

Material insecurity predicts greater commitment to moralistic and less commitment to local deities: a cross-cultural investigation

Adam Baimel, Coren Apicella, Quentin Atkinson, Alex Bolyanatz, Emma Cohen, Carla Handley, Joseph Henrich, Eva Kundtová Klocová, Martin Lang, Carolyn Lesogorol, Sarah Mathew, Rita McNamara, Cristina Moya, Ara Norenzayan, Caitlyn D. Placek, Monserrat Soler, Thomas Vardy, Jonathan Weigel, Aiyana Willard, Dimitris Xygalatas & Benjamin Purzycki

To cite this article: Adam Baimel, Coren Apicella, Quentin Atkinson, Alex Bolyanatz, Emma Cohen, Carla Handley, Joseph Henrich, Eva Kundtová Klocová, Martin Lang, Carolyn Lesogorol, Sarah Mathew, Rita McNamara, Cristina Moya, Ara Norenzayan, Caitlyn D. Placek, Monserrat Soler, Thomas Vardy, Jonathan Weigel, Aiyana Willard, Dimitris Xygalatas & Benjamin Purzycki (2022) Material insecurity predicts greater commitment to moralistic and less commitment to local deities: a cross-cultural investigation, *Religion, Brain & Behavior*, 12:1-2, 4-17, DOI: [10.1080/2153599X.2021.2006287](https://doi.org/10.1080/2153599X.2021.2006287)

To link to this article: <https://doi.org/10.1080/2153599X.2021.2006287>



© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 06 Apr 2022.



Submit your article to this journal [↗](#)









View related articles [↗](#)



View Crossmark data [↗](#)



Material insecurity predicts greater commitment to moralistic and less commitment to local deities: a cross-cultural investigation

Adam Baimel ^a, Coren Apicella^b, Quentin Atkinson ^{c,d}, Alex Bolyanatz^e, Emma Cohen ^{f,g}, Carla Handley^h, Joseph Henrichⁱ, Eva Kundtová Klocová^j, Martin Lang ^k, Carolyn Lesogorol^k, Sarah Mathew^h, Rita McNamara^l, Cristina Moya^{m,n}, Ara Norenzayan^o, Caitlyn D. Placek^p, Monserrat Soler^q, Thomas Vardy^d, Jonathan Weigel^r, Aiyana Willardⁿ, Dimitris Xygalatas ^{s,t}, and Benjamin Purzycki ^u

^aCentre for Psychological Research, Oxford Brookes University, Oxford, United Kingdom; ^bDepartment of Psychology, University of Pennsylvania, Philadelphia, Pennsylvania, USA; ^cDepartment of Linguistic and Cultural Evolution, Max Planck Institute for the Science of Human History, Jena, Germany; ^dSchool of Psychology, University of Auckland, Auckland, New Zealand; ^eSocial Science Sub-Division, College of DuPage, Glen Ellyn, IL, USA; ^fSchool of Anthropology and Museum Ethnography, Oxford University, Oxford, United Kingdom; ^gWadham College, University of Oxford, Oxford, United Kingdom; ^hInstitute of Human Origins, Arizona State University, Tempe, Arizona, USA; ⁱDepartment of Human Evolutionary Biology, Harvard University, Cambridge, Massachusetts, USA; ^jLEVYNA, Masaryk University, Brno, Czech Republic; ^kBrown School, Washington University in St. Louis, St. Louis, Missouri, USA; ^lSchool of Psychology, Victoria University of Wellington, Wellington, New Zealand; ^mDepartment of Anthropology, University of California-Davis, Davis, California, USA; ⁿCentre for Culture and Evolution, Brunel University London, London, United Kingdom; ^oDepartment of Psychology, University of British Columbia, Vancouver, Canada; ^pDepartment of Anthropology, Ball State University, Muncie, Indiana, USA; ^qDepartment of Anthropology, Montclair State University, Montclair, New Jersey, USA; ^rHaas School of Business, UC Berkeley, Berkeley, California, USA; ^sDepartment of Anthropology, University of Connecticut, Storrs, Connecticut, USA; ^tDepartment of Psychological Sciences, University of Connecticut, Storrs, Connecticut, USA; ^uDepartment of the Study of Religion, Aarhus University, Aarhus, Denmark

ABSTRACT

The existential security hypothesis predicts that in the absence of more successful secular institutions, people will be attracted to religion when they are materially insecure. Most assessments, however, employ data sampled at a state-level with a focus on world religions. Using individual-level data collected in societies of varied community sizes with diverse religious traditions including animism, shamanism, polytheism, and monotheism, we conducted a systematic cross-cultural test ($N = 1820$; 14 societies) of the relationship between material insecurity (indexed by food insecurity) and religious commitment (indexed by both beliefs and practices). Moreover, we examined the relationship between material security and individuals' commitment to two types of deities (moralistic and local), thus providing the first simultaneous test of the existential security hypothesis across co-existing traditions. Our results indicate that while material insecurity is associated with greater commitment to moralistic deities, it predicts less commitment to local deity traditions.


ARTICLE HISTORY

Received 25 March 2020
Accepted 27 August 2021

KEYWORDS

Religious commitment;
existential insecurity;
moralistic gods; cross-cultural

CONTACT Adam Baimel  abaimel@brookes.ac.uk

 Supplemental data for this article can be accessed at <https://doi.org/10.1080/2153599X.2021.2006287>.

© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

1. Introduction

As there is an immense diversity in the form, frequency, and intensity of religious commitments, scholars of religion have long been interested in answering the related questions of when, in what ways, and with what intensity people demonstrate commitment to their gods (e.g., Atkinson & Whitehouse, 2011; Cohen et al., 2003; Finke & Stark, 2005; Norenzayan, 2016; Power, 2017b; Purzycki & Sosis, 2011; Rappaport, 1999; Solt et al., 2011; Xygalatas et al., 2013). Moreover, researchers have taken on the challenge of developing accounts of how specific cultural variants in religious commitments come to spread and persist at the expense of others, resulting in the modern landscape of religious commitments that is dominated by the “world” religions (e.g., Baumard & Chevallier, 2015; Norenzayan et al., 2016). And, an emerging cultural evolutionary synthesis posits that the key to accounting for variation in religious commitments is to consider the adaptive benefits that varied forms of religious commitments may provide to adherents in the face of varied socio-ecological challenges (Purzycki & McNamara, 2016).

One such prevalent variant in religious systems is the extent to which they are “moralistic” (i.e., “traditions [that] are characterized as those that emphasize adherence to prosocial norms under the threat of punishment by knowledgeable deities explicitly concerned with how we treat each other”; Purzycki et al., 2018, p. 1). Cross-cultural evidence indicates that beliefs in these moralistic deities promote intra-group cooperation (e.g., Lang et al., 2019; Purzycki et al., 2016a) and that they may have evolved in response to the socio-ecological threats to cooperation associated, for example, with living in harsh or resource-scarce regions (e.g., Botero et al., 2014; Snarey, 1996). Bentzen (2019) provides global evidence for how largely unpredictable and potentially devastating ecological threats such as the frequency of earthquakes support the persistence of commitments to moralistic world religions over time (see also Sibley & Bulbulia, 2012 for a test of how natural disasters contribute to religious change following an earthquake in New Zealand). Taken together, the evidence suggests that in times of duress or *insecurity*, individuals are prone to seeking out commitment to certain types of religious traditions.

In a cross-national analysis of 191 societies, Norris and Inglehart (2011) provide evidence that *existential insecurity* (i.e., a perceived vulnerability to societal and personal risks and threats) is a fundamental determinant of the relative strength of religious fervor (in terms of commitment to religious values and practices). In this account – the existential insecurity hypothesis of religious commitments – public demand for and participation in “transcendent” religious traditions (i.e., those that provide a sense of confidence and predictability in a threatening and uncertain world) is greater when existential security is low. When existential security is provided by other means (e.g., effective secular institutions in welfare states), the demand for transcendental religious traditions that have otherwise provided solace from existential problems decreases. Thus, this hypothesis potentially provides a cohesive account of religion’s persistence in developing societies and the relative waning of religious fervor in industrialized societies with wider access to resources. Indeed, even in industrialized societies, religious commitment is positively correlated with income inequality such that those living at lower rungs of the ladder (i.e., in more uncertain circumstances) are more devout than more financially secure others (e.g., Solt et al., 2011). In support of the existential security hypothesis, these results suggest that religious commitments, heightened in times of need, may alleviate some effects of living under uncertain conditions (perhaps by virtue of providing a sense of confidence and predictability in uncertain times or, for example, practices that sustain social support networks in religious communities; see Weigel et al. in this issue).

The crux of Norris and Inglehart’s (2011) hypothesis is that certain religious systems offer their adherents specific absolution from the trials and tribulations of uncertain life circumstances – something special that is not on offer from affiliation with other cultural groups. This leads to the predictions that (1) insecure individuals should exhibit stronger religious commitments than secure individuals, and (2) religious commitments, specifically, rather than norm compliance to other types of cultural institutions, should adaptively increase under uncertain and insecure conditions. In support of this view, Henrich et al. (2019) observed that variability in prior exposure to war in Sierra Leone, Uganda,

and Tajikistan positively predicted years-later membership and active participation in Christian and Muslim – but not non-religious – social organizations. In addition to providing further evidence that individuals seek out religious commitments in insecure times, this work points to how moralistic religious traditions may have culturally evolved to “exploit the psychological states created by uncertainty and existential threats as a means to more effectively disseminate themselves” (Henrich et al., 2019, p. 129). In times of need, adherents seek out moralistic deities who offer help and protection. These omnipotent deities, however, are usually also punitive and omniscient, and thus communities of adherents may inadvertently benefit from the cooperative effects of commitments to moralistic deities. In insecure times, as commitments to moralistic deities increase and communities accrue the parochial cooperative benefits of these specific variants in religious beliefs and practices, they may head into more inter-group conflict creating a “feedback loop that will drive the cultural evolution of religions” (Henrich et al., 2019, p. 133).

This view stands in stark contrast to some accounts of how secure/insecure living conditions shape religious commitments. For example, Baumard and Chevallier (2015) propose that moralistic traditions and their focus on less immediate benefits emerge as a result of living in safer, less harsh, and less insecure environments. In a test of this hypothesis, Purzycki et al. (2018) examined whether materially secure individuals attributed their deities with more moralistic qualities and found no reliable evidence for this hypothesis. That being said, it remains an open question as to whether or not *commitments* to traditions that differ in their “moralistic-ness” vary as a function of secure/insecure living conditions. Indeed, examinations of the contributions of insecurity to religious commitments often employ large-scale survey data made available by research institutions such as Gallup and the World/European Value Survey. Although these datasets are valuable for testing these predictions, they are limited by their lack of sampling from *non-state* societies. Consequently, the sampling from nation states and adherents of world religions (e.g., Christianity, Islam, Buddhism, Hinduism) leaves the existential security hypothesis of religion largely untested amongst most of the world’s religious diversity – especially with regards to local traditions in non-state societies – preventing direct tests of how insecurities moderate commitments to traditions that vary in their moralistic qualities.

To address these concerns, we conducted a systematic cross-cultural examination of the individual-level contributions of perceived food security (an index of existential/material security) to variation in religious commitments directed at two types of deities in a large sample of participants from 14 societies that vary in community size (from hunter-gatherer groups to fully-market integrated urban samples). Moreover, our examination takes into further consideration the variation in the *form* of religious commitments. Across traditions, people express religious commitment in a wide variety of ways. One major dimension of this variation is a differential emphasis on belief and practice (e.g., Cohen et al., 2003; Purzycki & Sosis, 2011), and thus we examined commitment in terms of both belief and practice. In brief, we employed a diverse cross-cultural sample to assess (1) the relationship between two forms of religious commitment (mental—the strength of belief—and behavioral—the frequency of ritual performance/participation), and (2) the relationship between material insecurity and commitment to (3) two classes of deities (4) holding other demographic variables constant (i.e., age, sex, years of formal education, and number of children).

2. Methods

2.1. Pre-registration and open access

The data for this study is part of a larger dataset generated by The Cultural Evolution of Religion and Morality project (Lang et al., 2019; Purzycki et al., 2016a, 2016b). Focal variables were selected from the larger dataset and analytical strategy planned after data collection but prior to the lead author receiving access to the data. All but two of these pre-selected variables, however, were excluded from further analysis for reasons of insufficient variation within sites and/or problematic coding

differences between sites and waves of the data collection. Our pre-registration document is publicly available at <https://osf.io/8efwv/>; and data and R scripts for analyses at <https://osf.io/rq75m/>.

2.2. Sample and deity selection

Across two waves of data collection, 2,027 individuals from 14 populations participated in the larger study¹ (see Table 1 for demographics). Two target deities were selected following pretest interviews with an additional sample of locals. If collecting separate samples was not feasible, these participants would return at a future time to participate in the larger study. In these interviews, participants were asked to free-list up to five deities, to rank these deities in order of their importance, to rate the extent of these deities' knowledge, and how punitive/rewarding they are believed to be. From these ratings, at each site, we selected a *moralistic* deity (i.e., one that was high in moral interest and knowledge/punitiveness) and a *local* deity (i.e., one that was salient across participants but was rated relatively lower in moral interest, knowledge, and moral concern). Extensive post-test analyses of the selected deities and their believed attributes suggest that, by and large, participants did indeed distinguish between these deities along the intended dimensions (for more details, see Lang et al., 2019; Purzycki et al., 2016b; 2018).

Note that we recruited participants primarily on the basis of being associated with the moralistic gods of their sites. At the majority of the sites, the most salient moralistic deity was the Christian God. At predominantly Hindu sites (i.e., Lovu, Mauritius, and Mysore), researchers selected Shiva. At the Inland Tanna, and Tyva sites, the moralistic deities were *Kalpagan*, and *Buddha Burgan* (Buddha), respectively. By design, the identities of the local deities were more varied (see Table 1). At the Huatanani and Kananga sites some participants were unfamiliar with and/or did not believe in these local deities identified by the pretest samples (*Apus* and *Kadima*, respectively), and thus, some participants were asked about different deities (Catholic saints and ancestral spirits). At the Lovu and Samburu sites, researchers did not identify and thus did not ask questions about local deities.

2.3. Commitment measures

Commitment was assessed with the following questions asked about each deity:

- (1) How often do you think about [moralistic/local deity]?
- (2) How often do you perform activities or practices to talk to or appease [moralistic/local deity]?²

We consider responses to the first item a measure of *mental* commitment and the second *behavioral* commitment. Responses were recorded on a 5-point frequency scale (1 = very rarely/never, 2 = a few times per year, 3 = a few times per month, 4 = a few times per week, 5 = every day or multiple times per day). The distribution of responses at each sampling site are presented in the supplemental Figures S1 and S2.

2.4. Material insecurity and demographics

We created an index of material insecurity by averaging responses to four items asking participants about future food security: "Do you worry that in the next [month/six months/year/five years] your household will have a time when it is not able to buy or produce enough food to eat?" (1 = "yes", 0 = "no"; Hruschka et al., 2014). While perceived food security or lack thereof is but one aspect of the existential insecurities potentially facing participants across samples; it is a face-valid indicator of one's perceived capacity to be able to meet one's basic needs and is comparable across the range of economic systems represented in this dataset. Responses to these four items were strongly correlated (cross-sample $\alpha = 0.89$, 95% CI = [0.88, 0.90]). To determine the unique effect of material security on commitment when controlling for other factors expected to covary with either religious

Table 1. Means (standard deviations) for focal variables by site.

Sample/Site	Wave	MG	LG	N	Males	Material Insecurity	Age	Yrs. Formal Ed	No. of Children
Cachoeira (Brazil)	II	Christian God	Ogum	274	83	0.86 (0.29)	34.19 (12.87)	8.58 (4.02)	1.81 (1.92)
Coastal Tanna	I + II	Christian God	Tupunus	178	88	0.28 (0.36)	35.14 (14.33)	7.76 (4.22)	2.62 (2.06)
Huatasani (Peru)	II	Christian God	Apus/saints	94	37	0.79 (0.30)	38.51 (15.92)	8.96 (3.80)	2.47 (2.04)
Inland Tanna	I + II	Kalpapan	Tupunus	112	57	0.28 (0.38)	36.25 (15.40)	0.68 (2.04)	3.39 (3.35)
Kananga (DRC)	II	Christian God	Kadima/ancestor spirit	200	79	0.84 (0.34)	38.09 (14.46)	9.51 (3.32)	4.49 (2.98)
Lovu (Fiji)	I	Shiva	—	76	24	0.83 (0.34)	44.56 (16.94)	8.77 (3.78)	2.24 (1.59)
Marajó (Brazil)	I	Christian God	St. Mary	77	37	0.86 (0.24)	34.12 (13.08)	8.00 (3.53)	2.18 (2.56)
Mauritius	I + II	Shiva	Nam	245	144	0.36 (0.38)	36.93 (15.80)	8.84 (3.57)	1.34 (1.72)
Mysore (India)	II	Shiva	Chamundeshwari	165	94	0.10 (0.28)	33.56 (12.34)	13.35 (5.42)	0.91 (1.10)
Samburu (Kenya)	II	Christian God	—	40	12	0.64 (0.42)	51.27 (12.48)	0.70 (1.76)	8.43 (4.13)
Sursurunga (New Ireland)	II	Christian God	Sirmát	163	73	0.57 (0.41)	37.60 (14.13)	7.51 (2.63)	3.01 (2.49)
Turkana (Kenya)	II	Christian God	Ancestor spirit	247	91	0.20 (0.29)	38.03 (16.38)	0.48 (1.23)	3.96 (3.85)
Tyva Republic (Russia)	I	Buddha Burgan	Spirit masters	81	23	0.47 (0.28)	33.53 (12.52)	15.44 (2.29)	1.70 (1.43)
Yasawa (Fiji)	I	Christian God	Ancestor spirits	75	34	0.50 (0.40)	38.04 (15.91)	9.66 (2.42)	2.00 (2.07)
				2027	876	0.51 (0.43)	36.82 (14.87)	7.68 (5.27)	2.66 (2.84)

Notes: Wave I data were collected in the summer of 2013, and Wave II data were collected in 2015. See also Soler, Purzycki, & Lang, this issue and Cohen et al., 2017 for an account of why the Brazilian sites exhibit the highest insecurity. MG = Moralistic God; LG = Local God.

commitments or material insecurity or both, we adjusted the effects of material insecurity for the effects of age, sex, years of formal education, and number of children (see Vardy et al. in this issue on how sex differently predicts commitment to moralistic and local gods; and also Purzycki et al., 2018). By-site summary statistics are presented in Table 1. For ethnographic information about the selected deities, religious commitments, and local context at each field site see Lang et al. (2019) and its associated supplemental materials.

2.5. Models and analytical strategy

Reviewers of earlier drafts of this report identified limitations in our pre-registered analytical strategy. The most important of which was our pre-registered plan to dichotomize responses into low/high categories of commitment and then use logistic regressions to model the data. Rather than accepting the information loss associated with creating binary outcome variables, our focal models instead employ ordinal regressions to model the data more appropriately in their original format. This decision, however, came at the cost of dropping one of the commitment outcomes we had identified in our pre-registration.³ This item's response format varied between sites and waves of data collection, which made cross-sample models of this variable untenable (at least without recoding, which would, in turn, make an ordinal regression untenable). While the type of response model we employ (ordered-logit) is a departure from our pre-registered plans (logistic), the models are otherwise similarly specified. The review process identified additional and sensible model specifications, which we also include and discuss where relevant.

In line with our pre-registered model specifications, our focal Bayesian mixed-effect ordinal regressions (cumulative logit-link; Bürkner & Vuorre, 2019) estimate the association of food insecurity to commitment (mental or behavioral; independently modeled) to two types of deities (local/moralistic). In doing so, these models can provide insight as to whether and in what ways insecurity is associated with how participants allocate their commitments between the two deity types. Given that sampling occurred in 14 populations, commitment is modeled with a varying-intercept for site; and as each commitment item was asked twice (once for each deity), a varying-intercept for participant is also included. Insecurity was estimated as varying by sampling site. Models included simple effect covariates for age (years, mean centered), sex ($-1 = \text{female}$, $1 = \text{male}$), years of formal education (mean centered), and number of children (mean centered). In the supplemental materials we report results of models with and without covariates. There, we also report results of models where insecurity is treated as a simple effect. In what follows, we focus on the model estimated predictions of the interaction of deity type (local/moralistic) and food insecurity in predicting mental and behavioral religious commitments. Priors were set as weakly-regularizing: simple effects $\sim \text{Normal}(0,1)$; variance components for varying effects $\sim \text{Exponential}(1)$; and the correlation matrix of the variance components $\sim \text{LKJCorr}(4)$ (Lewandowski et al., 2009).⁴ Across all model specifications, four sampling chains converged ($\hat{R} < 1.01$ for all parameters; 1500 warmup; 4000 samples), and effective sample sizes were high. All analyses were conducted in *R* (R Core Team, 2017) and Bayesian models were executed using the *brms* (Bürkner, 2017) compiler for *RStan* (Stan Development Team, 2017). The summaries of which are presented in the supplemental materials (Tables S1 and S2). In the main text, we focus on the predictions generated by these models with regards to the association of material insecurity to mental and behavioral commitment to local and moralistic deities in these samples.

3. Results

3.1. Commitment descriptives

3.1.1. Is commitment different across deities?

Mental commitment was greater for moralistic deities than the local deities, and especially so at Christian sites (see Figures S1 and S2). At the non-Christian sites (e.g., Inland Tanna, Mysore,

Tyva Republic), the extent of mental commitment was more diffusely distributed for both deities. Similarly, behavioral commitment was more frequent toward moralistic deities than toward local deities, again especially at Christian sites (see Figure S2). However, the extent of this difference was more variable for behavioral commitment than it was for mental commitment (e.g., at Yasawa). Recall that participants were typically selected based on their association with the moralistic gods. In some contexts, everyone was associated with the moralistic deity by default. Sometimes, the belief in these two deities were in harmony or syncretically interwoven, but in others, there were religious markets and/or antagonism if the two deities came from different religious traditions (see Purzycki, et al. present volume for further discussion). Hence, the observed difference in commitment to moralistic and local deities may stem from preexisting antagonisms at some sites.

3.1.2. *Is there a differential emphasis on behavioral and mental religiosity?*

Can we see some traditions more consistently emphasizing either belief or practice? Figure 1 presents the by-site and deity distributions of responses as well as the correlations between mental and behavioral commitment. With few exceptions (Cachoeira, Yasawa, and Samburu), the relationships between these two forms of commitment were positively associated across sites and deities. At Cachoeira and Samburu, mental commitment for the moralistic deities was near the ceiling. At Yasawa, behavioral commitment for the moralistic deity was relatively quite low (although this is potentially capturing consistent and relatively unvaried weekly church attendance). Across sites, the relationship between belief and practice was consistently positive for the local deities.

3.2. *Accounting for religious commitment*

Figure 2 presents the predicted probabilities for each type of commitment to both deity types at low (−1 SD) and high (+1 SD) material insecurity. Predictions were made from models that included both demographic covariates (age, sex, years of formal education, and number of children) and in which the parameters for insecurity were estimated as varying by sampling site (the associated model summaries can be found in the last columns of Tables S1-S2). The figure illustrates the following focal results:

- (1) Moderate commitment to either deity type is infrequent, with predicted commitment concentrated at the lowest and highest options (representing no/minimal and maximal commitment).
- (2) Mental and behavioral commitment to moralistic deities is greater than commitment to local deities.
- (3) Material insecurity is associated with greater commitment to moralistic deities.
- (4) Material insecurity is associated with less commitment to local deities.

In detail, the results show that for both deity types, response options indicative of more moderate levels of commitment were chosen less frequently and show no clear difference between deities. Across all model specifications and commitment types, the average predicted probability of reporting maximal commitment (response level = 5) to the moralistic deity was 9 times greater than for the local deity (moralistic deities = 0.60; local deities = 0.07). Likewise, the average predicted probability of reporting *minimal* commitment (response level = 1) to the local deity was 7.88 times greater than for the moralistic deity (moralistic deities = 0.08; local deities = 0.65). These results are consonant with results reported in section 3.1.1 (including the caveats mentioned there).

Figure 2 also illustrates that the difference in commitment to these two types of deities is greater when existential insecurity is higher than when it is lower. With greater insecurity, the predicted probability of *maximal* mental commitment to the *moralistic* deity increases by about 1.17 times (−1 SD = 0.66, +1 SD = 0.78) while *minimal* mental commitment to the *local* deity increases by about 1.21 times (−1 SD = 0.54, +1 SD = 0.66). Similarly, with greater insecurity the predicted

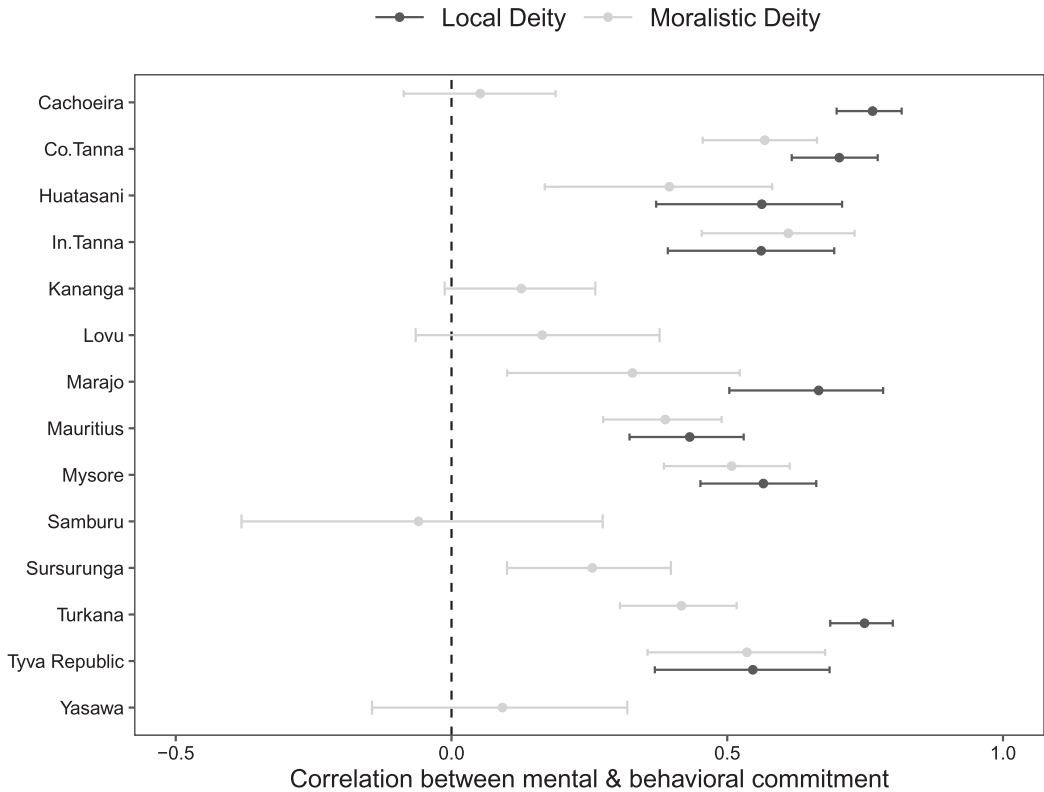


Figure 1. By-site and deity correlations between mental and behavioral commitment. Notes: At the Lovu and Samburu sites, no local deity was identified. Local deity data from the Kananga, Sursurunga, and Yasawa sites are not presented due to insufficient variation in commitment (floor effects). Error bars are 95% confidence intervals.

probability of *maximal* behavioral commitment is about 1.26 times greater for the *moralistic* deities ($-1\text{ SD} = 0.42$, $+1\text{ SD} = 0.53$) while the predicted probability of *minimal* behavioral commitment to the *local* deities is about 1.24 times greater ($-1\text{ SD} = 0.62$, $+1\text{ SD} = 0.77$). Put simply, while most participants were maximally committed to the moralistic deities and minimally committed to the local deities – the extent to which this is the case is associated with reported insecurities in ways consonant with the predictions of existential insecurity hypothesis of religious commitment. That is, greater commitment to moralistic deities was associated with greater insecurity. Also, these results indicate that commitment to the local deities is (even) less likely at higher levels of insecurity. Taken together, these results provide evidence that existential insecurities are associated with differences in both the strength and type of religious commitments to which individuals adhere.

3.2.1. Testing alternative model specifications

As mentioned above, the review process identified two additional analytical strategies. The first replaced the repeated-measures structure of the above-reported models with multivariate analysis (multiple response ordinal regression models). In so doing, this analysis tests the associations between insecurity and each type of commitment to each deity independently of the others. In contrast, the repeated measures models presented above considers commitment to both types of deities simultaneously. Despite this difference, this alternative modeling strategy remains (in our view) tenable as the existential insecurity hypothesis may very well predict that each type/form of insecurity is independently related to insecurity. The results of which indicate that material insecurity is unrelated to commitment when modeled this way (see Figure S3). Thus, in these samples,

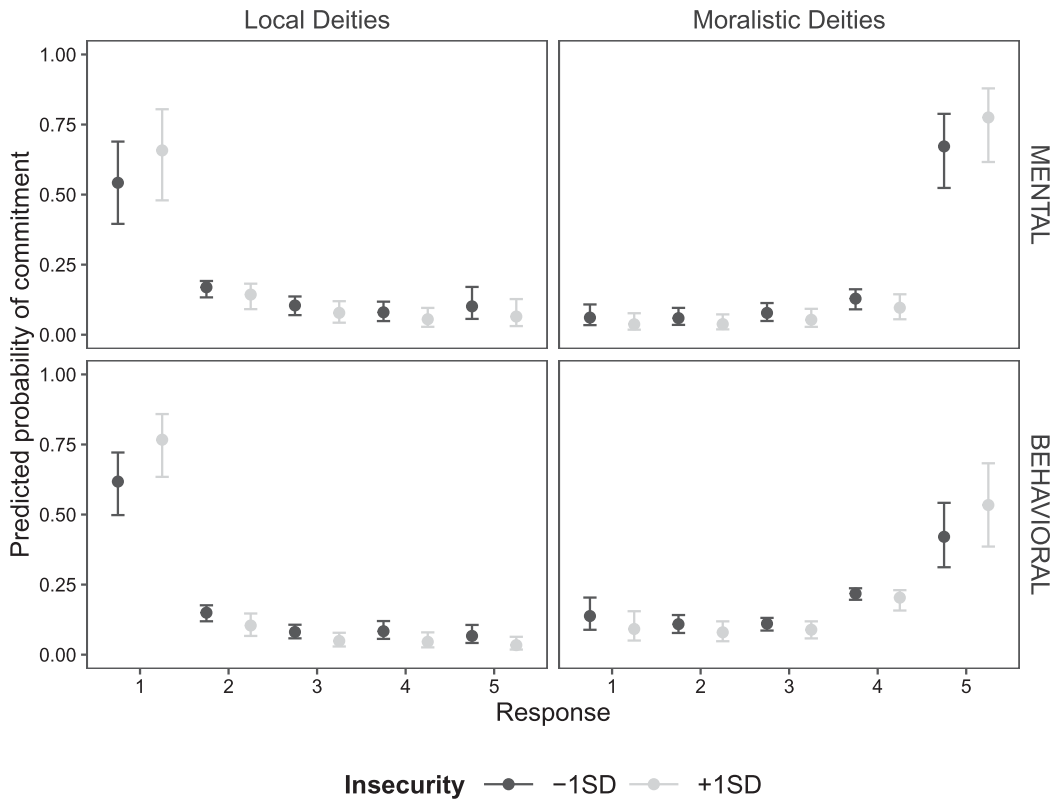


Figure 2. Predicted probability of commitment to local and moralistic deities. Notes: Predicted probabilities of commitment were estimated from ordinal regression models with a random-intercept for sampling site, individuals, and a by-site varying effect of material insecurity (covariates = age, sex, formal education, number of children held constant at their means; see last column of summary tables S1-S2). Bars are 95% credible intervals around each prediction. Black points illustrate commitment at low insecurity (-1 standard deviation) and gray points high insecurity ($+1$ standard deviation).

insecurity seems to be related to how individuals distribute their commitments *between* the examined deities rather than the extent of their commitments to either.

Another set of model specifications included deity type as a varying intercept rather than participant to account for the repeated measures. In these models, insecurity was estimated as varying by deity type as well as by site. Model summaries are presented in Table S3. The pattern of predictions estimated from these models largely corroborate our focal results but with some between-sample variability in the magnitude of commitment change (see Figures S5 to S8). Taken together, these additional results provide some indication of the stability of this pattern of results in these diverse populations.

4. Discussion

We employed a diverse data set in an examination of the prevalence, form, and demographic correlates of religious commitment across cultures in a novel test of the existential security hypothesis. Our results indicate that, across sites, commitment to (as indexed by time spent thinking about and time spent performing rituals for) *moralistic* deities is greater than to the less-moralistic *local* deities. Furthermore, of all the examined deities, the Christian God was consistently the target of the most commitment (at least with regards to how we indexed commitment in our analyses). Interestingly, the current data suggest that this might very well be at the expense of local traditions as

commitment to local deities was most distinct from that of the moralistic deities at Christian sites (see also Purzycki et al., this issue, on the interaction between belief in moralistic and local deities). This dataset still only brushes the surface of the diversity of the targets of religious commitment. That being said, these deities were selected based on their moralistic-qualities and local salience – and thus the differences in the levels of commitment observed (at least in how we measured commitment in this dataset) are notable.

In a cross-cultural test of the existential security hypothesis of religion (Norris & Inglehart, 2011), we find that greater food-related insecurity is associated with greater commitment to moralistic deities. Greater security, however, was not associated with a weakening of *all* religious commitments as would be predicted by the existential security hypothesis. Although commitment to the moralistic deities was lower amongst more secure participants, commitments to *local* traditions were greater. Thus, these results suggest that the contributions of material security to religious commitment might be better understood as shaping the *kinds* of religious commitments individuals uphold under difficult life circumstances rather than only the strength of their overall devotion. When feeling insecure, commitments to moralistic deities believed to have sufficient powers to help solve problems might serve an anxiolytic purpose (Norris & Inglehart, 2011), but when secure, adherents may be freer to explore other features of their local religious traditions. Moreover, this overall pattern of results held across two types of religious commitment (mental/behavioral) and the inclusion of other demographic controls. Importantly, however, our results do not hold for all examined modeling strategies. In particular, we find no clear association between insecurity and commitments towards these two types of deities when they are modeled independently of each other. That is, this evidence suggests that insecurity in these populations is better understood as being associated with how individuals allocate their commitments between these two deity types rather than associated with the strength of commitment to either of them independently.

Our results could be amenable to alternative interpretations. For instance, it is altogether possible that moralistic traditions thrive in and/or play a role in creating materially insecure places. However, in an analysis of a sub-sample of the current data, Purzycki et al. (2018) found no evidence that the extent to which deities are attributed with moralistic qualities covaries with material insecurity. Another interpretation may be that all of the mental and behavioral commitment demanded by moralistic traditions makes individuals feel more insecure. Nevertheless, given the growing body of research on how unpredictable, harsh, and insecurity-inducing socio-ecological conditions promote greater religious commitment and behavior (e.g., Bentzen, 2019; Botero et al., 2014; Henrich et al., 2019; Lang et al., 2015), we favor our current interpretation that the psychological experience of insecurity orients individuals towards particular kinds of religious commitments (i.e., primarily commitment to moralistic traditions).

The question, however, as to whether people explicitly seek out these moralistic deity traditions because these deities are moralistic, because they are believed to be powerful, or both, remains an open question for future research. Previous work suggests that in times of need, individuals seek out deities that are specifically believed to have capacities for ameliorating/influencing adverse life circumstances (e.g., Kay et al., 2010). And thus, in times of need, individuals may not be seeking out “moralistic” deities per se, but rather omnipotent ones. Research indicates that insecurity promotes and stabilizes harsher norm enforcement within communities (e.g., Gelfand et al., 2017), and moralistic deities may be particularly potent norm enforcers (e.g., Lang et al., 2019; Purzycki et al., 2018). The moralistic deities targeted in our samples, however, were selected for being both omnipotent and moralistic, and thus we cannot rule out these differences here. But importantly, both of these accounts might account for why we find that insecurity is associated with increased commitments to specifically moralistic deities and not all targets of devotion. Rather than seeking out specific deities, insecure individuals may seek out traditions explicitly offering support and respite from stressful conditions. As one example of how religious institutions in these populations help secure social safety nets, Weigel (this issue) discusses how involvement in the Pentecostal church in the Congo is related to prosocial sharing (at a cost to the self) amongst community members.

When food security is low, church community members generate informal insurance amongst themselves by spreading risk through their cooperative networks. More broadly, we cannot ignore that the traditions and associated deities examined here have long local histories, many of which are antagonistic in ways that likely have implications for how individuals experience, express, and/or signal their religious commitments as well as their insecurities (and the source thereof).

Indeed, another possibility is that in many societies moralistic traditions are practiced in ways that are antagonistic towards local traditions, forcing more vulnerable individuals to eschew the latter. Those who experience high insecurity are typically more socially vulnerable, and therefore might still believe in local spirits but cannot take the social risk of expressing these commitments because of antagonism between moralistic and local traditions. In Mauritius, for example, the local deity that we asked about is often appeased by black magic ceremonies. Although most people practice those ceremonies at least some of the time, there are strong norms—and even legislation—against doing so. For individuals with resources, being accused of dealing with those spirits may have reputational costs, but for those with no resources, it might be devastating, as it might cut off the only resources left to them, which is their social support network. For a wider discussion of the relationship between the deities examined here, see Purzycki et al. (this issue). This is a particularly interesting avenue for future research as most of the world's adherents to local religious traditions have been challenged with the (often antagonistic) presence of world religions like Christianity. Moreover, there is sparse empirical evidence regarding what ways and with what consequences individuals navigate the demands of adhering to multiple religious systems. In this vein, our results tentatively suggest that individual-level commitments to different traditions may be quite flexible and adaptive in light of differing socio-ecological conditions (Purzycki & McNamara, 2016).

Indeed, the results of this study might suggest that commitments are flexible such that they need not fluctuate homogeneously. In these samples, greater insecurity was most clearly related to lower *behavioral* commitments to local deities and greater of both forms of commitments to moralistic deities; whereas the differences in mental commitments to local deities at different levels of insecurity were less pronounced. This potentially highlights how mentally committing to varied deities at the same time may come at a low cost, while it is difficult, and perhaps especially so under insecure conditions, to commit resources (e.g., time) to the practices associated with different traditions. In such cases, individuals seem to adaptively allocate their resources to bolster their commitments to moralistic traditions, perhaps by virtue of the believed (e.g., divine intervention/salvation) and/or actual benefits of doing so (e.g., through the anti-anxiolytic effects of ritual participation combined with the cooperative benefits of regular participation in collective ritual practices; e.g., Lang et al., 2020; Power, 2018).

Our cross-cultural approach is correlational and cross-sectional. Moreover, the data presented here are not necessarily representative of responses in the broader communities from which our participants were sampled (except the Inland Tanna site where almost the entire community was sampled). Indeed, sampling methods were mixed across field sites, with some sites drawing participants from places of religious worship, others randomly asking participants on the street, others going door to door throughout specific neighborhoods. Importantly, these sampling methods may have differentially restricted the range of observed religious commitment (i.e., sampling at a place of religious worship is likely to draw from a population of relatively committed individuals). Furthermore, participants were primarily recruited on the basis of their adherence to moralistic god traditions; this selection process may have reduced the appearance of adherence to many local god traditions, and this should at least temper confidence in the stark contrast between commitment across both deities. Thus, insecurity could come to relate to religious commitments more clearly (and perhaps, quite differently) in a broader sample of these populations. Furthermore, in the interest of cross-culturally documenting the ebbs and flows of religious commitment, there is an obvious need for more rigorous longitudinal data. That is, an account of the patterns of religious commitment can greatly benefit from in-depth

efforts to document and account for the change in prevalence and forms of religious commitment *within* societies (Power, 2017, 2018; Purzycki, 2013b, 2016). Indeed, while the current work provides evidence for some cross-culturally stable relationships, longitudinal data would allow us to more stringently test hypotheses regarding the dynamics of religious commitments and their relationship to insecurity. Moreover, our analyses considered only one form of insecurity – food insecurity. Future research will certainly benefit from considering the relationship between alternative forms of insecurity (resource access vs safety concerns, and/or quality/quantity of local social services, for example) that can also vary in intensity and duration (acute vs chronic stressors) and forms/targets of religious commitments.

In stark contrast to predictions regarding how commitments to moralistic traditions should be greater in “safer” environments (Baumard & Chevallier, 2015), we find that it is commitment to moralistic (not local) traditions that is greatest in more insecure times. Admittedly, different hypotheses may be devised at the group and individual level regarding these associations, and future work should clarify the levels at which these correlations might develop. In their classic study of the existential security hypothesis, Norris and Inglehart (2011) hypothesized that material insecurity increases religious commitment to “transcendent” religious traditions. Our results indicate another dimension of between-tradition variability that might account for the types of religious commitments associated with material insecurity. That is, with greater insecurity, individuals invest more deeply in *moralistic* religious traditions – sometimes at the expense of less-moralistic ones. Looking forward, our results might predict that waning commitments to world religions that might accompany more certain living conditions may very well be accompanied by a resurgence in local, or even alternative religious commitments.

Notes

1. Data from one additional site (Hadzaland, Tanzania) were excluded from all our present analyses as responses to the focal items were not measured comparably to the other sites.
2. Participants were first asked to indicate whether they performed activities to talk to or appease either deity (yes/no). If participants said yes, they were also asked to indicate how often. If participants said no, they were not asked the follow up frequency question but we coded this a “never” on the frequency scale.
3. At the time of pre-registration, we had identified a third item (“How frequently do you worry about what [moralistic/local deity] thinks about you?”). However, responses to this question were recorded on different scales between sites and waves of data collection. We thus excluded this variable from our analyses.
4. The use of weakly regularizing priors systemically protects against overfitting of the model to the data during parameter estimation and underfitting (i.e., not learning enough from the data) which often leads to poor predictions (McElreath, 2015, p. 166).

Acknowledgements

The overarching project was made possible by a SSHRC partnership grant (#895-2011-1009) and the John Templeton Foundation (grant ID #40603). The project reported in this manuscript was directly supported by grants from the Understanding Unbelief Project, funded by the John Templeton Foundation (grant ID #60624) and the *Consequences of Formal Education for Science and Religion* project (#TIF0206) funded by the Issachar Fund. These grants were awarded to AB and BGP, who express thanks to Jon Lanman and Cristine Legare for their encouragement. AB acknowledges support from the Templeton World Charity Foundation (grant ID #TWCF0164) and BGP acknowledges support from the Aarhus University Research Foundation. We are thankful for Adam Barnett for being so awesome.

Funding

This work was supported by John Templeton Foundation: [Grant Number 40603,60624]; The Issachar Fund: [Grant Number TIF0206]; Social Sciences and Humanities Research Council of Canada: [Grant Number 895-2011-1009]; Templeton World Charity Foundation: [Grant Number TWCF0164].

Author contributions

AB and BGP initiated this study, preregistered the project, planned the analysis, and wrote the manuscript. AB wrote all R code, conducted all analyses, and made all graphs. J.H., A.N., and B.G.P. conceived the overarching study. C.L.A., Q.D.A., A.B., E.C., E.K.K., C.H., C.L, S.M., R.A.M., C.M., C.P., B.G.P, M.S., T.V., J.L.W., A.K.W., and D.X. collected data. M.L. and B.G.P. managed the dataset and team communication. All authors provided feedback on the manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by John Templeton Foundation: [Grant Number 40603.60624]; The Issachar Fund: [Grant Number TIF0206]; Social Sciences and Humanities Research Council of Canada: [Grant Number 895-2011-1009]; Templeton World Charity Foundation: [Grant Number TWCF0164].

ORCID

Adam Baimel  <http://orcid.org/0000-0002-2629-7952>
 Quentin Atkinson  <http://orcid.org/0000-0002-8499-7535>
 Emma Cohen  <http://orcid.org/0000-0002-5465-3440>
 Martin Lang  <http://orcid.org/0000-0002-2231-1059>
 Dimitris Xygalatas  <http://orcid.org/0000-0003-1561-9327>
 Benjamin Purzycki  <http://orcid.org/0000-0002-9595-7360>

References

- Atkinson, Q. D., & Whitehouse, H. (2011). The cultural morphospace of ritual form: Examining modes of religiosity cross-culturally. *Evolution and Human Behavior*, 32(1), 50–62. <https://doi.org/10.1016/j.evolhumbehav.2010.09.002>
- Baumard, N., & Chevallier, C. (2015). The nature and dynamics of world religions: A life-history approach. *Proceedings of the Royal Society B: Biological Sciences*, 282(1818), 20151593. <https://doi.org/10.1098/rspb.2015.1593>
- Bentzen, J. S. (2019). Acts of God? Religiosity and natural disasters across subnational world districts. *The Economic Journal*, 129(622), 2295–2321. <https://doi.org/10.1093/ej/uez008>
- Botero, C. A., Gardner, B., Kirby, K. R., Bulbulia, J., Gavin, M. C., & Gray, R. D. (2014). The ecology of religious beliefs. *Proceedings of the National Academy of Sciences*, 111(47), 16784–16789. <https://doi.org/10.1073/pnas.1408701111>
- Bürkner, P.-C. (2017). Brms: An R package for Bayesian multilevel models Using stan. *Journal of Statistical Software*, 80(1), <https://doi.org/10.18637/jss.v080.i01>
- Bürkner, P.-C., & Vuorre, M. (2019). Ordinal regression models in psychology: A tutorial. *Advances in Methods and Practices in Psychological Science*, 2(1), 77–101. <https://doi.org/10.1177/2515245918823199>
- Cohen, A. B., Siegel, J. I., & Rozin, P. (2003). Faith versus practice: Different bases for religiosity judgments by Jews and protestants. *European Journal of Social Psychology*, 33(2), 287–295. <https://doi.org/10.1002/ejsp.148>
- Cohen, E., Baimel, A., & Purzycki, B. G. (2017). Religiosity and resource allocation in marajó, Brazil. *Religion, Brain & Behavior*, 1–17. <https://doi.org/10.1080/2153599X.2016.1267029>
- Finke, R., & Stark, R. (2005). *The churching of america, 1776-2005: Winners and losers in Our religious economy* (Revised edition edition). Rutgers Univ Pr.
- Gelfand, M. J., Harrington, J. R., & Jackson, J. C. (2017). The strength of social norms across Human groups. *Perspectives on Psychological Science*, 12(5), 800–809. <https://doi.org/10.1177/1745691617708631>
- Henrich, J., Bauer, M., Cassar, A., Chytilová, J., & Purzycki, B. G. (2019). War increases religiosity. *Nature Human Behaviour*, 3(2), 129–135. <https://doi.org/10.1038/s41562-018-0512-3>
- Hruschka, D., Efferson, C., Jiang, T., Falletta-Cowden, A., Sigurdsson, S., McNamara, R., Sands, M., Munira, S., Slingerland, E., & Henrich, J. (2014). Impartial institutions, pathogen stress and the expanding social network. *Human Nature*, 25(4), 567–579. <https://doi.org/10.1007/s12110-014-9217-0>
- Kay, A. C., Gaucher, D., McGregor, I., & Nash, K. (2010). Religious belief as compensatory control. *Personality and Social Psychology Review*, 14(1), 37–48. <https://doi.org/10.1177/1088868309353750>

- Lang, M., Krátký, J., Shaver, J. H., Jerotijević, D., & Xygalatas, D. (2015). Effects of anxiety on spontaneous ritualized behavior. *Current Biology*, 25(14), 1892–1897. <https://doi.org/10.1016/j.cub.2015.05.049>
- Lang, M., Purzycki, B. G., Apicella, C. L., Atkinson, Q. D., Bolyanatz, A., Cohen, E., Handley, C., Kundtová Klocová, E., Lessorogol, C., Mathew, S., McNamara, R. A., Moya, C., Placek, C. D., Soler, M., Vardy, T., Weigel, J. L., Willard, A. K., Xygalatas, D., Norenzayan, A., & Henrich, J. (2019). Moralizing gods, impartiality and religious parochialism across 15 societies. *Proceedings of the Royal Society B: Biological Sciences*, 286(1898), 20190202. <https://doi.org/10.1098/rspb.2019.0202>
- Lang, M., Krátký, J., & Xygalatas, D. (2020). The role of ritual behaviour in anxiety reduction: An investigation of Marathi religious practices in Mauritius. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 375(1805), 20190431. <https://doi.org/10.1098/rstb.2019.0431>
- Lewandowski, D., Kurowicka, D., & Joe, H. (2009). Generating random correlation matrices based on vines and extended onell method. *Journal of Multivariate Analysis*, 100(9), 1989–2001. <https://doi.org/10.1016/j.jmva.2009.04.008>
- McElreath, R. (2015). *Statistical rethinking: A Bayesian course with examples in R and stan*. Chapman and Hall/CRC.
- Norenzayan, A. (2016). Theodiversity. *Annual Review of Psychology*, 67(1), <https://doi.org/10.1146/annurev-psych-122414-033426>
- Norenzayan, A., Shariff, A. F., Gervais, W. M., Willard, A. K., McNamara, R. A., Slingerland, E., & Henrich, J. (2016). The cultural evolution of prosocial religions. *Behavioral and Brain Sciences*, 39, e1 (19 pages). <https://doi.org/10.1017/S0140525X15001259>
- Norris, P., & Inglehart, R. (2011). *Sacred and secular: Religion and politics worldwide* (2 edition). Cambridge University Press.
- Power, E. A. (2017a). Social support networks and religiosity in rural South India. *Nature Human Behaviour*, 1(3), 0057. <https://doi.org/10.1038/s41562-017-0057>
- Power, E. A. (2017b). Praxis and doxa: What a focus on ritual can offer evolutionary explanations of religion. *Religion, Brain & Behavior*, 0(0), 1–3. <https://doi.org/10.1080/2153599X.2017.1323786>
- Power, E. A. (2018). Collective ritual and social support networks in rural South India. *Proceedings of the Royal Society B: Biological Sciences*, 285(1879), 20180023. <https://doi.org/10.1098/rspb.2018.0023>
- Purzycki, B. G. (2013). Toward a Cognitive ecology of religious concepts: Evidence from the Tyva republic. *Journal for the Cognitive Science of Religion*, 1(1), <https://doi.org/10.1558/jcsr.v1i1.99>
- Purzycki, B. G. (2016). The evolution of gods' Minds in the Tyva republic. *Current Anthropology*, 57(S13), S88–S104. <https://doi.org/10.1086/685729>
- Purzycki, B. G., Apicella, C., Atkinson, Q. D., Cohen, E., McNamara, R. A., Willard, A. K., Xygalatas, D., Norenzayan, A., & Henrich, J. (2016a). Moralistic gods, supernatural punishment and the expansion of human sociality. *Nature*, 530(7590), 327–330. <https://doi.org/10.1038/nature16980>
- Purzycki, B. G., Apicella, C., Atkinson, Q. D., Cohen, E., McNamara, R. A., Willard, A. K., Xygalatas, D., Norenzayan, A., & Henrich, J. (2016b). Cross-cultural dataset for the evolution of religion and morality project. *Scientific Data*, 3(1), sdata201699. <https://doi.org/10.1038/sdata.2016.99>
- Purzycki, B. G., Henrich, J., Apicella, C., Atkinson, Q. D., Baimel, A., Cohen, E., McNamara, R. A., Willard, A. K., Xygalatas, D., & Norenzayan, A. (2018a). The evolution of religion and morality: A synthesis of ethnographic and experimental evidence from eight societies. *Religion, Brain & Behavior*, 8(2), 101–132. <https://doi.org/10.1080/2153599X.2016.1267027>
- Purzycki, B. G., & McNamara, R. A. (2016). An ecological theory of gods' minds. In D. C. Helen, & N. Ryan (Eds.), *Advances in religion, cognitive science, and experimental philosophy* (pp. 143–167). Continuum.
- Purzycki, B. G., Ross, C. T., Apicella, C., Atkinson, Q. D., Cohen, E., McNamara, R. A., Willard, A. K., Xygalatas, D., Norenzayan, A., & Henrich, J. (2018b). Material security, life history, and moralistic religions: A cross-cultural examination. *PLOS ONE*, 13(3), e0193856. <https://doi.org/10.1371/journal.pone.0193856>
- Purzycki, B. G., & Sosis, R. (2011). Our gods: Variation in supernatural minds. In U. Frey (Ed.), *Essential building blocks of Human nature* (pp. 77–93). Springer. https://doi.org/10.1007/978-3-642-13968-0_5
- R Core Team. (2017). *R: A language and environment for Statistical computing*. R Foundation for Statistical Computing. <https://www.R-project.org>.
- Rappaport, R. A. (1999). *Ritual and religion in the making of humanity* (1 edition). Cambridge University Press.
- Sibley, C. G., & Bulbulia, J. (2012). Faith after an earthquake: A longitudinal study of religion and perceived health before and after the 2011 christchurch New Zealand earthquake. *PLoS ONE*, 7(12), e49648. <https://doi.org/10.1371/journal.pone.0049648>
- Snarey, J. (1996). The natural environment's impact upon religious ethics: A cross-cultural study. *Journal for the Scientific Study of Religion*, 35(2), 85. <https://doi.org/10.2307/1387077>
- Solt, F., Habel, P., & Grant, J. T. (2011). Economic inequality, relative power, and religiosity*. *Social Science Quarterly*, 92(2), 447–465. <https://doi.org/10.1111/j.1540-6237.2011.00777.x>
- Stan Development Team. (2017). *RStan: The R interface to Stan*. <http://mc-stan.org>.
- Xygalatas, D., Mitkidis, P., Fischer, R., Reddish, P., Skewes, J., Geertz, A. W., Roepstorff, A., & Bulbulia, J. (2013). Extreme rituals promote prosociality. *Psychological Science*, 24(8), 1602–1605. <https://doi.org/10.1177/0956797612472910>