The Cultural Evolution of Religion and Cooperation

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Abstract

Since the earliest days of the social sciences, the relationship between religion and cooperation has been a central topic. In this chapter, we critically review popular cultural evolutionary perspectives on religion and cooperation and consider how they frame the relationships between religious beliefs, behaviors, and the moral rules that motivate cooperation. We then offer an account of how religious systems can contribute to the stability of social life more generally, with cooperative dilemmas occupying a subset of a broader range of socioecological challenges that supernatural appeals might help resolve. We also provide a critical overview of methods used throughout much of the contemporary work on religion and cooperation. In doing so, we provide useful ways forward for testing how appeals to gods, spirits, and other supernatural forces can, in at least some cases, address locally important challenges to cooperation.

Keywords: religion, morality, cooperation, cultural evolution

1. Introduction

Religion is a human universal. All known societies, historical and contemporary alike, exhibit some commitment to superhuman agents or forces. Indeed, religion is often interwoven with the very fabric of community life. Since the dawn of the social sciences, this has led scholars to theorize the relationship between religion and cooperation (Durkheim, 1912; Evans-Pritchard, 1965; Malinowski, 1936; Rappaport, 1968; Swanson, 1960; Tylor, 1871; Wilde, 1897). To this day, the possible roles that religious beliefs and rituals might have played in societal evolution remain front and center in the cognitive and evolutionary human sciences (Beheim et al., 2021; McKay and Whitehouse, 2014). Broadly speaking, theorists have disagreed about the extent

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to which religions – and their myriad psychological and behavioral expressions – can contribute to the expansion and stability of cooperation beyond kith and kin.

In this chapter, we outline popular cultural evolutionary theories and methods that aim to characterize the relationship between religion and cooperation. We start by briefly clarifying our key terms (Section 2.1), and then review current perspectives on the cultural evolution of religion and cooperation (Sections 2.2 – 2.2.3). We then expand on existing perspectives and carve out a distinct account of how religious systems might contribute to the stability of social life (Section 3). We argue that beliefs in and appeals to gods and spirits are signals that point to locally salient and costly socioecological dilemmas and the behaviors that mediate their outcomes (Bendixen et al., nd; Bendixen and Purzycki, 2020, 2021; Purzycki and Sosis, 2022). The upshot of this view is that we can account for variation in religious expression by examining the contexts in which they have flourished (Bendixen and Purzycki, nd; Lightner and Purzycki, nd; Purzycki et al., nd). We conclude with a critical overview of some popular methods employed in the study of religion and cooperation (Section 4) and, along the way, point to avenues for future research with a particular emphasis on ethnography and behavioral observation.

2. The relationship between religion and cooperation

2.1. Key terms

The religion concept is regularly contested (Bloch, 2008; McKay and Whitehouse, 2014; Lightner et al., 2021), but at its heart – and as we use it here – “religion” refers to a conglomerate of diagnostic features that include beliefs, values, traditions, sacred objects, and ritual behaviors, each of which lend themselves to contemporary scientific inquiry (see Sosis, 2009, for discussion). We also use the notions “gods”, “spirits”, and “deities” interchangeably to refer generally to supernatural/spiritual forces or agents.

“Morality” is similarly ambiguous concept. Cooperation, morality, and prosociality are closely linked concepts (Alexander, 1987; Curry et al., 2019), and we take “morality” to refer to behavioral norms that involve some level of pro- or anti-sociality that confer either benefits or costs to others. “Moral” acts are those that offer benefits to others and “immoral” acts impose costs (Purzycki et al., 2018b). Note also that when we discuss research on religion fostering prosociality or cooperation, we assume *parochial* (i.e., in-group) cooperation as opposed to *universal* or *generalized* prosociality (e.g., Norenzayan et al., 2016b), unless otherwise specified. This distinction matters, since cooperation on one level of organization can be regarded as non-cooperation on another level (e.g., Muthukrishna et al., 2017), such as

when religions bind some groups together but inspire or rationalize violence toward other groups (Skali, 2017).

2.2. Hypotheses

The relationship between religion and cooperation has been a central discussion in the contemporary cognitive and cultural evolutionary sciences. A central question is whether or not religion contributes to cooperation, and approaches variously emphasize religious *beliefs* or *behaviors*.

Among the areas focusing on religious beliefs, the central debates are about whether or not beliefs' moral relevance is important in the evolution of cooperation. Some deny a strong impact of religious beliefs on cooperation. For instance, one suggestion is that the cooperative aspects of religion are relegated to how our evolved moral cognition makes morally interested deity concepts easier to retain and transmit to each other. Another position maintains that the so-called "moralistic traditions" (i.e., those with an explicit moral doctrines and/or with morally interested deities) are responses to increased material affluence and social complexity (Section 2.2.1). Others argue that the psychology underlying religious beliefs motivate individuals to cooperate or even expand cooperation beyond reciprocity between kith and kin (Section 2.2.2).

Others emphasize religious behaviors. Most of this work posits that as costly signals, ritual acts have a dual-function of reliably communicating commitment to the group, but also prevent non-cooperative individuals from joining. Some instead emphasize how religious traditions spread through costly rituals (Section 2.2.3). In Section 3, we broaden this perspective and assess a wider variety of spiritually motivated practices in context. There, we argue that religion's role in cooperation has been central, and that in the ethnographic record, religions frequently appear to improve the cooperative challenges that societies face.

2.2.1. Religion as an extension of evolved social and moral cognition

One popular view holds that god concepts are cross-culturally widespread because they are cognitively "catchy," resonating with reliably-developing social cognition (Willard & Baimel, present volume). Boyer (2001) proposes that in addition to their superhuman attributes (e.g., disembodied, invisible, omnipresent), gods, ghosts, and spirits are inferred to possess socially and morally relevant knowledge that in turn makes them particularly memorable. These attractive concepts are not socially consequential *per se*, but they can be (and often are) co-opted by mental mechanisms whose evolved design features are adaptive for dealing with social conflict and cooperation (Boyer, 2000). Some experimental evidence indeed suggests that superhuman

agents are intuitively associated with moral knowledge (e.g., [Purzycki et al., 2012](#)). In addition, cross-cultural individual-level studies have found evidence of baseline levels of moralization in people’s reasoning about spirits and deities using both item response scales ([Purzycki, 2013a](#); [Purzycki et al., 2022b](#)) and free-listing ([Bendixen et al., nd](#); [Purzycki, 2011, 2016](#)). These findings are corroborated by developmental research showing that young children in Western societies readily attribute moral knowledge to God (e.g., [Heiphetz et al., 2016](#); [Wolle et al., 2021](#)).

Others focus their efforts on examining the evolution of so-called “moralistic traditions”. These are variously operationalized as those with explicit moral rules about cooperation and/or those with gods that sanction immoral acts. Some speculate that moralistic traditions arose as a response to increased societal affluence among large-scale societies. For instance, based on a variant of life-history theory, [Baumard and Boyer \(2013\)](#) advance the argument that when basic human needs such as access to food and protection are met, people “turn their attention to other domains of evolved preferences, such as maximizing personal wellbeing, enjoying friendship, and cultivating aesthetics, the good life that is portrayed as the goal of many moral movements” ([Baumard and Boyer, 2013](#), p. 277). This view is consistent with the observation that contemporary world religions and moral movements largely emerged and spread out from a few particularly fertile geographical regions during the Axial Age (see also [Baumard et al., 2015](#)).

However, a growing body of literature has objected to the liberal use of life-history theory in many corners of the social sciences, specifically taking issue with the notion that environmental stress versus affluence evokes “fast” vs. “slow” behavioral strategies respectively (i.e., investment in short-term vs. long-term material and reproductive goals) (e.g., [Nettle and Frankenhuys, 2020](#)). This is the variant of life-history theory to which [Baumard and Boyer \(2013\)](#) generally appeal (see also [Baumard and Chevallier, 2015](#); [Jacquet et al., 2021](#)), warranting at least some skepticism about their argument on theoretical grounds. Moreover, using cross-cultural, individual-level data, [Purzycki et al. \(2018c\)](#) did not find clear empirical support for the key causal path from material (in)security to locally relevant deities’ moral salience, knowledge breadth, or punitiveness. Cross-cultural and historical data have also called into question the idea that societies reach some threshold level of energy capture and affluence before moralizing religions emerge (e.g., [Beheim et al., 2021](#)).

Furthermore, evidence from contemporary ethnographic research motivated by these exact questions ([Bendixen et al., nd](#); [McNamara et al., 2016](#); [McNamara and Henrich, 2018](#); [McNamara et al., 2021](#); [Purzycki, 2011, 2013b, 2016](#); [Purzycki et al., 2022b](#); [Singh et al., 2021](#)) as well as general surveys of the ethnographic literature ([Boehm, 2008](#); [Purzycki and McNamara, 2016](#); [Purzycki and Sosis, 2022](#); [Swanson,](#)

1960) suggest that many deities of smaller-scale societies are – and historically were likely to be – quite morally salient. In other words, gods that care about and even punish immoral behavior are quite common in the ethnographic record (see Section 3 for further discussion). Thus, the emergence of so-called “moralistic religions” likely predates higher levels of large-scale cooperation. This is particularly relevant for the view that moralistic supernatural punishment has contributed to human cooperation, a perspective to which we now turn.

2.2.2. Knowledgeable, monitoring, and punitive supernatural forces curb selfishness

The potential for large-scale cooperation among human societies is unrivaled in the animal kingdom; in lieu of close genetic kinship, for example, large-scale cooperative systems are difficult to achieve in nature (Boyd and Richerson, 2021; Henrich and Muthukrishna, 2021, Takezawa, present volume). As social complexity increases, selfish behavior can more easily go unpunished, and societies therefore require effective means to reduce defection and exploitation that will otherwise undermine social cohesion.

The *supernatural punishment hypothesis* (SPH) offers one such solution, positing that beliefs about punitive agents, such as moralizing gods, supply societies with a mechanism for curbing temptation to free-ride in human cooperative endeavors (Johnson, 2005, 2016; Johnson and Bering, 2006). According to this view, beliefs about supernatural punishment recruit reliably-developing social cognition, such as punishment avoidance and the ability to infer other people’s mental states, to anticipate a perceived, supernaturally imposed cost on deviations from normative behavior (e.g., Schloss and Murray, 2011). Such beliefs and their underlying motivational systems, in turn, can promote an expansion of parochial cooperation beyond tight-knit social networks, such as kin groups with genetically overlapping interests and reciprocal relations between routinely interacting non-kin. Hence, the SPH proposes that beliefs about knowledgeable deities that specifically punish for immoral behaviors may drive an expansion of cooperation beyond immediate parochial boundaries (Roes and Raymond, 2003; Norenzayan et al., 2016a). We return to this discussion in Section 3.

Though mixed, some experimental evidence indicates that people behave less selfishly when presented with cues of surveillance (Dear et al., 2019; Northover et al., 2017a,b); however, the extent to which supernatural attributes can be recruited to elicit this effect is unclear (Schloss and Murray, 2011). In two cross-community economic game experiments, Ge et al. (2019) failed to find clear evidence of an association between belief in supernatural punishment or reward and game play, instead finding that self-reported religious practices and reputational concerns, along

with economic stability and educational level, seemed to be stronger predictors of honest behavior. Importantly, one experiment in the study was not anonymous but public, which might partly account for the reported findings.

Other studies find clearer positive – but not unqualified – relationships between beliefs in supernatural punishment (and reward in some cases, such as karma and afterlife beliefs) and various indices of cooperation with society-level data (Botero et al., 2014; Johnson, 2005; Roes and Raymond, 2003; Skogsgard et al., 2020; Snarey, 1996; Stark, 2001; Swanson, 1960; Watts et al., 2015), in cross-national surveys (e.g., Atkinson and Bourrat, 2011; McCleary and Barro, 2006), and with individuals in experimental settings (e.g., Haruvy et al., 2018; White et al., 2019; Shariff and Norenzayan, 2007, 2011).

The relationship between moralizing gods (i.e., morally punitive and/or rewarding deities) and cooperation has been a central part of the cultural evolution literature, as suggested by the widespread influence of the SPH and similar perspectives in recent years (e.g., Johnson, 2016; Norenzayan et al., 2016a; Henrich, 2020; Watts et al., 2015). Across four experimental economic game experiments conducted with over 2000 individuals among 15 societies, individual-level ratings on a “supernatural punishment and omniscience” index predicted more cooperative game play (Lang et al., 2019) (Figure 1). That is, the more people said their deity knows and can punish, the more prosocial they behaved in the game.

Note, however, that we may need to distinguish a deity’s *generalized* punitive tendencies and knowledge breadth, on the one hand, from said deity’s *explicit* moral concerns on the other. In Lang et al. (2019) – which currently represents the most cross-culturally diverse assessment of religious beliefs and cooperation with individual-level data – unlike beliefs about a deity’s punitiveness and knowledge breadth, beliefs about gods’ moral interests (i.e., how much a god cares about punishing theft, deceit, and murder) did *not* predict game behavior². Figure 1 summarizes these results: “Omni/Pun” is the “supernatural punishment and omniscience” index³ while “Moral Interest” is explicit moral concerns⁴. Note too the null result

²Note too that a more developed examination suggests that omniscience drives the effect more than punishment; the more gods are believed to know, the more individuals give to others (Purzycki et al., 2018b).

³This was the mean of four questions: “Does [moralizing/local god] ever punish people for their behavior?”; “Can [moralizing/local god] influence what happens to people after they die?”; “Can [moralizing/local god] see into people’s hearts or know their thoughts and feelings?”; “Can [moralizing/local god] see what people are doing if they are far away, in...[distant town or city familiar to participants]”. Response options: Yes / No

⁴“How important is punishing thieves to [moralizing/local god]?”; “How important is punishing

Figure 1: **Relationship between beliefs in moralistic gods’ knowledge and punishment (Omni/Pun), interest in moralistic punishment (Moral Interest), reward, and cooperation across random allocation (top) and dictator (bottom) games.** The top plot reports odds ratios (and 95% confidence intervals) of estimates indicated the likelihood of allocating a coin to a geographically distant co-religionist in a random allocation game (x -axis is on logarithmic scale). The bottom plot reports estimates from a tobit regression predicting allocations in a dictator game. Illustrated here are outcomes in two different permutations across the two different games. In one, participants allocated coins between themselves and a geographically distant co-religionists (Self. vs. Distant) and in the other, they allocated coins between a co-religionist that was in the same community as participants and another anonymous geographically distant co-religionist (Local vs. Distant). Estimates across both games indicate effects predicting allocations to a geographically distant co-religionist. Estimates are from Models 5 in the supplements for [Lang et al. \(2019\)](#), pp. 32-33. See accompanying R code.

liars to [moralizing/local god]?”; “How important is punishing murderers to [moralizing/local god]?”.

for “Reward”, namely whether a deity is viewed as rewarding of “proper” behavior⁵.

To sum up, this lack of reliable and direct evidence that gods’ direct concern with human morality promote prosociality questions the importance of explicitly moral traditions in human cooperative affairs. Yet, the hypothesis that beliefs about watchful, monitoring, and knowledgeable supernatural agents in general can motivate prosocial tendencies in some form or another is on more firm evidentiary grounds (see also Watts, this volume).

2.2.3. *Rituals as costly signals*

What, then, is the relationship between religious *behavior* and cooperation? For Roy Rappaport (1999), morality is “implicit in ritual’s structure” (132). According to this view, ritual participation expresses commitment to a set of social mores, rules, and conventions which themselves are enacted and expressed through the ritual’s content and context. Rappaport’s view is instantiated in contemporary research examining the behavioral, psychological, and social implications of ritual participation (see also Whitehouse, this volume). Specifically, some scholars argue that participation in rituals amounts to a *costly signal* that conveys genuine commitment to the community and its moral and social codes (Brusse, 2020; Bulbulia and Sosis, 2011; Shaver and Bulbulia, 2016; Sosis, 2003, cf. Murray and Moore 2009). The otherwise puzzling costliness (e.g., in time, resources, and opportunity costs) of religious devotion, according to this view, is not a bug but a feature: high costs increase the reliability of a signal by making its display hard to fake, discouraging dishonest commitment displays (Sosis, 2003).

Consistent with predictions from this theoretical perspective, studies have found that observed as well as self-reported participation in various forms of ritual is positively associated with fair play in economic games (Soler, 2012; Xygalatas et al., 2018), longevity of communes (Sosis and Bressler, 2003), prosocial reputation (Power, 2017a), size of reciprocal social network (Power, 2017b), and perceived trustworthiness (Hall et al., 2015; Purzycki and Arakchaa, 2013; Ruffle and Sosis, 2007; Shaver et al., 2018; Tan and Vogel, 2008). Ritual involvement and costs increase with exposure to warfare (Henrich et al., 2019; Sosis et al., 2007), suggesting that signals will cost more in order to increase the clarity of their message in contexts where solidarity

Response options: (0) not important at all; (1) a little important; (2) important; (3) very important; (4) the most important thing.

⁵“How often does [moralizing/local god] assist people in their lives or reward them for proper behavior?”. Response options: 0) very rarely/never; (1) a few times per year; (2) a few times per month; (3) a few times per week; and (4) every day or multiple times per day.

is threatened. It also suggests that ritual signals can feed back into ingroup cohesion and intergroup conflict.

Several proximate mechanisms have been proposed to explain this causal relationship between religious behavior and cooperation, many of which posit that communal rituals harness input and output of reliably-developing psychosomatic systems (Legare and Nielsen, 2020), including rhythms and synchrony (e.g., Lang et al., 2017; Reddish et al., 2014; Wiltermuth and Heath, 2009, cf. Wood et al. 2018), experiencing collective pain (e.g., Mitkidis et al., 2017; Xygalatas et al., 2013a), dysphoria (Whitehouse, 1996), and euphoria (Russell et al., 2012; Whitehouse and Lanman, 2014), features which might be most potent at promoting cooperation when combined (e.g., Cohen et al., 2014).

A related view argues that the costliness of religious behaviors contribute to their own cultural propagation, along with their underlying values, commitments, symbols, and beliefs, all the while binding people together in distinct cultural communities (Atran and Henrich, 2010; Richerson and Henrich, 2012; Wildman and Sosis, 2011). Since people are generally sensitive to information sources, contexts, and attributes (Boyd and Richerson, 1985; Kendal et al., 2018, see present volume’s section on “Innovation and social learning”), it is likely that people preferably imitate and learn from individuals that exhibit consistency in their words and actions, and religion might recruit such social learning strategies. Specifically, performing costly actions in the name of some conviction might function as a “credibility-enhancing display”, which makes that conviction more likely to be adopted by onlookers (Henrich, 2009; Turpin et al., 2019). This perspective offers an explanation as to why religious specialists in many societies often refrain from sex and certain foods, namely that foregoing reproductive and caloric opportunities constitute costly displays of deep cultural commitment which in turn increase and bolster the commitment levels of community members, facilitating cooperation along the way⁶ (Singh and Henrich, 2020).

⁶Incidentally, this might also help explain the cultural evolution of non-belief; in lieu of religious CREDs in their immediate surroundings, people will be less inclined to adopt religious beliefs (Gervais and Henrich, 2010). This however matters to the extent that belief matters. Outside of the narrow subset of faith-based traditions, participation is typically more important as an indicator of commitment (Cohen et al., 2018).

3. Gods and the socioecological landscape

3.1. Appeals to the supernatural across cultures

Building on much of this work, [Purzycki and McNamara \(2016\)](#) argue that morality and cooperation-enhancing rituals are just a subset of general concerns that people ascribe to their deities. Other pertinent concerns include behaviors toward nature (e.g., spoiling natural resources, excessive foraging) and toward the divine (e.g., faith, devotion, ritual performance). According to this view, the things that a particular deity will come to be associated with in a particular cultural context will reflect salient features of the local social ecology ([Bendixen et al., nd](#); [Bendixen and Purzycki, 2020](#); [Purzycki and Sosis, 2022](#)). Some ethnographic cases help illustrate this view.

For instance, *spirit-masters* of the Tyva Republic, Siberia, are primarily angered by pollution and ritual neglect at places of worship located at natural springs and territorial borders. These associations correspond to problems with territorial trespassing and preservation of natural resources, salient issues for traditional herding communities ([Purzycki, 2011, 2013b, 2016](#)). Predictably, ritual offerings at cairns signal trustworthiness between Tyvans ([Purzycki and Arakchaa, 2013](#)).

On the island of Tanna, Vanuatu, a garden spirit, *Tupunus*, punishes violations of garden taboos, a set of ritualized rules prescribing what should and should not be done in the local gardens at various times of the year ([Atkinson, 2018](#); [Bendixen et al., nd](#)). Because these gardens are central to local subsistence, these rules likely ensure proper cultivation and equitable distribution of garden fruits and vegetables ([Bonnemaison, 1991](#); [Flexner et al., 2018](#)). In the Maya lowlands of Guatemala, forest spirits are believed to punish acts of devastation and exploitation of the flora and fauna of the forest, beliefs which in turn appear to sustain local biodiversity and agricultural output ([Atran et al., 2002](#)). In Panama, small areas of the rainforests are protected *Kalu*, or spiritual sanctuaries. Areas of the sea are similarly regarded as protected *Biria*. Deference to their guardian spirits prevent people from overexploiting resources ([Sandner, 2003](#)), and failing to respect these spirits is believed to incur their revenge through misfortune, such as epidemics, in an offender’s community. Medicinal plants in these territories are therefore collected with respect for these spirits, supporting a traditional “conservation ethic” among the Kuna ([Redford and Stearman, 1993](#); [Ventocilla et al., 1995](#)).

Among the Mentawai on Siberut Island, Indonesia, the local spirit *Sikameinan* attacks people who do not share meat – particularly private windfalls that are not easily monitored by other people – and can be appeased by hosting ceremonies that involve sharing meat with community members; however, *Sikameinan* is not

widely believed to care for other kinds of moral transgressions, such as stealing or lying (Singh et al., 2021). Across Fiji, ancestor spirits (*kalou-vu*) are typically perceived as concerned with adherence to rules of etiquette as well participation in nightly kava ceremonies, behaviors which are suggested to contribute to communal coordination (McNamara and Henrich, 2018; McNamara et al., 2021; Shaver et al., 2017; Tomlinson, 2004, 2007; Turner, 2012).

All such cases suggest that beliefs about and appeals to knowledgeable, watchful, and punitive deities reflect salient features of local social ecologies (Bendixen et al., nd; McNamara and Purzycki, 2020; Purzycki et al., nd). Specifically, gods’ concerns tend to revolve around pressing cooperative dilemmas (Bendixen and Purzycki, nd; Lightner and Purzycki, nd; Purzycki and McNamara, 2016; Shariff et al., 2014), such as social coordination and resource maintenance and distribution, that are notoriously difficult to solve due to a conflict of interest between the collective and the individual: the collective is better off if everybody cooperates (e.g., respecting territory borders, sharing foods, conserving public resources, adhering to local social norms, etc.), whereas the individual is better off (at least in the short-term) if *everybody else* cooperates while they themselves free-ride (e.g., by trespassing territories, accepting foods from others without sharing ones own foods, over-exploiting resources, violating norms, etc.).

Cross-culturally, then, beliefs about and appeals to deities are aligned with a variety of socioecological challenges, making them fundamentally morally *relevant* – that is, relevant for how people ought to behave around and toward each other – even if these traditions are not concerned with *explicit* moral prohibitions and prescriptions (cf., Teehan, 2016). In other words, deities evolve to care about what their cultural community needs them to care about to sustain relative stability (Lee-son and Suarez, 2015; McNamara and Purzycki, 2020; Rossano, 2007; Rossano and LeBlanc, 2017).

3.2. Moralistic gods revisited

With all this said, recent cross-cultural evidence in fact points to positive default levels of moral concerns attributed to deities: more often than not, people associate moral concerns with their gods and spirits (Bendixen et al., nd; Purzycki et al., 2022b). This observation, especially among small-scale societies, might seem at odds with the common claim that moralizing *high gods* are more prevalent among larger societies (e.g., Swanson, 1960; Roes and Raymond, 2003; Johnson, 2005), a subtlety that is often lost in the literature.

Consistent with other cross-cultural data sets (e.g., Murdock and White, 1969), Swanson (1960) defines a “high god” as a deity who “created all reality and/or

is reality’s ultimate governor” (p. 210). This operationalization leaves out many ethnographic examples of spirits and deities who sanction moral violations (e.g., with misfortune or afterlife effects) that aren’t creator deities. As a lot of work has shown (see [Purzycki and McKay, nd](#); [Purzycki and Watts, 2018](#)), if we limit our inquiry to high gods, we see that their limited presence is (weakly) positively associated with society size (Figure 2). When we focus more broadly on moralistic supernatural punishment (see [Watts et al., 2015](#)), however, we see that gods, spirits, and ancestors who sanction moral violations are substantially more widespread, including among smaller societies. In other words: While the claim that moralizing *high gods* are mostly associated with larger-scale and cooperative societies might be technically true (even though the actual values are quite low across all levels), gods that punish immoral behavior are found in abundance at all society types.

Figure 2: **Percentage of moralizing high gods (black) and gods who are broadly concerned about, and punitive toward, moral violations (gray) by society size.** *High gods* refer to creator deities, as described in the main text. *Supernatural sanctions* is more inclusively defined, and refers to any moralistic deities (high or otherwise) that impose supernatural sanctions for moral violations (e.g., with effects on health, afterlife consequences, or other types of misfortune). Data are from [Swanson \(1960\)](#). See the accompanying R code.

The ubiquity of moralizing gods across cultures makes sense from the discussion of moral cognition (Section 2.2.1) and the perspective we detailed in this section:

social life is rife with promises and pitfalls, many of which revolve around cooperation and coordination and therefore have inter-personal consequences for the local community. These are exactly the kinds of circumstances that often attract supernatural monitoring and punishment (Purzycki and McNamara, 2016; McNamara and Purzycki, 2020). Likewise, the finding discussed in Section 2.2.2 that certain explicit moral concerns of deities failed to predict economic game play in a large cross-cultural investigation is also consistent with this view. The specific moral concerns in question – theft, lying, and murder – were not directly relevant to the game context and therefore rating a deity high (or low) on these concerns should not necessarily translate into modified game behavior. Rather, we would expect god beliefs to be more potent at promoting cooperative behavior within the context of the given socioecological problem toward which appeals to the supernatural are enacted.

What makes some particular socioecological problems more likely than others to become the object of supernatural attention and punishment? This is currently an unresolved question, although some predictions include: the cost and salience of the problem and its widespread defection; feasibility and availability of secular monitoring and sanctioning; and how disruptive defection might appear to individuals (Bendixen et al., nd; Bendixen and Purzycki, 2020, nd). Another open question asks *how*, through some combination of cognitive and cultural evolutionary processes, gods’ concerns come to revolve around socioecological dilemmas and the behaviors that might mitigate these (Bendixen and Purzycki, 2020, 2021; Fitouchi and Singh, 2022). These open questions provide a clear theoretical path forward, and how we assess them requires careful attention to methodology.

4. Methods employed in the study of religion and cooperation

As reviewed in this chapter, the literature on religion and cooperation offers no shortage of theories, but much of the empirical work relies on either crude group-level data that were not originally collected with an eye to the research questions at hand (see Purzycki and McKay, nd; Purzycki and Watts, 2018), or on exclusively Westernized samples with sub-optimal research designs (see Galen, 2012). Recently, however, using cross-cultural and individual-level data, direct and systematic investigations of religion and cooperation have gained more popularity (e.g., Ge et al., 2019; Lang et al., 2019; Purzycki et al., 2018a). Furthermore, much of the current scholarly attention narrowly focuses on the explicit and generalized moral nature of deities, and relatively few studies have systematically surveyed the perceived concerns of deities in traditional and small-scale societies (for some exceptions, see Atran et al., 2002; Bendixen et al., nd; McNamara et al., 2021; Purzycki, 2011, 2013a, 2016; Singh

et al., 2021). Here, we turn to a critical overview of various methodologies employed in studies of religion and cooperation, distinguishing between measures of group-level and individual-level variation.

4.1. Group-level

Some studies analyze group- or society-level data to assess associations between various indices of cooperation and religiosity. Many popular hypotheses are about individual-level cultural and cognitive processes, but utilize group-level data. This runs the risk of confusing the appropriate levels of analysis, particularly when testing theoretical insights based on society-level trends (cf. Purzycki et al., 2018c).

Further, many society-level studies rely on data coded from ethnographic sources that did not necessarily attend to key variables necessary to reliably address contemporary theories (cf., Purzycki and Watts, 2018). While these data sources present a unique opportunity for modern research on cross-cultural trends (Slingerland et al., 2020), they are problematic for a few key reasons. First, an absence of evidence from an ethnographic source reflects a bias in the data-generating process, meaning that several processes could give rise to non-observation; a target feature could be truly absent, but it could also imply that the feature was either simply not observed or recorded by an ethnographer. In other words, absence of evidence should not be taken to imply evidence of absence (Beheim et al., 2021). Second, the coding schemes used to quantify features among ethnographic studies can be contested among different researchers. For instance, the criteria used to define what constitutes the presence vs. absence of a moralizing “high god” might or might not consider whether or not a deity is a creator deity. As we showed in Figure 2, the operationalizations applied to cross-cultural and ethnographic data can—and often do—substantially impact the results of cross-cultural analyses. If findings from these analyses are compressed into simplified narratives about, for example, moralistic gods and the expansion of cooperation, then those narratives are at risk of neglecting the methodological assumptions on which they are based. Third, group-level data of small-scale populations often comes from coded ethnographies, antiquated—and often racist—missionary reports, and casual observations and musings from travelers. Given this, such metadata such as source date, quality, motivation, and expertise that goes into the generation of data should be a necessary part of analysis (Purzycki et al. 2022a, Watts et al., in press).

4.2. Individual-level

As the preceding sections illustrate, several methodologies have been employed to assess the relationship between religion and cooperation on the individual level, such

as surveys and economic game experiments. Like group-level methods, however, many of these individual-level methods also carry limitations. For example, various biases such as stereotype effects and social desirability often confounds survey studies on the psychology of religion (Bloom, 2012; Galen, 2012), calling for measures that circumvent such tendencies (see e.g., Jones and Elliott, 2017; Møller et al., 2020).

While experimental economic game outcomes are convenient and standardized proxy measures of prosociality (Pisor et al., 2020), they are also subject to a wide range of possible interpretations among participants (Hagen and Hammerstein, 2006). That is, a scarcity of context can easily lead different people to play different games with different expectations about the social scenario it should reflect, often unbeknownst to the researcher (Lightner and Hagen, 2018). This variation can, in at least some cases, lead to substantially different outcomes (Cronk, 2007; Gerkey, 2013; Lightner et al., 2017).

Another caveat to consider in future research relates to how we conceptualize prosociality and cooperation. In a systematic review of research on religious prosociality, Galen (2012) concludes that while in many studies religious people are found to be generally more prosocial, the association is reduced markedly – or even reversed – when the recipient is not a co-religionist. Therefore, at minimum, a distinction needs to be drawn between parochial and universal religious prosociality (not to mention the nested layers that lie between the two). Future research, in other words, should not only view belief in gods and spirits as a simple impetus to behave prosocially (e.g., as discussed in Section 2.2.2). Instead, it should also carefully consider how we might expect the communication of religious beliefs (e.g., through ritual, as discussed in Section 2.2.3) to shape the scope for parochial vs. universal prosociality, and to address socioecological dilemmas more generally (see Section 3).

This, in our view, further highlights why theoretically driven, fine-grained and individual-level analyses are indispensable in future research on religion and cooperation. A useful way forward for gathering individual-level belief data that is also rich and informative can include systematic ethnographic data collection. Free-listing, for example, is an organic and convenient way of revealing the cultural salience of participants’ categories and subcategories in a given domain (e.g., beliefs) without placing undue emphasis on the researchers’ prior expectations (Quinlan, 2017). Combined with cross-cultural research and the theoretical framework outlined in Section 3, we see free-listing as an indispensable tool for future research on religion and cooperation (cf., Bendixen et al., nd; Purzycki, 2011, 2016; Willard et al., 2020), in tandem with contextualized economic game experiments. Furthermore, the view presented in Section 3 requires attention in another area that has received surprisingly little investment, namely collecting behavioral data in the wild. Rare exceptions include

examining individuals' time allocated to religious activities (e.g., [Shaver and Sosis, 2014](#)), assessing ritual frequency and social reciprocity ([Power, 2017b](#)), measuring ritual costs ([Xygalatas et al., 2013b](#)) and their impact on interpersonal relations, and examining how religiously motivated practices affect caloric return ([Bird et al., 2013](#)) and sustainable agroforestry ([Atran et al., 2002](#)). As we see it, the way forward requires high-resolution data about beliefs, behaviors, *and* the socioecological contexts in which we find them expressed ([Bendixen et al., nd](#); [Purzycki et al., nd](#)). Only then can we appreciate the diversity of roles that religion might play on cooperation.

5. Conclusion

In this chapter, we have critically reviewed existing theories and methods used to investigate the cultural evolution of religion and cooperation. Current perspectives have largely focused on the causal relationships between large-scale cooperation and beliefs in moralizing gods, and how rituals facilitate cooperation and the spread of religious beliefs.

In our view, scholars who argue over the explanatory primacy of cognition or culture neglect the broader socioecological contexts in which appeals to, beliefs about, and rituals devoted toward deities take place. We therefore offered a distinct cultural evolutionary view of how religions contribute to cooperation, arguing and reviewing evidence for the idea that gods' concerns reflect the broader social and ecological challenges that societies face. Cooperative dilemmas, according to this view, are a subset of these broader challenges that might be resolved by appeals to the supernatural.

As we have also discussed, popular methods used in cultural evolutionary studies of religion and cooperation have a range of limitations. This makes it critical that future work uses a pluralistic approach to answering the questions that our current theories raise. We also offered some possible methodological solutions, that can improve how we conduct cross-cultural empirical work going forward. Doing so will ensure that we not only gain cross-cultural insights, but also a better understanding of within- and between-group variation of religious systems with individual-level measures. With this chapter, then, we hope to emphasize the need for conceptual clarity and empirical rigor in the study of religion and cooperation, and to inspire ambitious future research.

Acknowledgments

We thank the editors for the invitation to contribute, Aiyana K. Willard for comments on an earlier draft, and the Aarhus University Research Foundation for gen-

erous support.

References

- Alexander, R. D. (1987). *The Biology of Moral Systems*. Aldine Transaction, New Brunswick.
- Atkinson, Q. D. (2018). Religion and expanding the cooperative sphere in kastom and christian villages on Tanna, Vanuatu. *Religion, Brain & Behavior*, 8(2):149–167.
- Atkinson, Q. D. and Bourrat, P. (2011). Beliefs about God, the afterlife and morality support the role of supernatural policing in human cooperation. *Evolution and Human Behavior*, 32(1):41–49.
- Atran, S. and Henrich, J. (2010). The Evolution of Religion: How Cognitive By-Products, Adaptive Learning Heuristics, Ritual Displays, and Group Competition Generate Deep Commitments to Prosocial Religions. *Biological Theory*, 5(1):18–30.
- Atran, S., Medin, D., Ross, N., Lynch, E., Vapnarsky, V., Ek’, E. U., Coley, J., Timura, C., and Baran, M. (2002). Folkecology, Cultural Epidemiology, and the Spirit of the Commons: A Garden Experiment in the Maya Lowlands, 19912001. *Current Anthropology*, 43(3):421–450.
- Baumard, N. and Boyer, P. (2013). Explaining moral religions. *Trends in Cognitive Sciences*, 17(6):272–280.
- Baumard, N. and 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. Publisher: Royal Society.
- Baumard, N., Hyafil, A., Morris, I., and Boyer, P. (2015). Increased affluence explains the emergence of ascetic wisdoms and moralizing religions. *Current Biology*, 25(1):10–15.
- Beheim, B., Atkinson, Q. D., Bulbulia, J., Gervais, W., Gray, R. D., Henrich, J., Lang, M., Monroe, M. W., Muthukrishna, M., Norenzayan, A., Purzycki, B. G., Shariff, A., Slingerland, E., Spicer, R., and Willard, A. K. (2021). Treatment of missing data determined conclusions regarding moralizing gods. *Nature*, 595(7866):E29–E34.

- Bendixen, T., Apicella, C., Atkinson, Q., Cohen, E., Henrich, J., McNamara, R. A., Norenzayan, A., Willard, A. K., Xygalatas, D., and Purzycki, B. G. (n.d.). Appealing to the minds of gods: A novel cultural evolutionary account of religious appeals and an empirical assessment using ethnographic data from eight diverse societies.
- Bendixen, T. and Purzycki, B. G. (2020). Peering into the minds of gods: What cross-cultural variation in gods' concerns can tell us about the evolution of religion. *Journal for the Cognitive Science of Religion*, 5(2):142–165.
- Bendixen, T. and Purzycki, B. G. (2021). Competing forces account for the stability and evolution of religious beliefs. *The International Journal for the Psychology of Religion*, 31(4):307–312.
- Bendixen, T. and Purzycki, B. G. (n.d.). Accounting for cross-cultural variation in the minds of gods. In Purzycki, B. G. and Bendixen, T., editors, *The Minds of Gods: A Cross-Disciplinary Survey*. Bloomsbury Publishing.
- Bird, R. B., Taylor, N., Coddling, B. F., and Bird, D. W. (2013). Niche construction and dreaming logic: aboriginal patch mosaic burning and varanid lizards (*varanus gouldii*) in australia. *Proceedings of the Royal Society B: Biological Sciences*, 280(1772):20132297.
- Bloch, M. (2008). Why religion is nothing special but is central. *Philosophical transactions of The Royal Society B: biological sciences*, 363(1499):2055–2061.
- Bloom, P. (2012). Religion, Morality, Evolution. *Annual Review of Psychology*, 63(1):179–199.
- Boehm, C. (2008). A biocultural evolutionary exploration of supernatural sanctioning. In Bulbulia, J., Sosis, R., Harris, Erica, Genet, R., and Wyman, K., editors, *Evolution of Religion: Studies, Theories, and Critiques*, pages 143–152. Collins Foundation Press, Santa Margarita, CA.
- Bonnemaison, J. (1991). Magic Gardens in Tanna. *Pacific Studies; Laie, Hawaii*, 14(4):71–89.
- Botero, C. A., Gardner, B., Kirby, K. R., Bulbulia, J., Gavin, M. C., and Gray, R. D. (2014). The ecology of religious beliefs. *Proceedings of the National Academy of Sciences*, 111(47):16784–16789.

- Boyd, R. and Richerson, P. J. (1985). *Culture and the Evolutionary Process*. Culture and the evolutionary process. University of Chicago Press, Chicago, IL, US. Pages: viii, 331.
- Boyd, R. and Richerson, P. J. (2021). Large-scale cooperation in small-scale foraging societies. *EcoEvoRxiv*. May, 17.
- Boyer, P. (2000). Functional origins of religious concepts: ontological and strategic selection in evolved minds. *Journal of the Royal Anthropological Institute*, 6(2):195–214.
- Boyer, P. (2001). *Religion Explained: The Evolutionary Origins of Religious Thought*. Basic Books.
- Brusse, C. (2020). Signaling theories of religion: models and explanation. *Religion, Brain & Behavior*, 10(3):272–291.
- Bulbulia, J. and Sosis, R. (2011). Signalling theory and the evolution of religious cooperation. *Religion*, 41(3):363–388.
- Cohen, E., Baimel, A., and Purzycki, B. G. (2018). Religiosity and resource allocation in Marajó, Brazil. *Religion, Brain Behavior*, 8(2):168–184.
- Cohen, E., Mundry, R., and Kirschner, S. (2014). Religion, synchrony, and cooperation. *Religion, Brain & Behavior*, 4(1):20–30.
- Cronk, L. (2007). The influence of cultural framing on play in the trust game: A maasai example. *Evolution and Human Behavior*, 28(5):352–358.
- Curry, O., Whitehouse, H., and Mullins, D. (2019). Is it good to cooperate? testing the theory of morality-as-cooperation in 60 societies. *Current Anthropology*, 60(1).
- Dear, K., Dutton, K., and Fox, E. (2019). Do ‘watching eyes’ influence antisocial behavior? a systematic review & meta-analysis. *Evolution and Human Behavior*, 40(3):269–280.
- Durkheim, E. (2001 [1912]). *The elementary forms of religious life / Emile Durkheim; translated by Carol Cosman*. Oxford world’s classics. Oxford University Press, New York.
- Evans-Pritchard, E. E. (1965). *Theories of primitive religion*. Oxford University Press, Oxford.

- Fitouchi, L. and Singh, M. (2022). Supernatural punishment beliefs as cognitively compelling tools of social control. *Current Opinion in Psychology*, 44:252–257.
- Flexner, J. L., Lindstrom, L., Hickey, F., Kapere, J., Lindstrom, L., Hickey, F., and Kapere, J. (2018). Kaio, kapwier, nepek, and nuk: Human and non-human agency and ‘conservation’ on Tanna, Vanuatu. In Verschuuren, B. and Brown, S., editors, *Cultural and Spiritual Significance of Nature in Protected Areas*, pages 251–262.
- Galen, L. W. (2012). Does religious belief promote prosociality? A critical examination. *Psychological Bulletin*, 138(5):876–906. Place: US Publisher: American Psychological Association.
- Ge, E., Chen, Y., Wu, J., and Mace, R. (2019). Large-scale cooperation driven by reputation, not fear of divine punishment. *Royal Society Open Science*, 6(8):190991.
- Gerkey, D. (2013). Cooperation in context: Public goods games and post-soviet collectives in kamchatka, russia. *Current Anthropology*, 54(2):144–176.
- Gervais, W. M. and Henrich, J. (2010). The Zeus Problem: Why Representational Content Biases Cannot Explain Faith in Gods. *Journal of Cognition and Culture*, 10(3-4):383–389.
- Hagen, E. H. and Hammerstein, P. (2006). Game theory and human evolution: A critique of some recent interpretations of experimental games. *Theoretical Population Biology*, 69(3):339–348. ESS Theory Now.
- Hall, D. L., Cohen, A. B., Meyer, K. K., Varley, A. H., and Brewer, G. A. (2015). Costly signaling increases trust, even across religious affiliations. *Psychological science*, 26(9):1368–1376.
- Haruvy, E. E., Ioannou, C. A., and Golshirazi, F. (2018). The religious observance of ramadan and prosocial behavior. *Economic Inquiry*, 56(1):226–237.
- Heiphetz, L., Lane, J. D., Waytz, A., and Young, L. L. (2016). How children and adults represent god’s mind. *Cognitive science*, 40(1):121–144.
- Henrich, J. (2009). The evolution of costly displays, cooperation and religion: credibility enhancing displays and their implications for cultural evolution. *Evolution and Human Behavior*, 30(4):244–260.
- Henrich, J. (2020). *The weirdest people in the world: How the west became psychologically peculiar and particularly prosperous*. Allen Lane.

- Henrich, J., Bauer, M., Cassar, A., Chytilová, J., and Purzycki, B. G. (2019). War increases religiosity. *Nature human behaviour*, 3(2):129–135.
- Henrich, J. and Muthukrishna, M. (2021). The Origins and Psychology of Human Cooperation. *Annual Review of Psychology*, 72(1):207–240.
- Jacquet, P. O., Pazhoohi, F., Findling, C., Mell, H., Chevallier, C., and Baumard, N. (2021). Predictive modeling of religiosity, prosociality, and moralizing in 295,000 individuals from European and non-European populations. *Humanities and Social Sciences Communications*, 8(1):1–12. Bandiera_abtest: a Cc_license_type: cc.by Cg_type: Nature Research Journals Number: 1 Primary_atype: Research Publisher: Palgrave Subject_term: Psychology;Religion Subject_term.id: psychology;religion.
- Johnson, D. and Bering, J. (2006). Hand of God, Mind of Man: Punishment and Cognition in the Evolution of Cooperation. *Evolutionary Psychology*, 4(1):147470490600400119.
- Johnson, D. D. P. (2005). God’s punishment and public goods. *Human Nature*, 16(4):410–446.
- Johnson, D. D. P. (2016). *God is watching you: How the fear of god makes us human*. Oxford University Press, USA.
- Jones, A. E. and Elliott, M. (2017). Examining Social Desirability in Measures of Religion and Spirituality Using the Bogus Pipeline. *Review of Religious Research*, 59(1):47–64.
- Kendal, R. L., Boogert, N. J., Rendell, L., Laland, K. N., Webster, M., and Jones, P. L. (2018). Social Learning Strategies: Bridge-Building between Fields. *Trends in Cognitive Sciences*, 22(7):651–665.
- Lang, M., Bahna, V., Shaver, J. H., Reddish, P., and Xygalatas, D. (2017). Sync to link: Endorphin-mediated synchrony effects on cooperation. *Biological Psychology*, 127:191–197.
- Lang, M., Purzycki, B. G., Apicella, C. L., Atkinson, Q. D., Bolyanatz, A., Cohen, E., Handley, C., Kundtová Klocová, E., Lesorogol, C., Mathew, S., et al. (2019). Moralizing gods, impartiality and religious parochialism across 15 societies. *Proceedings of the Royal Society B*, 286(1898):20190202.

- Leeson, P. T. and Suarez, P. A. (2015). Superstition and Self-Governance. *New Thinking in Austrian Political Economy*, 19:47–66.
- Legare, C. H. and Nielsen, M. (2020). Ritual explained: interdisciplinary answers to Tinbergen’s four questions. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 375(1805):20190419.
- Lightner, A., Garfield, Z., and Hagen, E. (2021). Religion: The weirdest concept in the world?
- Lightner, A. D., Barclay, P., and Hagen, E. H. (2017). Radical framing effects in the ultimatum game: the impact of explicit culturally transmitted frames on economic decision-making. *Royal Society Open Science*, 4(12):170543.
- Lightner, A. D. and Hagen, E. H. (2018). Mapping the terra incognita of economic cognition will require an experimental paradigm that incorporates context. *Behavioral and Brain Sciences*, 41.
- Lightner, A. D. and Purzycki, B. G. (n.d.). Game theoretical aspects of the minds of gods. In Purzycki, B. G. and Bendixen, T., editors, *The Minds of Gods: A Cross-Disciplinary Survey*. Bloomsbury Publishing.
- Malinowski, B. (1936). *The Foundations of Faith and Morals*. London: Oxford University Press UK.
- McCleary, R. M. and Barro, R. J. (2006). Religion and economy. *Journal of Economic perspectives*, 20(2):49–72.
- McKay, R. and Whitehouse, H. (2014). Religion and Morality. *Psychological Bulletin*.
- McNamara, R. A. and Henrich, J. (2018). Jesus vs. the ancestors: how specific religious beliefs shape prosociality on Yasawa Island, Fiji. *Religion, Brain & Behavior*, 8(2):185–204.
- McNamara, R. A., Norenzayan, A., and Henrich, J. (2016). Supernatural punishment, in-group biases, and material insecurity: experiments and ethnography from Yasawa, Fiji. *Religion, Brain & Behavior*, 6(1):34–55.
- McNamara, R. A. and Purzycki, B. G. (2020). Minds of gods and human cognitive constraints: socio-ecological context shapes belief. *Religion, Brain & Behavior*, 10(3):223–238.

- McNamara, R. A., Senanayake, R., Willard, A. K., and Henrich, J. (2021). God’s mind on morality. *Evolutionary Human Sciences*, 3:E6.
- Mitkidis, P., Ayal, S., Shalvi, S., Heimann, K., Levy, G., Kyselo, M., Wallot, S., Ariely, D., and Roepstorff, A. (2017). The effects of extreme rituals on moral behavior: The performers-observers gap hypothesis. *Journal of Economic Psychology*, 59:1–7.
- Møller, A. B., Pedersen, H. F., Ørnbøl, E., Jensen, J. S., Purzycki, B. G., and Schjoedt, U. (2020). Beyond the Socially Desirable: Longitudinal Evidence on Individual Prayer-Wellbeing Associations. *The International Journal for the Psychology of Religion*, 30(4):275–287.
- Murdock, G. P. and White, D. R. (1969). Standard cross-cultural sample. *Ethnology*, 8(4):329–369.
- Murray, M. and Moore, L. (2009). Costly signaling and the origin of religion. *Journal of Cognition and Culture*, 9(3-4):225–245.
- Muthukrishna, M., Francois, P., Pourahmadi, S., and Henrich, J. (2017). Corrupting cooperation and how anti-corruption strategies may backfire. *Nature Human Behaviour*, 1(7):0138.
- Nettle, D. and Frankenhuys, W. E. (2020). Life-history theory in psychology and evolutionary biology: one research programme or two? *Philosophical Transactions of the Royal Society B: Biological Sciences*, 375(1803):20190490.
- Norenzayan, A., Shariff, A. F., Gervais, W. M., Willard, A. K., McNamara, R. A., Slingerland, E., and Henrich, J. (2016a). The cultural evolution of prosocial religions. *Behavioral and brain sciences*, 39.
- Norenzayan, A., Shariff, A. F., Gervais, W. M., Willard, A. K., McNamara, R. A., Slingerland, E., and Henrich, J. (2016b). Parochial prosocial religions: Historical and contemporary evidence for a cultural evolutionary process. *Behavioral and Brain Sciences*, 39:43.
- Northover, S. B., Pedersen, W. C., Cohen, A. B., and Andrews, P. W. (2017a). Artificial surveillance cues do not increase generosity: Two meta-analyses. *Evolution and Human Behavior*, 38(1):144–153.
- Northover, S. B., Pedersen, W. C., Cohen, A. B., and Andrews, P. W. (2017b). Effect of artificial surveillance cues on reported moral judgment: Experimental failures to replicate and two meta-analyses. *Evolution and Human Behavior*, 38(5):561–571.

- Pisor, A. C., Gervais, M. M., Purzycki, B. G., and Ross, C. T. (2020). Preferences and constraints: the value of economic games for studying human behaviour. *Royal Society open science*, 7(6):192090.
- Power, E. A. (2017a). Discerning devotion: Testing the signaling theory of religion. *Evolution and Human Behavior*, 38(1):82–91.
- Power, E. A. (2017b). Social support networks and religiosity in rural South India. *Nature Human Behaviour*, 1:0057.
- Purzycki, B. G. (2011). Tyvan *cher eezi* and the socioecological constraints of supernatural agents’ minds. *Religion, Brain & Behavior*, 1(1):31–45.
- Purzycki, B. G. (2013a). The minds of gods: A comparative study of supernatural agency. *Cognition*, 129(1):163 – 179.
- Purzycki, B. G. (2013b). Toward a cognitive ecology of religious concepts: An example from the tyva republic. *Journal for the Cognitive Science of Religion*, 1(1):99–120.
- Purzycki, B. G. (2016). The evolution of gods’ minds in the Tyva Republic. *Current Anthropology*, 57(S13):S88–S104.
- Purzycki, B. G. and Arakchaa, T. (2013). Ritual Behavior and Trust in the Tyva Republic. *Current Anthropology*, 54(3):381–388.
- Purzycki, B. G., Bendixen, T., and Lightner, A. (2022a). Coding, causality, and statistical craft: The emergence and evolutionary drivers of moralistic supernatural punishment remain unresolved. Technical report, SocArXiv. type: article.
- Purzycki, B. G., Bendixen, T., Lightner, A., and Sosis, R. (nd). Gods, games, and the socioecological landscape.
- Purzycki, B. G., Finkel, D. N., Shaver, J., Wales, N., Cohen, A. B., and Sosis, R. (2012). What does god know? supernatural agents’ access to socially strategic and non-strategic information. *Cognitive Science*, 36(5):846–869.
- Purzycki, B. G., Henrich, J., Apicella, C., Atkinson, Q. D., Baimel, A., Cohen, E., McNamara, R. A., Willard, A. K., Xygalatas, D., and 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.

- Purzycki, B. G. and McKay, R. (n.d.). Moralistic gods and social complexity: A brief history of the problem. In Purzycki, B. G. and Bendixen, T., editors, *The Minds of Gods: A Cross-Disciplinary Survey*. Bloomsbury Publishing.
- Purzycki, B. G. and McNamara, R. A. (2016). An ecological theory of gods' minds. In De Cruz, H. and Nichols, R., editors, *Cognitive Science of Religion and Its Philosophical Implications*, pages 143–167. Continuum, New York.
- Purzycki, B. G., Pisor, A., Apicella, C., Atkinson, Q. D., Cohen, E., Henrich, J., McElreath, R., McNamara, R. A., Norenzayan, A., Willard, A. K., and Xygalatas, D. (2018b). The cognitive and cultural foundations of moral behavior. *Evolution and Human Behavior*, 39(5):490–501.
- Purzycki, B. G., Ross, C. T., Apicella, C., Atkinson, Q. D., Cohen, E., McNamara, R. A., Willard, A. K., Xygalatas, D., Norenzayan, A., and Henrich, J. (2018c). Material security, life history, and moralistic religions: A cross-cultural examination. *PloS one*, 13(3):e0193856.
- Purzycki, B. G. and Sosis, R. (2022). *Religion Evolving: The Dynamics of Culture, Cognition and Ecology*. Equinox.
- Purzycki, B. G. and Watts, J. (2018). Reinvigorating the comparative, cooperative ethnographic sciences of religion. *Free Inquiry*, 38(3):26–29.
- Purzycki, B. G., Willard, A. K., Klocová, E. K., Apicella, C., Atkinson, Q., Bolyanatz, A., Cohen, E., Handley, C., Henrich, J., Lang, M., Lesorogol, C., Mathew, S., McNamara, R. A., Moya, C., Norenzayan, A., Placek, C., Soler, M., Weigel, J., Xygalatas, D., and Ross, C. T. (2022b). The Moralization Bias of Gods' Minds: A Cross-Cultural Test. *Religion, Brain and Behavior*.
- Quinlan, M. B. (2017). The freelist method. *Handbook of research methods in health social sciences*. Singapore: Springer, pages 1–16.
- Rappaport, R. A. (1968). *Pigs for the Ancestors: Ritual in the Ecology of a New Guinea People*. Yale University Press.
- Rappaport, R. A. (1999). *Ritual and Religion in the Making of Humanity*, volume 110. Cambridge University Press.
- Reddish, P., Bulbulia, J., and Fischer, R. (2014). Does synchrony promote generalized prosociality? *Religion, Brain & Behavior*, 4(1):3–19. Publisher: Routledge
_eprint: <https://doi.org/10.1080/2153599X.2013.764545>.

- Redford, K. H. and Stearman, A. M. (1993). Forest-dwelling native amazonians and the conservation of biodiversity: interests in common or in collision? *Conservation Biology*, 7(2):248–255.
- Richerson, P. and Henrich, J. (2012). Tribal Social Instincts and the Cultural Evolution of Institutions to Solve Collective Action Problems. *Cliodynamics*, 3(1).
- Roes, F. L. and Raymond, M. (2003). Belief in moralizing gods. *Evolution and Human Behavior*, 24(2):126–135.
- Rossano, M. and LeBlanc, A. (2017). Why add the supernatural? *Religion, Brain & Behavior*, 7(4):375–377.
- Rossano, M. J. (2007). Supernaturalizing Social Life: Religion and the Evolution of Human Cooperation. *Human Nature*, 18(3):272–294.
- Ruffle, B. J. and Sosis, R. (2007). Does it pay to pray? costly ritual and cooperation. *The BE Journal of Economic Analysis & Policy*, 7(1).
- Russell, Y. I., Dunbar, R. I., and Gobet, F. (2012). Euphoria versus dysphoria differential cognitive roles in religion. *Attention, representation, and human performance: Integration of cognition, emotion, and motivation*, pages 147–165.
- Sandner, V. (2003). Myths and laws: changing institutions of indigenous marine resource management in central america. In *How Institutions Change*, pages 269–300. Springer.
- Schloss, J. P. and Murray, M. J. (2011). Evolutionary accounts of belief in supernatural punishment: a critical review. *Religion, Brain & Behavior*, 1(1):46–99.
- Shariff, A., Purzycki, B. G., and Sosis, R. (2014). Religions as Cultural Solutions to Social Living. In Cohen, A. B., editor, *Culture Reexamined: Broadening Our Understanding of Social and Evolutionary Influences*, pages 217–238. APA Books, Washington, DC.
- Shariff, A. F. and Norenzayan, A. (2007). God is watching you: Priming god concepts increases prosocial behavior in an anonymous economic game. *Psychological science*, 18(9):803–809.
- Shariff, A. F. and Norenzayan, A. (2011). Mean gods make good people: Different views of god predict cheating behavior. *The International Journal for the Psychology of Religion*, 21(2):85–96.

- Shaver, J. H. and Bulbulia, J. A. (2016). Signaling theory and religion. *Religion: Mental Religion*, pages 101–117.
- Shaver, J. H., Fraser, G., and Bulbulia, J. (2017). Charismatic signaling: How religion stabilizes cooperation and entrenches inequality. *The Oxford Handbook of Evolutionary Psychology and Religion*.
- Shaver, J. H., Lang, M., Krátký, J., Klocová, E. K., Kundt, R., and Xygalatas, D. (2018). The boundaries of trust: Cross-religious and cross-ethnic field experiments in mauritius. *Evolutionary Psychology*, 16(4):1474704918817644.
- Shaver, J. H. and Sosis, R. (2014). How does male ritual behavior vary across the lifespan? *Human nature*, 25(1):136–160.
- Singh, M. and Henrich, J. (2020). Why do religious leaders observe costly prohibitions? Examining taboos on Mentawai shamans. *Evolutionary Human Sciences*, 2. Publisher: Cambridge University Press.
- Singh, M., Kaptchuk, T. J., and Henrich, J. (2021). Small gods, rituals, and cooperation: The Mentawai water spirit Sikameinan. *Evolution and Human Behavior*, 42(1):61–72.
- Skali, A. (2017). Moralizing gods and armed conflict. *Journal of Economic Psychology*, 63:184–198.
- Skoggard, I., Ember, C. R., Pitek, E., Jackson, J. C., and Carolus, C. (2020). Resource Stress Predicts Changes in Religious Belief and Increases in Sharing Behavior. *Human Nature*, 31(3):249–271.
- Slingerland, E., Atkinson, Q. D., Ember, C. R., Sheehan, O., Muthukrishna, M., Bulbulia, J., and Gray, R. D. (2020). Coding culture: challenges and recommendations for comparative cultural databases. *Evolutionary Human Sciences*, 2.
- Snarey, J. (1996). The natural environment’s impact upon religious ethics: A cross-cultural study. *Journal for the Scientific Study of Religion*, pages 85–96.
- Soler, M. (2012). Costly signaling, ritual and cooperation: evidence from candomblé, an afro-brazilian religion. *Evolution and Human Behavior*, 33(4):346–356.
- Sosis, R. (2003). Why aren’t we all hutterites? *Human Nature*, 14(2):91–127.

- Sosis, R. (2009). The adaptationist-byproduct debate on the evolution of religion: Five misunderstandings of the adaptationist program. *Journal of Cognition and Culture*, 9(3-4):315–332.
- Sosis, R. and Bressler, E. R. (2003). Cooperation and commune longevity: A test of the costly signaling theory of religion. *Cross-cultural research*, 37(2):211–239.
- Sosis, R., Kress, H. C., and Boster, J. S. (2007). Scars for war: Evaluating alternative signaling explanations for cross-cultural variance in ritual costs. *Evolution and Human Behavior*, 28(4):234–247.
- Stark, R. (2001). Gods, rituals, and the moral order. *Journal for the Scientific Study of Religion*, 40(4):619–636.
- Swanson, G. E. (1960). *The birth of the gods: The origin of primitive beliefs*. University of Michigan Press.
- Tan, J. H. and Vogel, C. (2008). Religion and trust: An experimental study. *Journal of Economic Psychology*, 29(6):832–848.
- Teehan, J. (2016). Religion and Morality: The Evolution of the Cognitive Nexus. In Liddle, J. R. and Shackelford, T. K., editors, *The Oxford Handbook of Evolutionary Psychology and Religion*.
- Tomlinson, M. (2004). Perpetual Lament: Kava-Drinking, Christianity and Sensations of Historical Decline in Fiji. *The Journal of the Royal Anthropological Institute*, 10(3):653–673.
- Tomlinson, M. (2007). Everything and Its Opposite: Kava Drinking in Fiji. *Anthropological Quarterly*, 80(4):1065–1081.
- Turner, J. W. (2012). Listening to the ancestors: Kava and the Lapita Peoples. *Ethnology*, 51(1):31–53.
- Turpin, H., Andersen, M., and Lanman, J. A. (2019). Creds, cruds, and catholic scandals: experimentally examining the effects of religious paragon behavior on co-religionist belief. *Religion, Brain & Behavior*, 9(2):143–155.
- Tylor, E. B. (1871). *Primitive culture: Researches into the development of mythology, philosophy, religion, art and custom*, volume 2. J. Murray.
- Ventocilla, J., Nuñez, V., Herrera, F., Herrera, H., and Chapin, M. (1995). Los indígenas kunas y la conservación ambiental. *Mesoamérica*, 16(29):95–124.

- Watts, J., Greenhill, S. J., Atkinson, Q. D., Currie, T. E., Bulbulia, J., and Gray, R. D. (2015). Broad supernatural punishment but not moralizing high gods precede the evolution of political complexity in Austronesia. *Proceedings of the Royal Society of London B: Biological Sciences*, 282(1804):20142556.
- Watts, J., Jackson, J. C., Arnison, C., Hamerslag, E., Shaver, J. H., and Purzycki, B. G. (forthcoming). Building quantitative cross-cultural databases from ethnographic records: Promises, problems and principles. *Cross-Cultural Research*.
- White, C. J., Kelly, J. M., Shariff, A. F., and Norenzayan, A. (2019). Supernatural norm enforcement: Thinking about karma and god reduces selfishness among believers. *Journal of Experimental Social Psychology*, 84:103797.
- Whitehouse, H. (1996). Rites of terror: Emotion, metaphor and memory in melanesian initiation cults. *Journal of the Royal Anthropological Institute*, pages 703–715.
- Whitehouse, H. and Lanman, J. A. (2014). The ties that bind us: Ritual, fusion, and identification. *Current Anthropology*, 55(6):674–695.
- Wilde, N. (1897). Morality and Religion. *The Philosophical Review*, 6(1):64–67. Publisher: [Duke University Press, Philosophical Review].
- Wildman, W. J. and Sosis, R. (2011). Stability of groups with costly beliefs and practices. *Journal of Artificial Societies and Social Simulation*, 14(3):6.
- Willard, A. K., Baimel, A., Turpin, H., Jong, J., and Whitehouse, H. (2020). Rewarding the good and punishing the bad: The role of karma and afterlife beliefs in shaping moral norms. *Evolution and Human Behavior*, 41(5):385–396.
- Wiltermuth, S. S. and Heath, C. (2009). Synchrony and Cooperation. *Psychological Science*. Publisher: SAGE PublicationsSage CA: Los Angeles, CA.
- Wolle, R. G., McLaughlin, A., and Heiphetz, L. (2021). The role of theory of mind and wishful thinking in children’s moralizing concepts of the abrahamic god. *Journal of Cognition and Development*, 22(3):398–417.
- Wood, C., Caldwell-Harris, C., and Stopa, A. (2018). The rhythms of discontent: synchrony impedes performance and group functioning in an interdependent coordination task. *Journal of Cognition and Culture*, 18(1-2):154–179.
- Xygalatas, D., Kotherová, S., Maño, P., Kundt, R., Cigán, J., Klocová, E. K., and Lang, M. (2018). Big gods in small places: The random allocation game in mauritius. *Religion, Brain & Behavior*, 8(2):243–261.

- Xygalatas, D., Mitkidis, P., Fischer, R., Reddish, P., Skewes, J., Geertz, A. W., Roepstorff, A., and Bulbulia, J. (2013a). Extreme rituals promote prosociality. *Psychological Science*, 24(8):1602–1605.
- Xygalatas, D., Mitkidis, P., Fischer, R., Reddish, P., Skewes, J., Geertz, A. W., Roepstorff, A., and Bulbulia, J. (2013b). Extreme Rituals Promote Prosociality. *Psychological Science*, 24(8):1602–1605.