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Religious motivations for cooperation: an experimental investigation using explicit primes

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The role of religion in human cooperation remains a highly contested topic. Recent studies using economic game experiments to explore this issue have been largely inconclusive, yielding a range of conflicting results. In this study, we investigate the ability of religion to promote cooperation by using explicit theological primes. In the first study, conducted in a church, we find that subjects who report a stronger connection with a Christian passage about charitable giving are subsequently more likely to cooperate in a one-shot prisoner's dilemma game. In the second study, conducted over the Internet, we find that Christian subjects are more likely to cooperate after reading a Christian passage than a neutral one. However, in the same study, we find that Hindu and secular passages have no significant effect on Christians, and that none of the passages (Christian, Hindu, or secular) have an effect on non-Christians. Our results show the potential power of explicitly religious exhortations that promote cooperation, and also their selectivity.

Keywords: prisoner's dilemma; prosociality; religiosity; theological priming

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Introduction

Because cooperation is the cornerstone of successful human societies, it is a major area of research across the natural and social sciences (Dreber, Rand, Fudenberg, & Nowak, 2008; Fowler & Christakis, 2010; Fudenberg, Rand, & Dreber, 2012; Levin, 2006; Milinski, Semmann, & Krambeck, 2002; Nowak, 2006, 2011; Nowak & Sigmund, 2005; Ostrom, 1990; Rand, Dreber, Ellingsen, Fudenberg, & Nowak 2009; Rand & Nowak, 2011; Rockenbach & Milinski, 2006; Sigmund, 2010; Ule, Schram, Riedl, & Cason, 2009; Wedekind & Milinski, 2000). When people work together they can often achieve more than if each worked alone; yet cooperation poses a challenge: it requires individuals to incur costs to help others. Understanding what motivates people to engage in this "altruistic" (i.e., consciously cooperative, other-regarding) behavior is therefore a topic of great importance, particularly in the face of cooperative dilemmas of unprecedented global scale such as climate change. Generosity, compassion, and kindness to others are central tenets of most world religions, and these norms are often represented in the authoritative literatures of particular traditions

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(Smith, 1949/2009). Thus, it has been suggested that religious believers or adherents may be more cooperative than non-religious persons, that religious appeals may promote cooperation, and even that religion may have evolved to promote cooperation (e.g., Atran & Henrich, 2010; Henrich et al., 2010; Johnson, 2005; Norenzayan & Shariff, 2008; Shariff & Norenzayan, 2007; Sosis, 2006).

Several studies have recently explored the role of religion in promoting cooperation by using implicit priming. Some of these studies employ a subliminal procedure (for a review, see Dijksterhuis, Aarts, & Smith, 2005; Hoffmann, 2012). One study finds that subliminal religious primes decrease people's accessibility to temptation-related words (Fishbach, Friedman, & Kruglanski, 2003); another finds that subliminal Christian symbols significantly influence coping processes in Christians but not in non-Christians (Weisbuch-Remington, Mendes, Seery, & Blascovich, 2005); and a third finds that religiously primed concepts activate submissive behaviors for people who score high on self-reported submissiveness (Saroglou, Corneille, & Van Cappellen, 2009). Other recent studies utilize a supraliminal procedure (adapted from Costin, 1969), in which religion is primed by having participants unscramble five-word sentences to give grammatically correct four-word sentences, with some of the scrambled words being religious (e.g., "God," "divine," etc.). Using this set-up, one study finds that implicit religious priming increases generosity in the dictator game (DG) (Shariff & Norenzayan, 2007); a second study finds this effect in both the DG and the prisoner's dilemma (PD) among both religious and non-religious subjects (Ahmed & Salas, 2011). A third study uses the same implicit prime and finds that in a one-shot public goods game, primed Protestants become more cooperative, whereas Catholics become less cooperative (Benjamin, Choi, & Fisher, 2010). However, unlike Shariff and Norenzayan (2007) and Ahmed and Salas (2011), Benjamin et al. (2010) find no effect on DG behavior. One final study finds that the same implicit religious prime increases the punishment of unfair behavior, but only among those who donate to religious organizations (McKay, Efferson, Whitehouse, & Fehr, 2010).

To add to this body of research concerning the effect of religion on cooperation, and to probe a new dimension of it, we conduct two studies using *explicit* rather than implicit primes. Implicit primes are an interesting and powerful tool for exploring psychological phenomena; yet, explicit primes are also important in the context of contemporary religions: virtually all world religions—mostly through exposure to particular authoritative literatures—explicitly exhort their adherents to behave virtuously and to exercise selfless behaviors toward others (Smith, 1949/2009). In addition, previous work on priming not only suggests that implicit cognition operates in ways that are unique compared to explicit thought (Greenwald & Banaji, 1995), but also that explicit primes may have very different effects than implicit ones (Wheeler & Petty, 2001). Furthermore, using explicit primes to explore cooperation allows a more sophisticated, theological, and tradition-specific exploration of religious motivations, especially in contemporary contexts. By examining cooperative behavior in relation to reflection on historically authoritative scriptures, we can look at the particular effects of textual, theological primes on religious motivation. Thus, we ask whether explicit religious primes have the same positive effect on cooperation as found in most studies using implicit religious primes.

To that end, we have conducted two studies to explore the effect of explicit religious primes on cooperation: one field-based and correlational, and another experimental. In the first study, participants attending a church service read one of two Christian scriptural passages about charitable giving and then played a PD, all

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while sitting in the church sanctuary. We ask whether participants with whom the passage resonated more deeply were more cooperative in the PD. In the second study, prior to playing a PD, participants recruited over the internet read either a neutral passage or a particular passage about charitable giving that was Christian, Hindu, or secular in nature. We ask whether cooperation varies significantly across priming conditions and by the tradition of participants.

Results

Study 1: methods

Ethics statement

This research was approved by the Committee on the Use of Human Subjects in Research of Harvard University (application number F14306-103). Written consent was obtained from all participants prior to the experiment.

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Participants and design

Sixty-nine parishioners (41 women and 28 men, mean age 54 years) of an Episcopal congregation in New England participated in a correlational study on whether personal resonance with a biblical passage predicts subsequent cooperation in a one-shot PD game.

Procedure and materials

Immediately following a Sunday church service, parishioners participated in a one-shot PD while still seated in the church sanctuary, with the experiment being administered by one of the church's clergy. Thus, the circumstances of the experiment already provided a strong baseline religious prime.

Furthermore, immediately prior to reading the PD instructions, each participant read a New Testament passage (from the Christian religious tradition) exhorting the importance of charitable giving. Of the 69 participants, 36 read the following passage from 2 Corinthians 8:9–15:

> For you know the grace of our Lord Jesus Christ, that though he was rich, yet for your sakes he became poor, so that you through his poverty might become rich. And here is my advice about what is best for you in this matter: Last year you were the first not only to give but also to have the desire to do so. Now finish the work, so that your eager willingness to do it may be matched by your completion of it, according to your means. For if the willingness is there, the gift is acceptable according to what one has, not according to what he does not have. Our desire is not that others might be relieved while you are hard pressed, but that there might be equality. At the present time your plenty will supply what they need, so that in turn their plenty will supply what you need. Then there will be equality, as it is written: "He who gathered much did not have too much, and he who gathered little did not have too little."

Another 33 subjects read the following passage instead, which comes from the Gospel of Mark 10:17–23:

> As Jesus started on his way, a man ran up to him and fell on his knees before him. "Good teacher," he asked, "what must I do to inherit eternal life?" "Why do you call me

> good?" Jesus answered. "No one is good—except God alone. You know the commandments: Do not murder, do not commit adultery, do not steal, do not give false testimony, do not defraud, honor your father and mother." "Teacher," he declared, "all these I have kept since I was a boy." Jesus looked at him and loved him. "One thing you lack," he said. "Go, sell everything you have and give to the poor, and you will have treasure in heaven. Then come, follow me." At this the man's face fell. He went away sad, because he had great wealth. Jesus looked around and said to his disciples, "How hard it is for the rich to enter the kingdom of God!"

After reading their respective passage, participants indicated how strongly the passage resonated with them using a seven-point Likert scale. Then, each participant read the instructions for the PD (as shown in Table 1), where "A" represents cooperation and "B" represents defection.

Participants then indicated their decision in the PD game by circling A or B and folding over the page for privacy (see Table 1 for payoff matrix, as presented to subjects). Decisions were collected and payoffs were determined while participants completed a brief questionnaire. At the end of the experiment, at the request of the church, participants were informed that they could donate their earnings anonymously to an international charity; this was done *after* the PD game, so that the opportunity to donate would not influence participants' decisions.

Statistical analysis

We base our analysis in Study 1 on χ^2 tests and analysis of variance (ANOVA).

Study 1: results and discussion

We begin by reporting that 69.6% of participants chose to cooperate in the PD game. The fact that close to one-third of the participants defected, even with both the situational and written primes, and with the low dollar amounts given the upper-middle-class background of most participants, is remarkable. To understand this variation, we perform an individual-differences analysis of religiosity and cooperation. Specifically, we ask whether participants for whom the religious passage was more resonant were also more cooperative.

As shown in Figure 1, we find a significant positive relationship between cooperation and the resonance of the prime (χ^2 (1, $n = 69$) = 5.03, $p = .025$). This relationship becomes even stronger (χ^2 (1, $n = 69$) = 6.86, $p = .009$) when controlling for age, gender, passage, and self-reported percentage of annual income donated to charity. We also find a significant positive relationship between cooperation and annual charitable donations (χ^2 (1, $n = 69$) = 4.45, $p = .035$), and no effect for which

Table 1. PD payoff structure, as presented to subjects in Study 1.

		The other person's choice	
		A	B
Your choice	**A**	You = \$12 Other = \$12	You = \$4 Other = \$16
	B	You = \$16 Other = \$4	You = \$8 Other = \$8

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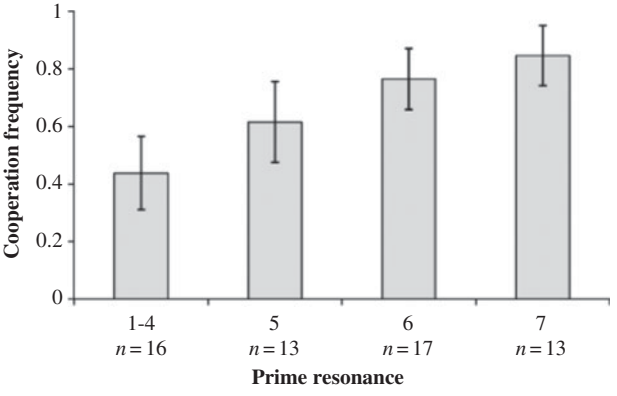

Figure 1. Cooperation in Study 1 as a function of amount of resonance of the priming passage.

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passage was read (χ^2 (1, $n = 69$) = 0.72, $p = .397$). The lack of difference in cooperation across passages is perhaps surprising, as the passage from Mark calls for a more extreme form of charity than the passage from 2 Corinthians. That being said, the passage from Corinthians may be clearer than that from Mark.

To test whether the relationship between cooperation and resonance varies across the two primes, we perform resonance prime ANOVA, which finds a significant main effect of resonance (F (1,69) = 6.26, $p = .015$), no significant main effect of prime (F (1,69) = 0.58, $p = .45$), and no significant interaction between resonance and prime (F (1,69) = 0.40, $p = .529$). Thus, we see that irrespective of which passage participants received, increased passage resonance was associated with a higher probability of cooperating.

These results provide some support for a connection between religious motivation and cooperation. Participants who responded more strongly to a scriptural passage exhorting charity before knowing anything about the PD game subsequently cooperated more than others. This suggests that these participants were more fully primed than those for whom the passage resonated less, and thus that the religious prime promoted cooperation. This result is consistent with research showing that automatic activation of concepts related to religion depends on individual differences in religious orientation (Wenger, 2004). However, it is also possible that these people were just fundamentally more predisposed to cooperate in general, and therefore the passage about charity resonated more. Alternatively, it is possible that the relationship we observe is the result of a demand effect or a consistency effect, whereby subjects try to behave in a consistent way across questions. To address these potential shortcomings of Study 1, we perform a manipulation experiment in Study 2.

Study 2: set-up

To further study how religious primes alter cooperation, Study 2 complements the individual-differences results from Study 1 by using an experimental manipulation. As opposed to looking at how variation across individuals in response to a religious prime predicts cooperation, we randomly assign participants to one of several prime conditions. We ask whether a particular religious prime can promote cooperation relative to a neutral prime, whether it matters which religion the prime comes from, and how religious primes compare to secular primes. Based on

previous work using implicit primes (Shariff & Norenzayan, 2007), we predict that the explicitly religious prime will increase cooperation relative to the neutral prime, and will do so to a greater extent than the secular prime. Furthermore, given that explicit primes clearly communicate the particular religion with which the prime is associated, we predict a greater increase in cooperation using a prime that comes from the subject's own religious tradition as compared to a prime from a different religion.

Study 2: methods

Ethics statement

This research was approved by the Committee on the Use of Human Subjects in Research of Harvard University (application number F17468-103). There was no collection of personally identifying information or any participation risk whatsoever, and the task was within the range of tasks typically conducted using the online labor market from which we recruited subjects. Thus, the need to obtain informed consent was waived by the ethics committee as part of its approval of the study.

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Participants and design

Five hundred forty-seven participants (257 women and 290 men, mean age 31 years) from around the world participated, and each participant was randomly assigned to one of four experimental priming conditions (neutral, Christian, Hindu, secular) in a between-participants design. Study 2 was conducted over the Internet using the website "Amazon Mechanical Turk" (MTurk). Thus, unlike Study 1, there was no baseline religious prime, and the participant pool was much more diverse in terms of religion, country of residence, and socio-economic status (see Table 2 for summary statistics of Study 2 subjects). In the analysis, we were mainly interested in how specific religious groups react to the primes in question, and therefore we focused on Christians, Hindus, and atheists (which together comprised 443 subjects).

MTurk is an online labor market in which employers can advertise jobs (typically taking less than 10 minutes and paying less than $1), and employees can accept posted jobs that are attractive to them. This makes MTurk an attractive tool for conducting incentivized experiments, as worker payments can be performance dependent. Unlike some other methods of performing online experiments, experimenters do not send out invitations to a specific set of subjects to participate, but instead the experiment is posted to the public job board.

Numerous studies have recently demonstrated the reliability of data collected using MTurk (Amir, Rand, & Gal, 2012; Buhrmester, Kwang, & Gosling, 2011; Horton, Rand, & Zeckhauser, 2011; Mason & Suri, 2011; Paolacci, Chandler, & Ipeirotis, 2010; Rand, 2012; Rand, Arbesman, & Christakis, 2011; Suri & Watts, 2011). The most relevant example for the current experiment concerns a study that found quantitative agreement between a one-shot PD game played in the physical laboratory and one played on MTurk, the latter of which had stakes 10 times smaller than the former (Horton et al., 2011). Similar results have been found for the repeated public goods game (Suri & Watts, 2011) and the one-shot DG, public goods game, ultimatum game, and trust game (Amir et al., 2012). Thus, although one might

Table 2. Summary statistics of Study 2.

Variable	Obs	*M*	SD	Min	Max
Cooperation	547	0.298	0.458	0	1
Gender	547	0.470	0.500	0	1
Age	547	30.905	10.107	16	63
Religious beliefs					
Buddhist	13	0.024	–	0	1
Christian	229	0.419	–	0	1
Hindu	141	0.258	–	0	1
Jewish	11	0.020	–	0	1
Muslim	35	0.064	–	0	1
Other	22	0.040	–	0	1
Atheist	96	0.176	–	0	1
Belief in God	547	6.837	–	1	10
Residence					
US resident	278	0.508	–	0	1
India resident	197	0.360	–	0	1
Other resident	72	0.132	–	0	1
Education					
Graduate degree	147	0.269	–	0	1
Bachelor degree	240	0.439	–	0	1
Some college	104	0.190	–	0	1
High school diploma	42	0.077	–	0	1
Some high school	8	0.015	–	0	1
Vocational	5	0.009	–	0	1
Unknown education	1	0.002	–	0	1
Income					
$0 – $5000	67	0.122	–	0	1
$5001 – $10,000	64	0.117	–	0	1
$10,001 – $15,000	61	0.112	–	0	1
$15,001 – $25,000	75	0.137	–	0	1
$25,001 – $35,000	49	0.090	–	0	1
$35,001 – $50,000	78	0.143	–	0	1
$50,001 – $65,000	56	0.102	–	0	1
$65,001 – $80,000	35	0.064	–	0	1
$80,001 – $100,000	33	0.060	–	0	1
Over $100,000	29	0.053	–	0	1

Note: All variables but age and beliefs in God are binary. Cooperation = 1 is cooperate, gender = 1 is female.

be concerned that the low stakes typical of MTurk (less than $1) might bias the results, there is substantial evidence that this is not the case. It has also been demonstrated that subjects on MTurk show equivalent levels of test-retest reliability as college undergraduates on a range of personality measures (Buhrmester et al., 2011) and demographics (Mason & Suri, 2011; Rand, 2012). Furthermore, MTurk subjects are significantly more representative of the American public than college undergraduates (Buhrmester et al., 2011).

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Procedure and materials

In all four conditions of Study 2, participants began the experiment by reading and then briefly summarizing a short passage of text. In the neutral condition ($n = 158$), the following passage describing three types of fish was read:

> A Flounder is a fish with a brown body, its shade depending on the color of the sea bottom. Flounders have numerous spots and blotches: 3 prominent eye-like spots forming a triangle and numerous white spots scattered over body and fins. Flounders also have strong canine-like teeth, and a fin in the shape of wedge, with its tip in the middle. The Jack is a fish with a bluish-green to greenish-gold back and silvery or yellowish belly. There is a prominent black spot on its gills, and a black spot at the base of each fin. The Jack has no scales on its throat. The Triple Tail is a fish with a somewhat rounded shape that gives it the appearance of an oversize panfish. Its color varies but is usually brownish and mottled. The head is curved above the mouth. The Triple Tail's name comes from the similarity and closeness of its three main fins, which resemble three tails.

In the Christian religious condition ($n = 123$), the passage from the Gospel of Mark about the importance of charity was again used, as in Study 1. In the Hindu religious condition ($n = 131$), subjects read the following passage about the importance of charity, which is taken from the S'rîmad Bhâgavatam, Canto 9:21:

> The fame of Rantideva is sung in this and the other world, Rantideva, who, though himself hungry, was in the habit of giving away his wealth as it came, while trusting in God to provide his needs. Even in time of famine, Rantideva continued his generosity though his family was reduced to poverty. For forty-eight days he and his family were starving; a little liquid, and that enough for only one, was all that remained. As he was about to drink it, an outcaste came begging for water. Rantideva was moved at the sight and said, "I do not desire from God the great state attended by divine powers or even deliverance from rebirth. Establishing myself in the hearts of all beings, I take on myself their suffering so that they may be rid of their misery." So saying, the compassionate king gave that little liquid to the outcaste, though he himself was dying of thirst. The gods of the three worlds came and desired to bestow upon him manifold blessings, but Rantideva, who had no attachment or desire, merely bowed to Lord Vasudeva in devotion.

The passage used in the secular condition ($n = 135$) was the following non-religious, factual account of an American family's dedication to charitable giving, which was taken from *The Power of Half* by Kevin and Hannah Salwen (2010):

> The Salwen family was a fairly prototypical foursome, they lived in a nice house with their two kids. However, a few years later they moved into an even larger, beautiful "dream house." They thought it would bring them the joy they desired. Then, at the urging of their 14-year-old daughter Hannah, they decided to do something drastic, sell their dream house and move into a home half the size, giving the price difference, more than $800,000, to charity. Now, more than 2 years later, they feel life is better in their cozy space, and much better than in their "dream house." Far more importantly, their family began to live more tightly, and as a result they feel better connected with one and other and their community. They play games together, sing and listen to music. As they learned to live smaller and focused on giving, those interconnected moments became more frequent. The more they shared, the more they bonded. The Salwen family says that the secret to togetherness is to be out there together in the community, no matter how you define community.

After reading their respective passage, and to ensure that subjects actually read the text, all subjects were asked to summarize the passage. After doing so, all subjects

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Table 3. PD payoff structure, as presented to subjects in Study 2.

		The other person's choice	
		A	B
Your choice	**A**	You = 120 cents Other = 120 cents	You = 40 cents Other = 160 cents
	B	You = 160 cents Other = 40 cents	You = 80 cents Other = 80 cents

read the instructions for the same PD game as in Study 1, except with 10 times smaller stakes (consistent with standard MTurk wages, which were paid in US dollars, as seen in Table 3). After completing the instructions, the subjects answered five comprehension questions about the game's payoff structure. The comprehension questions were:

(1) Which earns you more money: [You pick A, You pick B]?
(2) Which earns the other person more money: [You pick A, You pick B]?
(3) Which earns you more money: [Other person picks A, Other person picks B]?
(4) Which earns the other person more money: [Other person picks A, Other person pick B]?
(5) If you pick B and the other picks A, what bonus will you receive?

Subjects who correctly answered all five questions then chose either to cooperate or to defect; subjects who answered one or more questions incorrectly were not allowed to participate in the study. Following the PD decision, subjects completed a brief questionnaire. Once all subjects had completed the study, payoff were calculated using *ex post* matching, and subjects were paid accordingly.

Statistical analysis

We base our analysis of Study 2 on logistic regressions, since the sample size allows for a regression analysis, and since the outcome variable (cooperation or defection) is binary.

Study 2: results and discussion

The focus of Study 2 was assessing the causal role of explicit religious priming, and how this varies across different religious groups. We thus analyze each of the three main groups (*viz.*, Christians, Hindus, and atheists) separately in order to test whether, compared to the neutral prime, subjects in any of the three groups are more or less likely to cooperate when exposed to the Christian prime, the Hindu prime, or the secular prime. In our regression analysis, we include controls for potentially confounding demographic variables such as age, age ^2, gender, strength of belief in God (on a nine-point Likert scale), US residence, education, and income, all of which are particularly important given the diverse nature of the MTurk subject pool. The cooperation frequency for each prime in each group is shown in Figure 2. To reflect the consequences of controlling for demographics, Figure 3 shows the results of the regression model, predicting the probability of cooperating for the average subject.

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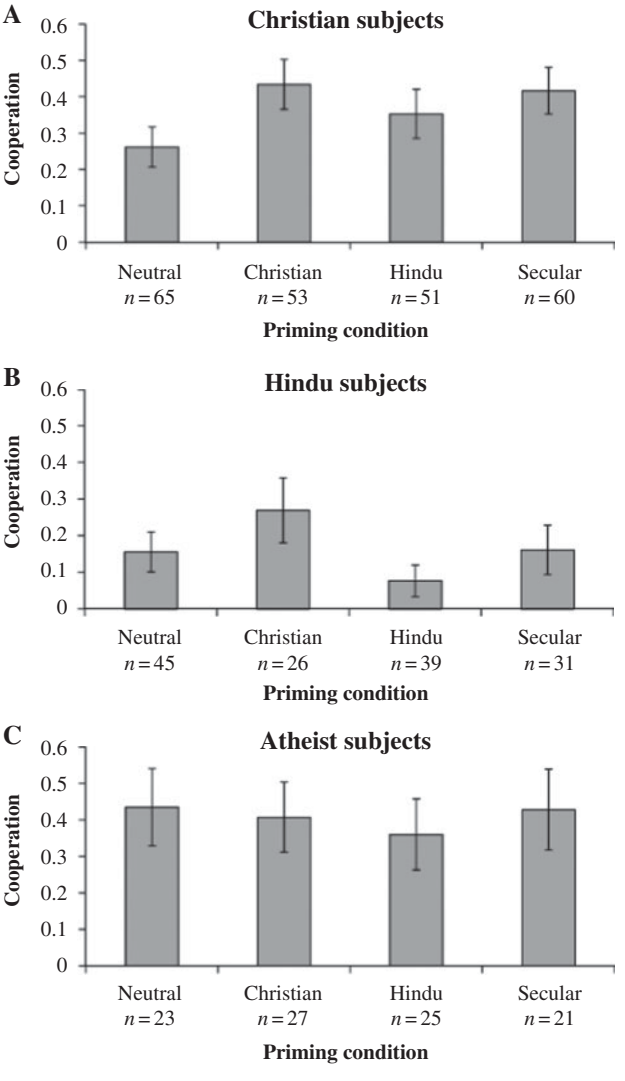

Figure 2. Cooperation in Study 2 as a function of the priming passage for Christians (A), Hindus (B), and atheists (C).

Among Christian subjects, the positive effect of the Christian prime on cooperation is significant ($p = .037$), whereas neither the Hindu nor the secular prime is significant (Hindu prime: $p = .417$; secular prime: $p = .209$). Among Hindu subjects, we see no significant effect of the three primes (Christian prime: $p = .235$; Hindu prime: $p = .192$; secular prime: $p = .725$), and the results are similar among atheists (Christian prime: $p = .650$; Hindu prime: $p = .637$; secular prime: $p = .925$), although we note that the sample sizes for the Hindus and atheists are somewhat smaller than for the Christians (see Table 4).

We also analyze the impact of the Christian, Hindu, and secular primes as compared to the neutral prime on those subjects who do not fit into the Christian, Hindu, or atheist category. The Hindu prime is perfectly correlated with defection and is therefore omitted by the logistic regression. There is a marginally significant

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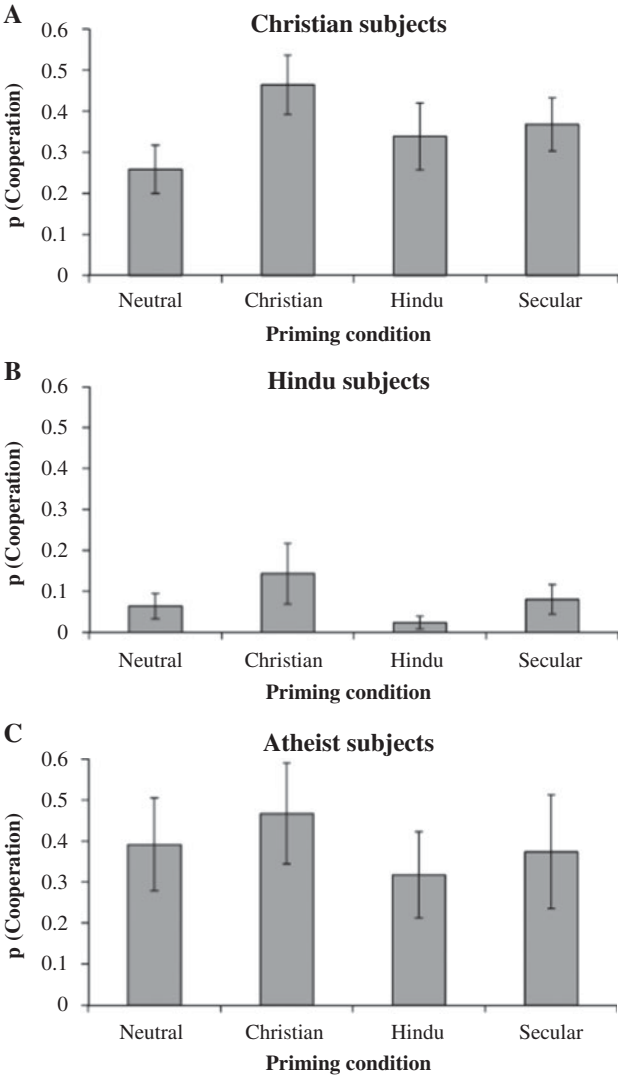

Figure 3. Visualization of logistic regression results for Study 2. Shown is the predicted probability of cooperating for an individual with the mean value of all control variables, as a function of prime received for Christians (A), Hindus (B) and atheists (C). This shows the effect of the primes extracting out any random variation introduced by demographics.

negative correlation between cooperation and both the Christian prime ($p = .066$) and the secular prime ($p = .053$) (see Table 5).

Discussion

We have presented two studies providing evidence that religious exhortations from authoritative texts can increase cooperation in a PD game, at least among certain individuals. Among American Christians at a church, participants who found a religious passage about charitable giving more resonant were more cooperative than

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Table 4. Regression table of cooperation for Christian, Hindu, and Atheist subjects—neutral prime as baseline.

	Christians	Hindus	Atheists
Christian prime	0.910**	0.896	0.307
	(0.436)	(0.754)	(0.676)
Hindu prime	0.385	−1.020	−0.326
	(0.474)	(0.783)	(0.693)
Secular prime	0.511	0.250	−0.0752
	(0.406)	(0.711)	(0.799)
Female	0.570*	−0.368	−1.553***
	(0.323)	(0.527)	(0.552)
Age	−0.0368	0.613**	0.0146
	(0.103)	(0.243)	(0.156)
Age ^2	0.000584	−0.00819**	0.000483
	(0.00132)	(0.00347)	(0.00204)
Belief in God	0.0253	−0.141	0.0164
	(0.0538)	(0.135)	(0.107)
US resident	0.573		−0.103
	(0.399)		(0.650)
Education controls	Yes	Yes	Yes
Income controls	Yes	Yes	Yes
Constant	−1.453	−26.77***	0.576
	(1.891)	(4.199)	(2.619)
Observations	227	120	96

Note: Robust standard errors in parentheses.
* $p < .1$, ** $p < .05$, *** $p < .01$

those who did not. Among an Internet sample of participants from around the world, Christians were more cooperative after reading a Christian prime, but not after reading a Hindu prime, and not robustly more cooperative after reading a secular prime. Non-Christians (including Hindus and atheists) were not significantly affected by any of the primes. It is also worth noting that both the Christian prime and the secular prime had marginally significant negative effects on cooperation in the small sample of subjects who were not Christian, Hindu, or atheist.

Our results build on conflicting prior results regarding implicit religious primes and cooperation. The success of our explicit Christian prime in increasing PD cooperation among Christians is consistent with previous results showing increased generosity in a DG primarily among believers (Shariff & Norenzayan, 2007), and is broadly consistent with the finding of increased PD and DG cooperation among all subjects (Ahmed & Salas, 2011). Our results are also consistent with those of Horton et al. (2011), who also examined the effect of reading religious passages on PD game. However, we note that Horton et al.'s religious priming experiment, also conducted on MTurk, did not use comprehension questions, and therefore is rather limited in its interpretability. Exploring the differential effect of religious priming across different games and subject pools is a promising direction for future research.

The failure of the Hindu prime to increase cooperation among Christians suggests that, insofar as people are influenced by religious primes, they may be more receptive to primes from their own religious tradition. The failure of the Christian prime to increase cooperation among Hindus is also consistent with this observation,

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Table 5. Regression table of cooperation for subjects that are not Christian, Hindu or atheists – neutral prime as baseline.

	Other subjects
Christian prime	−1.818*
	(0.990)
Secular prime	−2.766*
	(1.432)
Female	1.411**
	(0.710)
Age	0.501
	(0.728)
Age ^2	−0.00946
	(0.0126)
Belief in God	−0.322**
	(0.161)
US resident	−1.614
	(1.022)
Education controls	Yes
Income controls	Yes
Constant	−3.961
	(10.35)
Observations	55

Note: Robust standard errors in parentheses.
* $p < .1$, ** $p < .05$, *** $p < .01$

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although the lack of significance among Hindus may be driven by a lack of power due to a smaller number of Hindu subjects. With regard to this empirical result, the selectivity of cooperation is understandable given the extent to which Christians are exhorted to "read, mark, learn, and inwardly digest" what their scriptures teach them. Such selectivity (see Vilaythong, Lindner, & Nosek, 2010) is consistent with psychological and evolutionary theories of religion, which stress that the rise of world religions generally include cultivating norms for extremes of both in-group prosociality and out-group enmity (Atran & Henrich, 2010; Atran & Norenzayan, 2004; Bering & Johnson, 2005; Bulbulia & Mahoney, 2008; Johnson, 2005; Norenzayan & Shariff, 2008; Sosis, 2006; Sosis & Alcorta, 2003; Sosis & Ruffle, 2003; Wilson, 2002). Religious group-delimited selectivity in cooperation is also consistent with the vast literature on biases toward in-groups more generally, which has been defended both empirically (Bernhard, Fischbacher, & Fehr, 2006; Brewer, 1979; Efferson, Lalive, & Fehr, 2008; Fowler & Kam, 2007; Rand, Pfeiffer et al., 2009; Tajfel, Billig, & Flament, 1971; Yamagishi, Jin, & Kiyonari, 1999) and theoretically (Antal, Ohtsuki, Wakeley, Taylor, & Nowak, 2009; Choi & Bowles, 2007; Fu et al., 2012; García & van den Bergh, 2011; Masuda & Ohtsuki, 2007; Riolo, Cohen, & Axelrod, 2001). Neurophysiological evidence also confirms that the effects of religious primes are selective and based on the beliefs of the participants. For instance, explicit and implicit religious primes reduce an error-related negativity (ERN) signal arising from the anterior cingulate cortex, which has been measured in subjects after they make mistakes on general tasks (Inzlicht & Tullett, 2010). However, this effect only exists for religious believers, as nonbelievers had an *increased* ERN signal, suggesting an aversive response to religious out-group primes.

Inzlicht and Tullett (2010) interpret their results to suggest that priming already existing belief systems buffers against defensive arousal during times of conflict. Decisions about whether to cooperate or defect (especially in the one-shot PD game, where cooperation is riskier than defection) can produce great conflict. Thus, perhaps the lack of cooperation, which is often interpreted as a result of out-group primes, is rather due to feelings of anxiety, conflict, and defensive arousal.

However, it is also interesting to consider why our Christian prime increased cooperation among Christians, while our Hindu prime had no significant effect on cooperation among Hindus (and, if anything, trended in the negative direction, and was thus not attributable to small sample sizes). Perhaps the Hindu subjects, almost all of whom were located in India (134 out of 141), were averse to being exhorted by Westerners using the Hindu tradition; or perhaps a different Hindu passage would have been more effective. Another possibility is that the success of Hindu primes on Hindu subjects is conditional upon some other factor, such as the possibility of social shaming or sanctioning (see Sachs, 2010), or being read in Hindi rather than English. Another possibility is that the Hindu passage failed to elicit cooperation among Hindus because such texts in Hinduism are not used in the same manner as those in Christian ritual practices. Specifically, in the Christian tradition, the formalized and synchronized deployment of musical practices (e.g., chanting, instrumentation, singing), integrated with explicit scriptural recitation, rhythmic swaying, and prostrations, may all amplify the effectiveness of texts to alter charitable dispositions and behavior. Much more research is needed on how specific ritual practices do, or do not, alter attitudes and beliefs within and between different traditions. Lastly, the relative failure of our secular prime among all groups suggests that we did not choose an effective priming passage. Although the passage from the Gospel of Mark, which we used in both experiments, has emerged over the last 2,000 years as one of the most powerful charitable exhortations, the same cannot be said for our secular passage. Developing an understanding of what makes particular passages more or less effective for priming cooperation in different in-groups and out-groups is an interesting topic for future study.

We also note that cooperation was substantially higher among our church participants than participants in the online sample, which is not surprising given that subjects in the church setting knew each other and therefore experienced less anonymity. Social distance between partners in the PD game was thus most likely perceived as being greater in the MTurk study, where participants interacted with other strangers on the MTurk system, as opposed to the scenario in Study 1, where all game partners belonged to a stronger in-group church community. Several studies have found that increased social distance corresponds with decreased prosociality (e.g., Bohnet & Frey, 1999; Jaeggi, Burkart, & Van Schaik, 2010). This may explain why small-scale rural communities have less social distance than large urban communities, and also why the former tend to rely more on basic moral rules (e.g., act versus omission distinction) for greater assumed responsibility toward others (Abarbanell & Hauser, 2010; Haidt & Baron, 1996). However, a recent study found substantially more cooperation in a DG on MTurk than previous studies in the laboratory, despite the increased social distance of the laboratory setting (Raihani & Bshary, 2012). The fact that our church participants were in a church might also have increased their cooperation, especially when compared to their behavior in other settings. For example, Ruffle and Sosis (2010) have reported that both secular and religious participants behave more prosocially in religious venues. However, these

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were internet participants told to imagine being in such venues, as opposed to being physically present in them, as in our study. Furthermore, the methodology employed by Ruffle and Sosis (2010) to test prosociality is in the very direct form of a survey, and so may have limited interpretability. Testing whether the physical presence in a religious building influences behavior would be an interesting avenue for future research, which would build on recent experiments concerning the prosocial effects of religious environments in Mauritus (Xygalatas, in press). Another interesting extension would be to test whether cooperativeness is affected by religious holidays (see Akay, Karabulut, & Martinsson, 2013).

Finally, it is interesting to consider the relationship between religion and cooperation in the context of dual-process models of cognition (Frederick, 2005; Kahneman, 2003, 2011; Sloman, 1996). In the dual-process model, decision-making is the cognitive result of competition between fast, automatic, intuitive, and emotional brain processes, on the one hand, and slow, controlled, deliberative, and rational processes, on the other. Recent work has demonstrated that religious belief is associated with intuition, such that more intuitive thinkers experience greater religiosity since childhood (Shenhav, Rand, & Greene, 2012), and increased reports in belief in God after priming (Gervais & Norenzayan, 2012; Shenhav et al., 2012). Cooperation has also been shown to be preferentially associated with intuitive thinking (Rand, Greene, & Nowak, 2012). Thus, one might expect that religious believers would be more cooperative. However, as described above, there is at best weak evidence for such a relationship. Our results may help to explain why. In-group bias and prejudice have also been shown to be intuitive (e.g., Greenwald, McGhee, & Schwartz, 1998), and our data suggest that religion may primarily have a positive effect on in-group cooperation.

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Conclusion

In sum, we have shown that explicit scriptural primes from a religious tradition can promote cooperation among followers of that religion. Christians, for whom a religious passage resonated more strongly, cooperated more in a PD game; and Christians who read the same passage cooperated more in a PD game than subjects who read a neutral prime. Thus, our results demonstrate that explicit religious exhortations for generosity can increase cooperation in a similar way to more subtle implicit primes. These findings support the contention that at least among some populations, religion may play an important role in promoting cooperation. The selectivity of the religious primes observed in our experiment is thus consistent with evolutionary hypotheses, which suggest that religion arose by promoting specifically in-group cooperation. Still, it is also possible that existing in-group cooperation was goaded to further altruistic efforts by beliefs in transcendent goals. Further untangling these possibilities is an important direction for future research.

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