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# Beliefs about God, the afterlife and morality support the role of supernatural policing in human cooperation☆

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**Abstract**

Reputation monitoring and the punishment of cheats are thought to be crucial to the viability and maintenance of human cooperation in large groups of non-kin. However, since the cost of policing moral norms must fall to those in the group, policing is itself a public good subject to exploitation by free riders. Recently, it has been suggested that belief in supernatural monitoring and punishment may discourage individuals from violating established moral norms and so facilitate human cooperation. Here we use cross-cultural survey data from a global sample of 87 countries to show that beliefs about two related sources of supernatural monitoring and punishment — God and the afterlife — independently predict respondents' assessment of the justifiability of a range of moral transgressions. This relationship holds even after controlling for frequency of religious participation, country of origin, religious denomination and level of education. As well as corroborating experimental work, our findings suggest that, across cultural and religious backgrounds, beliefs about the permissibility of moral transgressions are tied to beliefs about supernatural monitoring and punishment, supporting arguments that these beliefs may be important promoters of cooperation in human groups.


*Keywords:* Religion; Afterlife; Supernatural beliefs; Prosociality; Cooperation; Supernatural punishment; Supernatural monitoring

## 1. Introduction

Group living in modern humans is characterized by a unique level of cooperation and exchange among large numbers of unrelated individuals. We rely on others for information, aid and resources, and we are willing to share information, aid and resources with others whom we may never see again. Despite advantages as a survival strategy, this system of trust and reciprocity is vulnerable to exploitation by free riders or cheats who reap the benefits of the group without contributing their share to the common pool. Nevertheless, humans appear to have overcome, or at least mitigated, the free-rider problem and are able to maintain cooperative social networks for indefinite periods.

Recently, there has been increasing interest in the role played by religion in the origin and evolution of human cooperation and prosociality (Alcorta & Sosis, 2005; Dunbar, 2009; Johnson, 2005; Johnson & Bering, 2006; Johnson & Krüger, 2004; Monsma, 2007; Norenzayan & Shariff, 2008; Pyysiäinen & Hauser, 2010; Richerson & Boyd, 1998; Roes & Raymond, 2003; Rossano, 2007; Ruffle & Sosis, 2007; Snarey, 1996; Sosis & Alcorta, 2003; Wilson, 2002). Whilst some argue that religion is simply a cultural parasite (Blackmore, 1999; Dawkins, 1976, 2006; Dennett, 2006) or evolutionary by-product of other adaptive processes (Atran, 2002; Barrett, 2000; Boyer, 2001; Guthrie, 1993; Pyysiäinen & Hauser, 2010), others see it as providing fitness advantages by guarding against free-riding and facilitating group cohesion, cooperation and trust (Alcorta & Sosis, 2005; Dunbar, 2009; Richerson & Boyd, 1998; Sosis & Alcorta, 2003; Sosis, Kress, & Boster, 2007; Wilson, 2002).

The claim that religion increases prosocial behaviour is supported from a number of sources. Members of religious

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congregations and regular churchgoers are more likely to report giving time and money to charities than non-members or those who attend church less regularly (Monsma, 2007). Experimental work indicates that religious individuals are also both more trusting and more trusted in cooperative economic games (Tan & Vogel, 2008). Perhaps the most convincing evidence, however, comes from studies of religious organizations themselves. Controlling for other relevant predictors, studies found that males in religious Kibbutzim are more likely to cooperate in economic games than males from secular Kibbutzim, with the highest rates of cooperation among those males who most regularly engage in collective rituals (Ruffle & Sosis, 2007; Sosis & Bressler, 2003). A historical survey of 19th century communes showed that religious communes were four times as likely to survive each year than secular communes (Sosis & Bressler, 2003) and that those religious (but not secular) communes with stricter taboos and prohibitions lasted longest.

It remains unclear exactly why religion should have this effect. Dunbar (2009) argues that endorphin release during intensely arousing rituals, such as communal singing or trance dancing, may directly enhance bonding within small groups. Irons (1996a,b) has used signalling theory from biology to argue that restrictive taboos or costly rituals (that are risky, unpleasant or demanding of time and resources) promote trust and cooperation more indirectly by providing reliable signals of commitment to the group. However, the finding that religious groups are more prosocial and robust than their statistically controlled secular counterparts suggests that there is more to religious cooperation than participation and proscription.

The nature of religious belief itself is also thought to influence levels of cooperation (Bering, 2006; Johnson & Krüger, 2004; Norenzayan & Shariff, 2008; Roes & Raymond, 2003; Snarey, 1996; Stark, 2001). Stark (2001) has shown that strength of belief in God is a better predictor of prosocial attitudes than church attendance. This raises the question of what it is about the beliefs religious individuals hold that could promote prosociality. One mechanism that has been put forward is that belief in the existence of a supernatural agent or agents can increase prosocial behaviour merely by creating the perception of being watched. Reputational concerns are known to be crucial for motivating and maintaining cooperation towards public goods in human groups (Lotem, Fishman, & Stone, 1999; Milinski, Semmann, & Krambeck, 2002; Nowak & Sigmund, 1998a,b). 'Supernatural monitoring' is hypothesized to activate cognitive architecture associated with reputation management and so promote prosocial behaviour (Johnson & Bering, 2006; Rossano, 2007). Consistent with this proposal, even subtle, subliminal primes of monitoring, such as an image of 'watching eyes' (Bateson, Nettle, & Roberts, 2006; Haley & Fessler, 2005) or three dots oriented to reflect a face (Rigdon, Ishii, Watabe, & Kitayama, 2009), can increase some prosocial behaviours (cf. Fehr & Schneider, 2009), particularly towards in-group members (Mifune, Hashimoto, & Yamagishi, 2010). Regarding supernatural primes, Bering, McLeod, and Shackelford (2005) found that subjects told that a ghost had been seen in the lab were significantly less likely to cheat on a competitive task. Similarly, Shariff and Norenzayan (2007) have shown that implicitly priming God concepts is at least as effective at increasing generosity in an anonymous dictator game as priming secular moral institutions. If such subtle monitoring cues can affect prosocial tendencies, it seems plausible that strongly held belief in an ever-present God or spirits that are always watching could have a similar effect.

Belief in supernatural agents may also promote prosociality by providing a threat of punishment for non-cooperation (Johnson & Krüger, 2004). The viability of cooperation within human groups is thought to rely on the potential to punish free riders or reward prosocial behaviour (Boyd, Gintis, Bowles, & Richerson, 2003). However, such enforcement generally incurs a cost that must be borne by those in the group. Enforcement, then, is itself a public good subject to exploitation by free riders. Economic games under anonymous laboratory conditions have revealed that humans are willing to pay a cost to punish free riders (Fehr & Gachter, 2002; Gintis, Bowles, Boyd, & Fehr, 2003) or reward cooperators (Rand, Dreber, Ellingsen, Fudenberg, & Nowak, 2009), but it is not clear to what extent this generalizes to real-world social interactions. Such a strategy remains vulnerable to exploitation by 'second-order free riders' who avoid the cost of punishment, unless those who shirk punishing duties are themselves punished (and those who shirk the punishing of non-punishers are punished, and so on) or there is some external policing mechanism (Henrich & Boyd, 2001). The supernatural punishment hypothesis (Johnson & Krüger, 2004) holds that the threat of supernatural punishment (in this life or the afterlife) arising from belief in morally concerned supernatural agents can help enforce cooperative norms by exporting the cost of enforcement to ostensibly infallible supernatural forces beyond the group. Belief in a punitive supernatural agent can, in principle, exert this effect without requiring that the imagined agent actually punishes free riders — it is enough that group members perceive such a threat.

By deterring free riders and reducing enforcement costs, supernatural policing may have played an important role in human evolution, increasing group stability and cooperation towards public goods (Johnson & Krüger, 2004; Norenzayan & Shariff, 2008). This hypothesis finds some support from cross-cultural data. Johnson (2005) has shown that the presence of moralizing 'high gods' — defined as active in human affairs and specifically supportive of human morality (Swanson, 1960) — is associated with some indices of societal cooperation such as taxation, policing and measures of norm compliance, although only two of these relationships remain significant after controlling for regional effects and influence of world religion. To the extent that supernatural policing can promote prosocial behaviour, belief in a morally concerned deity should be selected for

or stabilized in societies where free-riding is more likely to be a problem. Again, cross-cultural evidence is consistent with this claim, with moralizing high gods significantly more likely to occur in larger societies, where enforcement costs are likely to be high (Roes & Raymond, 2003), and in regions of water scarcity, where free riding may be especially costly to the group (Snarey, 1996).

One limitation of these cross-cultural studies is that they examine variation at the societal level, but can say little about whether a widely held belief affects those individuals within a society in the manner predicted. Hence, as Johnson (2005) notes, the causal mechanisms linking the presence of moralizing high gods to other societal characteristics remain obscure. Conversely, experimental work supports a link between priming supernatural agent concepts and individual cooperation, but we do not yet know whether such effects apply to long-standing beliefs about supernatural agents and enduring moral dispositions. Furthermore, experimental work has been carried out in only a handful of WEIRD (Western, Educated, Industrialized, Rich and Democratic) cultures (Henrich, Heine, & Norenzayan, 2010). The effect of supernatural monitoring and punishment is put forward as universal, but without a large cross-cultural sample we cannot tell whether any observed association between supernatural belief and morality is the result of underlying psychological universals or some other factor peculiar to the cultural context of the experiments. In the United States for example, a culture has developed in which religious beliefs are particularly closely tied to moral judgements about abortion. To disentangle the effects of universal tendencies from cultural context, we need individual-level data sampled across many cultures and belief systems.

In the present article, we bridge these two levels of analysis, using the World Values Survey (WVS, 1981–2008) to assess individual differences across 87 countries covering a diverse range of social and religious backgrounds. Whilst previous sociological studies have established an association between self-reports of religiosity and prosociality (Monsma, 2007; Stark, 2001), predictions relating specifically to supernatural monitoring and punishment have not been tested using individual survey data. Here, we test these predictions using questionnaire data from the WVS on individuals' beliefs about God and the afterlife, together with ratings of the justifiability of a standard set of moral transgressions. This direct approach — asking individuals to state their beliefs about the supernatural and about conformity to the moral order — is of course subject to the potential biases and limitations of any self-report data. The advantage of such an approach, however, is that a large amount of information can be collected from across many different cultural settings. We can therefore use the questionnaire data to investigate whether supernatural beliefs are related to moral thinking consistently across cultures, controlling for possible cultural differences or the effect of other potential confounds such as religious activity or education.

First, we predict that, due to the effect of supernatural monitoring and/or supernatural punishment, those individuals who profess belief in God will rate moral transgressions as less justifiable than those who do not (Hypothesis 1). Second, following the fear of supernatural punishment hypothesis, we predict that stronger beliefs about the unjustifiability of moral transgressions will be present in individuals who profess belief in heaven and/or hell (Hypothesis 2) — implying belief in reward and punishment in the afterlife. Note that the supernatural punishment argument also applies to rewards, since withholding a reward can be seen as equivalent to punishment. Third, following the supernatural monitoring hypothesis, we predict that, among those who believe in God, those individuals who profess belief in a personal God will rate moral transgressions as less justifiable than those who believe in a Spirit or Life Force, since believing in a personal God is more likely to imply active monitoring and a sense of 'being watched' (Hypothesis 3). These predictions should hold after controlling for variation in religious participation (discussed above). Similarly, the predictions should hold after controlling for the effect of cultural or religious background in the form of level of education, reported religious denomination and cultural variation across countries.

## 2. Material and methods

### 2.1. Data sources and variables

To test our hypotheses we used cross-cultural survey data from five waves of the World Value Survey (WVS, 1981–2008), covering the period from 1981 to 2008. This aggregate includes standardized surveys conducted in 87 countries all over the world, comprising a total of 355,298 individual face-to-face interviews. Each interview consists of the administration of a questionnaire, covering a total set of 1079 variables. The questionnaires for the five waves of the survey as well as the data and the code book are available at http://www.worldvaluessurvey.com/.

#### 2.1.1. Moral transgressions

Since the first wave of the WVS, questionnaires have asked individuals about the justifiability of a range of moral transgressions. We took advantage of these variables to approach the morality component of our hypotheses. Not all items were used in all countries, but the majority were, making it possible to examine variation in moral thinking across a range of cultural and religious backgrounds. Of the 31 moral transgressions listed in the WVS we selected 14 items that were the most well sampled across countries and relatively uncontroversially reflect a moral transgression. These 14 items were as follows:

> "Please tell me for each of the following statements whether you think it can always be justified, never be justified, or something in between"

F114. — Claiming government benefits to which you are not entitled
F115. — Avoiding a fare on public transport
F116. — Cheating on taxes if you have a chance
F117. — Someone accepting a bribe in the course of their duties
F125. — Taking and driving away a car belonging to someone else (joyriding)
F127. — Lying in your own interest
F128. — Married men/women having an affair
F129. — Throwing away litter in a public place
F130. — Driving under influence of alcohol
F131. — Paying cash for services to avoid taxes
F134. — Speeding over the limit in built-up areas
F135. — Sex under the legal age of consent
F139. — Buying something you knew was stolen
F142. — Failing to report damage you've done accidentally to a parked vehicle

Respondents were asked to indicate their response on a scale from 1 (*never justifiable*) to 10 (*always justifiable*) for each statement. We excluded all individuals who did not know what to answer, did not answer, to whom the question was not applicable and to whom the question was not asked.

As with any self-report data, approaching moral thinking in this way must be done with caution, since what is declared does not always match actual behaviour. However, responses should provide a reasonable indication of likely conformity to the moral order across the different categories of people we test here. We do not require that justifiability ratings give an absolute measure of cooperation, since our hypotheses relate only to the relative likelihood of cooperation.

### 2.1.2. Supernatural beliefs

The WVS also includes information about religious beliefs. Respondents were asked the question: "Which, if any, of the following do you believe in?" This question was followed by different religious and supernatural concepts. Belief in God was assigned based on the response to "F050. — Do you believe in God?" To gage beliefs about reward/punishment in the afterlife, we built a composite variable from the two items "F053. — Believe in hell" and "F054. — Believe in heaven", distinguishing those individuals who do not believe in heaven or hell (0) from those who do believe in heaven or hell (1). We used the variable "F062. — Personal God vs. Spirit or Life Force", to examine predictions relating to the nature of God beliefs. This question which asks:

> "Which of these statements comes closest to your beliefs?"

'Personal God'
'Spirit or Life Force'
'Don't know what to think'
'No spirit God or life force'

Whilst the above supernatural concepts were not explicitly defined in the survey, we take it as implicit that God concepts will involve some sense of agency and an active interest in human affairs. Heaven and hell are also taken to imply reward and punishment in the afterlife. These questions were chosen for the survey precisely because most respondents should be familiar with the concepts, which are present to some degree in all the major world religions. We eliminated from our test individuals who did not know what to answer, did not know what to think, did not answer, or to whom the question was not applicable or the question was not asked.

### 2.1.3. Religious participation

Supernatural beliefs should correlate with religious participation. Given the previous work showing an effect of religious participation on cooperative behaviour (Ruffle & Sosis, 2007; Sosis & Bressler, 2003; Sosis & Ruffle, 2003), it makes sense to control for the effect of religious participation in our analyses. We wanted to determine whether belief in God exerts an effect on moral thinking, independent of the effect of religious participation. Religious participation may also be a good indicator of general level of indoctrination, essentially allowing us to control for the extent of exposure to other elements of religious doctrine. To measure and control for religious participation, we used the variable:

> "F028. — Apart from weddings, funerals and christenings, about how often do you attend religious services these days?"

'More than once a week'
'Once a week'
'Once a month'
'Only on special holy days/Christmas/Easter days'
'Other specific holy days'
'Once a year'
'Less often'
'Never practically never'

We merged the answers 'Only on special holy days/Christmas/Easter days' and 'Other specific holy days' under the label 'Only on special holy days' since we are interested in the frequency of attendance, rather than in the specific type of holy day. Note that higher scores on 'Religious participation' represent lower frequency of church attendance. Again, we eliminated from our tests individuals who did not know what to answer, did not answer, to whom the question was not applicable and to whom the question was not asked.

### 2.1.4. Cultural and religious background

We also wanted to control, as much as possible, for the effects of other more general aspects of religious and cultural background that might influence moral judgements or the nature of beliefs about supernatural monitoring and punishment. To do this, we made use of the categorical variables "F025. — Religious denomination", recording self-assigned religious affiliation, and "S003. — Country/region", recording the country in which each individual was surveyed.

Including the country in which the survey was conducted also serves to control for possible biases introduced by any variation in the way each version of the survey was translated and administered. Finally, level of education is also thought to be associated with both religious beliefs and moral judgements. In order to control for the effect of education we used the variable "X025R. — Education level" (recoded) with three states: 'Lower', 'Middle' and 'Upper' — ordered such that higher scores represent a higher level of education.

### 2.2. Statistics

We tested our hypotheses using a series of models based on ordinal regressions. For each of the 14 morality items we fitted a model with justifiability rating as the dependent variable and both belief in God and belief in heaven/hell as predictor variables. Among those who believe in God, we also fitted a model using belief in a personal God vs. a Spirit or Life Force to predict justifiability ratings. We then repeated the same ordinal regressions controlling for the combined effect of the four potential confounding variables — frequency of religious participation, religious denomination, country/region and level of education. Frequency of religious participation and level of education were included in the regressions as covariates, whilst the categorical variables — country/region and religious denomination — were included as factors.

## 3. Results

### 3.1. General predictions

Table 1 summarizes the results of the ordinal regressions relating supernatural beliefs to beliefs about the justifiability of moral transgressions. Consistent with Hypothesis 1, belief in God predicts stronger belief in the unjustifiability of all 14 moral transgressions examined (all $p$ values <.001). Likewise, consistent with Hypothesis 2, those individuals who believe in heaven or hell rated all 14 moral transgressions as less justifiable than those who do not believe in heaven or hell (all $p$'s<.001 except for the variable "F129. — Throwing away litter in a public place", $p$<.05). Table 1 also shows that, consistent with Hypothesis 3, among those individuals who believe in God, belief in a personal God (as opposed to a Spirit or Life Force) is associated with stronger belief in the unjustifiability of all 14 moral transgressions (all $p$'s<.001).

### 3.2. Controlling for religious participation and religious and cultural background

Table 2 summarizes the results of the ordinal regressions relating supernatural beliefs to beliefs about the justifiability of moral transgressions, after controlling for the combined main effects of religious participation, religious denomination, country and level of education. This combined analysis is a relatively stringent test of the relationship between supernatural beliefs and moral thinking since effect sizes are reduced by adding parameters to the regression model, and, in addition, sample size is reduced because we do not have data on all predictors for all respondents. Nevertheless, the table shows that, controlling for the combined effect of these other factors, we observe the same pattern of support for our three hypotheses. Belief in God has a significant effect in the predicted direction for 13 out of 14 morality items. Belief in heaven or hell has a significant effect in the predicted direction for seven out of 14 items, with 12 out of 14 effects in the predicted direction. Belief in a personal God, rather than in a Spirit or Life Force, has a significant effect in the predicted direction for 11 out of 14 morality items, with 13

Table 1
Ordinal regressions of supernatural beliefs against justifiability ratings

| Justifiable variable (dependent) | $n$ | Belief in God | Belief in heaven/hell | $n$ | Personal God vs. Spirit or Life Force |
|---|---|---|---|---|---|
| Claiming government benefits | 197,194 | .088 (.014)*** | .066 (.011)*** | 78,223 | .094 (.015)*** |
| Avoiding fare on public transport | 183,084 | .238 (.014)*** | .194 (.011)*** | 67,631 | .236 (.015)*** |
| Cheating on taxes | 196,492 | .244 (.014)*** | .401 (.011)*** | 78,526 | .283 (.014)*** |
| Someone accepting a bribe | 204,331 | .238 (.015)*** | .267 (.013)*** | 78,788 | .331 (.016)*** |
| Joyriding | 86,109 | .336 (.025)*** | .089 (.022)*** | 77,724 | .185 (.02)*** |
| Lying | 87,987 | .323 (.017)*** | .409 (.015)*** | 77,329 | .425 (.013)*** |
| Adultery | 86,036 | .592 (.018)*** | .646 (.016)*** | 76,653 | .752 (.014)*** |
| Driving under influence of alcohol | 73,129 | .259 (.024)*** | .311 (.021)*** | 64,171 | .342 (.019)*** |
| Throwing away litter | 70,819 | .35 (.022)*** | .044 (.019)* | 63,018 | .094 (.017)*** |
| Paying cash | 29,913 | .242 (.028)*** | .316 (.025)*** | 26,116 | .43 (.023)*** |
| Speeding over the limit | 30,873 | .277 (.029)*** | .286 (.026)*** | 27,134 | .295 (.023)*** |
| Sex under the legal age | 70,686 | .288 (.02)*** | .492 (.018)*** | 61,530 | .507 (.017)*** |
| Buy stolen goods | 120,753 | .281 (.019)*** | .179 (.016)*** | 51,153 | .317 (.021)*** |
| Failing to report damage | 54,598 | .345 (.024)*** | .07 (.021)*** | 49,997 | .26 (.018)*** |

Values are shown as coefficient (S.E.). Variables were coded in such a way that correlations are positive if they meet the theoretical expectations.
Tests are two tailed.
* $p$<.05.
*** $p$<.001.

Table 2
Ordinal regressions of supernatural beliefs against justifiability ratings, controlling for religious participation, religious denomination, country and level of education together

| Justifiable variable (dependent) | *n* | Religious participation | Level of education | Belief in God | Belief in heaven/hell | *n* | Religious participation | Level of education | Personal God vs. Spirit or Life Force |
|---|---|---|---|---|---|---|---|---|---|
| Claiming government benefits | 110,019 | .032 (.004)*** | .009 (.009)ns | .092 (.029)** | −.023 (.017)ns | 28,194 | .05 (.008)*** | .031 (.018)ns | .078 (.028)** |
| Avoiding fare on public transport | 100,079 | .044 (.004)*** | .068 (.009)*** | .215 (.03)*** | −.012 (.018)ns | 18,727 | .071 (.009)*** | .238 (.021)*** | .216 (.033)*** |
| Cheating on taxes | 109,771 | .072 (.004)*** | .076 (.009)*** | .186 (.028)*** | .043 (.017)* | 28,291 | .088 (.007)*** | .135 (.017)*** | .184 (.027)*** |
| Someone accepting a bribe | 116,307 | .047 (.004)*** | −.006 (.010)ns | .173 (.033)*** | .055 (.02)** | 28,483 | .063 (.009)*** | .120 (.020)*** | .139 (.033)*** |
| Joyriding | 26,785 | .006 (.011)ns | .095 (.025)*** | .314 (.07)*** | .037 (.043)ns | 27,401 | .023 (.011)* | .131 (.025)*** | .108 (.04)** |
| Lying | 26,700 | .121 (.007)*** | .193 (.017)*** | .205 (.047)*** | .078 (.028)** | 27,270 | .136 (.007)*** | .169 (.016)*** | .229 (.026)*** |
| Adultery | 25,345 | .14 (.008)*** | .317 (.019)*** | .208 (.049)*** | .311 (.031)*** | 27,042 | .159 (.008)*** | .331 (.018)*** | .354 (.029)*** |
| Driving under influence of alcohol | 26,823 | .039 (.01)*** | .202 (.022)*** | .255 (.06)*** | .13 (.038)*** | 27,450 | .056 (.01)*** | .218 (.022)*** | .199 (.035)*** |
| Throwing away litter | 26,797 | .018 (.009)* | .096 (.020)*** | .144 (.055)** | .025 (.034)ns | 26,411 | .032 (.009)*** | .095 (.019)*** | .03 (.032)ns |
| Paying cash | 21,426 | .092 (.008)*** | .225 (.018)*** | .188 (.049)*** | .032 (.031)ns | 21,326 | .097 (.008)*** | .221 (.018)*** | .224 (.029)*** |
| Speeding over the limit | 22,114 | .059 (.009)*** | .406 (.020)*** | .251 (.05)*** | .064 (.032)* | 22,165 | .065 (.009)*** | .408 (.019)*** | .236 (.031)*** |
| Sex under the legal age | 14,311 | .119 (.012)*** | .460 (.027)*** | .429 (.071)*** | .198 (.045)*** | 15,537 | .142 (.011)*** | .448 (.026)*** | .374 (.04)*** |
| Buy stolen goods | 48,215 | .089 (.007)*** | .036 (.015)* | .212 (.045)*** | .035 (.028)ns | 5636 | .026 (.022)ns | .069 (.048)ns | .101 (.081)ns |
| Failing to report damage | 4544 | .069 (.019)*** | .246 (.042)*** | −.341 (.202)ns | .103 (.08)ns | 5112 | .07 (.018)*** | .265 (.041)*** | −.028 (.068)ns |

Values are shown as coefficient (S.E.). Supernatural beliefs were coded in such a way that correlations are positive if they meet the theoretical expectations. Tests are two tailed.

* $p<.05$.
** $p<.01$.
*** $p<.001$.

out of 14 in the predicted direction. There were no significant effects in the opposite direction to that predicted by any of the three hypotheses. In addition to these individual item findings, aggregating results from across the justifiability items, a sign test confirms that the number of correlations in the predicted direction is significantly higher than chance for belief in God ($p<.001$), belief in heaven or hell ($p=.013$) and belief in a personal God ($p<.001$).

As expected, increased religious participation was associated with stronger belief in the unjustifiability of moral transgressions, but this effect does not explain the association between supernatural beliefs and justifiability ratings. Religious participation and the nature of belief in God and the afterlife show independent effects on justifiability ratings in the regressions in Table 2. Similarly, level of education has a significant independent effect on 13 of the 14 justifiability items, with more education linked to higher justifiability ratings. Ratings were also significantly different across countries and religious denominations (although we do not report the large number of individual effects for each country and denomination here), but again, this was independent of the effect of supernatural beliefs.

## 4. Discussion

The results we present here are consistent with and provide support for specific predictions of the supernatural monitoring and fear of supernatural punishment hypotheses. As predicted by both theories and consistent with our Hypothesis 1, individuals who professed belief in God rated moral transgressions as less justifiable than those who did not. Consistent with Hypothesis 2 and the supernatural punishment hypothesis, stronger beliefs about the unjustifiability of moral transgressions were present in individuals who professed belief in heaven or hell. And consistent with Hypothesis 3 and the supernatural monitoring hypothesis, among those who believe in God, those who professed belief in a personal God rated moral transgressions as less justifiable than those who professed belief in a Spirit or Life Force.

These general patterns hold even after controlling for the combined effects of religious participation and religious and cultural background as measured by religious denomination, country and level of education. Some justifiability items, such as throwing away litter and failing to report damage to a parked car, do show a weaker association with individuals' supernatural beliefs after controlling for these other factors (Table 2). Whilst this could simply be due to noise in the data, it is also possible that supernatural policing effects are stronger in some conditions or moral domains than others. In Table 2, the weakest relationships between justifiability ratings and supernatural beliefs appear to be among the least serious of the moral transgressions, possibly because such transgressions are perceived by respondents as unlikely to invoke the 'wrath of god'.

Effects also varied across the different supernatural beliefs. Most notably, the association between morality and belief in heaven or hell shows some sensitivity to controlling for other religious and cultural factors, such that seven out of 14 morality items do not show a significant relationship in the predicted direction. As mentioned above, the power of the combined ordinal regression analyses to demonstrate a significant association is somewhat reduced and 12 out of 14 relationships remain in the predicted direction — well above what would be expected by chance. It is interesting that belief in God and belief in a personal God show a more robust association with justifiability ratings, indicating they may have a stronger effect on prosociality. Unlike belief in heaven or hell, which introduces only a threat of punishment in the afterlife, belief in God is likely to introduce a combination of supernatural monitoring and fear of punishment effects (Johnson and Bering, 2006). Conversely, the effect of belief in a personal God as opposed to a Spirit or Life Force should operate chiefly via supernatural monitoring. Within major world religions, perceived supernatural monitoring in the present may thus be of greater importance than the effect of reward or punishment in the afterlife.

As well as corroborating previous work linking religiosity to prosociality (Henrich et al., 2010; Snarey, 1996; Johnson & Bering, 2006; Johnson & Krüger, 2004; Norenzayan & Shariff, 2008; Roes & Raymond, 2003; Stark, 2001), we find support for the thesis that across cultures specific features of religious beliefs relevant to perceived supernatural monitoring and punishment directly impact our moral thinking. In a recent review, Pyysiäinen and Hauser (2010) argue that many of our moral intuitions operate independently of religious background. However, the research they cite has not explicitly addressed supernatural policing and focuses mainly on identifying limiting cases and moral trade-offs, which may be less affected by the perception of supernatural policing. Inasmuch as our self-report data reflects genuine beliefs about the supernatural and moral conformity, our findings support the suggestion that, by enhancing reputational concerns and/or a perceived threat of punishment, supernatural beliefs increase conformity to the moral order and can therefore act to promote cooperation in human groups. Whilst the effects we find are not large, we note that cross-cultural differences in the perceived risk of being punished that give rise to even a small increase in the likelihood of individuals behaving prosocially can nonetheless dramatically affect the long-term stability of cooperation in groups (Boyd et al., 2003; Fehr & Fischbacher, 2003; Fehr & Gachter, 2002; Henrich et al., 2001).

As with any correlational study, the relationships we report do not in themselves demonstrate causality. The WVS data allowed us to control for the effect of some alternative causal explanations, and the experimental findings we discussed in the Introduction make a causal link between supernatural beliefs and prosocial behaviour seem likely, but it remains possible that the relationships we observe are spurious or reflect some other causal mechanism. For example, in face-to-face interviews social desirability (Edwards, 1953) or impression management (Leary & Kowalski, 1990) effects may cause a bias in some individuals' responses to questions about both religion and morality. Some respondents may thus feel they ought to report they believe in God and ought to report that various moral transgressions are unjustifiable. As pointed out by a reviewer, impression management is correlated with some measures of religiosity (Burris & Navara, 2002; Leak & Fish, 1989; Trimble, 1997), which may itself be a consequence of supernatural monitoring. Conversely, morality may be tied to supernatural beliefs in some other way. It is possible that those with stronger views about conforming to moral norms are just more likely to believe in God. Although possible, such alternative explanations are more difficult to reconcile with an effect of afterlife beliefs or belief in a personal God vs. Spirit or Life Force, and do not fit with the experimental findings.

Even if the causal story does turn out to be unexpectedly different, the association between specific supernatural beliefs and morality across many cultures is interesting in itself. Whether due to supernatural monitoring, fear of supernatural punishment, concerns about social desirability or biases towards strict moral conformity, if certain beliefs are reliably linked to prosociality, these beliefs can become meaningful and potentially important markers of trustworthiness. Such a culturally mediated 'green beard effect' (Dawkins, 1976), perhaps in conjunction with the sort of hard-to-fake costly signals associated with many religious doctrines (Irons, 1996a,b), could itself facilitate cooperation towards public goods by allowing cooperators to interact preferentially with fellow cooperators.

The cognitive and cultural processes that give rise to the patterns we observe need to be investigated further, combining evidence from across a range of disciplines. Cooperative economic games of the sort mentioned above can be repeated, explicitly targeting the effects of supernatural monitoring and punishment on trustworthiness and prosociality. Promising work in this direction has already begun (e.g., Bering et al., 2005; Shariff & Norenzayan, 2007), but in order to separate the effects of cultural context

from the beliefs themselves, these studies need to be carried out in a range of cultural and religious settings. Henrich et al. (2010) have recently found cross-cultural support for a link between generosity in economic games and participation in world religion, although they admit their sampling of different religious background needs to be expanded. Interestingly, whilst participation in world religion did predict more generous offers in the dictator and ultimatum games, religious individuals were no more likely to engage in altruistic punishment of non-cooperators. One explanation for this is that belief in supernatural punishment can increase individuals' generosity but decreases their motivation to engage in costly punishment themselves.

More precise cross-cultural surveying at the societal level is also needed. Johnson (2005) identifies six potential sources of supernatural punishment in a 20th century survey of 50 cultures (Swanson, 1960) — moralizing high gods, active ancestral spirits, reincarnation and sanctions affecting health, the afterlife and other aspects of life, such as accidents, misfortunes or mishaps. Currently, we do not know how prevalent these beliefs are around the globe, whether some are more effective than others at promoting prosociality or whether they tend to be associated with particular social or ecological conditions. By cataloguing the diversity and distribution of these and other supernatural beliefs around the globe we should be able to test more detailed hypotheses about their putative function and the selective forces that may account for their current distribution. Whether this can be explained in terms of competition between rival groups or competition between different belief systems within groups, the results presented here suggest that supernatural monitoring and punishment could indeed have played an important role in the emergence of the levels of cooperation characteristic of modern humans. We have shown that individual differences in beliefs about God, the afterlife and morality across cultures support the predictions of the supernatural monitoring and supernatural punishment hypotheses. There is thus good reason to think that the major world religions now often associated with large-scale, hierarchical political systems may owe their success to their gods and their ability to promote cooperation and trust among believers.

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