

SUPERNATURAL EXPLANATIONS AND NORM ENFORCEMENT IN NINE SOCIETIES

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ABSTRACT

Historical and ethnographic evidence suggests that people around the world use supernatural beliefs to explain misfortune. The cross-cultural prevalence of this pattern may arise from our expectations that norm violations lead to sanctioning. In cases where an outcome seems punitive yet lacks an identifiable cause, individuals, motivated to fill this explanatory gap, may rely on beliefs in supernatural punishment to make sense of what has happened. If true, supernatural explanations for misfortunes should be more common when a victim is believed to have not cooperated in the past (i.e., in cases where misfortunes might be unexplained but otherwise appear deserved). Using a vignette experiment across nine diverse populations ($N = 714$), including African hunter-gatherers and Melanesian horticulturalists, we tested if knowledge of past bad actions increased participants' endorsements of supernatural causes for misfortune. Across all populations, participants rated a misfortune as more likely to be supernaturally caused when the victim was known to have failed to reciprocate a favour or engage in generous actions toward others in the past. This was slightly increased when the behaviour was additionally labelled normative. Responses to open-ended free-listing questions provide additional evidence that when the victim was known to be uncooperative, participants were more likely to propose supernatural causes for misfortune as well as supernatural solutions. Additional normative labelling had only a small effect. Together, these findings suggest that when misfortunes lack clear causes, people's motivation to explain interacts with moral evaluations, leading them to invoke supernatural beliefs most commonly when misfortune appears deserved.

INTRODUCTION

If your house burns down on Christmas day, ‘bad wiring’ may not feel like a satisfying explanation for the enormity of the event. When truly bad things happen, exclusively naturalistic or mechanistic explanations can leave us feeling unsatisfied, especially when they involve randomness (why on Christmas day of all days?). These mechanistic explanations lack the more socially relevant information we crave, such as ‘why this person?’ and ‘why now?’ (Evans-Pritchard, 1937). The belief that bad things happen to bad people (Callan et al., 2014; Kaplan, 2012), or that bad things are a punishment for past bad actions, allows social and reputational answers for these otherwise unanswerable questions. While these additional *why* questions can sometimes be answered through ordinary non-supernatural social explanations (e.g., someone with a grudge tossed a Molotov cocktail through a window), they may be more convincingly answered with supernatural explanations (e.g., de Barra et al., 2025; Legare et al., 2012; Legare & Gelman, 2008) where people see supernatural punishment for past actions (e.g., God caused the fire to happen as a punishment for the bad behaviour, or maybe a person did it through witchcraft rather than arson; Willard, Rosun, Lesage, et al., 2025).

Religious beliefs, including those related to magic, sorcery and witchcraft¹, are prevalent explanations for misfortune (Boyer, 2021; Jackson et al., 2023). They are frequently invoked to explain apparent cases of supernatural punishment (Fitouchi & Singh, 2021; Norenzayan et al., 2016; Watts et al., 2015). Previous work has found that

¹ By witchcraft we mean both the innate power or ability to use magic and learned magic. This second sense is sometimes referred to as sorcery (Evans-Pritchard, 1937). We use witchcraft as shorthand for both because this distinction is not relevant to our data and ‘sorcery’ is part of the common understanding of witchcraft in much of the contemporary world.

people are less likely to behave badly when they are worried about supernatural punishment (Lang et al., 2019; Purzycki et al., 2016; White et al., 2019), and that beliefs about punishment may be tied to violation of certain norms (Purzycki, 2011; Singh et al., 2020; Willard, Rosun, Lesage, et al., 2025). Still, the link between actions and perceived supernatural punishment is causally ambiguous, particularly if the punishment is within a victim's lifetime; how do people decide when a misfortune is actually a supernatural punishment?

We have three aims in this paper. First, we lay out an argument that beliefs about supernatural punishment extend from an evolved norm psychology (Chudek et al., 2013; Chudek & Henrich, 2011; House et al., 2020), and that norm psychology is the best framework for the existing evidence. Second, to provide cross-cultural evidence that knowledge of a past misdeed (in this case, the violation of a cooperative norm) can increase the belief that an otherwise random misfortune could be a supernatural punishment, suggesting that people are using past reputation in their beliefs about supernatural punishment. And finally, to test if people are additionally sensitive to information about the normativeness of the behaviour, which would suggest that the 'badness' of a behaviour and thus how much it deserves punishment, is susceptible to information about others' normative expectations as well as an assessment of the behaviour itself.

The tendency to see ostensibly unexplainable misfortunes as supernatural punishments for past actions could help sustain people's beliefs in effective supernatural punishment (Singh et al., 2020). This may be especially true in the absence of moralised afterlife beliefs (Willard et al., 2020). For beliefs like witchcraft, spirits, or deities that don't punish in the afterlife to be used as norm enforcement (see Purzycki et al., 2021),

random misfortune would need to be believed a consequence of a past bad action (e.g., Baumard & Chevallier, 2012; Boyer, 2022; Willard, Rosun, & de Barra, 2025).

Using vignettes to tap people's intuitions, we test this idea by looking at how participants use information about a past norm violation to decide if a misfortune is more or less likely the result of supernatural punishment. We look at norms in two ways: first, by using stories about cross-culturally consistent cooperative norms around reciprocity and generosity; and second, by manipulating perceptions of how normative these cooperative behaviours were claimed to be. When the victim is known to have not reciprocated or not been generous in the past, we predict that participants will be more likely to see a misfortune as supernaturally caused. We also predict that this effect will increase when the cooperative behaviour is claimed to be normative in the character's community compared to when it is not. We test this across nine culturally, religiously, economically, and ecologically diverse societies, including populations from Asia, Africa, Oceania, Eastern Europe, Western Europe, North America and South America.

SUPERNATURAL PUNISHMENT AND NORM ENFORCEMENT

Supernatural punishment beliefs are an effective way to encourage cooperative behaviour (Henrich et al., 2010; Lang et al., 2019; Purzycki et al., 2016; Purzycki, 2025b). However, much of this research has focused on 'moralising religions', such as Christianity and Islam. These religions show a distinct type of supernatural punishment that focuses on broad moral rules that address interactions among strangers, and include punishment from omniscient deities (Norenzayan et al., 2016). Within such systems, all behaviour is always known by the deity, and the punishment of moral norm violations is completely unavoidable because it can be enacted in the next life. Karma beliefs have

been similarly found to enforce this type of large group morality with unavoidable consequences to one's actions, often in the next life (White et al., 2019; Willard et al., 2020).

Although given less attention in the literature, “smaller” more local gods also care about and punish norm-violating behaviour (Bendixen et al., 2024; Boehm, 2012; Purzycki et al., 2021). Unlike the potent moralising gods of world religions, these deities tend to be less omniscient, seeing only what is happening in their immediate vicinity (Purzycki, 2011) or only caring about violations in specific domains (Singh et al., 2020; Willard, Rosun, Lesage, et al., 2025) and within circumscribed communities (e.g., clans; McNamara et al., 2016). These supernatural agents tend to be concerned with specific community norms rather than broad moral edicts and are more likely to punish immediately rather than in the afterlife or next life. Because we see any mind as capable of judging us on our behaviour, any supernatural agent believed to have a human-like mind has the potential to enforce community norms (Purzycki et al., 2021).

Witchcraft beliefs, or any belief in the supernatural power of people, can also be effective norm enforcement if the breaking of norms or taboos by the victims is one type of explanation for why someone might suffer from a witchcraft attack (Gershman, 2021; Kluckhohn, 1944; Willard, Rosun, & de Barra, 2025). In Mauritius, witchcraft beliefs are effective in enforcing prohibitions against bragging or otherwise behaving in ways that would evoke the envy of others. These behaviours are non-normative in Mauritius (as is witchcraft itself; Kundtová Klocová et al., 2022) and engaging in them increases the chances that people believe you will be cursed, but not that you will be punished by God, suggesting different supernatural beliefs can support different norms (Willard, Rosun, Lesage, et al., 2025).

NORM PSYCHOLOGY AS A FOUNDATION FOR SUPERNATURAL PUNISHMENT

We approach this topic from the evolutionary framework of norm psychology and norm enforcement (Chudek & Henrich, 2011; Henrich & Muthukrishna, 2021; Zefferman, 2014). Norms are learned behavioural standards shared and enforced by a community and are at the foundation of our ability to create institutions and sustain shared cultural representations (Chudek et al., 2013; House et al., 2020; Sripada & Stich, 2007). Norms encompass any socially expected behaviour that is policed by others, including cooperative acts like reciprocity and generosity. As part of becoming a cultural species, we have evolved an ability to socially learn the rules and expected behaviours of our communities. As such, humans possess evolved sensitivities to cues that something is a norm, and a desire to punish norm violators (Bhui et al., 2019; Boyd et al., 2010; Boyd et al., 2003; Henrich et al., 2006, 2015; Panchanathan & Boyd, 2004). This set of evolved traits has been termed “norm psychology” in the literature (Chudek et al., 2013; Chudek & Henrich, 2011; House et al., 2020). With this, norm psychology accounts for how we learn when and why to cooperate with others, and why we have the desire to punish non-cooperators. Cultural evolutionists have proposed and documented a wide variety of sanctioning mechanisms aimed at policing others’ behaviours within this framework (see Henrich & Muthukrishna, 2021 for a review). We suggest that supernatural punishment is built on these same basic building blocks.

One of the key features of norm psychology is paying attention to the reputation of others to decide who to cooperate with or who to punish (Chudek & Henrich, 2011). Crucially to our purposes here, social punishments are often dispersed, and the direct action is not obvious. For example, if increased stinginess in trades is used as punishment towards someone with a bad reputation, the resulting lowered success would not be easily

linked to any specific person or act of social punishment. Expecting a causal link between the reputation and the outcome would be a correct belief, but the actual causal pathway would be difficult or impossible to track.

Norm psychology may create an inclination, bias or susceptibility to seeing misfortune (a person experiencing costs) as a punishment for a norm violation (i.e., when the punishment is believed to be deserved; see Willard, Rosun, & de Barra, 2025), and for the substantial cultural variation in beliefs about what should be punished across populations. For example, some communities may see overly generous allocations as a punishable norm violation while others do not (Henrich et al., 2010), and more religious communities may be more willing to engage with supernatural explanations for misfortune because these explanations themselves are more normative (e.g., Corriveau et al., 2014; Raman & Gelman, 2004).

IMMANENT JUSTICE BELIEFS AND OTHER THEORIES

Existing work within psychology dovetails nicely with the above-described norm-psychological approach. Specifically, the psychological concept of immanent justice – the belief that punishment automatically follows misdeeds – suggests that people do use the reputational information of norm violations to judge misfortune (Medinnus, 1959; Piaget, 1932). What this framework lacks is a mechanism: *why* do people expect punishment for bad behaviour? Norm psychology can offer this mechanism by outlining why we might evolve to expect social punishment. In general, work in the immanent justice framework has shown that negative events are seen as more deserved if a person is believed to have behaved badly in the past (e.g., Boyer et al., 2024; Boyer & Chantland, 2025). Immanent justice beliefs have been linked to religious beliefs with the claim that people use religion to fulfil this desire for justice and punishment when others behave

badly (Baumard & Boyer, 2013) and the finding that religious people are more prone to this type of thinking than non-religious (Harvey & Callan, 2014).

Other work in this area that has sought to explain why people might decide that a misfortune is a supernatural punishment has suggested it is a strategically motivated response to get out of helping others by assuming the victim has done something to deserve it (Boyer, 2022). This verbal argument follows the formal logic of negative indirect reciprocity, which is one kind of mechanism that cultural evolutionists have proposed to explain how norms are sustained in some societies (Bhui et al., 2019; Henrich & Henrich, 2014; Henrich & Muthukrishna, 2021). Under a norm-enforcement system rooted in negative indirect reciprocity, people who harm those with ‘good’ reputations or violate the prescribed social norms get ‘bad’ reputations; but people can harm or exploit those with bad reputations, thereby gaining a direct personal benefit, without sacrificing their own reputation (Bhui et al., 2019). Seeing someone ‘harmed’ may intuitively mark them as a norm violator, and others may see them as someone worthy of exploitation, including by such things as witchcraft (Willard, Rosun, Lesage, et al., 2025). Research demonstrating that blame is more common when the victim has a bad reputation (Boyer et al., 2024; Boyer & Chantland, 2025) suggests this pattern fits within a norm psychological account.

Other work has claimed that an evolutionary root for supernatural punishment can be found in an innate need for fairness, and suggests that because of this link to fairness punishments should be proportional to the crimes (Baumard & Chevallier, 2012). There are some problems with this approach. First, this research was based on reaction time measures to misfortune when deserved and not deserved and did not look at supernatural beliefs. The use of IAT reaction time measures here makes the ‘proportional’ findings

difficult to interpret, as this method measures cognitive associations not beliefs. The increased reaction is caused by how concepts are commonly paired in society (e.g., apples and oranges, vs. apples and kumquats) not beliefs about their relatedness. Second, fairness cannot explain why norm violations such as not wearing the right clothing or marrying a same-sex spouse should be punished. It does not explain *why* we want to punish others at all. Finally, religious punishments often do not seem to follow rules of proportionality. The Siberut Mentawai believe that not distributing certain types of meat evenly among the clan can upset the Sikameinan crocodile spirit who might kill the norm violator (Singh et al., 2020). Within Christianity, one can receive eternal damnation for cowardice, sexual immorality, or even lying (Rev. 21:8). These types of extreme punishments are used as a deterrent rather than solely as payment for one's crimes. All these factors suggest a foundation in norm psychology.

Other explanations for the origins of supernatural punishment, such as a type of interpersonal policing and social control (Fitouchi et al., 2025; Fitouchi & Singh, 2021), and error management (Johnson & Bering, 2006) can also be parsimoniously consolidated within a norm psychological framework. "Mutual Policing" claims that supernatural punishment exists to police others' behaviours (Fitouchi et al., 2025), which is a function of norm psychology. Where Mutual Policing differs from the theories mentioned above is in the claim that people adopt supernatural punishment beliefs because they believe these beliefs will influence others to cooperate, rather than the cooperative benefits themselves. We did not test this idea here.

Johnson and Bering's (2006) error management proposal is straightforward norm-psychology but was proposed before the norm-psychological framework had been fully articulated. They suggest that we extend the social monitoring mechanism to supernatural

punishments. Their proposal is specific to moralising gods, and we aim to extend it to all sorts of supernatural punishment, and specifically punishment within one's lifetime. We suggest that people will see situations worthy of social punishment as also worthy of supernatural punishments. Given the existing theoretical and empirical evidence for an evolved norm psychology as an explanation for the tendency towards rule following and social punishment of rule violators, we suggest that it is also the best framework for understanding supernatural punishment and no additional special mechanism is needed. Thus, we have used norm psychology to frame this study.

CURRENT PROJECT

Supernatural punishment beliefs in a norm psychological framework function as a deterrent. Punishment is directed at violations that are seen as punish-worthy by a community. This may foster the tendency to use supernatural punishment explanations to explain misfortune, particularly when a person is believed to deserve punishment. Though this is widely suggested as the basis for supernatural punishment beliefs, this link between knowledge of past bad action as increasing supernatural punishment attributions has rarely been looked at directly (for previous examples see: Willard, Rosun, & de Barra, 2025; Willard, Rosun, Lesage, et al., 2025). If this is a general human tendency, we expect to find a similar pattern of effect across a diverse set of societies. From this, we predict that: 1) victims are more likely to be blamed for their misfortune when they are known to have violated cooperative norms; 2) misfortune is more likely to be perceived as supernatural punishment when the victim is known to have violated cooperative norms; 3) as norm violations are first and foremost socially punished, we will see the perceived likelihood of supernatural punishment increase in a similar way to the

perceived likelihood of social punishment.

Though bad behaviour should always increase the chances of punishment, the ‘badness’ of an action may be determined by whether it is normatively expected. Something that may be bad behaviour in some places can become good behaviour under different normative rules. Therefore, we expect 4) participants to see non-cooperative behaviour that we identify as a norm violation as more blameworthy, and misfortune as more likely explained by social or supernatural punishment, than non-cooperative behaviour that we identify as more acceptable in the vignette character’s community. Though all our predictions fit within the norm psychological framework, this final prediction is a unique prediction of norm violation and punishment as a basis of supernatural punishment beliefs.

We test these possibilities using vignettes. In these stories, a character is faced with a normative cooperative dilemma (generosity or reciprocity) and either cooperates or defects (neither gives generously nor reciprocates). These types of cooperative norms were chosen because of their relative universality across populations. Additionally, participants were told if cooperation in this specific context was normatively expected in the vignette character’s community. Although a weaker test of the norm hypothesis than the cooperative behaviour (telling people something is or is not a norm in a different community is not the same as a violation of a norm they themselves hold and beliefs in the universality of norms differ across cultures; Shweder et al., 1987), this allowed us to assess if participants pay attention to variations in norms when making these judgments.

Participants were given both open-ended and Likert scale questions to assess potential causal beliefs about the misfortune. We expected that participants would rate both social and supernatural punishments as more likely when the target character

defected and when it was claimed they had broken a local norm (i.e., we expect an interaction effect when the character defected, and the behaviour was described as normative). We also predicted that participants, given the chance to claim any cause, would more readily infer supernatural causes for the misfortune under these conditions.

We also asked about how to fix, or ‘cure’, the problem. This was more exploratory than our other theoretically driven research questions but nonetheless produced interesting results. Here, we explore how past bad behaviour influenced the rate at which participants suggested supernatural solutions. This is a more indirect form of causal reasoning but may suggest that people believe misfortunes related to past bad actions require a non-natural solution (Willard, Rosun, & de Barra, 2025).

PARTICIPANTS

Table 1 summarises the demographics from 714 individuals in nine populations sampled from around the world, with between 50 and 104 participants in each sample. The Austin, Vancouver, Brno and Nagoya samples were student samples. All others were community samples. The São Gonçalo sample was a community sample collected around the University and consists of predominantly highly educated participants. This set covers a wide range of social and political organisations, as well as a range of diverse religious traditions including Christian, Buddhist, Hindu and small-scale religions as well as largely atheist populations (see SOM for additional site information). Samples were selected based on willingness to participate, with an attempt to achieve as much diversity across sites as possible.

Table 1: Samples and demographics

	N	Number female	Average Age (SD)	Average years education (SD)	Primary religion
Austin (students), USA	50	29	18.75 (1.04)	13.72 (1.46)	Christian
Belfast, UK	71	38	32.06 (14.04)	17.72 (2.77)	Christian
Brno (students), Czech Republic	103	67	23.15 (3.39)	14.04 (1.57)	None/Christian
Hadza (Hadzaland, Tanzania)	104	57	38.32 (14.43)	--	Animistic
Nagoya (students), Japan	94	40	20.87 (2.74)	14.35 (1.80)	Buddhist/Shinto
Sursurunga (New Ireland, Papua New Guinea)	67	33	40.52 (14.18)	7.23 (2.89)	Christian
Pointe aux Piments, Mauritius	79	39	24.14 (4.77)	14.12 (1.80)	Hindu
São Gonçalo (University), Brazil	72	40	36.72 (12.06)	19.35 (8.91)	Christian
Vancouver (students), Canada	74	55	20.27 (2.66)	14.19 (3.48)	None/Christian

MATERIALS AND METHODS

Participants read (or had read to them; see SOM) a series of vignettes about a community described as different from their own, and a normative expectation for reciprocity or generosity behaviour within that community (e.g., “people from this community are/are not expected to give food to the poor”). After the norm information, the vignette character either cooperated (reciprocated past aid or was generous) or defected (did not reciprocate past aid or was not generous). At the end of each vignette, the story character suffered from either a disease/physical ailment or loss of resources (e.g., went blind; lost all their belongings in a flood). A set of 16 vignettes was created to iterate over all possible pieces of information, plus two control vignettes that contain only information about the misfortune. Each participant read/was read 8 test vignettes plus the

2 controls (10 in total; see details in SOM). All vignettes were translated in their respective sites by someone familiar with the project aims and checked over for translation accuracy by a separate researcher.

After the vignettes and a comprehension check, participants answered two open ended free-list questions (Purzycki, 2025a; Quinlan, 2019) about possible causes and cures for the misfortune (see SOM Table S1). Participants could give up to five answers for each list. Lists were translated into English by the site research teams and coded for:

- 1) Supernatural agent (e.g., gods, spirits)
- 2) Supernatural other (e.g., fate, karma and other non-agentic supernatural claims including claiming the misfortune as punishment for past actions without a natural or social cause)
- 3) Other person inflicted (e.g., his neighbour/brother etc. caused it)
- 4) Victim blaming (in cause questions, e.g., he was careless or clumsy) / Behavioural change (in cure questions, e.g., he should take more care)
- 5) Natural causes (e.g., disease, natural disaster, weather, random chance etc.)
- 6) Other: anything else

For each site, intercoder reliability was coded across answers from 4 vignettes (Cohen's kappa between 0.80 and 0.96; see SOM Tables S2-S3 for coding scheme and full reliability metrics).

Participants were then asked a set of Likert scale questions (-2 to 2) asking if 1) the other character in the story, 2) a member of the character's community, or 3) God could be responsible for the character's misfortune. In addition, participants were asked a question about the goodness or badness of the character, how good or bad that action would be if committed in their community, and a yes or no question asking if the

character was to blame. Participants who did not pass the comprehension test were read the vignette again and re-asked the comprehension question until they passed.

Among the Hadza hunter-gatherers, some modifications to our protocols were necessary. First, because the Hadza live largely without personal property, the resource vignettes were altered to be about the breaking of a hunting bow or loss of a spouse. Second, due to the strangeness of the task within this community, we limited the number of vignettes to only 5 (4 test vignettes plus 1 control) per participant. Each vignette was paired with only one norm condition (rather than two) for a total of 8 test vignettes (4 normative and 4 non-normative). All other counterbalancing remained the same. Third, ample experience indicates that Hadza don't do well with Likert scales, which were part of our protocol. To address this, Hadza simply responded with 'yes,' 'no,' or 'don't know' and we coded these as 1.5, -1.5, and 0 respectively. Finally, the reciprocity and generosity situations were modified to fit this community's ethnographic context. Analyses excluding the Hadza can be found in the SOM.

Materials, data, and analysis code can be viewed at: <https://osf.io/ackvt/>.

RESULTS

We divide our analyses into three sections. First, we look at whether our vignette conditions influenced how good or bad the character was as a manipulation check. Second, we look at if the vignette conditions impact how much participants see the victim as blameworthy for their own misfortune. This follows from previous work on victim blaming (Boyer et al., 2024; Boyer & Chantland, 2025). Finally, our main analyses look at if the conditions increase expectations of social and supernatural causes. This is our primary analysis. In all cases, we are primarily interested in two effects – does defecting

have an impact on outcome variables and if these effects increase/decrease when the behaviour that is violated is named as normative or not normative (the interaction between defection and norm).

Analyses used multi-level Bayesian models using the brms package in R (Bürkner, 2017) and weakly regularizing priors (see SOM Equation S3). All models include random intercepts and slopes for site and random intercepts for participant. A Bernoulli distribution was used for blame in section 2 and a Poisson distribution for free-list analyses in section 3. All other analyses were linear models. Both 95% and 89% credible intervals were used. Models with demographic controls, including western and student samples, effects compared to the control condition, and analyses in each site individually can be found in the SOM.

*1) Did the cooperation and normative information influence character judgments?
(manipulation check)*

Yes. The cooperation and normative information influenced the “goodness” or “badness” rating of the character suggesting our manipulation was effective. Across populations, when the character cooperated (reciprocated/was generous), and cooperating was claimed to not be a norm, participants rated the character on average between ‘good’ and ‘very good’ (post mean = 1.23, 95%CI 0.96 to 1.48; on a 5-point scale from very bad [-2] to very good [2]). The character’s rating increased a negligible amount if the behaviour was a norm (rather than not a norm) and they cooperated (post mean = 0.05, 95%CI -0.03 to 0.14). The character was rated 1.76 points lower if they defected and cooperating was not the norm (post mean = -1.76, 95%CI -2.19 to -1.26), putting the average rating in the bad end of the scale. The character was rated an additional 0.19 points lower if they defected and cooperation was claimed to be normative (interaction

post mean = -0.19, 95%CI -0.30 to -0.07). This demonstrates that both behaviour and norm information impacted participants' moral evaluations (see SOM Table S9 for full analysis and S4 comparison of each condition against the control). Similar effects were found when the participant was asked how good or bad the act would be if the character had come from their own community. This analysis can be found in the SOM (Table S10).

2) Did the character's actions and the normative information influence whether participants blamed the victim?

Yes. There were much higher odds of blaming the character for their misfortune when the character had defected rather than cooperated (OR = 6.57, 95%CI 3.61 to 10.48; Figure 1). There was also an increase in those odds when they defected and cooperating was the norm (interaction OR = 1.56, 95%CI 1.04 to 2.37). When blame ratings were compared to the control, we found that across both norm conditions knowledge of past bad behaviour increased blame (44.5% said yes) and knowledge of good behaviour decreased blame (16.25%) compared to the control (28.02%). Table 2 summarises the breakdown across conditions (see Table S5 for statistical analysis). Figure 2 shows the variation in effects across sites when cooperation is normative. We chose to show only the two normative conditions as showing all four conditions for each country makes the figures difficult to understand (see Table S34 for analyses).

Table 2: Percentage who answered yes to the question “was the character to blame for his misfortune?” in each condition

Behaviour	Cooperation is the Norm	Percent
Control	Control	28.02%
Cooperation	No	17.09%
	Yes	15.41%
Defection	No	42.30%
	Yes	46.70%

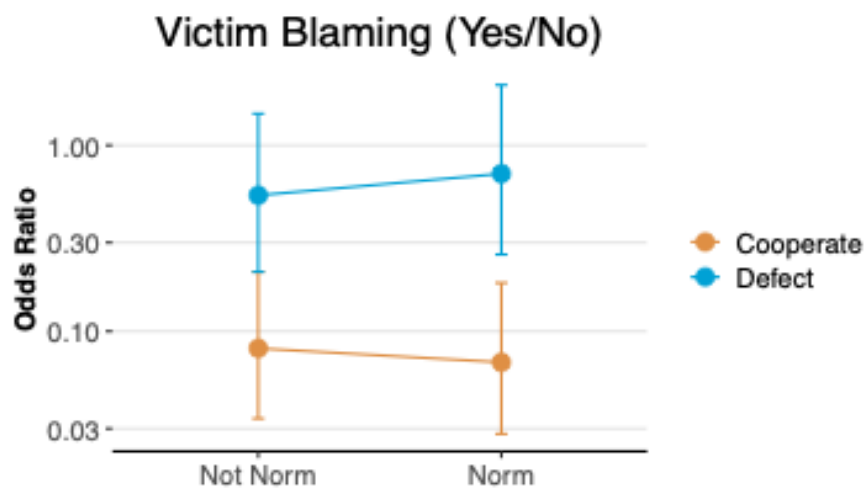


Figure 1: Odds Ratios and 95% credible intervals for blaming the victim in each condition. Effects are calculated as simple slopes. Effects below 1 suggest that participants were more likely to say no than yes on average. Y-axis is log10.

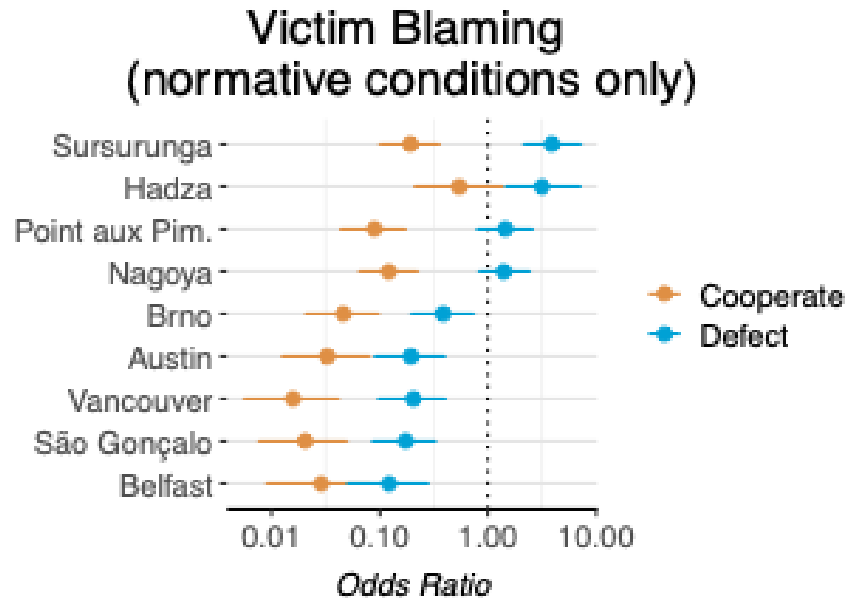


Figure 2: Odds ratios and 95% credible intervals for each site looking at blaming the victim when cooperating is normative. Effects are calculated as simple slopes and X-axis is log10. Effects below 1 suggest that participants were more likely to say no than yes on average.

3) *What or who caused the misfortune?*

When we look at the questions about cause (5-point Likert scale [-2] “not at all likely” to [+2] “very likely”), participants rated the other character, the community, and God as more likely to be responsible for the misfortune if the target character defected (Table 3 and Figure 3). Norm information positively interacted with this effect in all cases – participants were somewhat more likely to suggest punishment when they were told that cooperation was normative. In all cases, the outcome agent(s) in question was rated as more likely to be responsible if the victim was to blame for their own misfortune (yes/no question), but the effects of blameworthiness do not remove the effects of either cooperation or normativeness (see SOM Tables S12 to S14 for these additional models). This suggests that participants believe bad behaviour increased the possibility of social and divine punishment and were somewhat sensitive to the normative information.

Results for indirect social punishment (community) were weaker and less reliable. No notable differences were seen between reciprocity and generosity vignettes, but resource loss was rated as more likely to be punished by the community than illness. Site-level effects for cooperating or defecting (when cooperation is a norm) are shown in Figure 4.

Table 3: Cooperation and Norm Conditions predicting Likert scale answers for questions about likelihood of responsibility for the presented misfortune

<i>Predictors</i>	Other Character(s)		Community		God	
	<i>Estimates</i>		<i>Estimates</i>		<i>Estimates</i>	
	<i>95% CI</i>		<i>95% CI</i>		<i>95% CI</i>	
Intercept	-1.32*	-1.29*	-1.20*	-1.18*	-0.82*	-0.79*
	(-1.69 – -0.95)	(-1.66 – -0.91)	(-1.48 – -0.89)	(-1.45 – -0.88)	(-1.19 – -0.43)	(-1.14 – -0.41)
Defect	0.61*	0.53*	0.26†	0.22	0.37†	0.32†
	(0.26 – 0.99)	(0.16 – 0.87)	(-0.07 – 0.59)	(-0.11 – 0.54)	(-0.00 – 0.71)	(-0.01 – 0.64)
Normative	0.07	-0.02	0.09*	0.04	0.04	-0.03
	(-0.06 – 0.21)	(-0.13 – 0.11)	(0.02 – 0.16)	(-0.04 – 0.12)	(-0.01 – 0.09)	(-0.10 – 0.04)
Reciprocity	-0.03	-0.03	-0.01	0.00	0.00	0.00
	(-0.33 – 0.25)	(-0.28 – 0.25)	(-0.14 – 0.12)	(-0.13 – 0.11)	(-0.06 – 0.06)	(-0.06 – 0.06)
Resource	0.05	0.07	0.12*	0.13*	-0.07	-0.06
	(-0.19 – 0.28)	(-0.17 – 0.29)	(0.02 – 0.22)	(0.03 – 0.23)	(-0.17 – 0.03)	(-0.16 – 0.03)
Defect*Norm		0.16*		0.10†		0.13*
		(0.02 – 0.31)		(-0.02 – 0.23)		(0.02 – 0.24)

Note: sites = 9, subjects = 713, observations = 4908 (OC), 5221 (Com), and 5220 (God). Reference categories: Defect ref is Cooperate; Normative ref is Not Normative; Reciprocity ref is Generosity; Resource ref is Illness.

*95%CI does not cross 0; †89%CI does not cross 0; presented credible intervals are 95%

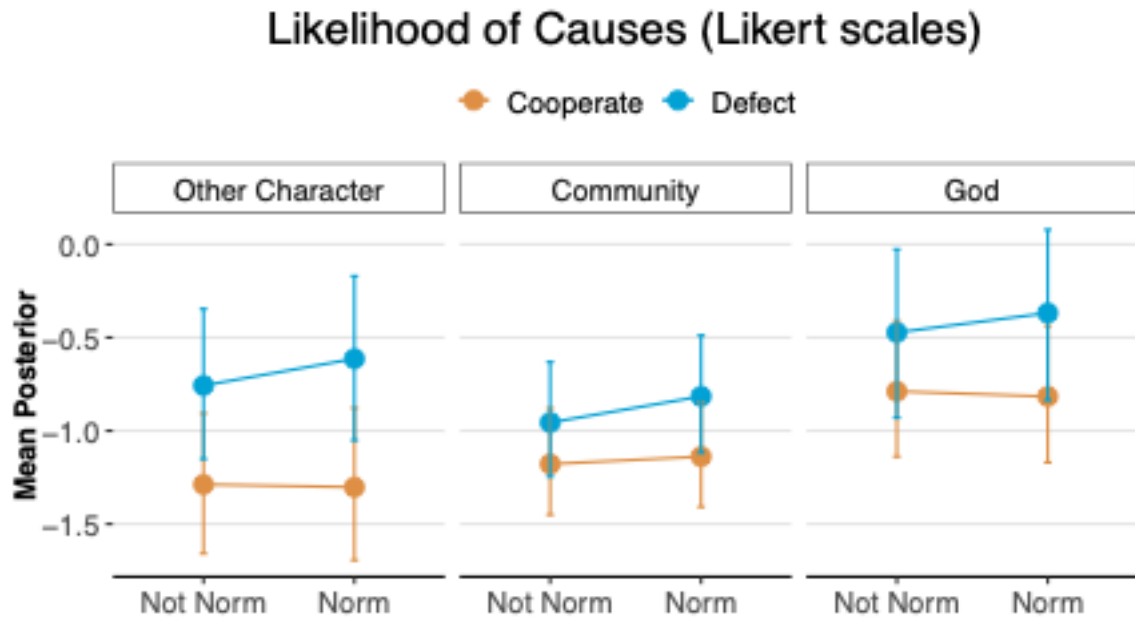


Figure 3: Mean posterior and 95% credible intervals for cooperating and defecting in each condition. Effects are calculated as simple slopes.

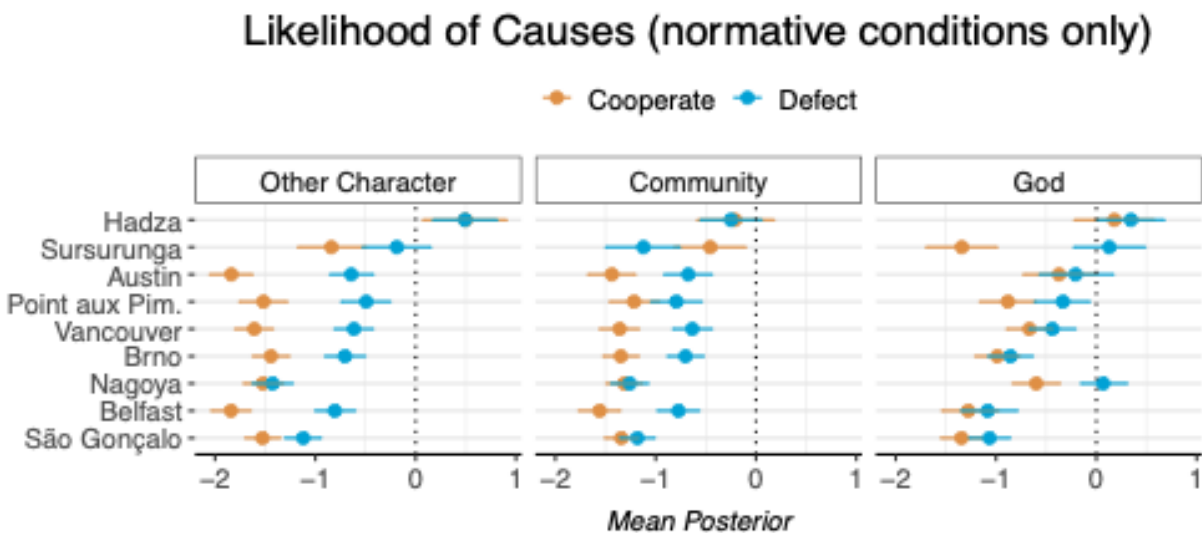


Figure 4: Mean posterior and 95% credible intervals for each site looking at cooperating and defecting when cooperating is normative. Effects are calculated as simple slopes.

We coded the open-ended responses for cause and cure questions into 6 categories: (1) supernatural agent, (2) supernatural other, (3) other person, (4) victim blaming [causes]/self-improvement [cures], (5) natural and (6) other. These data were

analysed as an average frequency of items within individual lists (Table 4). Averages of greater than one mean that more than one item on average was included in each list. Codes for supernatural and supernatural agent were combined into a single category of ‘supernatural’ for all analyses, as this is the category of most relevance to our hypothesis. Results follow the same pattern when items coded as ‘supernatural agents’ were analysed separately, but this category was much less common overall (see SOM Table S31).

Table 4: Average number of times category appears in lists for Cause and Cure free lists split by condition

Code	Control (no information)	Cooperates		Defects	
		Cooperation is not a norm	Cooperation is a norm	Cooperation is not a norm	Cooperation is a norm
Causes					
Natural	1.51	1.33	1.29	1.05	0.98
Supernatural	0.27	0.36	0.36	0.57	0.61
Other Person	0.27	0.10	0.13	0.34	0.34
Victim Blame	0.27	0.16	0.17	0.19	0.17
Other	0.01	0.01	0.01	0.00	0.00
Cures					
Natural	1.50	1.09	1.11	0.92	1.10
Other Person	0.40	0.55	0.50	0.43	0.45
Supernatural	0.13	0.23	0.19	0.34	0.40
Beh. change	0.03	0.01	0.01	0.01	0.01
Other	0.00	0.00	0.00	0.00	0.00

Across all sites and conditions, both supernatural and social causes were more common when the character defected than in the control condition or in conditions when the character cooperated. Answers were coded as supernatural when they invoked a supernatural agent (e.g., “God’s punishment” - São Gonçalo; “Divine punishment for not helping relatives in need” - Nagoya), concept (e.g., “fate” or “karma”), or when they linked the outcome with the character’s behaviour in a non-natural way (e.g., “[because

of] the way he treated the poor, build-up of bad energy.” -Belfast). Causal connections made about the character deserving his fate were more common than direct claims of God intervening everywhere but among the Sursurunga. Direct claims of ‘curses’ were only prevalent in 3 sites: Pointe aux Piments (e.g., “it was a curse”), the Hadza (e.g., “he was bewitched”), and the Sursurunga (e.g., “Sorcery, because of jealousy over his wealth”). “Karma” was also a common answer, but predominantly in the North American samples. Social causes directly referenced other people being involved with no overt supernatural link (e.g., “poisoned by someone” - Nagoya; “[other character] started the fire” -Brno).

Supernatural causes, but not social ones, were also more common in conditions where the story character cooperates than in the control condition, suggesting that any information about a character may increase supernatural explanations somewhat (see SOM Table S7). Across all conditions, natural causes were the most common. This is true within all sites except for the Sursurunga, who named natural causes less frequently than both supernatural and social causes. In the control condition, all explanations other than natural causes have relatively low frequency.

Similar patterns emerged when participants were asked how to fix these problems (cures). Natural cures, such as seeking medicine or rebuilding a house, were most common in all categories, as was seeking help from another person (e.g., “Go to the doctor” -Austin; “ask neighbours for help” -Nagoya). Supernatural cures only became prevalent when the character defected. This pattern was consistent across all sites except the Hadza. Supernatural cures were statements like asking forgiveness for his sins, praying, and other more tenuous links to correcting the behaviour (e.g., “Make things right with [other character], his sight will be restored” - Sursurunga; “Give all his money

to the poor to correct his sins” - Pointe aux Piments), or seeking help for a curse (e.g., “Go to a witch doctor” -Hadza).

We further analysed item counts for each person in each free list data category using Poisson regression. Victim Blame/Behaviour Change analyses are not shown here because they appeared at too low a frequency to be reliably estimated and were not central to our research questions (see SOM Tables S26 and S30 for these results). Results are presented as incidence rate ratios, which can be interpreted as the predicted number of times the outcome category appears in a list when one condition is present versus another (e.g., when the character cooperates versus defects). A value of 1 indicates that the items appear an equal number of times in both conditions.

Supernatural causes were given 1.80 times more often when the character defected than when they cooperated. Person causes were 4.02 times more common when the person defected than when they cooperated. Natural causes were given less often when the person defected (0.71 times). Norm information had a small positive effect for supernatural causes, but these effects were not reliably estimated. There were no notable interaction effects. ‘Other person’ causes were more likely to be employed when the misfortune was resource rather than illness related (2.17 times). Natural causes were more likely in the reciprocity than generosity condition (1.18 times).

Table 5: Condition predicting average relative rates of answer types in causes free list questions (Poisson regression)

Predictors	Supernatural		Other Person		Natural	
	Incidence Rate Ratios		Incidence Rate Ratios		Incidence Rate Ratios	
	95% CI		95% CI		95% CI	
Intercept	0.20*	0.21*	0.05*	0.04*	1.08	1.07
	(0.10 – 0.44)	(0.11 – 0.42)	(0.02 – 0.11)	(0.02 – 0.11)	(0.70 – 1.61)	(0.70 – 1.57)
Defect	1.84*	1.80*	3.58*	4.02*	0.70*	0.71*
	(1.47 – 2.33)	(1.41 – 2.37)	(2.16 – 5.66)	(2.32 – 6.62)	(0.52 – 0.95)	(0.52 – 0.97)
Normative	1.07	1.04	1.08	1.28†	0.96	0.96
	(0.96 – 1.19)	(0.88 – 1.21)	(0.87 – 1.26)	(0.97 – 1.67)	(0.89 – 1.02)	(0.88 – 1.04)
Reciprocity	1.02	1.02	1.05	1.05	1.17†	1.18†
	(0.89 – 1.19)	(0.89 – 1.19)	(0.87 – 1.27)	(0.88 – 1.30)	(0.99 – 1.40)	(0.99 – 1.40)
Resource	1.07	1.07	2.16*	2.17*	0.83†	0.83†
	(0.90 – 1.30)	(0.90 – 1.32)	(1.50 – 3.06)	(1.51 – 3.07)	(0.69 – 1.00)	(0.69 – 1.00)
Defect*Norm		1.05		0.79		0.99
		(0.87 – 1.28)		(0.58 – 1.05)		(0.87 – 1.12)

Note: sites = 9, subjects = 706, observations = 4905 for all. Reference categories: Defect ref is Cooperate; Normative ref is Not Normative; Reciprocity ref is Generosity; Resource ref is Illness.

**95%CI does not cross 0; †89%CI does not cross 0; presented credible intervals are 95%*

When we look at these data for cures, we again see that participants are more likely to suggest supernatural cures when the vignette character defected (1.79 times) than when they cooperated. We also found a negative effect for seeking help from another person when the character defected (0.76 times). Participants were less likely to state supernatural cures and more likely to state natural cures when the outcome was resource related than when it was an illness (0.71 times and 1.17 times, respectively). Suggesting help from another person was more common (1.33 times) in the reciprocity than generosity condition.

Table 6: Condition predicting average relative rates of answer types in cures free list questions (Poisson regression).

Predictors	Supernatural		Other Person		Natural	
	Incidence Rate Ratios		Incidence Rate Ratios		Incidence Rate Ratios	
	95% CI		95% CI		95% CI	
Intercept	0.12*	0.13*	0.36*	0.37*	0.85	0.86
	(0.06 – 0.28)	(0.07 – 0.27)	(0.17 – 0.87)	(0.17 – 0.89)	(0.58 – 1.21)	(0.59 – 1.25)
Defect	2.01*	1.79*	0.81†	0.76*	0.97	0.98
	(1.46 – 2.70)	(1.31 – 2.49)	(0.63 – 1.03)	(0.59 – 0.97)	(0.85 – 1.11)	(0.85 – 1.12)
Normative	1.11	0.95	0.96	0.91	0.98	0.99
	(0.97 – 1.28)	(0.77 – 1.17)	(0.82 – 1.08)	(0.77 – 1.05)	(0.90 – 1.05)	(0.89 – 1.08)
Reciprocity	1.00	1.00	1.33*	1.33*	0.95	0.95
	(0.77 – 1.39)	(0.76 – 1.33)	(1.14 – 1.52)	(1.14 – 1.51)	(0.83 – 1.09)	(0.83 – 1.10)
Resource	0.70*	0.71*	0.89	0.89	1.17*	1.17*
	(0.53 – 0.95)	(0.54 – 0.94)	(0.66 – 1.20)	(0.66 – 1.21)	(1.03 – 1.32)	(1.03 – 1.32)
Defect*Norm		1.28†		1.11		0.98
		(0.98 – 1.67)		(0.86 – 1.40)		(0.87 – 1.10)

Note: sites = 9, subjects = 708, observations = 4734; Reference categories: Defect ref is Cooperate; Normative ref is Not Normative; Reciprocity ref is Generosity; Resource ref is Illness.

**95%CI does not cross 0; †89%CI does not cross 0; presented credible intervals are 95%*

Figure 5 illustrates the variation in supernatural explanations across samples by showing the average proportion of supernatural answers in each participant's lists when cooperation is normative across sites. There was substantial variation in the proportion of supernatural causes and cures present in lists across groups, but in all cases supernatural explanations were higher when the character defected (except in the Hadza cure lists). The Sursurunga, Hadza, and Pointe aux Piments samples showed the highest numbers of these supernatural causes. These are also the three samples that included explicit references to witchcraft. Supernatural cures were given less frequently than supernatural causes overall. See SOM Tables S38-S43 for individual site analyses.

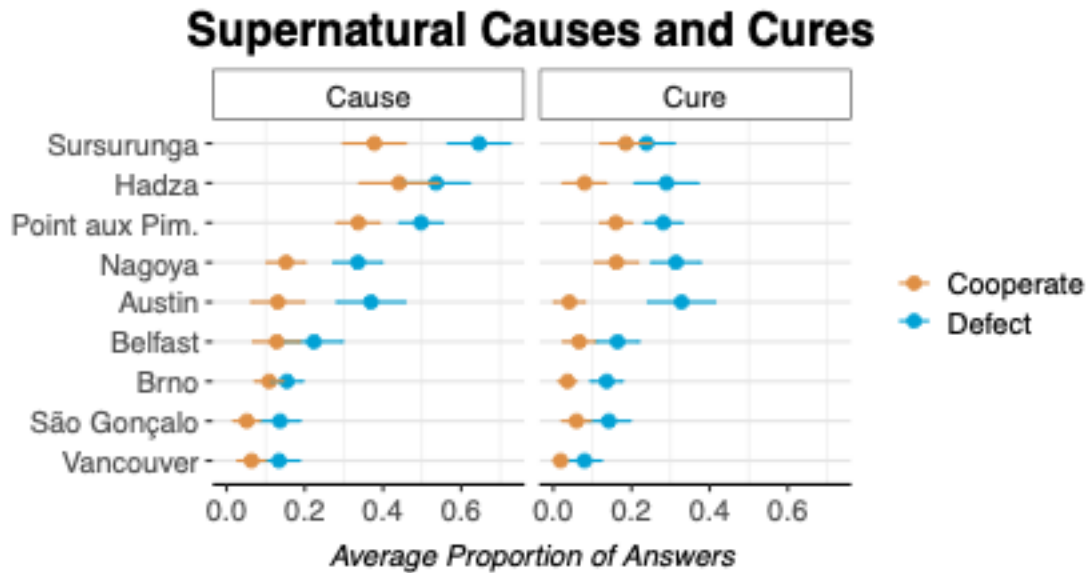


Figure 5: Average proportion of supernatural items in each individual's lists for A) Causes, and B) cures within each sample when cooperation is normative. Error bars are 95% confidence intervals of the mean. Countries ordered from highest to lowest average inclusion (proportion) of supernatural causes.

DISCUSSION

Across all questions and sites, knowledge of a person's past actions changed how people judged a current misfortune. Specifically, knowledge that a person did not reciprocate help, or was not generous when they had the means (behaved badly), increased the belief that the person was to blame for their own misfortune, that the misfortune was either socially or supernaturally caused, and the rate at which participants suggested social and supernatural causes and cures in free list tasks.

Information on normativeness had an impact in increasing beliefs that misfortune could be the result of social or supernatural punishment (Likert scale questions). There was a small interaction effect in the cures lists where supernatural cures were more likely when someone defected and cooperation was claimed as normative, but it is difficult to say what we should make of this finding. This was a weak manipulation, and all these

effects were small and were not apparent in cause free lists. Still, this suggests that people may be sensitive to the stated norms of other communities when making these judgments, even when widely held norms like reciprocity and generosity are violated. This effect of information on normativeness is difficult to explain outside of a norm psychological framework. Participants were less likely to suggest a person helping could ‘cure’ the issue when people had defected, suggesting that others may be less available when you have violated a social norm. This is consistent with the role of negative indirect reciprocity in sustaining social norms, where people should be less likely to help others when they know they have behaved badly (Bhui et al., 2019), and with previous work looking at victim blaming (Boyer et al., 2024; Boyer & Chantland, 2025).

Supernatural punishment across societies

These results give insight into why religious belief systems, even folk religions, include supernatural sanctioning for norm violations at such a high frequency. Across all 9 of our societies, supernatural explanations were more likely in situations where social punishment could be expected, suggesting that supernatural punishment beliefs may be built upon beliefs about social punishment. Finding that social punishment explanations increased under the same conditions strengthens this link. The expectation that someone will be socially punished for violating cooperative norms is central to norm psychology (Chudek & Henrich, 2011). We note that, consistent with a role for negative indirect reciprocity (as a common norm-sustaining mechanism), costs inflicted upon norm-violators (operating as sanctions) are often delivered secretly (e.g., crops burned at night or cherished item stolen). The future nature of sanctioning under negative indirect reciprocity increases the scope for supernatural hijacking. Religions can borrow this expectation and apply it to different types of punishment beliefs.

Importantly, all these results are specific to punishment in this life rather than the afterlife. Contingent punishment in the afterlife or the next life may be an innovation of certain moralised religions. While many religious systems incorporate beliefs about afterlives, only moralising (Norenzayan et al., 2016) and karma-based religions (Obeyesekere, 2002; Willard et al., 2020) use punishment in a next life/afterlife as a way of supporting the belief that punishment for bad behaviour is inescapable, but the basic intuition underlying these beliefs may be for the more immediate punishment found in other types of religious and supernatural beliefs (Willard, Rosun, & de Barra, 2025). This type of punishment would follow more directly from beliefs about social punishment and fits well with the idea that any supernatural mind has at least the potential to judge and punish us for violating norms (Purzycki et al., 2021). Beliefs that a supernatural agent can only see what is near to it (Purzycki, 2011), that a supernatural agent might only care about specific types of violations (Singh et al., 2020), and that witchcraft can support certain normative behaviours (Willard, Rosun, Lesage, et al., 2025) also fit more readily with how we think we might be judged and punished by other members of our society. The type of punishments we find in ‘Big God’ moralising religions are similarly a specific set of cultural innovations that may stem from this more basic intuition.

It is worth noting that many or all our samples may not be generalizable to the broader population within their respective societies. Samples like the Brazilian one are more educated and may have very different perspectives on the supernatural than the broader population. Further, to enable the vignettes to be used across sites, they needed to be simple. This may have seemed strange to some participants, particularly those in more industrialised settings. Still, the pattern of effects across all sites is noteworthy, and provides evidence that these effects may be broadly applicable across many diverse

human populations, though variation in the size of the effect is clearly present. Relatedly, while Christianity was the predominant religion across our samples, it is unlikely that our effects are driven by this one religious context. First, although the scaled questions asked specifically about the potential role of “God”, when participants were given the chance to offer any cause, supernatural agents (and specifically God) occurred much less frequently than other supernatural causes.

Second, these other supernatural causes were often ambiguous. Outside of those who stated karma (which was most common in the Austin and Vancouver samples rather than our Hindu or Buddhist samples), many invoked concepts like magic or evil not tied to particular religious traditions. These vague assertions could be referring to causal processes related to either God(s), supernatural forces, or people with supernatural powers. This ambiguity highlights how the boundaries between supernatural and social explanations are often porous, with causation attributed to agents that may be simultaneously human and otherworldly. Rather than reflecting discrete belief systems, such attributions suggest an underlying tendency to link misfortune to intentional agency (divine, magical, or social) that blurs distinctions between religion, morality, and interpersonal suspicion in explanations of misfortune.

Explanations of misfortune often don’t clearly distinguish between social and supernatural causes, as when people suspect witchcraft or the evil eye rather than ordinary acts of harm. Witchcraft is a taboo topic in many places and even talking about witchcraft can get you cursed. Nevertheless, we did see direct mentions of witchcraft in some of our samples (Sursurunga, Hadza, and Pointe aux Piments), but we also saw many vaguer claims that pointed at neighbours or friends which could more indirectly indicate a belief that witchcraft explained the misfortune. Despite the relative dearth of

psychological research into beliefs about the supernatural powers of people, the number of people who currently believe in witches or the evil eye has been estimated to be at least one billion worldwide (Gershman, 2021), putting witchcraft in a similar numeric category to Hinduism and well above Buddhism in terms of the number of believers. Beliefs in human-based supernatural powers have an exceedingly long history in human societies (Singh, 2018, 2019). They are well worth greater attention from psychological researchers wanting to explain supernatural beliefs and their social dynamics.

Although supernatural explanations were used in all sites, they were not the most frequent causes our participants gave in most of our study populations, and the averages for the Likert-scale questions about God were in the negative side of the scale in many sites. Even when punishment should be expected, natural explanations were more likely to be given than supernatural ones in the free list task across all conditions and most of the sites. Supernatural explanations do not seem to be the default way of solving these problems. This suggests that theories linking religious belief directly to intuitive cognition are likely missing a considerable amount of nuance (see Willard et al., 2023; Willard & Russell-Wilks, 2025). Specifically, they are missing the existence of culturally acquired commitments (Harris & Corriveau, 2014; Henrich, 2009; Lanman, 2012; Mead, 1932). This is not to say intuitions like mind-body dualism or capacities like theory of mind are not important in explaining why certain supernatural beliefs look the way they do, but rather the perspective that these types of capacities are the main drivers of religious belief leaves a rather impoverished view of what religion is (Gervais et al., 2011; Purzycki & Sosis, 2022). If we want to understand when, how, and why supernatural beliefs are used by people, we need a better understanding of when, how, and why these choices are made. Our findings begin to address these questions but only

scratch the surface of what is possible here, and much more research needs to be done.

CONCLUSION

Overall, our results show that people are sensitive to past bad actions and the violation of social norms when establishing if a misfortune could be supernaturally caused. This can help explain the cognitive and cultural path by which gods come to be perceived as morally concerned and relate the origins of these beliefs to other systems of supernatural punishment, such as karma and witchcraft. Beliefs about the inevitability of punishment for bad behaviour and norm violations should underlie all these supernatural punishment systems in a similar way. If people are more likely to attribute misfortunes to supernatural punishment when victims are seen as having behaved badly, this moral evaluation helps keep such beliefs psychologically and socially credible. By linking reputation information to causal interpretation, communities continuously reaffirm the idea that supernatural forces monitor and enforce normative behaviour. This reciprocal relationship, where beliefs promote cooperation, and judgments about cooperation reinforce belief, may contribute to stabilised moralising religious systems in diverse social ecologies.

Our results, along with other recent papers (Hong et al., 2023; Purzycki, 2011; Purzycki et al., 2021; Singh et al., 2020; Willard et al., 2020; Willard, Rosun, Lesage, et al., 2025), suggest that greater attention to the variety of religions and the cultural diversity of belief is needed to better understand the potential origins of religion. Research on the origins of religion in human psychology does exist, but it is sparse and much of it is outdated and in need of updating with more current theories and research. Where these findings are particularly helpful in explaining the relationship between

supernatural punishment and normative behaviour is when the punishment is believed to happen in this life rather than the afterlife. Where this framework may be of the most interest is in explaining the relevance of beliefs that humans have supernatural powers. Though there is a lot of variation in these beliefs, they are incredibly widespread.

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