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# Religious priming as a research tool for studying religion: evidentiary value, current issues, and future directions

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Religious priming allows researchers to explore the causal impacts of religious concepts on a wide variety of psychological outcomes. We review recent meta-analytic findings, and discuss the impact of methodological variation and convergent effects. We conclude that current evidence supports religious priming as having evidentiary and utilitarian value, but more assessment of moderators and the robustness of these effects across methods and contexts is needed.

## Addresses

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Religion's persistence throughout the ages and importance to billions of people make it a critical area of research for gaining a more complete picture of human psychology. Despite a long history of psychological research on religion, efforts to draw strong conclusions about causal effects of religion on psychology have been hampered by a lack of methodological tools [1]. People's religious attachments consist of long-standing constellations of beliefs, norms, and social connections. Yet, to confidently answer causal questions, we need to randomly assign elements of religion in an experimental setting. One solution to this challenge has been found in the methodological tool of priming [2,3]. By increasing the cognitive accessibility of religious concepts through priming the causal impact of religion is tested in a wide variety of domains.

Priming works by exposing participants to a stimulus in order to temporarily affect a response in a relevant domain [4–6]. In the psychology of religion, priming techniques allow random assignment to different treatment groups in which the salience of religious concepts is systematically varied. This helps researchers disentangle the influence of religious concepts from myriad other characteristics that covary with

a religious affiliation, such as personality dimensions and demographics [7–9]. Religious priming has led to a profusion of experiments on the impact of religious concepts on a variety of psychological outcomes in the past decade [10\*].

However, despite their widespread use in psychology, priming methodologies have come under acute scrutiny. Recent failures to replicate priming effects in social psychology [11–13] have cast doubt on the idea that incidental exposure to primes can affect behavior [14\*\*]. Though others have argued that this skepticism is premature [15–18], these criticisms signal a need for more rigorous reviews of the evidentiary value of the priming literatures. In this paper, we summarize our recent meta-analysis of religious priming studies [10\*], review how religious priming is used in the literature, and discuss findings in a broader theoretical perspective that address convergent validity.

## A meta-analysis of religious priming

What is the evidentiary value of research on religious priming? This was the key question of a recent set of seven meta-analyses, which featured a combination of traditional effect size analyses that corrected for publication bias and *P*-curve analyses [10\*]. Effect-size analyses assess the strength and reliability of an effect, and *P*-curve analyses assess the degree to which questionable research practices and researcher degrees of freedom (also known as *P*-hacking) are a factor [19\*,20].

The effect-size analysis found a small-to-moderate effect of religious priming across 92 published and unpublished studies comprising 11,653 participants ( $g = 0.40$ ). There was heterogeneity of effect sizes including null effects. Though evidence for publication bias was found, a trim and fill correction ( $g = 0.29$ ) indicated that the effects are not solely driven by publication bias, and a *P*-curve analysis found no evidence they were driven by *P*-hacking [10\*].<sup>1</sup> The *P*-curve analysis estimated the average

<sup>1</sup> The trim and fill correction has been criticized for not sufficiently adjusting for publication bias. Since this meta-analysis was first published a second paper re-analyzed this data with two additional tools that use different approaches to correct for publication bias: Bayesian Biased corrected model and a PET model [21]. The Bayesian model, similar to our analysis, found strong evidence for an overall effect. However, the PET model did not. The authors concluded that there is mixed evidence for the effectiveness of religious priming. Efforts are underway in the field to create and refine new meta-analytic tools that correct for publication bias, and there are ongoing debates — also about PET. Simulations show PET fails to find a true effect in samples with similar effect sizes between 33% and 53% of the time. When the data is heterogeneous, PET's performance in correctly detecting a real effect declines even further [22].

power to be 31% across all studies, suggesting that these studies are, on average, highly underpowered. Future studies ought to recruit substantially larger samples to reliably detect these effects.

We further looked for one important moderator of religious priming — comparing effect sizes for religious and non-religious participants. We found that, across the 17 studies ( $n = 4038$ ) that had recorded the effect of priming for religious and non-religious participants separately, the effect for religious participants to be  $g = 0.44$ , whereas for non-religious participants it was  $g = 0.04$  *n.s.* This suggests that religious priming depends on pre-existing culturally acquired religious belief — supporting the hypothesis that the effects of religious priming are not the result of universal low-level associations [23].

Our analysis did find some priming techniques and experimental settings to be more effective than others, though these differences were small (Table 1). In general, the more overt the prime, the larger the effect. Subliminal primes — for example rapid sub-threshold presentation of the word ‘God’ during a lexical decision making task (e.g. [24]) — found slightly smaller effects than contextual primes — such as having participants in a field study complete the dependent measure while the Muslim call to prayer rang in the background [25].

Our meta-analysis examined the entire body of religious priming research, covering a broad array of measures [see 10 SOM for a complete list]. The single most studied topic, however, was the effect of religious priming on prosocial behavior. We looked specifically at this subset of 25 studies, testing behavioral outcomes such as generosity and cooperation. The average effect across these studies was 0.27 (trim and fill correction:  $g = 0.18$ ). A *P*-curve analysis again was consistent with evidentiary value. Notably, the power estimate produced by this *P*-curve is 68% — much higher than the estimate for religious priming studies as a whole. This finding is notable because simply looking at whether religious people act more prosocially in baseline (unprimed) situations typically yields null effects [26]. Only when religious concepts are activated, do we find an empirically reliable indication of any prosocial effects.

### The significance of null effects

Rigorous meta-analytic methods are as important to evaluating the conclusions we draw from null effects as they are for evaluating those from significant effects. For example, the finding that using the same experimental techniques, there is no reliable effect of religious priming for nonbelievers is important for theory-building. Still, accounting for null effects in a meta-analysis is not always straightforward. Null effects can be caused by normal variation around a true underlying effect,

**Table 1**

**Distribution and effect sizes of studies broken down in different categories. Subliminal primes are delivered below conscious awareness for example words flashed on a screen for <40 ms; implicit primes are supraliminally perceived but not recognized to be about religion for example including religious words in a word puzzle; explicit primes are actively perceived stimuli for example reading a religious text; contextual primes are exposing people to a religious context or environment for example running the experimental condition in a church.**

	<i>k</i>	<i>n</i>	Effect size	95% CI
<i>Priming technique</i>				
Implicit	40	5190	0.39 <sup>***</sup>	0.29–0.49
Explicit	26	3846	0.42 <sup>***</sup>	0.31–0.53
Subliminal	18	1702	0.33 <sup>***</sup>	0.20–0.48
Contextual	8	870	0.49 <sup>***</sup>	0.28–0.71
<i>Experimental setting</i>				
Lab	55	5336	0.40 <sup>***</sup>	0.32–0.48
Online	25	4709	0.38 <sup>***</sup>	0.26–0.49
Mechanical Turk	13	1907	0.34 <sup>***</sup>	0.17–0.52
Not mechanical Turk	12	2802	0.41 <sup>***</sup>	0.27–0.56
Field	11	1365	0.44 <sup>***</sup>	0.25–0.62
<i>Dependent measure</i>				
Self-report measures	42	5152	0.46 <sup>***</sup>	0.37–0.55
Behavioral measures	50	6456	0.34 <sup>***</sup>	0.26–0.42

<sup>\*\*\*</sup>  $P < .001$ .

differences in methodological design or experimental context, and a number of other causes. Standard effect-size analyses can only account for methodological variation that can be coded for and included as a moderator (such as the different priming techniques in Table 1). When differences are idiosyncratic to a single study, coding for them becomes difficult. Our meta-analyses tell us that the null effects seen in this literature are unlikely to represent an underlying null effect of religious priming on believers, but may not give us the whole picture.

One notable high-powered pre-registered study by Gomes and McCullough [27] aimed to replicate the effect of religious priming on the dictator game (measuring generosity) originally found in Shariff and Norenzayan [7], but found a null effect. One interpretation of this null effect is that the religious priming effect on the dictator game is precarious or even absent. However, high baseline dictator game contributions in all conditions of Gomes and McCullough’s study — including the control condition — hint at another interpretation: that there were methodological, participant, or contextual differences from Shariff and Norenzayan’s original study. Since dictator game contributions are highly sensitive to experimental variations [28,29], various factors may have been at work in Gomes and McCullough’s study that curtailed selfishness even in the control condition, leaving little room for religious primes to reduce selfishness further [30].

Similarly, religious priming studies differ widely on context and task. It is unlikely that priming effects will be consistent across all populations, contexts, relevance, or levels of motivation [31\*,32,33]. Religious primes are not likely to be an exception given the diversity of populations and their religious beliefs. For instance, Protestants and Catholics may be affected differently by the same prime because of different associations these groups make between the prime and the task [9]. A recent cross cultural field study that covered a wide range of religious beliefs and practices found supernatural punishment beliefs predicted more impartial behavior toward co-religionists, but religious priming effects emerged in only a minority of the sites, with no reliable effect apparent across field sites [34\*\*]. Even different gene variants — rarely controlled for in experimental studies — have been found to moderate the responsiveness to religious primes [35,36]. There is more (and more difficult) work that lies ahead to identify the moderators and boundaries of religious priming effects across populations, contexts, and types of belief and practice.

### How religious primes are used, and what they can tell us

In experiments, priming can either be the mechanism of interest, or it can be used as a methodological tool to assess the causal impact of a difficult to manipulate variable. Priming is the mechanism when the effect of incidental exposure itself is what is interesting. For example, Rutchick [37] used subliminal religious primes to demonstrate the causal role of subtle religious cues in explaining differences in voting behavior. Rutchick previously found people who voted in churches voted more conservatively on topics like same-sex marriage or the ‘abortion pill’ than people who voted in community centers. The hypothesis in this case is specifically that incidental exposure to religious cues affects behavior, and the finding is interesting because it reveals how people may be unknowingly affected by a religious situation in their environment.

More commonly, however, religious priming is used as a method — the prime is used as a proxy for the causal effect of religious thinking. In this case, researchers are not interested in how incidental exposure to religious words or images affect behavior, but how the religious concepts that are tapped by the priming procedure do. This has implications for how we interpret the results of a study. In the example above, where priming is the mechanism of interest, the outcome of the experiment, and the effect size, map clearly onto the real world impact on voting behavior. On the other hand, when priming is being used as a method, the effect of the prime can establish the existence and direction of a theoretical relevant effect, but the size of the prime’s effect in a tightly constrained laboratory setting does not tell us much about the size of the real world impact of religious

belief or thought on behavior. This type of priming experiment is more appropriately seen as providing important but limited evidence. It is one piece of a larger theoretical puzzle.

### The importance of theory and convergent evidence

The impact of some elements of religion on prosocial behavior, derived from several theories, is supported by a large amount of convergent evidence [38,39]. These effects have been shown historically [40], across cultures [41], and in studies that have narrowed down to specific types of beliefs [34\*\*,42] and practices [43\*]. Understanding the conditions under which the temporary accessibility of religious concepts influences prosocial behavior yields important insights about the reliability, direction, and moderators of this effect, but priming studies are only one piece of a much larger set of theory and research on religion.

Theory-informed convergent evidence is an important part of evaluating any psychological effect. It allows us to assess the plausibility of a new finding, and help guide us to ask better questions and design more refined and targeted experiments. The theoretic underpinnings and convergent evidence for religious priming effects help us determine effects in the broader literature.

Skepticism is a bedrock principle of the scientific method. Therefore, new evidence is best considered provisional and subject to ongoing revision, as new research methods and more data accumulate to address a particular hypothesis. Religious priming is a relatively new technique with current evidentiary value in the methodological toolbox for studying religion, but more research is needed to evaluate the robustness of these effects across methods, contexts, and individual and cultural differences.

### Conflict of interest statement

Nothing declared.

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