CHAPTER 11

Socio-cultural Differences in Judgments about the Power of Thought

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Abstract

We examined participants' (*N* = 145) beliefs in the power of thought by comparing their judgments about whether desires would be fulfilled through prayer or through another petitionary activity, namely wishing. Three groups of adults (theists, agnostics, and atheists) read scenarios in which a protagonist desires to assist another person and either 'wishes' or 'prays to God' for their desires to be fulfilled. Requests varied by domain (psychological, biological, physical outcomes) and by plausibility (ordinarily plausible versus impossible outcomes). Participants reported whether each request would be fulfilled. Overall, participants judged that requests for plausible phenomena would be fulfilled more often than requests for impossible phenomena. Atheists were similar to theists and agnostics in belief that wishes would be fulfilled, perhaps suggesting that all groups appealed somewhat to metaphysical causality. However, agnostics, and especially atheists, were less likely than theists to report that prayers would be fulfilled. Engagement in prayer activities was a particularly strong predictor of participants' belief in the power of prayer but was unrelated to their belief in the power of wishing.

Keywords

agnostics – atheists – prayer – theists – wishing

Individuals typically assume that their thoughts can influence their bodies and actions, but that thoughts alone cannot directly influence the external world. Most individuals appreciate that they lack telepathic and telekinetic skills. Indeed even young children understand that the mind and thought are limited in many ways (Evans, 2001; Lane, Wellman, & Evans, 2014; Shtulman, 2009). For example, 5-year-olds appreciate that just thinking or wishing for something to occur cannot make it happen (Woolley, Phelps, Davis, & Mandell, 1999). Yet certain forms of thought, namely praying and wishing, are sometimes believed, at least by adults, to directly influence the external world. Individuals throughout the world engage in prayer (Pew Research Center, 2008a; 2010) as a means to connect with, communicate with, and make requests of the divine. (Ladd & Spilka, 2002). In the current study, we focus on concepts of the power of a particular type of prayer, 'petitionary' prayer (Capps, 1982; Stump, 1979). Such prayers call upon the intervention of a divine being with extraordinary powers, and thus individuals may believe that such petitions can produce outcomes that cannot otherwise be produced through other forms of petition, such as wishing.

We directly compare participants' concepts of petitionary prayer to their concepts of wishing by examining the extent to which individuals believe that praying and wishing will fulfil desires. Wishing was chosen as a contrast to prayer because of its similarity to prayer in several respects: both can be used to make petitions, both can be performed silently, and both are intentional, effortful psychological activities, as opposed, for example, to merely 'thinking' about an outcome. By contrasting wishing and praying, we can examine whether individuals conceive that prayer specifically (and not just any petitionary activity or any effortful psychological activity) can fulfil desired outcomes. Conceptually, petitionary prayer and wishing are interesting because both entail that we suspend some intuitions about the natural world, particularly intuitions about psychological-physical causality. Belief in the effectiveness of either form of petition may reflect an appeal to metaphysical causality.

In the current study, participants read scenarios where a protagonist desired to assist someone in need and the protagonist either wished for that desire to be fulfilled or prayed to God for that desire to be fulfilled. For each scenario, participants judged whether or not the request would indeed be fulfilled. Conceivably, participants' reasoning about the power of thought might vary depending upon *what* is requested. Thus, we vary within subjects aspects of the scenarios to examine whether concepts of the power of thought varies by plausibility (ordinarily plausible versus impossible outcomes) and by domain (requests for psychological, biological, or physical outcomes).

Socio-cultural context may influence concepts of the power of thought in several ways. Personally engaging in prayer and exposure to biblical stories and testimony about the efficacy of prayer may lead individuals to believe that petitionary prayer can indeed yield extraordinary outcomes via God's intervention (Vaden & Woolley, 2011). Alternatively, such exposure may more generally increase individuals' beliefs that extraordinary events can really occur (as concluded by Corriveau, Chen, & Harris, 2015). Given that religious beliefs, practices, and instruction vary across religions and cultures, fully understanding concepts of petitionary prayer will require studies in multiple cultural and religious settings. Here we begin with U.S. participants. The vast majority of the U.S. public (roughly 82%–92%) reports believing in a God or higher power (Kosmin & Keysar, 2008; Pew Research Center, 2008b) and many U.S. adults report attending religious institutions (Pew Research Center, 2008a).

In addition to tapping into a large theist population, we aim to examine how individuals who do not strongly identify with a theist belief system (agnostics) and individuals who identify as *not* believing in deities (atheists) reason about the power of praying versus wishing. In a large, representative survey, 2% of the U.S. population self-identified as 'agnostic' (Pew Research Center, 2008b), although results from a smaller survey suggest that as much as 10% of the population holds agnostic beliefs; when asked whether God exists, they reported either that 'There is no way to know' or 'I'm not sure' (Kosmin & Keysar, 2008). Another 1–2% of U.S. participants in the large survey self-identified as 'atheist' and when participants in the smaller survey were asked about God, a similar proportion responded 'There is no such thing' (Kosmin & Keysar, 2008; Pew Research Center, 2008b). Some atheists might hold negative sentiments towards religious others (Jackson & Hunsberger, 1999). These negative sentiments may be partly a reaction to widespread anti-atheist attitudes in North America (Edgell, Gerteis, & Hartmann, 2006; Jackson & Hunsberger, 1999), or may simply reflect a characterization of religious ideas as ridiculous (Dawkins, 2006). Indeed, atheists often report that belief in a god is illogical (Caldwell-Harris, Wilson, LoTempio, & Beit-Hallahmi, 2011), and some prominent, outspoken atheists proclaim that atheists are more rational thinkers than theists (e.g., Dawkins, 2006; Dennett, 2006; Harris, 2004).

Are atheists subject to the same 'irrational' thinking that is often attributed to theists, or are they wholly logical in their causal reasoning? The empirical record suggests that atheists might not be so distinct from theists after all. For example, priming God concepts influences the behaviour of both theists and atheists alike: in experiments, both groups were more generous towards anonymous others when God concepts had been primed as opposed to when they were not primed (Shariff & Norenzayan, 2007), and both groups showed

greater physiological arousal when asked to make negative statements that invoke God's name as opposed to when they were asked to make negative statements without God's name (Lindeman, Heywood, Riekki, & Makkonen, 2014). To date, little research has specifically examined these concepts and beliefs among agnostic participants (rare exceptions include studies of agnostic individuals' concepts of death and immortality, e.g., Heflick & Goldenberg, 2012; Vail, Arndt, & Abdollahi, 2012).

In the current study, we test several hypotheses about socio-cultural differences in individuals' reasoning about the power of thought. Because theists likely have greater cultural exposure to Biblical stories and anecdotal testimony about the power of prayer, humans' direct communication with God, and God's miraculous abilities, we anticipated that they would judge that desires would more often be fulfilled when individuals make requests via praying versus via wishing. We also anticipated that theists would more often judge that requests would be fulfilled than would atheists, especially when protagonists pray. Two hypotheses were tested with regard to atheists' judgments. A 'hyper-rational atheist' hypothesis predicts that atheists' greater appeal to rationality will render the mode of the request (praying versus wishing) trivial because both requests call upon the metaphysical and are thus equally irrational. In this case, we should find firstly that atheists will be less likely than theists to judge that praying *and* wishing are effective, and secondly that atheists will show no difference in judgments about the effectiveness of praying versus wishing. An alternative 'ordinary atheist' hypothesis predicts that atheists' beliefs about the power of thought are not unlike those of theists, but because atheists might hold negative sentiments towards religion, or at the very least consider religion irrational, they might outright reject ideas that are associated with religion, including ideas about prayers being fulfilled. On this hypothesis, atheists and theists will equally judge the effectiveness of wishing in being able to fulfil desires, but atheists will judge that praying is less effective than wishing. As little prior research has been conducted with agnostics, we do not have firm hypotheses about whether their judgments will be more similar to atheists' judgments, more similar to theists' judgments, or somewhere in between. Indeed, the current study is among the first that specifically targets agnostics' reasoning about metaphysical causality. In addition to examining differences between theists, atheists, and agnostics, we examine how participants' participation in prayer and religious activities relate to their causal judgments. This will allow us to assess whether exposure to theism generally and/or engagement in prayer specifically predicts belief in the power of thought.

We anticipated that participants' judgments will vary depending upon what the protagonist requests. Participants were expected to judge that requests for

outcomes that are ordinarily more plausible (e.g., preventing a fish bowl from falling off of a table during an earthquake) will more likely be fulfilled than requests for outcomes that are generally impossible (e.g., preventing a crumbling, leaning building from falling during an earthquake). Thus, we expected there to be a limit even to what theists would deem to be feasible products of prayer. We did not hold firm hypotheses regarding how judgments might vary along with the domain of the requests (psychological, biological, physical). Nevertheless, including this factor in our analyses allowed us to examine whether effects involving our variables of primary interest (mode of request and socio-cultural background) generalize across domains.

In summary, the current study has two primary goals: first to examine adults' judgments about how wishing and praying can influence phenomena of varying plausibility, and second to examine the relation between participants' socio-cultural backgrounds and their causal judgments.

Method

Participants

Participants (N = 145; 61 females) ranging from 19 to 82 years in age (M = 34.5 years) were recruited online through Amazon's Mechanical Turk. All participants resided in the U.S. Samples of participants recruited through Mechanical Turk are often much more diverse than typical U.S. college samples (Burhmester, Kwang, & Gosling, 2011). Most participants completed some college without earning a degree (n = 64) or had earned a Bachelor's degree (n = 47). Twenty-two participants had earned a high school diploma or General Education Diploma (GED), 11 had earned a graduate degree, and one did not complete high school or earn a GED.

To examine how participants' reasoning about the power of thought varies by their religious background, the sample was divided into participants who were theist (n = 58), agnostic (n = 47), and atheist (n = 40). Participants were categorized based on their responses to multiple-choice demographic questions at the conclusion of the survey. Theist participants identified with either 'Christianity' (n = 56) or 'Judaism' (n = 2), identified with the belief system at least 'Somewhat' (i.e., chose at least the second option on a 4-point scale ranging from 'Very little' to 'Very strongly'), and reported that their belief system was at least 'Somewhat important' to them (i.e., chose at least the second option on a 4-point scale ranging from 'Not at all important' to 'Very important'). Agnostic participants either identified with 'Agnosticism (Uncertain of God's existence)' (n = 41) or they identified with 'Christianity' (n = 5) or 'Judaism' (n = 1) but did so 'Very little' and reported that their belief system was 'Not at all

important'. All atheist participants identified with 'Atheism (Does not believe in God's existence)'.

The primary goal of this study was to examine differences between participants who identified as monotheist, atheist, and agnostic; thus an additional 24 participants who did not identify with Christianity, Judaism, agnosticism, or atheism, or those who did not fit any of the three socio-cultural categories (e.g., reported that they were Christian and that their belief system was 'very important' to them, but identified with that system 'very little') were excluded from the final sample. An additional seven participants were excluded because they completed the study in fewer than four minutes, and thus were unlikely to have thoroughly read the instructions and questions. An additional five participants were excluded because they had previously participated in a pilot version of the study.

Procedure

Participants completed an internet browser-based survey designed with and hosted by Qualtrics. The informed consent document described that participants would complete a survey about the power of thought, but participants were not told what form of thought they would be questioned about and were not made aware that the study had two survey versions, one version about praying and the other about wishing. Approximately half of the participants (n = 73) completed the survey about the power of praying and the other half (n = 72) completed the survey about the power of wishing. Aside from references to 'praying to God' versus 'wishing', the two surveys were identical in their structure and wording. Within each of the three religious-background groups, participants had been assigned to the 'wish' and 'pray' conditions relatively evenly (atheists: n = 22 and 18; theists: n = 28 and 30; agnostics: n = 22 and 25, respectively).

The surveys consisted of four parts: (1) judgments about the power of praying/wishing, (2) experiences and beliefs about praying/wishing (not reported here), (3) religious background, and (4) additional demographic questions. Responses to the additional demographics questions in Section (4) were summarized in the *Participants* section, above. Next, we describe Sections (1) and (3) in detail.

Judgments about the Power of Praying/Wishing

For the first part of the survey, participants read scenarios in which a protagonist, Mark, held a desire regarding one of his friends and he either prayed to God for that desire to be fulfilled or wished for that desire to be fulfilled. Subsequent studies of ours (unpublished) have examined how children reason about the power of thought and thus, to allow for later comparisons between

children's and adults' responses, we opted to use similar (and in most cases identical) scenarios for adults and for children. This required that scenarios remained relatively brief and included simple language. The instructions for adult participants explained that the scenarios were brief in order to encourage participants to think seriously about the scenarios and to respond honestly to the questions. The scenarios were introduced as follows:

> On the following pages, you will read short stories about Mark and his friends. In these stories, Mark [makes wishes/prays to God] for his friends, and we'll ask you whether Mark's [wishes/prayers] will come true. These stories were designed to be read by adults and by children, so they are brief. For your answers, we would like you to tell us what you really think. There will be a different story on each page, and each story will be about a different one of Mark's friends.

Following this general introduction, participants read 12 scenarios, each on a separate page, which described a different one of Mark's desires. Following each scenario, participants were asked whether the request would be fulfilled or not. After reading a scenario and rating whether a request would be fulfilled, participants clicked 'Next' to proceed to the next scenario. To examine how participants' reasoning about the power of thought varies by ontological domain, four of these scenarios dealt with Mark's requests about biological phenomena, four dealt with physical phenomena, and four dealt with psychological phenomena. Half of these phenomena (two per domain) dealt with phenomena that can plausibly occur on their own or with modest human intervention and the other half dealt with phenomena that are impossible even with direct human intervention. The presentation order of these 12 scenarios was randomized across participants. All scenarios are presented in the Appendix. For each scenario, participants' decisions that requests would be fulfilled were coded 1 and decisions that requests would not be fulfilled were coded 0. The two items for each of the six domain-plausibility combinations were moderately to highly inter-correlated (see Table 1). Thus, scores for the two items within each of six combinations were averaged and rescaled, yielding six domain-plausibility scores ranging from 0% to 100%, with higher scores reflecting more frequent judgments that requests would be fulfilled.

Religious Background

To gather data on participants' religious backgrounds, they were asked first to indicate their belief system and then to report how much they identified with that belief system, using a scale ranging from 'Very little' (=1), to 'Very strongly' (=4). Finally, they were asked how important religion is in their life, using a

TABLE 1   *Inter-item correlations and descriptive statistics for the six domain-plausibility categories*

	Inter-item correlation	Mean	SD
		%	%
Physical-plausible	0.26	34	38
Psychological-plausible	0.45	31	39
Biological-plausible	0.37	26	37
Physical-impossible	0.46	14	30
Psychological-impossible	0.68	16	34
Biological-impossible	0.49	6	20

Note: All correlations are significant at $p \leq 0.001$.

scale ranging from 'Not at all important' (=1), to 'Very important' (=4). To gather additional data on participants' socio-cultural backgrounds, they responded to a 17-item questionnaire about their engagement in a variety of activities. Focally, this questionnaire included three items about their engagement in religious activities generally (reading religious stories or texts, watching religious TV shows or movies, attending a place of religious worship or religious classes) and included three items about their engagement in prayer activities specifically (praying before going to bed, praying before a meal, talking about prayer with others). The ordering of the 17 questions was randomized across participants, and all questions appeared on a single webpage. Participants could report performing each activity, 'Very rarely or never', 'At least twice a year', 'Every month or two', 'Every week', or 'Daily (or almost every day)'. Several of these options contained number terms (e.g., 'two'), and thus to avoid confusion the response options were not numbered for participants. Responses were later assigned scores, ranging from 1 (for 'Very rarely or never') to 5 (for 'Daily or almost every day'). The three items involving general religious activities were highly interrelated ($\alpha = 0.94$) and so were the three items specifically about prayer activities ($\alpha = 0.90$). Religious participation and prayer participation composites were created by averaging across the respective three items.

Results

We first examined the influence of participants' religious backgrounds, the mode of the request, plausibility of the phenomena, and domain of the

phenomena with a 3 (Background: Atheist, Agnostic, Theist) × 2 (Mode: Pray, Wish) × 2 (Plausibility: Plausible, Impossible) × 3 (Domain: Physical, Biological, Psychological) mixed-effects ANOVA. According to Mauchly's Tests, the data violated the assumption of sphericity, both for the factor of Domain (*Mauchly's W* = 0.92, *p* < 0.01) and the interaction of Plausibility × Domain (*Mauchly's W* = 0.91, *p* = 0.001). Thus, all effects involving these factors are reported using the Greenhouse-Geisser correction. This analysis revealed significant effects of Background ($F(2, 139) = 7.76$, $p < 0.001$, $\eta^2 = 0.10$), Plausibility ($F(1, 139) = 98.13$, $p < 0.001$, $\eta_p^2 = 0.41$), and Domain ($F(1.86, 254.58) = 9.78$, $p < 0.001$, $\eta^2 = 0.07$). As well, there were significant interactions of Background × Mode ($F(2, 139) = 3.52$, $p < 0.05$, $\eta_p^2 = 0.05$), Background × Plausibility ($F(2, 139) = 5.61$, $p < 0.01$, $\eta^2 = 0.07$), Background × Mode × Plausibility ($F(2, 139) = 3.09$, $p = 0.05$, $\eta_p^2 = 0.04$), Mode × Plausibility × Domain ($F(1.87, 138) = 3.34$, $p < 0.05$, $\eta_p^2 = 0.02$) and a marginal interaction of Background × Plausibility × Domain ($F(3.66, 254.58) = 2.37$, $p = 0.06$, $\eta_p^2 = 0.03$). Because all of the 3-way interactions had relatively small effect sizes and modest statistical significance, for the sake of parsimony our interpretation of the data will focus on the significant main effects and 2-way interactions. In what follows, post-hoc pair-wise comparisons for between-subjects factors are corrected using Tukey's HSD and pair-wise comparisons for effects involving within-subjects factors are corrected using Sidak.

Posthoc pairwise comparisons for the effect of Domain revealed that participants judged that requests for physical phenomena ($M = 24\%$, $SD = 29\%$) and psychological phenomena ($M = 24\%$, $SD = 33\%$) were more likely to be fulfilled than requests for biological phenomena ($M = 16\%$, $SD = 24\%$), all probabilities < 0.01. The main effects of Background and Plausibility, and the interaction between these factors are depicted in Figure 1. As expected, participants judged that requests for plausible phenomena ($M = 29\%$, $SD = 31\%$) would be fulfilled much more often than requests for impossible phenomena ($M = 11\%$, $SD = 23\%$). On average, theists judged that the protagonists' requests would be fulfilled ($M = 30\%$, $SD = 27\%$) significantly more than atheists ($M = 11\%$, $SD = 20\%$, $p < 0.001$) and marginally more than agnostics ($M = 19\%$, $SD = 23\%$, $p = 0.07$). Figure 1 illustrates that the differences between participants from the three backgrounds were especially pronounced for plausible phenomena. For impossible phenomena, theists more often reported that requests would be fulfilled than did atheists ($p < 0.05$). However, for plausible phenomena, theists much more often reported that requests would be fulfilled than did atheists ($p < 0.001$) and theists also did so significantly more often than agnostics ($p < 0.05$).

The interaction of Background × Mode is depicted in Figure 2. Theists were more likely than atheists ($p < 0.001$) and (to a lesser extent) more likely than agnostics ($p < 0.05$) to judge that the protagonist's prayers would be fulfilled. However, theists, atheists, and agnostics were equally likely to judge that the
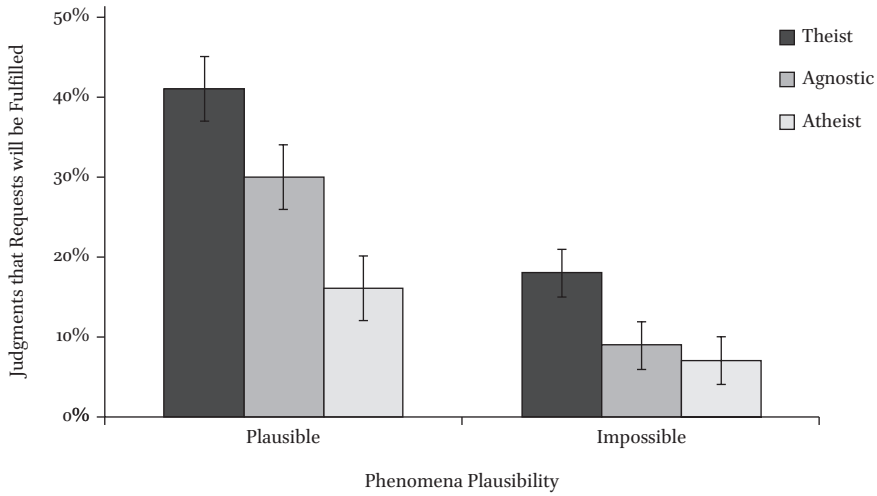
FIGURE 1   *Theist, agnostic, and atheist participant's judgments that the protagonist's requests will be fulfilled for plausible and impossible phenomena. Error bars represent ±1 standard error of the mean*
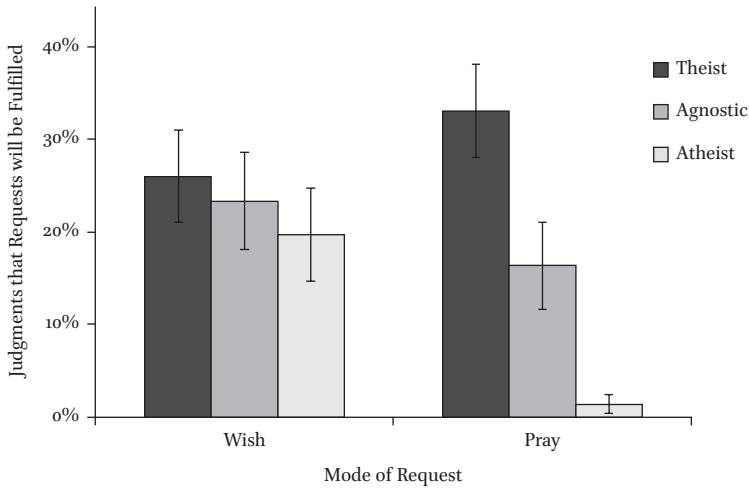

FIGURE 2   *Theist, agnostic, and atheist participants' judgments that the protagonist's requests will be fulfilled when requests are made through wishing or through praying. Error bars represent ±1 standard error of the mean*

protagonist's wishes would be fulfilled. An alternative way to interpret this interaction is to compare judgments about wishing and praying within each group. Atheists judged that wishes would be fulfilled more often than prayers ($p < 0.05$), whereas theists and agnostics judged that prayers and wishes would be fulfilled equally often.

So far, we have broadly examined relations between participants' religious (or non- religious) backgrounds and their judgments about the effectiveness of wishing and praying. To more precisely examine relations between participants' socio-cultural backgrounds and their judgments, we consider relations between participant's responses to questionnaire items about their general religious participation (including their engagement in activities such as reading religious texts) and their more specific prayer participation (including activities such as praying before bed). These two composites were entered simultaneously into linear regression analyses predicting participants' judgments that prayers or wishes would be fulfilled (i.e. averaging across judgments for all 12 scenarios). Among participants who made judgments about the power of wishing, these two variables were not related to judgments either collectively (R^2 = 0.02, $F(2, 69)$ = 0.74, ns) or individually (religious participation: β = 0.19, t = 0.58, ns; prayer participation: β = −0.05, t = −0.14, ns). However, among participants who made judgments about praying, these two variables collectively accounted for significant variance in judgments about the efficacy of prayer (R^2 = 0.18, $F(2, 70)$ = 7.69, $p < 0.001$). Individually, prayer participation significantly predicted participants' causal judgments (β = 0.45, t = 2.14, $p < 0.05$), whereas more general religious participation was unrelated to participants' causal judgments (β = −0.03, t = −0.14, ns).

Discussion

In the current study, we explored individuals' beliefs in the power of thought, how such beliefs vary depending upon the form of thought (praying versus wishing), and how such beliefs vary across participants from different socio-cultural backgrounds (theist, agnostic, atheist). In general, as might be expected, participants reasoned that requests for ordinarily plausible phenomena were more likely to be fulfilled than requests for ordinarily impossible phenomena. Across socio-cultural backgrounds, participants held similar beliefs about the power of wishing, but differed markedly in their beliefs about the power of prayer. We discuss these socio-cultural differences in detail.

Theists, agnostics and atheists were equivalent in their judgments that wishes would be fulfilled. However, atheists and (to a lesser extent) agnostics were less likely than theists to report that prayers would be fulfilled. Moreover, atheists reported that prayers would less likely be fulfilled than wishes. These findings suggest that atheists discount in their estimates of whether desires will be fulfilled following prayer. Prayer is often associated with organized religion, and negative sentiments that some atheists hold about organized religion

(e.g., Jackson & Hunsberger, 1999) might lead them to adjust downward their estimates that requests made via prayer will be fulfilled. Note that atheists were equivalent to theists and agnostics in their judgments that wishes would be fulfilled, so atheists' judgments about prayer cannot simply be credited to a more general skepticism toward supernatural or metaphysical causality. These data are consistent with the 'ordinary Atheist' hypothesis, and are consistent with prior research demonstrating that, although atheists may explicitly and intentionally disavow belief in the supernatural, they are not necessarily more rational thinkers who are unaffected by pervasive supernatural beliefs and indeed are not immune to holding such beliefs themselves (e.g., Lindeman et al., 2014; Shariff & Norenzayan, 2007). The difference between atheists' judgments about the power of wishing versus their judgments about the power of praying suggests that probabilistic judgments may be influenced by emotional reactions to the context or phenomena in question, in this case atheists' potential aversion to formal religion.

It is important to note that we do not claim that all or that even most atheists hold negative sentiments towards organized religion. To the contrary, we acknowledge that there is likely great variability in atheists' views of religion, ranging from respect and understanding to outright disdain and condemnation. Moreover, we acknowledge that some religiously fundamentalist individuals hold negative views of non-religious individuals (Edgell et al., 2006; Jackson & Hunsberger, 1999). We speculate that atheists' downward adjustment in their judgments about prayer, relative to their judgments about wishing, might be due to some (but not all) atheist participants' (implicit or explicit) negative sentiments towards religion or religious others. This downward adjustment may be due, in part, to pervasive anti-atheist sentiments in the U.S. Alternatively, such adjustment may be made by atheists because questions that include religious content (such as those questions asked of participants in the 'prayer' condition) are considered to have an illogical premise. These speculations should be directly tested in future research using both implicit and explicit measures of participants' attitudes towards religion and religious others.

The judgments of atheists differed from those of theists and agnostics especially when they reasoned about requests for plausible phenomena, phenomena that may occur on their own or with modest human intervention. In contrast, participants from these backgrounds were more similar in their judgments that requests for impossible phenomena, which cannot ordinarily occur even with direct human intervention, would very rarely be fulfilled. Moreover across all groups, participants reasoned that requests for plausible events were more likely to be fulfilled than requests for impossible events. Thus, there may

be a limit in the extent to which religious background influences judgments about the power of thought: not all judgments are influenced equally, and judgments about the fulfilment of requests for plausible phenomena appear to be especially malleable.

Note that even when theists reasoned about requests for plausible phenomena, they judged that fewer than half of those requests would be fulfilled. Similarly, theists judged that fewer than half of the prayers (including prayers for plausible and impossible phenomena) would be fulfilled. Thus, even though theists demonstrated greater belief (relative to atheists and agnostics) that certain requests would be fulfilled, they were nonetheless relatively conservative in their estimates that requests would be fulfilled. This raises questions as to why theists pray if they do not think it 'works'. Future research should investigate how individuals reason about the power of thought while they engage in petitionary praying or wishing. Conceivably, reasoning about the success of one's own real-world petitions might increase predictions that such petitions will be fulfilled.

The current findings are among the first to address the topic of metaphysical reasoning specifically among agnostics (but see Heflick & Goldenberg, 2012; Vail, Arndt, & Abdollahi, 2012). As illustrated in Figures 1 and 2, agnostics' judgments about the power of thought appear to fall between those of atheists and theists. This likely does not reflect an averaging across two extremes (where half of the agnostic participants reason like atheists and the other half reason like theists). If that were the case, the variability of responses within the agnostic group might be greater than that found within the theist and atheist groups; but in fact the variability found among agnostic participants was typically similar to that found among theists and atheists (as determined by the *SE*s within each group; see Figures 1 and 2). Rather, it is more likely the case that either (a) agnostics' causal judgments are influenced by both theist and atheist philosophies, or (b) agnostics may be providing the most "rational" response pattern. To elaborate on the latter possibility, perhaps theists' causal judgments about prayer are adjusted upward because of their affinity towards religion and atheists' causal judgments are adjusted downward because of a potential dislike of religion. In contrast, agnostics may provide similar judgments about the power of wishing and praying because they hold neither strong positive nor strong negative sentiments towards religion. This would not necessarily imply that agnostics are more rational in general. Conceivably, if asked to make causal judgments about a more emotion-eliciting topic, they might also adjust their causal estimates according to their sentiments. Clearly, more research is warranted that specifically focuses on agnostic participants' metaphysical reasoning, and it is important for future work to

directly examine whether participants' sentiments about religion mediate their judgments about the power of thought.

Additional analyses examined which aspects of religious exposure might account for variability in participants' reasoning about the power of thought. Specifically, we examined how participants' general engagement in religion (e.g., attending a place of worship) versus their more specific engagement in prayer (e.g., praying before bed) are related to their judgments about whether requests would be fulfilled. We found that neither of these factors predicted participants' reasoning about the power of wishing. However, participants' engagement in activities involving prayer strongly predicted their judgments that prayers would be fulfilled, and their participation in prayer activities was a stronger predictor than their more general engagement in religious activities. Thus, individuals' participation in religious activities, including prayer, does not appear to ~~influence globally~~ their beliefs about the power of thought. Rather, participation in prayer activities is related specifically to their beliefs about what can be accomplished through a particular form of thought, namely petitionary prayer.

Future research is needed to investigate how beliefs about the power of thought develop; to examine whether children are more conservative or more liberal in their estimates of what wishing and praying can accomplish, and to identify exactly how socio-cultural background factors into this development. Such research could identify the specific aspects of prayer participation and cultural messages about prayer that most influence developing concepts of the power of thought.

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Appendix

Scenarios (*Wish version*)
Physical-Plausible

One of Mark's friends lives in a town. One day it started to rain in the town, so there was a little water on the ground. If the water stays there too long, his friend might slip and hurt himself.

Mark wants to help his friend get rid of the water. If Mark wishes for all of that water to go away by tomorrow, will the **water stay or will it go away**?

One of Mark's friends lives in a house. One day there was a small earthquake, making the house shake. It's shaking enough that his friend's fishbowl is starting to slide to the edge of its table. Mark wants to help his friend and save the fishbowl from falling and breaking. If Mark wishes for the fishbowl to stay on the table, will the **fishbowl stay on the table or will it fall off**?

Physical-Impossible

One of Mark's friends lives in a big building. One day there was an earthquake, making the whole building shake. It's shaking so much that the building is starting to crumble, tilt to the side, and fall over. Mark wants to help his friend and save the building. If Mark wishes for the building to stay up and not fall over, will the **building stay up or will it fall over**?

One of Mark's friends lives in a town. One day it rained and rained in the town. It rained so much that it started to flood the whole town. Mark's friend can't open the door to go out, or his house would flood. Mark wants to help his friend get rid of the water. If Mark wishes for all of the water to go away right now, will the **water stay or will it go away**?

Biological-Plausible

One day, one of Mark's friends was in her yard, when she got bitten by some ants. The bites made her hand get red and hurt. Mark wants to help his friend feel better. If Mark wishes for his friend's hand to heal, will **her hand stay red and hurt or will it heal**?

One day, one of Mark's friends was watching TV when he started to feel very sick; his head and stomach hurt and he got very tired. He is so sick, he can't go to school. Mark wants to help his friend feel better. If Mark wishes for his friend to feel completely better right now, will his **friend feel better or will he stay sick**?

Biological-Impossible

One of Mark's friends has a birthday, and for her birthday, she got a frog. She really does not like frogs and she's always wanted a kitten. Mark wants to help

his friend have a kitten, not a frog. If Mark wishes for his friend's **frog to change into a kitten, will the frog stay a frog or turn into a kitten**?

One day, a bully started chasing one of Mark's friends, so the friend ran away. Then Mark's friend came to a very high, strong wall, and the bully was catching up. Mark wants to help his friend escape. If Mark wishes for his friend to run right through the wall to get to the other side, will his **friend run right through or be stuck on the side with the bully**?

Psychological-Plausible

One day, a big dog started barking at one of Mark's friends, and after that she was scared of dogs. Mark wants to help his friend to be brave and not scared of dogs anymore. If Mark wishes for his friend to be brave and not scared anymore, will his **friend still be scared of dogs or not scared anymore**?

One of Mark's friends had a very bad day; his friends teased him. So now he feels very sad. Mark wants to help his friend feel better. If Mark wishes for his friend to feel better, will his **friend feel better or will he still feel sad**?

Psychological-Impossible

One of Mark's friends doesn't know where his pet hamster is; it ran away. It could be under his bed, it could be anywhere. Mark's friend wants to find his hamster right now, without looking around. And Mark wants to help him. If Mark wishes for his friend to know where the hamster is right now without looking, will his **friend know where it is or not know**?

One of Mark's friends is sick and doesn't know where her medicine is. It could be in her dresser, it could be anywhere. Mark's friend wants to find her medicine right now, without looking around. And Mark wants to help her. If Mark wishes for his friend to know where the medicine is right now without looking, will his **friend know where it is or not know**?

Note: The order in which the scenarios were presented was randomized across participants. The Prayer scenarios were identical to the Wish scenarios seen here, except that the word "wishes" was replaced with "prays to God". Bolded text seen here was bolded as well for participants, in order to highlight the response options. The categories of the scenarios (e.g., Physical-Impossible) are noted here but were not noted for participants.