fervently they believe. Of course, these proposals are only speculative at this point and are furthermore limited to the Christian and non-religious students from which we sampled. Manipulating death anxiety and religious belief in samples of diverse religiosity will be necessary to confirm them.

CONCLUSION

The growing interest in religious *belief* as a psychological phenomenon encourages a re-examination of the methodological tools available to researchers in the field, and our review of the literature yielded very few psychometrically tested measures of religious belief *per se*. Therefore, in Study 1, we designed and evaluated a new measure of religious belief—the SBS—and found that it reliably assesses respondents' tendencies towards belief in the supernatural. The SBS also shows promising signs of convergent validity with other indicators of religiosity. In Study 2, we replicated and extended the psychometric evaluation conducted in Study 1 and used the SBS to examine the relationship between death anxiety and religious belief. Our results, which show that the relationship between death anxiety and supernatural belief is moderated by religious identity, serves as a starting point for an experimental integration of previous discrepant findings.

An obvious limitation of this research is that despite our attempts to incorporate multiple samples into the development of the scale, these samples were demographically similar. In principle, the SBS should be adaptable to other cultural contexts, because the supernatural concepts to which it refers are themselves instantiated cross-culturally. Beliefs about post-mortem survival, for example, recur in a wide range of cultural contexts (Barrett, 2004; Bloom, 2004), as do beliefs about *realms* for the dead (e.g. Heaven and Hell; analogously, *Tian* in East Asian contexts and *Naraka* in South Asian contexts). Nevertheless, it should be noted that although these concepts are conceptually similar, there are subtle differences among them whose effects on the scale's structure and validity are unknown. We hope that other researchers will re-evaluate the SBS in more, and more diverse samples, and in experimental contexts. As a valid and focussed measure of a core component of religiosity, it has the potential to help researchers unravel the complex functions and emotional and behavioural consequences of supernatural religious belief.

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