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Moralizing gods, impartiality and religious parochialism across 15 societies

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The emergence of large-scale cooperation during the Holocene remains a central problem in the evolutionary literature. One hypothesis points to culturally evolved beliefs in punishing, interventionist gods that facilitate the extension of cooperative behaviour toward geographically distant co-religionists. Furthermore, another hypothesis points to such mechanisms being constrained to the religious ingroup, possibly at the expense of religious outgroups. To test these hypotheses, we administered two behavioural experiments and a set of interviews to a sample of 2228 participants from 15 diverse populations. These populations included foragers, pastoralists, horticulturalists, and wage labourers, practicing Buddhism, Christianity, and Hinduism, but also forms of animism and ancestor worship. Using the Random Allocation Game (RAG) and the Dictator Game (DG) in which individuals allocated money between themselves, local and geographically distant co-religionists, and religious outgroups, we found that higher ratings of gods as monitoring and punishing predicted decreased local favouritism (RAGs) and increased resource-sharing with distant co-religionists (DGs). The effects of punishing and monitoring gods on outgroup allocations revealed between-site variability, suggesting that in the absence of intergroup hostility, moralizing gods may be implicated in cooperative behaviour toward outgroups. These results provide support for the hypothesis that beliefs in monitoring and punitive gods help expand the circle of sustainable social interaction, and open questions about the treatment of religious outgroups.

1. Introduction

Over the last 12 millennia, the scale of human societies has dramatically expanded from hunter–gatherer networks involving a few hundred individuals to vast nation-states involving millions. Theories explaining the scaling-up of societies have combined insights about evolved cognition with cultural evolutionary models of social norms [1–3], delineating important roles for markets, kinship systems, marriage institutions, and religions [4–7]. Focusing on the role of supernatural beliefs, cultural evolution may have favoured the extension of intuitions about social punishment to beliefs in increasingly interventionist gods who, because of their capacity to monitor and punish people for violating norms related to interpersonal conduct, fostered less favouritism toward individuals themselves, their families, and their communities vis-à-vis strangers sharing religious identities, effectively expanding the cooperative circle [8].

Historically, competition among communities to control fertile lands dramatically intensified at the onset of the Holocene, favouring larger, sedentary populations capable of communal defence and various forms of collective action [9,10]. Although there are ongoing debates about the precise timing of these historical changes and the nature of the causal relationships, a combination of archaeological and ethnographic data [11,12] suggests that the scaling-up of societies was associated with the gradual evolution of religious beliefs and practices into cultural packages that included more powerful gods who were increasingly motivated and capable of monitoring norms favourable to the emergence of large-scale societies. In particular, analyses of ethnographic data revealed the centrality of divine punishment in the evolution of political complexity in the Pacific [13] and robust global relationships between beliefs in punishing gods and various indicators of societal scale and complexity [14–16].

Consistent with these observations, global surveys have linked a stronger belief in heaven, hell, and punishing gods with stronger moral disapproval for cheating on taxes, buying stolen goods, and other such public goods [17], and a cross-cultural study of market integration revealed robust correlations between adherence to world religions involving moralizing deities and prosociality in economic games [6]. Complementing these macro-level patterns, a substantial body of literature using priming techniques has shown that among believers, religious reminders can effectively reduce self-favouritism and increase resource-sharing in economic games involving strangers [18–21]. Importantly, to experimentally test the role of belief in punishing and monitoring gods in the expansion of cooperative circle, we previously employed the Random Allocation Game (RAG) among participants from eight diverse field sites and found that beliefs in monitoring and punishing gods were associated with less favouritism toward the self and local communities when playing with geographically distant co-religionists [8,22].

However, while these initial findings support the hypothesis of intra-religious impartiality (i.e. extending impartiality to geographically distant co-religionists), the question as to whether these beliefs may also favour more equitable treatment of religious outgroups remains open to study. One cultural group selection account [23] suggested that parochial cooperation should be generally favoured (compared to indiscriminate prosociality and uncooperative selfishness), especially during the fierce conflict over resources/values [24,25] because it gives a competitive edge to groups with tight cooperative norms

[26]. While supernaturally sanctioned norms may stabilize cooperation within a particular religious group (intra-religious impartiality), other groups may have different normative regulations and/or not extend their norms to outsiders [27]. Hence, cooperation between groups with different supernatural commitments is risky and prone to free-riding, predicting parochialism as a baseline relationship between religious groups. However, the cultural evolutionary account put forth by Norenzayan *et al.* [23] also predicts that in situations where a more inclusive strategy attracts new recruits and enhances cooperative networks, group norms may shift toward more universal application and indiscriminate prosociality to incorporate the members of religious outgroups if they are not in a direct conflict over resources/values [5,28]. To date, evidence appears to be mixed: some studies showed that participants affiliated with religions emphasizing universal morality embrace the extension of cooperation behaviour to outgroup members [20,29–31] while other studies indicated that religious participants reveal hostility toward religious outgroups [32,33].

In this paper, we present data from 2228 participants sampled in 15 socio-ecologically and religiously diverse societies (table 1). We aimed to replicate our previous findings that belief in punishing and monitoring gods helps to curb local favouritism [8,22] by deploying the same protocol in additional societies and, moreover, by deploying a different economic game, namely the Dictator Game (DG). Furthermore, we aimed to extend the previous research by examining the outstanding questions about the role of beliefs in punishing gods in the treatment of religious outgroups. At each site, we used preliminary ethnographic interviews to select one god interested in norms of interpersonal conduct and assessed those gods' abilities to monitor norm following and punish transgressions. In line with previous research, we labelled such gods as 'moralizing' [22]; however, note that these gods need not be a creator or supreme gods and do not need to care about 'morality' as understood in Western philosophy. Rather, they care about group-specific norms regulating interpersonal conduct [34,35]. As a comparison, we also selected locally salient gods on the basis of their being relatively less concerned with interpersonal conduct, less punitive, and less knowledgeable than their 'moralizing' counterparts (table 1).

We adopted two experimental games, the RAG and the DG, to measure two distinct facets of cooperative behaviour: curbed favouritism and impartial resource-sharing. In the RAG, participants anonymously selected one of two cups designated for different recipients. They rolled a two-coloured die. If it came up one colour, participants were supposed to put the coin into the cup they selected. If the die came up the other colour, participants were supposed to put the coin into the opposite cup. Participants repeated this procedure for 30 coin allocations and understood that all money would be distributed accordingly [36]. Since the allocations were made in private, only the participants knew their decisions and they could distribute the endowment according to their preferences (rather than die rolls), reflecting in- and/or outgroup biases. In the DG, participants anonymously allocated 10 coins between two recipients (also designated by cups) based purely on their preferences [37]. These games have been widely used in cross-cultural research and benchmarked against relevant real-world behaviours [6,36,38–41]. In different ways, these experiments permit us to assess the relationship between people's religious beliefs and their biases in favour of themselves and their communities.

Table 1. Site descriptive statistics.

group	country	N	DISTANT	OUTGROUP	prime	moralizing god	local god
Cachoeira	Brazil	274	Candomble	Evangelical	MLSC	Christian God	Candomblé God (<i>Ogum</i>)
Coastal Tanna	Vanuatu	178	Christian	Kastom	MLC	Christian God	Garden spirit (<i>Tupunus</i>)
Hadza	Tanzania	201	<i>Hadza</i>	<i>Datoga</i>	—	<i>Haine</i> (Traditional)	<i>Ishoko</i> ^a
Huatasani	Peru	94	Catholic	Evangelical	MC	Christian God	Mountain Spirits
Inland Tanna	Vanuatu	112	Kastom	Christian	MC	<i>Kalpapan</i> (Traditional)	Garden spirit (<i>Tupunus</i>)
Kananga	DRC	200	<i>Non-Luluwa</i> Christ.	<i>Non-Luluwa</i>	MLSC	Christian God	<i>Kadim</i> /Ancestor spirits
Lovu	Fiji	76	Hindu	—	MC	Hindu Bhagwan	None available
Marajó	Brazil	77	Christian	—	MC	Christian God	Virgin Mary
Indo-Mauritians	Mauritius	245	Hindu	Muslim	MSC	Hindu Shiva	Ghost (<i>Nam</i>)
Mysore	India	165	Hindu	Christian	MC	Hindu Shiva	Chamundeshwari
Samburu	Kenya	40	Christ. <i>Samburu</i>	<i>Samburu</i>	—	Christian/Traditional (<i>Nkai</i>)	None available
Sursurunga	Papua New Guinea	163	Christ. <i>Sursurunga</i>	<i>Foreigner</i>	MLC	Christ. God (<i>Kaláu</i>)	Spirit (<i>Sirmát</i>)
Turkana	Kenya	247	Christ. <i>Turkana</i>	<i>Turkana</i>	MLSC	Christ. God (<i>Akuj</i>)	Ancestor spirits
Tyvans	Tyva Republic	81	Buddhist	—	MC	Buddha Burgan	Spirit-masters (<i>Cher eez</i>)
Yasawa	Fiji	75	Hindu	—	MC	Christian God	Ancestor spirits (<i>Kalou-vu</i>)

^aThere are no *Ishoko* data in Wave II (see electronic supplementary material, section S2.2.3). DRC, Democratic Republic Congo; primes: M, moralizing gods prime; L, local gods prime; S, secular authority prime; C, control condition. No outgroups were selected for sites taking part only in Wave I (see Material and methods).

Participants played four rounds of either the RAG or the DG, distributing endowed money between two cups in each round. To investigate the intra-religious impartiality, two rounds consisted of contributions to distant co-religionists versus the self (SELF versus DISTANT) or local co-religionists (LOCAL versus DISTANT). These two rounds aimed to replicate prior findings that belief in punishing and monitoring gods promotes expansion of rule following toward DISTANT co-religionists (RAG); and to assess whether these beliefs are also associated with increased resource-sharing (DG). The other two experimental rounds collected data on allocations to religious outgroups compared to allocations to the self (SELF versus OUTGROUP) or to distant co-religionists (DISTANT versus OUTGROUP), aiming to assess whether belief in punishing and monitoring gods promotes indiscriminate prosociality or whether the cooperative circle is limited only to religious ingroups (religious parochialism). SELF represented allocations that participants made to themselves. LOCAL co-religionist allocations were distributed to randomly selected, anonymous members of the same religion (associated with the selected moralizing gods) in the camp/village/town where we conducted experiments. DISTANT co-religionist allocations were distributed to randomly selected, anonymous individuals in a geographically distant village who practice the same religion as LOCALS. OUTGROUP allocations were distributed to anonymous members of a different religion in a geographically remote village (OUTGROUPs were selected such that they were not in a direct conflict with LOCALS).

Finally, to investigate the causal relationship between beliefs in moralizing gods and treatment of other groups, we utilized priming techniques by using locally salient reminders of (a) punishing and monitoring moralizing gods, (b) relatively less moralistically punitive and knowledgeable local gods, (c) secular authorities (e.g. police), and (d) a control condition. Although previous research has suggested a causal influence of punishing gods on rule-following and resource-sharing

[21], the use of priming methods has been almost exclusively limited to Western populations and it is not clear whether the reported effects extend also to small-scale, non-industrial societies. By selecting our sites, we aimed to capture a significant portion of the world's human diversity while investigating the individual-level effects of belief in and priming with moralizing gods. We pre-registered two sets of predictions in the Open Science Framework (<https://osf.io/epkbw/>) before data analysis:

1. Expanding the cooperative circle to distant co-religionists (DISTANT games)

Corresponding to the intra-religious impartiality hypothesis, we predicted that participants who (A) reported higher ratings of moralizing gods as punitive and monitoring will show less favouritism toward the SELF and LOCAL co-religionists when playing with DISTANT co-religionists in the RAG and DG. Likewise, participants who (B) were primed with the concept of punitive and monitoring moralizing gods will show less SELF and LOCAL co-religionist favouritism compared to the other conditions.

2. Parochial Religious Norm Adherence (OUTGROUP Games)

According to the religious parochialism hypothesis, allocations in the SELF versus OUTGROUP RAG and DG should not be influenced by (A) the ratings of, or (B) priming with, punitive and monitoring moralizing gods. That is, participants should bias allocations toward the SELF, irrespective of their religious belief or treatment conditions due to the limited scope of religious norms.

Moreover, we predicted that when allocating between DISTANT co-religionists and OUTGROUPs, participants who (C) reported higher ratings of, or (D) were primed with, punitive and monitoring moralizing gods will bias their allocations away from OUTGROUP members and in favour of DISTANT co-religionists in both the RAG and DG (religious parochialism).

However, we also explored whether participants at Christian sites (universalistic, proselytizing religion) will taper their bias against OUTGROUPS by virtue of the aforementioned propensity to attract new members (indiscriminate prosociality).

2. Material and methods

(a) Participants

During two waves of data collection, we recruited a total of 2228 participants from 15 societies (1126 females; M age = 37.0, $s.d.$ = 14.8). Specifically, during Wave I, we recruited 591 participants who played the DISTANT RAGs and reported the results of this data collection in several publications [8,22]; however, 208 of those participants were contacted again during Wave II to collect the OUTGROUP RAGs. For Wave II, 1637 new participants were recruited, playing either the DISTANT and OUTGROUP RAGs or the DISTANT and OUTGROUP DGs (153 participants played both RAGs and DGs). Here, we collapsed both Wave I and Wave II samples to provide robust tests of our hypotheses.

We excluded all participants from our analyses whose allocations did not sum to 30 for a particular RAG or 10 for a particular DG. Specifically, we excluded 30 participants from at least one RAG and 33 from at least one DG. Furthermore, we excluded 22 participants who misunderstood the procedure or did not correctly follow procedural steps. At one site, two research assistants counterfeited data, thus all the RAG and DG data collected by these assistants were removed (72 participants). The number of participants in each analysis is displayed under specific models. While tables in the main text report only full models (these are missing three sites due to missing some of the covariates), reduced models including all sites can be found in the electronic supplementary material, section S3. Our protocols were approved by the University of British Columbia's Behavioural Research Ethics Board (BREB) and by the equivalent at each individual researcher's home university. All subjects provided an informed verbal consent for participation before the experiment.

(b) Procedures

Participants were recruited by random sampling from a street or chain sampling, while in smaller communities, researchers randomly sampled households. Upon arrival at a study location, participants were asked to wait before the experiment in a separate area to prevent collusion and then entered individually into a room/tent/or a secluded area to play the RAGs and DGs. Before playing the games, each participant was given a show-up fee (approximating 1/4 of one day's wage), learned about game-specific rules and had to demonstrate an understanding of those rules. Afterwards, the participant was left alone to play four rounds of either RAGs or DGs. Both DGs and RAGs were played in a random order. After the gameplay was finished, each participant received the amount contributed to the SELF cups and was escorted into a different area for demographic and religiosity interviews where we asked about moralizing and local gods (see electronic supplementary material, section S2 for more details on procedure).

(c) Materials

We first conducted ethnographic surveys asking roughly 20 participants to list and rank up to five gods and spirits, from which each site selected one monitoring and punitive god/spirit (here labelled 'moralizing') and one god/spirit less concerned with the interpersonal aspects of human normative behaviour (here labelled 'local'). Confirming our choices of moralizing versus local gods, the survey showed that the selected moralizing gods were rated on average as more punitive and monitoring than local gods (electronic supplementary material, table S3).

To examine the relationship between belief in punitive and monitoring gods who care about norm transgressions (i.e. moralizing gods) and the RAG and DG allocations, we created a punishment–monitoring score by averaging four binary questions pertaining to the gods' ability and willingness to punish and monitor people (for discussion, see electronic supplementary material, section S2.1.2).

To examine the causal relationship between moralizing gods and impartiality, we adapted priming materials to the specificities of local contexts (table 1 for an overview of primed concepts). Four of our sites (Cachoeira, Mauritius, Sursurunga, Yasawa) used contextual priming in the RAGs (games were played inside a temple and a control location) while other sites used religious/secular imagery printed on a mat/table cloth (Coastal and Inland Tanna, Kananga, Huatasani, and Mauritius DG); religious/secular material objects (Cachoeira DG, Lovu, Marajó, Mysore, Turkana, Tyva); or verbal priming (Sursurunga DG). See electronic supplementary material, sections S2 and S3 for details. Note that in our correlational analyses, we hold the priming effects constant.

(d) Analyses

In our regression models, we used the punishment–monitoring score of moralizing gods as well as our treatment conditions as the main predictors of the RAG and DG allocations, adjusting for a host of potentially confounding variables. In five modelling steps, we hold site-membership constant as simple fixed effects (i.e. mean site allocations), allowing us to make inferences about the general effect present across our sites while accounting for an unmeasured between-site variance. Furthermore, we adjust for potentially competing explanations by holding constant the ratings of moralizing gods' rewarding abilities, local gods' punishment–monitoring score and relationship to local secular authorities (e.g. police). Apart from these controls, we also hold constant demographic variables, emotional closeness to LOCAL, DISTANT, and OUTGROUPS and game-related variables such as game-order (see electronic supplementary material, section S3 for details).

3. Results

We observed high between-site variability in mean allocations in the RAG and DG (figure 1). On average, in both games, participants tended to allocate more coins to the SELF and to LOCAL co-religionists compared to DISTANT co-religionists and OUTGROUPS. The allocations were generally more equitable in the RAG compared to the DG (despite the greater anonymity in the RAG), indicating that the rule-following aspect of the RAG played an important role in participants' decision-making.

(a) Moralizing gods promote allocations to distant co-religionists

To replicate our previous findings from Wave I [8,22], we first analysed the DISTANT RAGs on the sample from both data collection waves. In line with Wave I, we observed that participants who rated their moralizing god as more punitive and monitoring tended to allocate more money to DISTANT co-religionists. Figure 2 illustrates that going from zero to one in our punishment–monitoring score was associated with an increase in the mean allocations to DISTANT co-religionists. To examine this effect more closely, we regressed RAG allocations on the punishment–monitoring scores using binomial regression models. In all specifications, the estimated

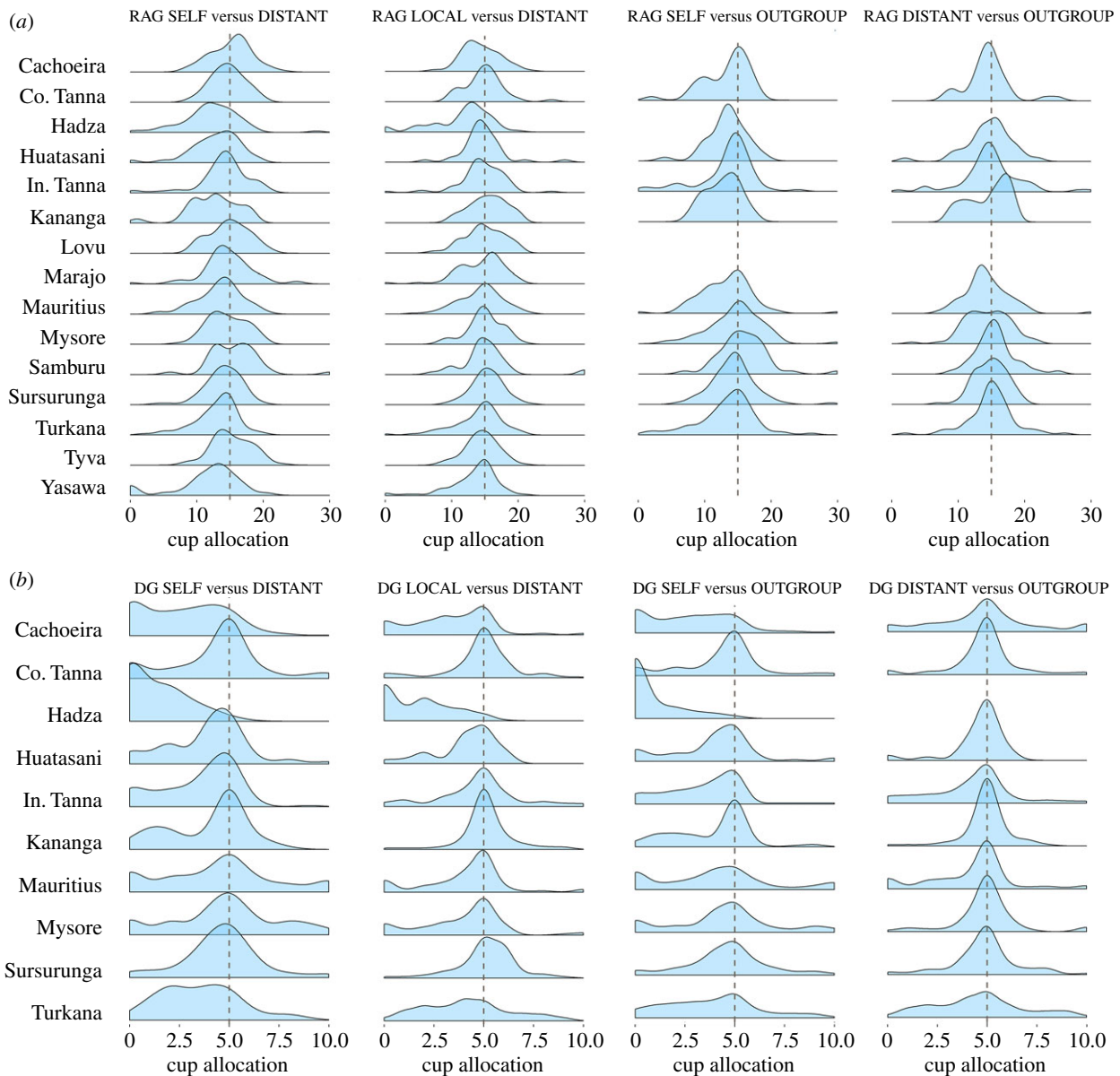


Figure 1. Density plots of DISTANT co-religionist and OUTGROUP allocations in the RAGs and DGs. (a) Participants allocated 30 coins between two cups in each RAG. Deviations from the predicted binomial distribution point to biased money allocation. (b) The distribution of participants' allocations in the DGs revealed more between-site variability compared to the RAGs. The dashed vertical lines indicate an equitable split between cups (15 in the RAGs and 5 in the DGs). In. Tanna: Inland Tanna; Co. Tanna: Coastal Tanna. (Online version in colour.)

punishment–monitoring coefficients were positive, predicting larger DISTANT allocations: rating moralizing gods as punitive and monitoring increased the chances of allocating a coin to the DISTANT cup by 26% [95% CI = 6–49%] in the SELF versus DISTANT RAG and by 22% [95% CI = 3–45%] in the LOCAL versus DISTANT RAG. Crucially, none of the key control variables showed stable effects on DISTANT allocations (table 2 and figure 3; electronic supplementary material, section S3.2 for specific modelling steps and figure S6 for comparison of Wave I and Wave II).

To extend the RAG results to a different economic game measuring a distinct facet of intra-religious impartiality, we included the DISTANT DGs during Wave II. We observed similar effects of moralizing gods on DISTANT allocations as in the RAGs (figure 2). Regressing the DISTANT allocations on the punishment–monitoring measure in a series of five Tobit models revealed that the punishment–monitoring score was associated with an increase in participants' allocations to DISTANT co-religionists. The effects of moralizing gods' ratings

predicted up to a 1.25 coin increase [95% CI = 0.25–2.24] in allocations to DISTANT co-religionists when playing with the SELF, and up to a 0.89 coin increase [95% CI = 0.07–1.70] when playing with LOCAL (maximum allocation was 10 coins). These results held for various model specifications, and none of our key controls predicted DISTANT allocations (table 2 and figure 3; electronic supplementary material, section S3.2 for specific modelling steps).

To examine whether the effects of punishing gods on behaviour can be experimentally manipulated under field conditions, in some sites (table 1), we randomly assigned participants to be primed with either moralizing gods, local gods, secular authority (the latter in the DG only), or a control condition. Since we were interested in the strength of effects of the moralizing gods prime compared to the other conditions, we set the moralizing gods prime as a reference category for comparisons in our models (note that this choice does not affect other coefficients of interest; see electronic supplementary material, S2.1.5).

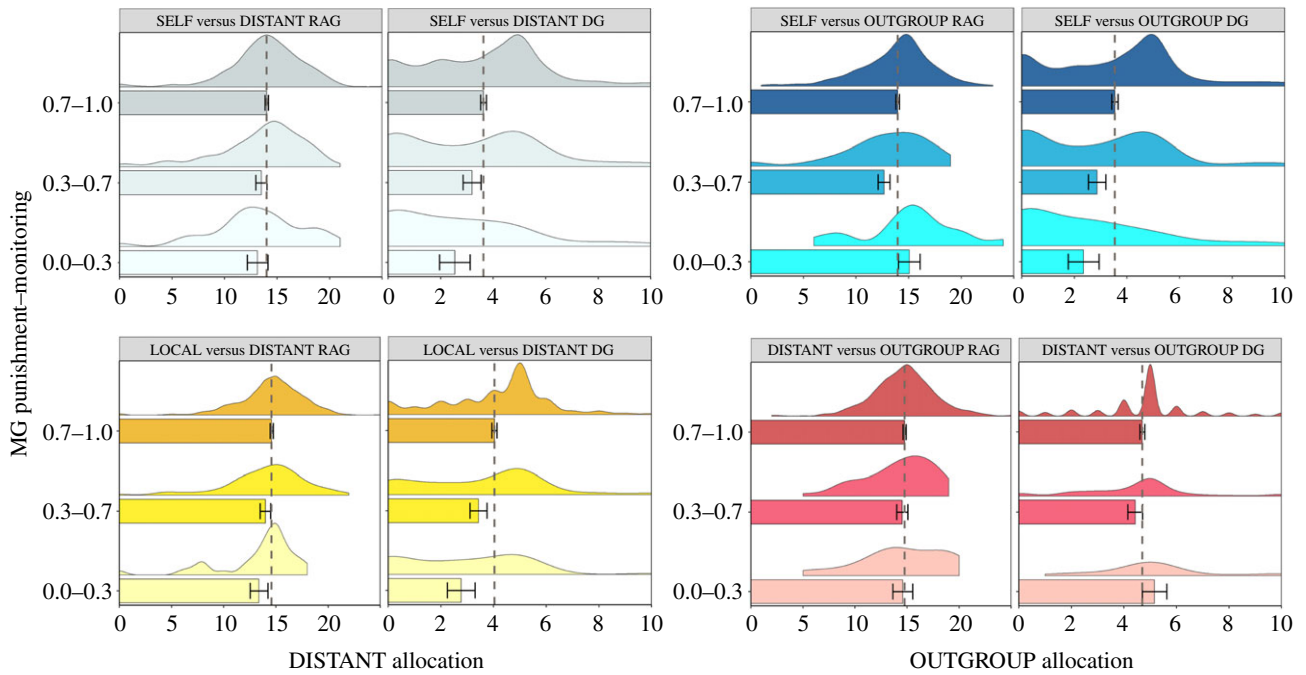


Figure 2. Positive effects of moralizing gods (MGs) on DISTANT allocations and varying effects on OUTGROUP allocations. Displayed are raw means with 95% CI and density plots; dashed vertical lines indicate the moralizing gods' effect. These effects are illustrative only because we collapsed the punishment–monitoring score into three instead of five categories for easier reading: 0.0–0.3, 0.3–0.7, 0.7–1.0. These plots also do not take into account between-site differences and distributional assumptions (table 2 for specific estimates). Note that the number of participants in each level of the MG Pun–Mon variable substantially differs (with MG Pun–Mon = 1 having the most and MG Pun–Mon = 0 the least participants); see electronic supplementary material, figure S2. (Online version in colour.)

We observed priming effects consistent with our hypotheses in the raw data (see electronic supplementary material, figure S7), although these patterns weakened after accounting for site fixed effects. Using binomial regression, we did not observe a difference between the moralizing gods and control conditions in the RAGs; however, participants in the local gods condition had odds between 0.85 and 0.89 of allocating a coin into the DISTANT cups compared to the moralizing gods condition (electronic supplementary material, table S16). Similar patterns were observed for the DISTANT DGs: there were no differences between the moralizing gods and control conditions but the coefficients of the treatment with moralizing gods were higher compared to the local gods and secular authority treatments. While some of these differences were imprecisely estimated, all the coefficients were in predicted directions (ranging from a difference of 0.22 to 0.63 coins; electronic supplementary material, table S16). Thus, these findings offer only tentative support for prediction #1B and should be interpreted with caution (see electronic supplementary material, section S3.2 for further discussion).

(b) Varying effects of moralizing gods on allocations to outgroups

The OUTGROUP games further expanded our Wave I design, pitting the SELF against an OUTGROUP individual, or a DISTANT co-religionist against an OUTGROUP individual. Exploring the raw data displayed in figure 2 suggested that the effects of punishing and monitoring gods on OUTGROUP allocations are highly variable and may be site dependent. To test the OUTGROUP hypotheses (indiscriminate prosociality versus religious parochialism), we used the same set of regression models as in the DISTANT games.

First, consistent with hypothesis #2A, we observed that the punishment–monitoring score showed no reliable effect on

players' contributions to OUTGROUPS in the SELF versus OUTGROUP RAG (table 2). In the DG, moralizing gods' punishment and monitoring was associated with increased contributions to OUTGROUPS at the players' expense up to an increase of 1.23 coins [95% CI = 0.08–2.39]. However, this estimate was fairly imprecise and confidence intervals tightened to exclude zero only when holding the emotional closeness to and similarity with the OUTGROUP constant, suggesting that allocations to OUTGROUP members depend on pre-existing relationships (table 2 and figure 3; electronic supplementary material, table S19).

Testing whether the punishment–monitoring score is associated with favouritism toward DISTANT co-religionists at the expense of OUTGROUPS (hypothesis #2C), the results from both the DISTANT versus OUTGROUP RAG and DG revealed variable effects of the punishment–monitoring score. The general coefficients were in predicted directions, indicating that the punishment–monitoring score was associated with the odds of 0.9 [95% CI = 0.66–1.24] of allocation to the OUTGROUP cup in the RAG and with 0.33 [95% CI = –1.20–0.54] lower coin allocations in the DG. However, the confidence intervals suggested high between-site variation (table 2 and figure 3). Breaking down the variation by the type of moralizing gods' religion at each site (Christian versus Other) suggested that the absence of the main effect may be explained by the fact that at Christian sites, gods' punishment–monitoring score was on average associated with higher allocations to OUTGROUPS, while the reverse applied to the other sites (see electronic supplementary material, section S3.3 for discussion).

Regarding experimental manipulation in the OUTGROUP games, we employed the same priming techniques as in the DISTANT games (see electronic supplementary material, figure S10). For the SELF versus OUTGROUP RAG, we compared a control condition with the moralizing gods treatment, observing the odds ratio of 0.91 [95% CI = 0.84–0.99] for

Table 2. Coefficients and 95% confidence intervals from binomial and Tobit regressions estimating allocations to the DISTANT/OUTGROUP cups. Abbreviated results from full models. OR, odds ratio (exponentiated coefficients) from binomial regression; β -Est., beta estimate from Tobit regression; MG, moralizing gods; LG, local gods; Pun – Mon, punishment – monitoring. The full models hold constant site-specific mean allocations, treatment, age, sex, number of children, household size, material insecurity, emotional closeness and practice similarity to local and distant co-religionists and to outgroup, and police evaluation. Site means are modeled as simple fixed effects with Mysore as the reference category (see electronic supplementary material, section S3.1). Note that these models exclude three sites due to the lack of local god beliefs (Hadza, Lovu, and Samburu). Reduced models including all sites are displayed in electronic supplementary material, tables S7 – S10 and S17 – S20 (Model 2).

	DISTANT games						OUTGROUP games												
	random allocation game			dictator game			random allocation game			dictator game									
	SELF versus DISTANT	LOCAL versus DISTANT	β -Est.	SELF versus DISTANT	LOCAL versus DISTANT	β -Est.	SELF versus OUTGROUP	DISTANT versus OUTGROUP	OR	SELF versus OUTGROUP	DISTANT versus OUTGROUP	β -Est.							
MG pun – mon	1.26** (1.06, 1.49)	1.22* (1.03, 1.45)	0.89* (0.07, 1.70)	1.25* (0.25, 2.24)	0.89* (0.07, 1.70)	1.08 (0.79, 1.49)	1.08 (0.79, 1.49)	0.90 (0.66, 1.24)	1.23* (0.08, 2.39)	0.90 (0.66, 1.24)	1.18 (0.94, 1.47)	1.14 (0.94, 1.38)	1.23* (0.08, 2.39)	0.90 (0.66, 1.24)	1.18 (0.94, 1.47)	1.14 (0.94, 1.38)	1.23* (0.08, 2.39)	0.90 (0.66, 1.24)	
LG pun – mon	1.07 (0.94, 1.21)	0.99 (0.87, 1.12)	–0.04 (–0.62, 0.54)	0.57 (–0.13, 1.28)	–0.04 (–0.62, 0.54)	0.76* (0.61, 0.94)	0.76* (0.61, 0.94)	1.18 (0.94, 1.47)	–0.05 (–0.88, 0.79)	1.18 (0.94, 1.47)	1.14 (0.94, 1.38)	1.14 (0.94, 1.38)	–0.05 (–0.88, 0.79)	1.18 (0.94, 1.47)	1.14 (0.94, 1.38)	1.14 (0.94, 1.38)	–0.05 (–0.88, 0.79)	1.18 (0.94, 1.47)	1.14 (0.94, 1.38)
MG reward	0.98 (0.86, 1.11)	0.96 (0.84, 1.09)	–0.27 (–0.80, 0.25)	–0.49 (–1.13, 0.15)	–0.27 (–0.80, 0.25)	0.88 (0.73, 1.06)	0.88 (0.73, 1.06)	1.14 (0.94, 1.38)	–0.34 (–1.05, 0.37)	1.14 (0.94, 1.38)	1.02 (0.97, 1.07)	1.02 (0.97, 1.07)	–0.34 (–1.05, 0.37)	1.14 (0.94, 1.38)	1.02 (0.97, 1.07)	1.02 (0.97, 1.07)	–0.34 (–1.05, 0.37)	1.14 (0.94, 1.38)	1.02 (0.97, 1.07)
police	1.03# (1.00, 1.07)	1.00 (0.97, 1.04)	–0.08 (–0.22, 0.05)	0.01 (–0.16, 0.17)	–0.08 (–0.22, 0.05)	1.01 (0.96, 1.06)	1.01 (0.96, 1.06)	1.02 (0.97, 1.07)	0.02 (–0.17, 0.21)	1.01 (0.96, 1.06)	1.02 (0.97, 1.07)	1.02 (0.97, 1.07)	0.02 (–0.17, 0.21)	1.02 (0.97, 1.07)	1.02 (0.97, 1.07)	1.02 (0.97, 1.07)	0.02 (–0.17, 0.21)	1.02 (0.97, 1.07)	1.02 (0.97, 1.07)
constant	0.81* (0.66, 0.98)	0.94 (0.77, 1.15)	3.54*** (2.50, 4.58)	4.43*** (3.24, 5.62)	3.54*** (2.50, 4.58)	1.30 (0.94, 1.79)	1.30 (0.94, 1.79)	0.94 (0.68, 1.29)	2.65*** (1.29, 4.02)	0.94 (0.68, 1.29)	0.94 (0.68, 1.29)	0.94 (0.68, 1.29)	2.65*** (1.29, 4.02)	0.94 (0.68, 1.29)	0.94 (0.68, 1.29)	0.94 (0.68, 1.29)	2.65*** (1.29, 4.02)	0.94 (0.68, 1.29)	4.75*** (3.71, 5.79)
N people	602	598	792	802	792	261	261	255	636	255	255	255	636	255	255	255	636	255	636
N sites	12	12	9	9	9	7	7	7	8	7	7	7	8	7	7	7	8	7	8

$p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

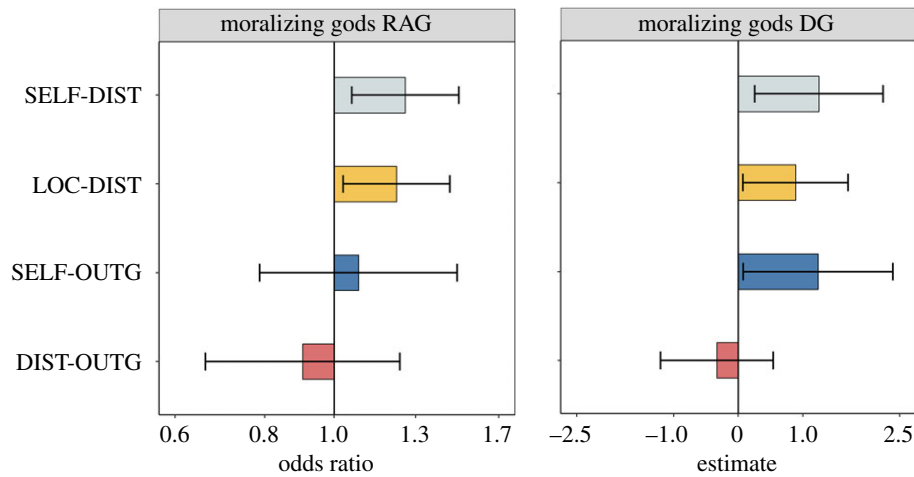


Figure 3. Moralizing gods' punishment–monitoring regression coefficients with 95% CI. Rating moralizing gods as monitoring and punishing predicted larger allocations to the DISTANT co-religionist cups when playing with both SELF and LOCAL co-religionist. The same rating did not predict allocations to the OUTGROUP cups in the SELF versus OUTGROUP RAG; however, we observed a positive effect in the SELF versus OUTGROUP DG. The coefficients for the DISTANT versus OUTGROUP RAG and DG were in predicted directions but exhibited between-site variability. *X*-axis for the RAG is on the logistic scale. (Online version in colour.)

allocations to OUTGROUPS in the control condition compared to the moralizing gods treatment (electronic supplementary material, table S24). In the SELF versus OUTGROUP DG, we added treatments with local gods and local secular authority, observing that the moralizing gods treatment predicted an increase of 0.36 coins [95% CI = -0.06 – 0.79] compared to the control condition, 0.68 coins [95% CI = 0.21 – 1.14] compared to the local gods treatment and 0.75 coins [95% CI = 0.20 – 1.31] compared to the secular authority treatment (electronic supplementary material, table S24). For the DISTANT versus OUTGROUP games, there were no differences between the moralizing gods and control conditions in the RAG and only weak negative differences between the moralizing gods and other treatments in the DG. In sum, the priming results in the OUTGROUP games do not provide support for our predictions (#2B and #2D) and suggest that priming may instead promote indiscriminate prosociality in the SELF versus OUTGROUP games (see electronic supplementary material, section S3.3 for discussion).

4. Discussion

Through four iterations of both the RAG and the DG, as well as a priming battery, we examined the effects of beliefs related to supernatural monitoring and punishment on the impartial treatment of various receivers. Adjusting for a host of potentially confounding factors, our results show that higher ratings of moralizing gods as punitive and monitoring were associated with larger allocations to DISTANT co-religionists when playing with both the SELF and LOCAL co-religionists in the RAGs and DGs, supporting the intra-religious impartiality hypothesis. The experimental priming with moralizing gods typically produced larger contributions to DISTANT co-religionists compared to the treatments with local gods and secular authority, but not compared to the control condition. The lack of difference between the moralizing gods and control conditions resulted from the fact that the majority of participants committed to moralizing gods played close to 50/50 split in the control condition, hence the primes had low variation to act upon (in both the DG and RAG, giving half of the endowment is generally the ceiling on allocations to strangers [6,36]).

These findings support the idea that the cultural evolution of supernatural agents into punishing and monitoring gods who care about interpersonal, normative conduct may have played a role in the extension of the cooperative circle beyond kin-networks and local ingroup interests. In small-scale societies, supernatural agents are often confined to local ecologies where they may promote parochial cooperation by demanding collective activities [42,43]. However, because some local gods are tied to a specific place, they do not necessarily provide an overarching identity for geographically distant communities and are not as interested in normative conduct of anonymous members of different communities ([5]; see also electronic supplementary material, table S3). In line with this proposition, our correlational results showed that belief in moralizing—but not local—gods reduced local favouritism. Moreover, in the analyses of the priming conditions, the average allocations to DISTANT co-religionists across all the games were smaller in the local gods treatment compared to the moralizing gods treatment.

The negligible effects of another key control variable—the reward ratings of moralizing gods—suggest that it is specifically the belief in the punishing and monitoring (not rewarding) aspects of supernatural agents that promote higher DISTANT allocations [44]. Similarly, a different body of literature has suggested that in some cultural and historical circumstances, secular institutions may outcompete the policing functions provided by belief in punishing and monitoring gods [45,46]. Again, our results in the DISTANT RAGs and DGs hold even when controlling for a relationship to local secular authority in this particular sample. Consistent with this finding, the secular authority prime led to lower allocations to DISTANT co-religionists compared to the moralizing gods prime in the DGs, although confidence intervals for these estimates were quite wide, suggesting considerable variability for which we have not accounted.

The cultural evolutionary approach developed above further suggests that the increased impartiality shown toward DISTANT co-religionists in the RAG and DG should not necessarily extend to religious outgroups (religious parochialism; prediction #2A). Indeed, while self-favouritism was constrained by commitments to moralizing gods in the SELF versus DISTANT RAG (above), the punishment–monitoring

score did not play a role in curbing self-favouritism when playing the RAG with OUTGROUP. This result points to the parochial effects of moralizing gods, who may be concerned with normative conduct toward co-religionists but not necessarily toward outgroups. The result of SELF versus OUTGROUP DG was more complicated. In this DG, we observed a positive correlation between punishment–monitoring ratings and allocations to OUTGROUPs; however, this coefficient was not robust across different model specifications and only emerged as significant at conventional levels when both people’s relationship with, and similarity to, the OUTGROUP were held constant (cf. [47]). This relationship suggests that when groups are sufficiently similar and maintain prior favourable relationships, belief in punishing and monitoring gods may deter extremely selfish treatment of outgroup members in the DG (i.e. zero allocations; see electronic supplementary material, section S3.3 for discussion). In line with this interpretation, priming moralizing gods increased OUTGROUP allocations in both the SELF versus OUTGROUP RAG and DG compared to the control condition (but never raised them above the 50/50 split).

Finally, we hypothesized that individuals would make a distinction between DISTANT co-religionists and OUTGROUPs (#2C), promoting the competitiveness of one’s own religious group by increasing allocations to DISTANT co-religionists at the expense of OUTGROUPs. While the coefficients in both the RAG and DG were in the predicted direction, the confidence intervals of those effects suggested considerable between-site variability. We explored a hypothesis stating that in the absence of intergroup hostility (as shown by our OUTGROUP emotional closeness measure, see electronic supplementary material, table S4), religions appealing to universal norms—which may ultimately foster proselytizing—would put emphasis on indiscriminate prosociality manifested in higher OUTGROUP allocations. Our supplemental analyses indeed suggest opposite trends in allocation to OUTGROUPs at Christian versus non-Christian sites; however, caution should be exercised in interpreting these results as we would need larger samples and other religions with a universalistic appeal for precise estimates of this effect (see electronic supplementary material, section S3.3 for further discussion).

While deploying our experiments across cultures, we also encountered limitations to our multi-site experimental approach. Our main measure (punishment–monitoring abilities) exhibited low variation at some sites where the maximum value possible was also the modal score. This may have been an artefact of our pre-selection of gods that were specifically concerned with human interpersonal normative conduct, but more nuanced measurements of participants’ beliefs should improve future estimates. Furthermore, while we attempted to define DISTANT co-religionists and OUTGROUPs solely along religious lines,

some sites—due to facts on the ground—had to merge ethnicity and religion when defining recipient groups (see electronic supplementary material for more details and additional analyses). We attempted to adjust our models for different OUTGROUP relationships but future research should obtain detailed estimates of interaction frequency, cooperative exchange, and conflict history. This applies to other types of culturally evolved groupings such as markets or political institutions (for details see [48]). Finally, adapting priming techniques to fit the specific context at each site yielded substantial variability in those techniques, possibly hindering the general estimates of the priming effects. These effects might have also been confounded by the fact that our design necessitated the use of religious reminders on cup labels, possibly subtly priming all participants (see electronic supplementary material, section S3.2.4 for discussion).

Despite these limitations, the current work used a larger and more culturally diverse sample to support our previous findings regarding the role of moralizing gods in expanding the social circle [8,22] and replicated these findings in a new experiment (the Dictator Game) while also revealing tentative support for our predictions using the priming technique in the field. Extending our experimental paradigm to investigate religious parochialism, we observed little or no support for our outgroup predictions; however, exploratory analyses suggested new lines of theoretical and empirical work. Taken together, this study investigated a particular culturally evolved mechanism that may have contributed to the expansion of human societies and illustrates one interdisciplinary approach for moving beyond narrow sampling strategies and harnessing the planet’s rich human diversity to shed light on key questions of cultural evolution.

Data accessibility. The dataset used for the current analyses together with protocols, hypotheses and R code can be found at the Open Science Framework (<https://osf.io/epkbw/>).

Authors’ contributions. J.H., A.N., and B.G.P. conceived the study, prepared protocols, and managed data collection. 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, and M.L. conducted all analyses and made all graphs and tables. M.L., J.H., B.G.P., and A.N. drafted the paper. All authors provided input on methods and the manuscript.

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