# An Experimental Exploration of *Big Gods*:

# Proposing an Expansion of Supernatural Inference

Empirical thesis submitted in partial fulfilment of the requirements for the degree of Master of Research (Psychology), Macquarie University, 2016.

## Table of Contents

Abstract

The contribution of perceived supernatural punishment to large-scale cooperation, specifically integral to Norenzayan's *Big Gods* (2013), remains unresolved. This study aims to deduce the contributing effect of three of Norenzayan's main factors in a perceived cooperative task; religious affiliation, individual versus large-scale interaction, and the threat of punishment versus no punishment. Community and Punishment are manipulated within a population that explicitly denies the existence of God, compared to a population who inherently believes, or does not deny, the existence of God (atheists and non-atheists). The combination of the Community and Punishment conditions is hypothesised to result in the highest levels of prosociality, and the combination of the Individual and No Punishment conditions to result in the lowest levels of prosociality (despite religious affiliation). The effects of Community and Punishment in those who are assumed to rely on non-supernatural institutions as foundations for cooperation (atheists, representing a 'pre-religious' population) versus those who are assumed to rely currently on supernatural institutions as foundations for cooperation (non-atheists; agnostic and religious participants, representing a 'peri-religious' population) reveal differential behavioural predictors. Experimental manipulations predict prosociality for atheists, whereas supernatural belief score predicts prosociality for non-atheists. In the absence of targeted religious priming effects, perception of supernatural monitoring is not the most compelling explanation of the data. The role of supernatural beliefs in the induction of cooperative schemas is not dismissed, but proposed to exist within methodological, contextual and cultural boundaries of wider inference, encompassing both the supernatural and the secular. The contribution of supernatural belief, by extension, is neither insignificant nor necessary overall.

**Declaration of Originality**

The works found within this thesis are original and have not been submitted for publication, written by another person, nor submitted for a higher degree to any other university or institution. The empirical research contained within this thesis was approved by the Human Research Ethics Committee at Macquarie University (reference number: HREC5201600211; Appendix A).

Bianca Slocombe

**Acknowledgements**

I would like to express my sincere gratitude to my supervisor, Associate Professor Colin Wastell. Thank you for inspiring my research pursuits, and for your unfaltering commitment, not only to my success, but to my happiness throughout this year. I can't imagine where I'd be without your guidance.

To those with whom I shared the adventure, especially Liv and Aydin, thank you for enriching my experience. I'm so lucky to finish this year with friends like you.

Finally, this wouldn't be a reality without the constant support of my family. Katie, I thank you always for your technical assistance. Michael, thank you for debating with me, proofreading for me, encouraging me, and loving me unconditionally. To my parents, for absolutely everything, I can never thank you enough.

## List of Tables

## List of Figures

# 1. Introduction

An astounding majority of the human population are religiously affiliated. A global analysis, comprising over 2500 primary sources, found that 84% of the world's 6.9 billion people identified with a religious group in 2010 (Pew Research Centre, 2012). Scientific examination of the phenomenon relates to its emergence, as well as its continued role in post-industrial societies, i.e. societies which are technically advanced and largely reliant on secular institutions. The study of religiosity has developed within varied fields, including cognitive and social psychology, cultural anthropology and behavioural economics.

## 1.1 The *Big Gods* Hypothesis

A current leader in the field, Ara Norenzayan, has integrated correlational and experimental evidence to form a cultural-evolutionary account of religion in his recent book, *Big Gods: How Religion Transformed Cooperation and Conflict* (*Big Gods*; Norenzayan, 2013). 'Big gods' refer to those supernatural beings which are omniscient, omnipotent, able to intervene in human affairs and punish transgressions. Norenzayan proposes that big gods were the catalyst of large-scale cooperation as societies 'scaled-up' beyond hunter-gatherer kin-based groups, providing the threat of punishment beyond that which is possible via tangible monitoring strategies. *Big Gods* rests on four main theoretical foundations; the influence of cognitive mechanisms on the constraint and transmission of religious beliefs, social instincts that guide a perception of supernatural monitoring, cultural learning mechanisms which allow for the spread of religious ritual and behaviour, and intergroup competition, which informs religious belief and behaviour (Norenzayan, 2013; Norenzayan et al., 2016).

Modern humans live predominantly in large-scale, anonymous societies. However, humans are long thought to have evolved from small groups of primates (Darwin, 1859;

Langergraber et al., 2012) and lived predominantly in small-scale, hunter-gatherer groups only some 12,000 years ago (Johnson & Earle, 2000). Norenzayan postulates that the existence of large-scale human cooperation is one of the greatest puzzles in our evolutionary history, given the assumption that group expansion leads to a subsequent inflation of the 'free-rider problem.' This refers to the possibility that individuals within a society may fail to contribute fairly to the needs of the group whilst consuming more than their fair share of resources (Norenzayan, 2013). Increasing group size decreases biological relatedness within a group and systems based on reciprocity, direct or indirect, are endangered as a result (Norenzayan et al., 2016).

Our primate ancestors display behaviours consistent with reciprocal altruism and kin selection (de Waal, 2008). An act of reciprocal altruism is one by which an animal (or human being) acts to benefit the fitness of another whilst reducing its own, coupled with an expectation that the other organism will reciprocate the gesture at another time. Kin selection relates to altruistic acts also, but the act occurs in order to benefit fitness outcomes for a biological family member or group of kin. These factors are not puzzling, however, it is the expansion of cooperation beyond kin groups to larger groups of strangers that is counterintuitive to both the process of natural selection famously postulated by Charles Darwin (1859) and to a modern theory of the 'selfish gene' (Dawkins, 1976). Natural selection refers to the preservation and dissemination of beneficial traits, adaptations and genetic mutations which provide fitness benefits to an organism. Advantageous mutations are inherited by the offspring, and by their offspring; leaving other members of the species at a disadvantage, with less chance of survival over time, and hence less chance to reproduce. This model has formed the foundation for an understanding of human nature and its evolutionary lineage. Dawkins' 'selfish gene' is one recent reconstruction of the traditional theory, suggesting that fitness-maximising behaviours are driven at the level of the gene,

rather than at the level of the group. Still, reformulations of evolutionary theory generally address the historical process of evolution as 'survival of the best fitted'; they fail to adequately explain the phenomenon of large-scale cooperation amongst anonymous strangers.

Norenzayan ties this historical puzzle to another occurring within the same period; that is, the rise of prosocial religions and the subsequent imposition of perceived supernatural punishment. The term 'prosocial religions' is used due to the fact that prosocial behaviour is encouraged among believers. Norenzayan and his colleagues clarify this prosociality as an expression of 'parochial altruism' occurring within groups as a protective mechanism against threat, and often associated with hostility towards members of out-groups. Norenzayan refers here to the rise of 'big gods'; omniscient, omnipotent, morally concerned and powerful deities who are believed to monitor, reward and punish human conduct in line with appropriate social and cultural standards (Norenzayan, 2013). These gods are understood separately from preceding deities of small, hunter-gatherer societies. In general, early tribal deities are thought to have lacked the power, complexity and moral concern for human behaviour that is characteristic of Norenzayan's big gods (Norenzayan, 2013; Swanson, 1960).

Historical accounts contribute to the interdisciplinary synthesis of evidence. Historical scholarship carries the familiar burden of inferring direction of causality. The increased complexity of group size and societal systems (including political and economic), with beginnings approximately 12000 years ago, is a matter of interdisciplinary debate. Large-scale societies refer to expansions beyond tight-knit groups of early hunter-gatherer societies, which were often underpinned by kin relations, repeated exposure to cooperative partners, and a resulting lack of anonymity (Norenzayan, 2013). The most commonly accepted explanation for this historical scaling-up of society is the advent of agriculture and

domestication of animals. Norenzayan's thesis provides an expansion of this hypothesis via the addition of supernatural monitoring. He is not the first to postulate a link between belief in supernatural monitoring, cooperation and punishment in large groups (Johnson & Bering, 2006). However, his proposal is novel in that it places the theistic worship under the influence of overriding evolutionary and cultural processes, rather than primarily cognitive processes. Integral to Norenzayan's theory is the temporal correlation between the rise of large scale cooperative societies and the rise of big gods. Norenzayan acknowledges three possibilities for the inference of causality (societies were able to expand due to perceived supernatural punishment, belief in supernatural punishment arose as a by-product of the expansion of society, or the two were mutually entangled). Norenzayan's thesis relies on the assumption that belief in supernatural punishment is necessary for large-scale cooperation, and he provides support principally for the former causal assertion.

#### 1.1.1 Principle one: 'Watched people are nice people'

The *Big Gods* hypothesis relies on eight principles, of which the first two relate directly to the current study. The first principle, 'watched people are nice people,' reflects the notion that perceptions of being watched reliably increase prosociality in human agents who otherwise display behaviour generally consistent with nefarious intentions. Evidence for this is primarily provided by small-scale experiments (e.g. Shariff & Norenzayan 2007; 2011), which show a general trend for prosocial behaviour to increase under conditions of perceived anonymity, when the threat of monitoring is absent or unclear. Consistent with Norenzayan's experimental history, prosocial behaviour will be defined and operationalised in the current study as a construct regarding normative actions that benefit others (for a brief review, see Norenzayan & Shariff, 2008). For example, the presence of eyes behind an 'honesty box' at a self-serving coffee stand resulted in nearly three times as much money left by participants, despite equal consumption of coffee in the control condition (Bateson, Nettle, & Roberts,

2006). Beginning with his first principle, Norenzayan postulates that religion catalysed cooperation among large groups of anonymous strangers. Though he does not dismiss the possibility of prosociality under the protection of anonymity or in the absence of incentives, *Big Gods* investigates increases in prosociality due to perceived surveillance, and presents little discussion regarding the reasons for anonymous generosity and prosociality that exists when nobody is watching. In opposition to the evidence presented in *Big Gods,* a recent meta-analysis concluded that the presence of eyes does not result in more prosocial outcomes (Northover, Pedersen, Cohen, & Andrews, 2016). However, the use of economic games has consistently revealed increases in generosity, cooperation and prosocial behaviour when anonymity is guaranteed or undetermined. For example, Zhong, Bohns and Gino (2010) have demonstrated the phenomenon of 'illusory anonymity.' Participants in a well-lit room compared to a dark one, or participants wearing clear glasses compared to dark ones, act significantly more generously in an experimental setting. Although these manipulations have no physical bearing on anonymity in the given situations, the experience of subtle changes in darkness may induce individual perceptions of anonymity which moderate behavioural consequences.

### 1.1.2 Principle two: 'Religion is more in the situation than in the person'

The second principle is linked to the first, and addresses the manifestation of the supernatural context integral to *Big Gods*; 'religion is more in the situation than in the person.' Norenzayan postulates that 'unless a believer is thinking religious thoughts every moment of her waking life, awareness of a watchful God is merely one of many competing imperatives that might influence an action at any given moment' (p. 40). That is, a social standard will affect the actions of an agent only with conscious activation of its relevance. This process directly opposes an intuitive notion of consistent personality dispositions, a discrepancy termed the 'fundamental attribution error' (Ross, 1977). This regards the

inclination to attribute an agent's behaviour to internal characteristics, such as intention, rather than external factors, such as environment. Self-report measures of prosociality are often consistent with such biases. Religious participants report participation in more prosocial behaviours than do non-believers. However, widespread stereotypes regarding the correlation between religiosity and prosociality (Gervais, Shariff, & Norenzayan, 2011) may result in an unrepresentative 'halo effect' (Galen, 2012). Furthermore, a meta-analysis of the relationship between religiosity and socially desirable responding revealed a positive effect, demonstrated by an association between belief and self-enhancement (Sedikides & Gebauer, 2010). The fundamental attribution error, the impact of stereotyping, the halo effect, and other socially desirable response biases may skew perceptions of the religious on a personal and societal level. An absence of evidence for 'intrinsic religiosity' is further highlighted by priming effects.

### 1.2 Theories and impacts of priming

If 'religion is more in the situation than in the person,' cognitive activation of religious concepts may reveal between-group differences not otherwise evident in the comparison of participants by intrinsic or self-reported religiosity. Random assignment to religious versus non-religious conditions allows analysis via the use of priming, whilst controlling for other variables. Priming is used widely within psychological research. It is a tool by which to measure the temporary effects of an induced state, especially when it is difficult to test naturalistically. In general, religious primes are shown to decrease cheating and increase prosocial behaviour in participants, despite baseline measures of religious affiliation (e.g. Randolph-Seng & Nielsen, 2007). The results of Shariff and Norenzayan's (2007; study one) experiment highlight the power of religious reminders in shaping situational behaviour. Participants randomly assigned to one of two priming conditions, neutral or religious, played a one-shot dictator game (see page 24 of the current thesis for a

review). Those primed with reminders of religion (e.g. ‘God,’ ‘divine’) gave an average of $4, approximately twice that of those in the control condition. Most commonly, participants in the control condition chose to give nothing. Atheists in the neutral condition did give approximately one dollar less on average, though this was not a statistically significant trend. As is typical, results revealed an absence of evidence for ‘intrinsic religiosity,’ consistent with principle two, given that self-reported levels of religiosity and belief in God were not reliably related to measures of prosociality.

Religiosity priming effects have been attributed to perception of a supernatural monitor, consistent with principles one and two. Religious priming has been shown to increase both prosocial outcomes and feelings of being watched (Shariff & Norenzayan, 2007). These conclusions are most reliable among believers, and shown to be specifically absent for those with autism or deficits in mind perception (Norenzayan, Gervais, & Trzesniewski, 2012; Gray, Knobe, Sheskin, Bloom, & Barrett, 2011). However, one recent study determined that the impact of mentalising deficits on religious cognition may be minor (Reddish, Tok, & Kundt, 2016). These trends provide support for the notion that perception of God is an extension of the secularly-based capacity to perceive the minds of other agents. Theists hold intuitive perceptions of supernatural deities as intentional agents with human-like mental states, an intuition logically restricted by mentalising capacities (Norenzayan et al. 2012). Further support for this claim is highlighted by the correlation between higher rates of religiosity for women, and a higher likelihood of attributing agentic characteristics to God (Willard & Norenzayan, 2013). These trends provide evidence for the validity of a supernatural monitoring hypothesis, which relies on reminders of God to invoke personal perceptions of being watched.

### 1.2.1 Ideomotor versus supernatural monitoring accounts

Norenzayan advocates a supernatural monitoring account of behavioural priming to explain experimentally manipulated increases in prosociality, and outlines the advantages of this account over an ideomotor framework. An ideomotor account would describe prosocial outcomes of priming as reflexive and non-conscious, triggered by an awareness of general associations between religion and benevolence (Gervais et al., 2011), regardless of personal endorsement. This reflects a traditional priming model of passive association, via which the likelihood of a specific response is enhanced by increasing accessibility to targeted mental content (Srull & Wyer, 1980; Dijksterhuis & Bargh, 2001). However, as prosocial outcomes are not reliably measured in non-believers, and self-report measures of perceived monitoring differ for believers and non-believers, awareness of general associations is not an explanatory account. Supernatural monitoring, however, predicts the distinction. For believers, religious priming activates feelings of being watched, and subsequently increases measured prosociality. For non-believers, or those with mentalising deficits, subsequent behaviour should not be reliably manipulated by the activation of perceived supernatural surveillance.

Outside of the laboratory, this trend is found consistently in field experiments. Malhotra's (2010) 'Sunday effect' demonstrates the tendency for religious people to act consistently more generously than non-believers on their day of worship. Malhotra measured a 300% increase in giving to secular, charitable causes for religious people on Sundays. No difference between religious and non-religious givers was evident on any other day, or when giving was for competitive, rather than charitable, gain. Situational or contextual priming is similarly evident in Xygalatas' (2012) experiment, in which participants recruited off the street were paired, split between a temple and a restaurant, and asked to make decisions regarding a shared sum of money. Participants randomly allocated to the temple withdrew significantly less for personal gain than did those in the restaurant, despite reporting the same

expectations of return. In this field experiment, religious affiliation was again an insignificant predictor of giving. Instead, participants who played in the restaurant reported more strategic or tactical reasons for their decisions, and fairness-related terms were evoked more frequently by those in the temple compared to those in the restaurant. Contextual priming also extends to audible cues, including, for example, use of the Islamic call to prayer (Duhaime, 2015).

On average, reliable impacts of priming are not evident for non-believers, though evidence for priming effects in at least some non-believers is highlighted by considerable variability in effect sizes across the literature, and a systematic model of priming for this population is undetermined (Shariff, Willard, Andersen, & Norenzayan, 2016). The reliability of priming effects only for believers forms the foundation for a claim that responsiveness is not dependent on implicit and low-level cognitive associations, or the activation of widespread stereotypes regarding religiosity (Gervais et al., 2011), but may depend on the situational activation of culturally transmitted belief structures (Norenzayan, Henrich, & Slingerland, 2013; Shariff et al., 2016).

This model of activation is most consistent with more recently proposed constructionist models of priming effects, which emphasise an active construction of interpretation and meaning as integral to the priming process. The accessibility of conceptually primed concepts may determine the best response in order to achieve goals (Cesario, Plaks, Hagiwara, Navarrette, & Higgins, 2010; Cesario & Jonas, 2014). For example, conceptual accessibility to the concept of aggression will not dictate a fight or flight response, but this decision will be moderated by environmental variables (Cesario et al. 2010). Though a constructionist framework is not directly advocated in their recent meta-analysis on religious priming, the suggestion that priming is dependent on situationally activated, and culturally bound, cognitive associations is reflective of this framework.

Furthermore, Shariff et al. (2016) acknowledge the impact of perceived self-relevance on the effectiveness of priming. This constructionist framework considers an agent's attribution about the source of the accessible concept, as internal versus external, to be most influential for its outcome (Loersch & Payne, 2011; 2014). This is the situated-inference model of priming effectiveness. Attributions to external environment often result in dismissal of the accessible prime and have little impact on responses. Only when attribution is internal, including personal values or desires, does accessible knowledge form the foundation for decision making, even when attributions of internality are mistaken (Wheeler, DeMarree, & Petty, 2014; the 'active-self account').

Though this trend may provide further opposition to a traditional ideomotor framework, providing support for original accounts of supernatural monitoring, it may also negate the narrow scope of inference from which the latter account arises. A theory which relies on personal perception of supernatural monitoring can predict the distinction between effectiveness of primes for believers compared to non-believers. It cannot account, however, for disparity in results for non-believers across studies; or the tendency for prosocial behaviour to increase in primed groups, most typically unrelated to self-reported measures of affiliation (consistent instead with an ideomotor theory).

Contradiction of the supernatural monitoring account, in light of inconsistencies for non-believers, invites further investigation of the constructionist framework suggested by recent publications. Given that the implementation of a measured priming technique is absent in the current study (see section 2.5; Methodological Exclusions), an opportunity is provided to investigate the possible confounds of constructionist priming. Discrepancies in giving behaviour for believers and non-believers across studies (Shariff et al., 2016), or measured differences within studies (though not significant; e.g. Shariff & Norenzayan, 2007), may be further explored in the absence of religious reminders.

Measured differences in giving scores as a result of only secular experimental manipulations would highlight the moderating capacity of more general cooperative schemas; with the capacity to encompass schematic associations, both religious and secular. A schema is described as an implicit cognitive representation, a heuristic shortcut by which to encode and quickly retrieve learned information (Kleider, Pezdek, Goldinger, & Kirk, 2008). For example, the capacity for a contextual prime (temple versus restaurant) to differentially predict models of decision-making, and subsequently affect behavioural outcomes (Xygalatas, 2012), highlights that the inference of direct effects is problematic in relation to priming. In Xygalatas' (2012) study, experimental checks of factors relevant to the decision, including strategising and fairness, determined their capacity to moderate the relationship between context and outcome. Importantly, examination of these results within a framework of supernatural monitoring, and in the absence of manipulation checks, would potentially affirm expectations of more generosity, dependent only on the assumption that the temple evokes feelings of being watched. Conceivably, contextual priming may occur as a result of exposure to secular conditions in the current experiment, including words such as community or rejection (used in the punishment condition). Activation of schematic associations for cooperation may be related to specifically secular or supernatural sources of induction, cognitively manifested in similar or distinct ways for believers and non-believers. In future, these considerations may contribute to an understanding of the role of belief in the supernatural in large-scale cooperation more generally via cognitive activation of cooperative schemas.

### 1.3 Nefariousness, and the Supernatural Foundation of *Big Gods*

Experimental and observational evidence in support of the *Big Gods* hypothesis, specifically principles one and two, relies on two broad assumptions; nefariousness is inherent to the human population, and reminders of supernatural punishment are a necessary

solution. Experimental evidence for this claim is often reliant on measured generosity within the well-established framework of game theory (see section 1.6.4). For example, participants primed with the concept of religiosity, compared to a neutrally primed group, gave more than double when distributing a $10 sum between themselves and another participant (Shariff & Norenzayan, 2007). Participants in the control condition made decisions consistent with selfishness, with 52% leaving $1 or less, and no participant leaving more than $5. Conversely, 64% of those in the religious condition left at least half of the sum for their partner.

These studies draw conclusions relevant to the 'scaling-up' of human society, though fail to provide evidence for prosociality and cooperation at the societal level. In fact, an array of evidence suggests that cooperative and prosocial behaviour arise in the absence of punishment. For example, ethnographic evidence from fifteen disparate societies across the world results in the conclusion that assumptions of inherent selfishness are not supported in any society studied (Henrich, Boyd, Bowles, Camerer, & Fehr, 2004).

Fuentes (2014) provides a critique of the *Big Gods* hypothesis by challenging Norenzayan's assumption of inherent human nefariousness, and postulating that hyper-cooperation is ingrained more deeply in our evolutionary history. The most common view of the evolutionary landscape is a history in which selfish individuals work to maximise benefits for themselves and their kin group, whilst remaining wary of other selfish individuals and their capacity for exploitation and free-riding; where cooperation and altruism are generally costly, and their occurrence calls for an explanation (Dugatkin, 2006). In contrast, the phenomenon may be captured by an explanation of evolutionary nodes (Mackinnon & Fuentes, 2011; Sussman & Cloninger, 2011). Fuentes (2014) postulates that the frequent occurrence of cooperation in the evolution of a social system may not be subject to causal explanation 'if over its evolutionary history a system arrives at a node wherein cooperation

becomes a basal aspect of its adaptive niche' (p. 285). Fuentes claims that the evolutionary explanation for prosociality is akin to that of the human hand. Social tendencies have been morphed by selection pressures and scaled up throughout the evolution of our hominoid ancestors, just as the evolution of the hand throughout our ancestral lines has been modified by relevant selection pressures. Under this assumption, the attempt to understand our sociality via current selection pressures would be as futile as attempting to understand the morphology of the modern human hand via current selection pressures. Instead, these are mammalian patterns, historically morphed. Under this pretence, personal gain, advantageous reciprocity and kin selection are flawed as modern, primary explanatory variables.

According to these claims, the *Big Gods* hypothesis begins too late to adequately address our evolutionary history as a niche. A niche is defined as the context in which a species exists, temporally, structurally and socially. Environmental factors such as food and space, as well as the interrelated experience of agents in the shared environment, comprise factors of the human socio-cognitive niche. Sterelny (2012) defines the human socio-cognitive niche as the behavioural and cognitive mechanisms configured according to the socio-behavioural context of our hominin lineage, the modern niche comprising hyper-cooperation (as well as theory of mind capacities, language and innovation). Moral instincts including empathy and shame have roots in our ancient past; they remain observable instinctually and in the physical cognitive features of the mammalian brain (Churchland, 2012). Fuentes postulates that large scale cooperation was an expectation of the human niche, captured by increased population density at the transition to the current form of the human genus 'Homo sapiens sapiens' (approximately 400 – 100,000 years ago). This claim that hyper-cooperation is an inherent characteristic of our evolutionary history is in direct opposition to Norenzayan's view. Evidence is provided by the emergence of particular human behaviours early in our history, including the extension of cooperation beyond kinship

groups in order for communities to overcome challenges such as predation and child rearing (Fuentes, 2013; Hrdy, 2009). This highlights hyper-cooperation as integral to the human niche many thousands of years before the advent of domestication and agriculture, and the nativity of Norenzayan's hypothesis.

However, inconsistencies in the historical timeline do not provide grounds to dismiss the construction of an adaptive cooperative niche *within* the bounds of religion as it evolved (as advocated by Bulbulia, 2008; 2012). In a note to chapter one of *Big Gods*, Norenzayan acknowledges uncertainty regarding religion as catalytic for cooperation in pre-agricultural groups of the early Holocene (with beginnings approximately 12000 years ago). He claims, however, that this is not dismissive of his hypothesis; 'this suggests dependence on some forms of cultural institutions to foster cooperation among strangers, at least some of the time' (p. 94). He acknowledges that big gods contributed significantly to the expansion of cooperative societies without being necessary, and that other cultural institutions may have had similar effects.

Since the publication of *Big Gods* in 2013, Norenzayan has more explicitly integrated these ideas, softening the imposition of directional causation advocated in the book. His most recent work postulates that religiosity was not a necessity for the rise of cooperation in modern society, and he no longer retains religion as necessarily catalytic for large-scale anonymous cooperation (Norenzayan, 2014; Norenzayan et al., 2016). Though his thesis remains mostly intact, the direction of causation is flexible. Prosocial religions are seen as only one of an array of factors which contributed to large-scale cooperation in our evolutionary history. Rather than a direct relationship, 'causality can run in both directions, in a feedback loop between prosocial religions and an expanded cooperative sphere' (Norenzayan et al., 2016, p. 3). In fact, Norenzayan and colleagues even entertain the idea

that prosocial religions may have arisen as a result of cultural-evolutionary pressures after the rise of large-scale cooperation, and played a role in maintenance and expansion instead.

Some literature advocates the possibility that prosocial religions are in fact only a by-product of large-scale cooperation, and are essentially nonadaptive (Baumard & Boyer, 2013; Baumard, Hyafil, Morris & Boyer, 2015). Norenzayan et al. (2016) specifically address this by-product only approach, not by determining that religious evolution is separate from innate cognitive mechanisms, but by claiming only the culturally beneficial variants of these adaptations were selected due to their successful contribution to intergroup competition. Norenzayan et al. (2016) clarify that multiple cultural-evolutionary systems may have, in fact, contributed to cooperation on a societal scale. Secular institutions, norms, practices, political constructs, social and economic infrastructure, exchange and markets are suggested as having a causal and inter-correlatory influence on the rise of religiosity via an expanding cultural-evolutionary process, binding the supernatural to the moral and prosocial elements of societies.

Clarifications relative to secular infrastructure and societal makeup successfully address issues with the strictly catalytic approach to *Big Gods.* However, they further highlight criticism about the necessity of religiosity in prosocial evolution. The physical and social infrastructure for cooperative interaction is shown to have been in place for a minimum of 20000, speculated up to 100000, years. Wadley (2013) places the use of symbols for meaningful communication in social systems at the latter, providing evidence of formative social coordination roughly 90000 years before the beginning of the Holocene era, and the emergence of big gods. Early cooperative ritual within and across community groups is also evidenced by the production of complex tools and the emergence of art as symbolic culture by the later Pleistocene, approaching a transition to the beginning of the Holocene era. Fuentes claims that these factors help to break down the *Big Gods* hypothesis, not by

disputing that big gods had a role in the scaling up of large cooperative societies, but by challenging the assertion that they were the primary driving factor. As is currently accepted by Norenzayan and colleagues, perceived supernatural monitoring and punishment may fit in to an evolutionary human niche in a contributory, rather than expository, manner. The nature of the feedback loop posited by Norenzayan et al. (2016) breaks down further, however, as the timeline for large-scale cooperative behaviour is inconsistent with the rise of prosocial religions. Norenzayan et al. (2016) claim 'one consequence of this process is that group size and long-term stability should positively correlate with the prevalence of big gods (p. 6)' If the evolutionary timeline provided in *Big Gods* is questionable, an important consideration is whether big gods played any vital role in the establishment of cooperation on a large scale.

Norenzayan et al. (2016) make an attempt to explain the outlying issue of prosociality in terms of traditional kinship relations and evolutionarily unexplained altruism via 'synchrony and fictive kinship.' A combination of synchrony and shared intentionality has been shown to reliably increase cooperation, via the reinforcement of a group's cooperative tendencies (Reddish, Fischer, & Bulbulia, 2013). This phenomenon has a foundation in the sentiment of collective effervescence (Durkheim, 1912); a shared or synchronised stimulation via group ritual. Extensive evidence in favour of this perspective includes the role of synchronous arousal in military solidarity (McNeill, 1982), feelings of affiliation and group cohesion (Swann, Gomez, Seyle, Morales, & Huici, 2009; Hove & Risen, 2009), increased trust and cooperation (Wiltermuth & Heath, 2009). These are secular examples, however Norenzayan et al. (2016) claim that fictive kinship and religious solidarity are logically related. Prosocial religions are often culturally, linguistically and geographically integrative, and adopt kin-affiliated language; for example, 'brotherhood' (Atran & Henrich, 2010; Atran & Norenzayan, 2004). However, the necessity of supernatural overtones in the synchrony and fictive kinship phenomenon is debatable. The evidence for the existence of fictive kinship

effects is consistent in both secular and religious group contexts. It is problematic to assume that prosocial religions and fictive kinship provided any platform from which group solidarity and cooperation emerged. If secular institutions and social infrastructure were in place thousands of years before the rise of religious groups, and the necessary building blocks for fictive kinship were already in place, it is possible that prosocial religions merely adopted the social phenomenon.

Norenzayan et al. (2016) converge multiple lines of evidence in the claim that prosocial religions have other evolutionary benefits, specifically for reproductive and economic success. Over time, religious communes outlast secular ones (Sosis, 2000), displaying higher fertility rates (Blume, 2009) and faster economic growth (McCleary & Barro, 2006). This suite of benefits may be enough to explain the transmission and persistence of religious beliefs in light of evolutionary theory. The issues discussed in relation to the *Big Gods* hypothesis do not raise questions about the importance of religious beliefs since their advent, or in the modern period. It is the assumption of inter-correlated growth that is questionable, given evidence to suggest that cooperative infrastructure was in place long before the rise of large-scale prosocial religious groups.

These considerations are integral to the current study, which aims to measure the contributing impact of secular variables in 'pre-' and 'post-religious' populations.

### 1.4 Secular Institutions and the 'Ladder of Religiosity'

The *Big Gods* hypothesis treats religious beliefs as a 'ladder,' which may be climbed in order to reach large-scale cooperative capacities, and be subsequently 'kicked away' when replaced by secular institutions for monitoring and punishment (Norenzayan, 2013; p. 172). Experimental evidence for this is provided by comparable prosocial outcomes using supernatural versus secular punishment primes (e.g. Norenzayan, 2014). Shariff &

Norenzayan (2007; study two) replicate initial increases in prosociality for religiously primed participants, with the addition of a third priming group in order to examine the relative effect of a secular authority prime, compared to a religious or neutral one. Results reflect the capacity for secular authority to positively impact prosocial behaviour, statistically indistinguishable from results of the religious priming group, and significantly higher than those in the control condition.

In addition, there are predominantly non-theistic societies which fall amongst the most peaceful and cooperative on earth (Zuckerman, 2008). Norenzayan (2014) acknowledge that 'the same forces of cultural evolution that gave rise to prosocial religions with Big Gods also have, more recently, given rise to secular mechanisms that promote large-scale cooperation and trust' (p. 23). Despite the evidence that certain social, cultural and environmental factors are able to predict prosociality and cooperation under the right circumstances, the *Big Gods* hypothesis does not advocate a societal model in which large-scale cooperation was well-established and maintained prior to the rise of prosocial religiosity.

### 1.5 Generalisability and WEIRD Samples

Initially described as the catalyst of cooperative behaviour in *Big Gods*; and as a less monopolistic contributor in recent publications, the effects of perceived supernatural punishment on our evolutionary history are unresolved, specifically relative to large-scale cooperation. The familiar problem of the WEIRD (Western, Educated, Industrialised, Rich, Democratic) sample is amplified in relation to the current literature. Data gathered from American samples lacks generalisability, given an important exception to a global trend. A general correlation exists between increased wealth of a nation and decreased religiosity.

Survey data from 44 countries (Pew Research Centre, 2015) highlights the American exception; exceptionally wealthy, and highly religious (figure 1, below). Figure 1 represents a society-level trend. Furthermore, Americans' self-reported attitudes revealed an outstanding emphasis on individualism. Norenzayan's recent publications use predominantly Canadian samples, a country almost inseparable from Australia in figure 1. The use of economic games to measure religion and prosociality in Australian samples is relatively anomalous. However, similar measures of religiosity and industrialisation in Canada compared to Australia provides some grounds for generalisation and opportunity for replication.

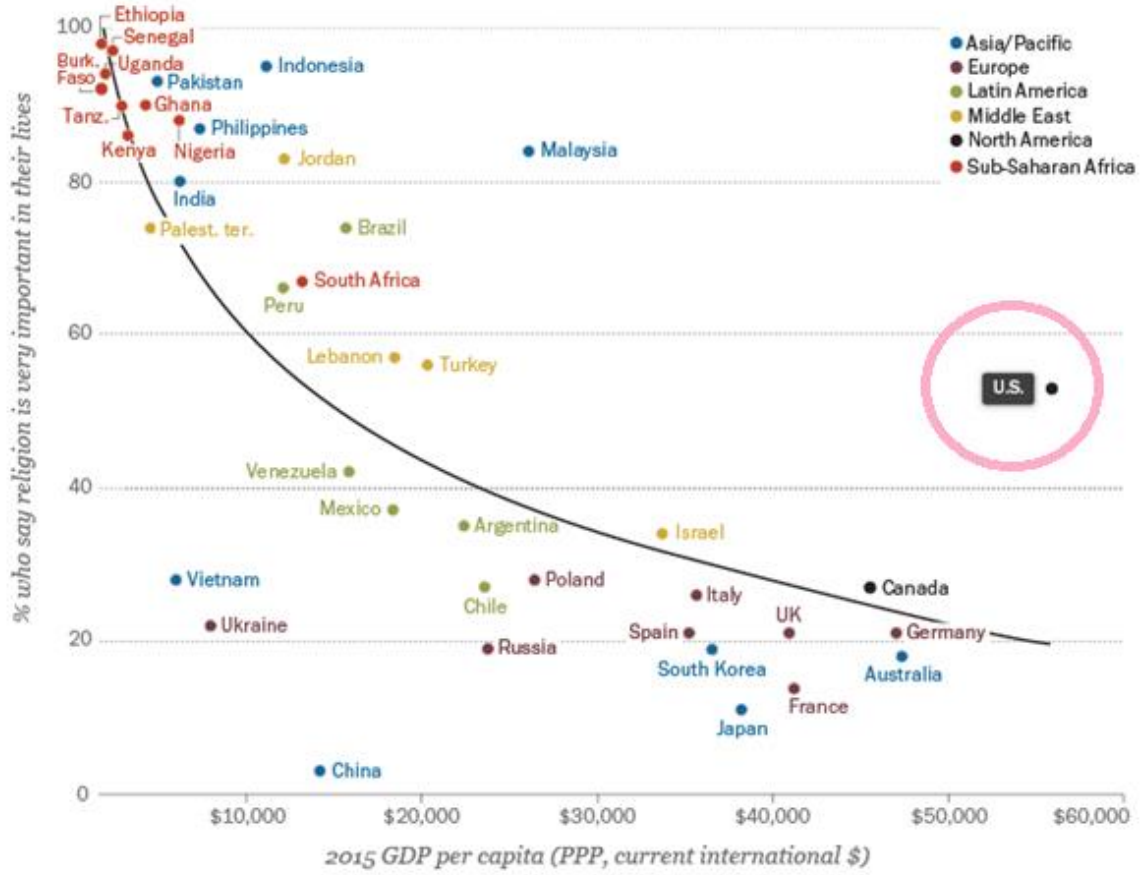


*Figure 1.* From Pew Research Centre (2015); the logarithmic relationship between GDP per capita and percentage of respondents claiming religion is very important to their lives.

A recent exception has provided initial indications that the effects of perceived supernatural punishment are not limited to WEIRD samples. Via extensive ethnographic interviews and the use of economic games, Purzycki et al. (2016; authors inclusive of

Norenzayan) demonstrated that beliefs in moralistic, punitive and knowing gods increased impartial rule-following behaviour amongst participants from eight diverse communities worldwide, and therefore could contribute to the expansion of prosociality.

### 1.6 The Current Experiment

The current experiment is a controlled examination of the *Big Gods* hypothesis. The aim of the experiment is to deduce the contributing effect of two of Norenzayan's main factors in a perceived cooperative task. The independent variables for the current experiment are personal versus large-scale interaction, and the threat of punishment versus no punishment. The combinations of these two binary variables form four outcome groups by which to measure sacrifice (prosociality) in an economic game (details of final design and measurement provided in Section 1.6.2; Design).

In the initial design of this study, each of these four groups was further split by random allocation to one of two priming groups, religious and neutral. The priming manipulation aimed to allow random allocation of participants to a religious versus non-religious condition for the purposes of comparison between-subjects. However, implementation of the priming technique was ineffective (see section 2.5; Methodological Exclusions). Therefore, religious distinctions rely on self-reported affiliation, as opposed to priming effects, providing the capacity to examine Norenzayan's first two principles in the absence of targeted religious reminders. The expectation that, regardless of religious affiliation, punishment in a community setting will result in significantly higher rates of giving than no punishment in an individual setting, is directly reflective of the assumption of nefariousness inherent to *Big Gods.* If secular manipulations (personal versus large-scale interaction, and the threat of punishment versus no punishment) significantly increase prosociality in all participants, the second principle ('religion is more in the situation than in

the person') will be supported, though the overall contribution of the supernatural in this theoretical framework may be undermined. Conversely, failure to significantly increase prosociality in atheists and non-atheists (see section 1.6.3 for affiliative distinction) via the manipulation of secular variables may provide evidence for the necessity of belief in the supernatural in accounts of large-scale cooperation.

### 1.6.1 Exclusion of the prime

Attempted implementation of a religious priming technique (sentence unscrambling task; from Shariff & Norenzayan, 2007) had no measurable effects on giving outcomes. Furthermore, a manipulation check of the prime revealed a lack of evidence that the target concept of religiosity was cognitively activated or salient for participants, regardless of religious affiliation (see section 2.5). Self-reported religious affiliation replaced primed religiosity as the third independent variable in the current experiment.

### 1.6.2 Design

Participants reported affiliation as religious, agnostic, or atheist. Religious and agnostic participants were collapsed to form the group 'non-atheist' for the purposes of the experiment (see section 1.6.3; The theoretical distinction between atheists and non-atheists). Hypotheses relate to the manipulation of Community and Punishment within a population who explicitly denies the existence of God, compared to a population who inherently believes, or does not deny, the existence of God. This is an attempt to recreate the manipulations within a 'pre religious' (atheist) versus 'peri-religious' (non-atheist) society. The use of the word 'God' to explain a supernatural deity in the current study regards a predominantly Christian sample, and maintains consistency with Western literature, specifically that of Norenzayan.

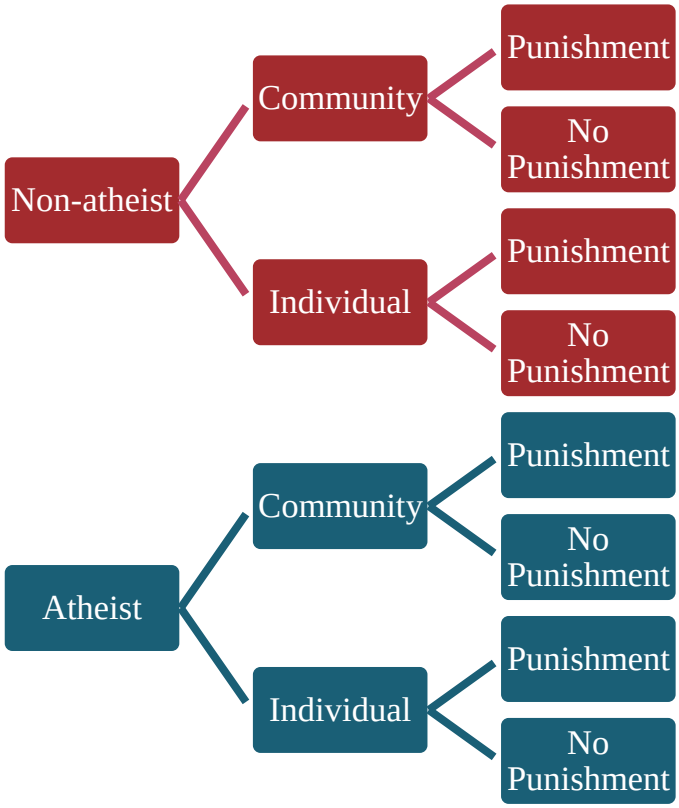


*Figure 2*. Experimental design. Self-reported atheists and non-atheists are randomly allocated to play an economic game in a community versus individual context, and with the threat of secular punishment versus no punishment.

In order to distinguish the experimental conditions, Community/Individual and Punishment/No Punishment, from the general discussion of community and punishment in this paper, the former will be capitalised (and abbreviated as C, I, P and NP, respectively).

### 1.6.3 The theoretical distinction between atheists and non-atheists

The distinction between atheists and non-atheists is theoretically important in the design of this study. The established literature discussed thus far has been fragmented, addressing the effects of religious affiliation in a community context (e.g. the Sunday effect; Malhotra, 2010), reminders of monitoring or punishment on the individual (e.g. eyes behind an honesty box; Bateson, Nettle, & Roberts, 2006), the effects of religious priming on generosity (Shariff & Norenzayan, 2007), or the way in which priming affects perception of

supernatural monitoring and punishment for individuals (increases feelings of being watched; Shariff & Norenzayan, 2007). However, analysis of believers and non-believers within a single context is absent of contextual considerations central to the *Big Gods* hypothesis. Norenzayan specifically addresses the capacity for religious belief, or perceived supernatural monitoring, to have an impact on pre-religious minds and the subsequent scaling-up of societies (strictly catalytic approach). The capacity for such beliefs to sustain cooperation throughout generations of believers, however, is secondary to this key hypothesis (a contributory approach). Cross-sectional samples view a modern population of theists and atheists, believers and non-believers, or religious and non-religious participants; with distinct categorisation of agnostics, integration of agnostics and theists, or agnostics and atheists. The distinct categorisation of atheists only in the current study, compared to all other participants in the sample, refers to those most directly reflective of the historical context of *Big Gods*, compared to those who are not. The distinction between these groups is the theoretical foundation for categorisation of groups, rather than levels of devotion. That is, analysis of atheists compared to non-atheists encompasses the analysis of supernatural belief in a strictly catalytic approach to Big Gods ('pre-religious'), compared to a contributory one ('peri-religious'). This is integral to the hypothesis, and the capacity to analyse results, given the measurement of purely secular manipulations in the final design of the study. Hypotheses relate to the capacity for these secular variables to increase prosociality, or facilitate cooperation, distinctly within the historical context of *Big Gods*, and in a modern society.

The *compound* effects of Community and Punishment variables in those who are assumed to rely on non-supernatural institutions as foundations for cooperation (atheists, representing a 'pre-religious' population) versus those who are assumed to rely currently on supernatural institutions as foundations for cooperation (non-atheists, representing a 'peri-religious population) is undetermined. This study aims to provide a holistic manipulation.

Furthermore, the distinction between atheists and non-atheists reflects a second divergence in the *Big Gods* hypothesis. An atheist sample is not only reflective of a 'pre-religious' population, but also conversely reflective of a 'post-religious' dependency on secular institutions, the result of Norenzayan's 'ladder of religiosity.' Given the centrality of the historical rise of religiosity in Norenzayan's *Big Gods*, the theoretical imposition of 'pre-religiosity' will most saliently regard this sample. The use of atheists to reflect a 'pre-religious' population is necessarily imperfect, given the impossibility of replicating such a sample. Although this is the most appropriate modern, Western population from which to infer 'pre-religiosity,' religious stereotypes will impact associative tendencies of non-believers (Gervais et al., 2011). Furthermore, a modern sample lacks the capacity to reflect small-scale societal structures integral to the *Big Gods* hypothesis. The impossibility of replicating such a sample invites the imposition of theoretical division in order to gain some insight in to the historical value of this hypothesis for a population whose cooperative foundations are inherently non-supernatural.

Principle one concludes that perceived supernatural monitoring is effective for increasing prosociality in an anonymous, community setting, when secular punishment is absent or difficult to enforce. However, principle two of *Big Gods* dictates that this is true only when reminders are present. In this study, participants are randomly allocated to a binary Punishment condition in which secular punishment is entirely absent, or entirely unavoidable (participants distribute a sum of $10 between themselves and a receiving party in an economic decision-making task, either with no threat of consequence from the receiving party, or with the possibility that their offer will be rejected and all allocated money sacrificed).

Consistent with principle two, it is expected that perceived supernatural monitoring should not have an effect on non-atheists in the No Punishment condition. These hypotheses

have not been previously compared in terms of societal size. *Big Gods* is a comprehensive explanation of supernatural punishment in the context of large-scale cooperation and increasing societal complexity. However, the economic games commonly used to measure prosociality in participants have not been replicated in this context. Evidence for the *Big Gods* hypothesis would not only be provided by demonstrating a lack of internalised religious standards, but by demonstrating the reliability of these trends in a perceived context relevant to the hypothesis.

This experiment aims to demonstrate the compound versus specific effects of Community and Punishment within theoretically relevant 'pre-religious' versus 'peri-religious' paradigms. Two hypotheses will address the first two principles of *Big Gods*, which will subsequently combine to address the *Big Gods* hypothesis more holistically. If Community and Punishment can reliably increase generosity across all participants in the absence of a prime, the contribution of the supernatural context inherent to the hypothesis may be coincidental or minimal.

### 1.6.4 Game theory

Game theory is a mathematical language for assessing strategy and outcomes in multiple domains. The dictator game (Hoffman, McCabe, Shachat, & Smith, 1994) can be manipulated in order to measure levels of cooperation and prosocial behaviour under different circumstances, including the effect of priming god concepts (e.g. Shariff & Norenzayan, 2007) and introducing the threat of punishment (e.g. Fehr & Gachter, 2000). The game involves the division of a fixed sum of money *S* between a proposer and a responder. Proposer offers *x;* proposer earns *S-x,* and the responder earns *x*. The ultimatum game is based upon the same principles, but allows the responder to reject the offer from the proposer. In this case, if the responder rejects the amount *x*, both participants earn zero; if *x* is

accepted, the proposer earns *S-x* and the responder earns *x* (Henrich et al., 2004). The current experiment adapts the ultimatum and the dictator game as the conditions for an economic decision making task in which there is a threat of punishment versus no punishment respectively. The two variations of the game can be differentially inferred as occurring due to pure altruism (dictator game; No Punishment condition) versus negative reciprocity for unfair offers in the Punishment condition (ultimatum game; Henrich et al., 2004).

The economic tasks are further manipulated in the current experiment to scale-up perceived interactions in the community condition. In order to address the current gap surrounding the assumption of nefariousness from small-scale, individually-focused experiments in *Big Gods*, half of the participants in the current experiment made an economic decision as part of a perceived group of 100 anonymous strangers. The other half of the sample made a comparable decision under the rules of the original task, independently with only one perceived partner. Task instructions were responsible for the perception of a group or partner with whom the participant interacts. No player interacted with another player or confederate at any time, though this deception was necessary to elicit reliable responses (for more details, see Section 2.3.3; Economic task).

Giving in an economic task is conceptually distinguishable from the complex constructs of prosociality and cooperation. However, in light of its previous extrapolations throughout the relevant literature (e.g. Shariff & Norenzayan, 2007; from which the task is derived) comparative inferences reflect a foundation of 'cooperation.'

### 1.6.5 Hypotheses

**Hypothesis one** - The key hypothesis for this study is:

*For both atheists and non-atheists, the combination of the Community and Punishment conditions will result in the highest levels of prosociality, and the combination of*

*the Individual and No Punishment conditions will result in the lowest levels of prosociality (despite measures of religious affiliation).*

This expectation is relevant to two further hypotheses, which align to examine the contribution of the supernatural in *Big Gods*:

**Hypothesis two - The assumption of nefariousness:**

*Significantly lower giving scores in the No Punishment conditions, compared to the Punishment conditions, will reflect the phenomenon of societal-level selfishness, integral to the claim that human agents would not have thrived cooperatively in the absence of punishment.*

**Hypothesis three - Uniform models of giving (atheists and non-atheists):**

*Given the absence of priming effects, models of giving behaviour will be the same across affiliative groups. Community and Punishment, as opposed to any measure of religious belief, are expected to predict giving for all groups. This is consistent with the notion that religious standards affect behaviour only when cognitively salient; the second principle of Big Gods, 'religion is more in the situation than in the person.'*

**Contribution of the supernatural**

Each hypothesis predicts some evidence in line with the Big Gods hypothesis. Rejection of the null hypothesis in any case will indicate opposition to the principles of Big Gods. However, evidence for all three hypotheses will cast doubt on the necessity of a supernatural context in large-scale cooperative capacities:

*If secular conditions, Community and Punishment, significantly and consistently increase prosociality from a 'nefarious baseline' within 'pre-religious' (atheistic) and 'peri-religious' (non-atheist) populations, the contribution of the supernatural to large-scale*

*cooperative capacities may be coincidental or minimal.*

## 2. Method

### 2.1 Participants

A total of 120 participants (68% female) between the ages of 18 and 50 (M = 21.1, SD = 4.3) were recruited online via the Macquarie University student participant pool (SONA). The sample consisted of first and second year students who all received course credits for thirty minutes of participation. Participants were required to be over the age of 18 years.

Participants identified as religious (59%), agnostic (18%) or atheist (23%). Religious and agnostic participants were combined to form a single group, 'non-atheist' (77%), for the purposes of the experiment. The number of participants in this sample identifying as religious was unexpectedly large. Given that approximately three quarters of the sample made up the non-atheist group, the capacity to draw strong conclusions regarding this group is stronger than originally anticipated. Conversely, the number of participants in the sample who identified as atheist was relatively small (see Appendix A for a breakdown of atheists and non-atheists per condition).

### 2.2 Design and Apparatus

This study included random allocation to one of eight groups (collapsed to form four final groups after exclusion of the prime), followed by an economic decision-making task, and a set of questionnaires (designed and completed via Qualtrics). All participants completed all parts of the study. The study was approved by the Macquarie University Human Research Ethics Committee (approval number: 5201600211).

## 2.3 Materials

### 2.3.1 Consent forms

The consent forms signed by participants prior to the session displayed the temporary project title, 'The Effects of Literacy on Economic Decision Making' (consistent with the online advertisement). They outlined the requirements and risks associated with the study, and provided relevant contact information, but did not include the true title or aims.

### 2.3.2 Questionnaires

All questionnaires were administered via Qualtrics online, an online survey platform.

***Demographics:***

Participants completed four questions regarding their gender, age, ethnicity and religious affiliation. Self-reported religious affiliation determined categorisation as atheist or non-atheist (religious or agnostic).

***Credibility Enhancing Displays (CREDs) Exposure Scale*** (Lanman & Buhrmester, 2016):

Although exposure to credibility enhancing displays are not of specific theoretical importance for the current experiment, this scale is a common and reliable measure of religiosity in participants. It is a measure of participants' previous exposure to religiosity, specifically during childhood. This scale is a predictor of current supernatural belief and theism, controlling for religious socialisation ($\alpha = .95$ in the current study).

Lanman and Buhrmester (2016) have demonstrated the scale's high internal consistency ($M = 3.27$, $SD = 1.51$; Coefficient $\alpha = .92$) and discriminant validity. The scale has been shown to significantly predict both dichotomous (theism vs. non-theism) and

continuous measures of theistic belief (belief certainty) whilst controlling for religious socialisation.

See Appendix A for a copy of the scale.

***Supernatural Belief Scale*** *(*Jong, Bluemke, & Halberstadt, 2013):

The scale is used to assess individual tendency to believe in the supernatural (specifically in a Western context), individual religious identification and behaviour. It provides a targeted measure of participants' current tendency towards religious belief ($\alpha = .96$ in the current study).

Construct reliability of the scale is demonstrated by SEM-based estimates of its composite reliability, amounting to $\Omega t = .81$ (a high indication of reliability; Jong et al., 2013). Cronbach's alpha and split-half reliability are inappropriate indicators (Fornell & Larcker, 1981; Raykov & Shrout, 2002). See Revelle & Zinbarg (2009) for the use of SEM-based statistics.

This scale aims specifically to measure supernatural belief, as opposed to religiosity. However, given the centrality of supernatural belief to religiosity, it displays predictive qualities. Scores are shown to be positively correlated with the importance of religion to individual identity (r=.54; Jong et al., 2013). Furthermore, Jong et al., (2013) demonstrate the convergent validity of the scale using t-tests. Atheists are shown to score significantly lower than non-religious participants, with religious participants displaying significantly higher scores.

See Appendix B for a copy of the scale.

***Self-Report Manipulation Checks:***

Brief questions were asked of participants randomly allocated to Community and/or Punishment conditions only. These questions were used as a measure of intended effect (validity) for the novel implementation of these variables, and to detect differences in explicit experience of the manipulations for atheists compared to non-atheists.

These questions are provided in Appendix C.

### 2.3.3 Economic task

This task was derived from Shariff & Norenzayan's (2007) experiment, in which each participant played a one-shot, anonymous version of the dictator game (Hoffman, McCabe, Shachat, & Smith, 1994) with another participant (a confederate in the experiment). The original instructions for the task are as follows: 'You have been chosen as the giver in this economic decision-making task. You will find 10 one-dollar coins. Your role is to take and keep as many of these coins as you would like, knowing that however many you leave, if any, will be given to the receiver subject to keep.'

The task was adapted for the current experiment to be played under four conditions (with or without a community context, and with or without the threat of punishment). Each participant was instructed that they had been randomly allocated as the giver in a giver/receiver pair (Individual condition), or that they had been randomly allocated to a group of 100 givers in a giver/receiver group scenario (Community condition). Each participant was instructed to take and keep as many of the coins as they would like, leaving the rest for the receiver, or for distribution amongst the receiving group. Participants simply distributed the money as they saw fit (No Punishment condition), or relied on the receiver(s) to accept the offer. In the latter case, rejection of the offer resulted in both parties receiving zero (Punishment condition). Participants completed the task using ten $1 coins and two

envelopes, labelled GIVE and KEEP. Each participant was entitled to the full amount of $10 after the final debrief.

The original instructions were used for the null condition in the current experiment (Individual x No Punishment). Three modified sets of instructions, adapted to manipulate Community and Punishment for the current study, are provided in Appendix D.

## 2.4 Procedure

### 2.4.1 Experiment

The experimenter was not present for the duration of the experiment. Participant instruction was embedded throughout the questionnaire:

1. Stroop priming task (no inferable effects; excluded)

2. Economic decision-making task

3. Self-report manipulation checks

4. Demographics

5. Credibility Enhancing Displays (CREDs) Exposure Scale

6. Supernatural Belief Scale

Participants began the experiment by reading one of four instructions for the economic task, and splitting ten $1 coins between two envelopes, labelled GIVE and KEEP. Participants in Community (as opposed to Individual), and Punishment (as opposed to No Punishment), conditions answered simple questions regarding their perception of the manipulation and its effects. Participants then completed three questionnaires; demographics, CREDs exposure, and supernatural belief scales. After being debriefed, participants were

entitled to keep the full amount of $10 allocated to the economic task, regardless of their decision.

### 2.5 Methodological Exclusions (Religiosity Prime and Manipulation Check)

Participants completed a sentence unscrambling task (a disguised priming technique, from Srull & Wyer, 1979; Shariff & Norenzayan, 2007) before the economic task, used to prime religiosity in half of the sample. A modified Stroop paradigm was used to test the cognitive activation of the target concept. Significant colour identification latency for words related to religiosity, compared to neutral words, would provide evidence for the cognitive salience of the target concept. Further explanation, and a brief methodological review, is provided in Appendix E.

See Appendix F for the sentence unscrambling task (participant instruction and included words), and Appendix G for the Stroop task (participant instruction and lists of words).

### 2.6 Statistical Methods

#### The key hypothesis:

The key hypothesis for this study is: *For both atheists and non-atheists, the combination of the Community and Punishment conditions will result in the highest levels of prosociality, and the combination of the Individual and No Punishment conditions will result in the lowest levels of prosociality (despite measures of religious affiliation).*

Giving in the Individual x No Punishment condition is expected to be significantly less than the Community x Punishment condition; for the overall sample, for atheists, and for non-atheists.

**Hypothesis two - the assumption of nefariousness:** *Significantly lower giving scores in the No Punishment conditions, compared to the Punishment conditions, will reflect the phenomenon of societal-level selfishness, integral to the claim that human agents would not have thrived cooperatively in the absence of punishment.*

Average giving scores for participants in the Punishment conditions are expected to be significantly higher than the No Punishment conditions. This expectation is consistent with the effectiveness of monitoring and punishment, and the notion of selfishness in the absence of consequence.

**Hypothesis three - uniform models of giving (atheists and non-atheists):** *Given the absence of priming effects, models of giving behaviour will be the same across affiliative groups. Community and Punishment, as opposed to any measure of religious belief, are expected to predict giving for all groups. This is consistent with the notion that religious standards affect behaviour only when cognitively salient; the second principle of Big Gods, 'religion is more in the situation than in the person.'*

In order to analyse consistency in models of giving, three regression analyses will be used to determine significant factors for the sample overall, for atheists and for non-atheists. In line with the second principle, key variables expected to contribute significantly to models of giving behaviour for all participants are experimental manipulations (Community and Punishment), as opposed to measures of intrinsic belief (operationalised by CRED score or supernatural belief score).

## 3. Results

### 3.1 Descriptive Statistics

Observation of the data revealed expected disparities in scores on the religiosity scales for atheists compared to non-atheists, consistent with the theoretical distinction. Similar

overall giving means for atheists compared to non-atheists ($5.30 compared to $5.92) reflected the hypothesised uniformity across affiliative groups. Hypothesised outcomes of experimental manipulation were observed for atheists, who displayed an increase in giving from $3.40 in the Individual x No Punishment condition, to $6.86 in the Community x Punishment condition. However, unexpected consistency in giving scores was revealed for non-atheists across all four conditions.

*Table 1.*

*Demographics, scale scores, and mean amount given by condition for atheists, non-atheists, and overall sample*

| | Atheist (n= 27) | | Non-atheist (n= 93) | | Overall (n= 120) | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| Age | 22.59 | 6.06 | 20.71 | 3.52 | 21.13 | 4.27 |
| Supernatural belief score | 2.77 | 1.67 | 5.37 | 2.23 | 4.79 | 3.83 |
| CREDs exposure score | 2.84 | 1.58 | 4.17 | 1.69 | 3.83 | 1.74 |
| Amount given overall ($) | 5.30 | 2.40 | 5.92 | 2.29 | 5.78 | 2.32 |
| Amount given (I x NP) | **3.40** | 2.19 | **5.68** | 2.36 | 5.30 | 2.52 |
| Amount given (C x NP) | **5.00** | 3.07 | **6.09** | 2.41 | 5.80 | 2.59 |
| Amount given (I x P) | **5.43** | 1.13 | **6.09** | 1.98 | 5.93 | 1.82 |
| Amount given (C x P) | **6.86** | 1.86 | **5.87** | 2.49 | 6.10 | 2.37 |

Despite similar overall means, observation of giving scores for non-atheists suggested surprisingly consistent scores across experimental conditions, further highlighted below in figures 3 and 4.

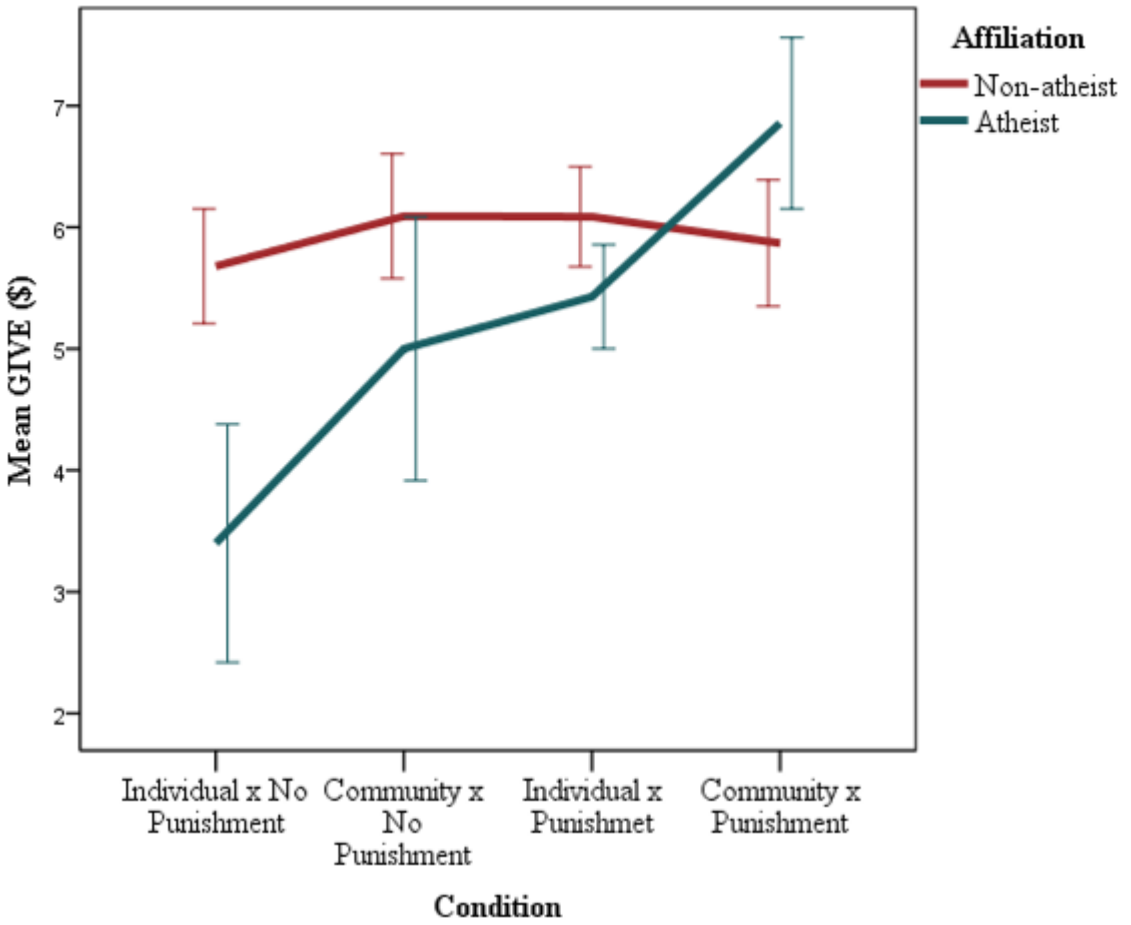


*Figure 3.* Average amount given ($) by condition; atheists and non-atheists (error bars: +/- 1 SE).

Figure 3 indicates differential trends by affiliation, inconsistent with the hypothesis. For non-atheists, giving responses appear consistent despite manipulation of experimental variables (Community and Punishment). In contrast, giving responses appear to be dependent on manipulation of experimental variables, consistent with the hypothesised results, for atheists only. This graph provides compelling opposition to the key hypothesis for non-atheists in this sample. It provides evidence that experimental context manipulated the behaviour of atheists, and had no observable impact on non-atheists.

Figure 4 represents this distinction across the compound conditions (IxNP, and CxP). For non-atheists, giving responses range from an average of $5.68 to $5.87 respectively (a

difference of $0.21). For atheists, giving responses range considerably (consistent with expectations), from an average of $3.40 to $6.86 (a difference of $3.46).

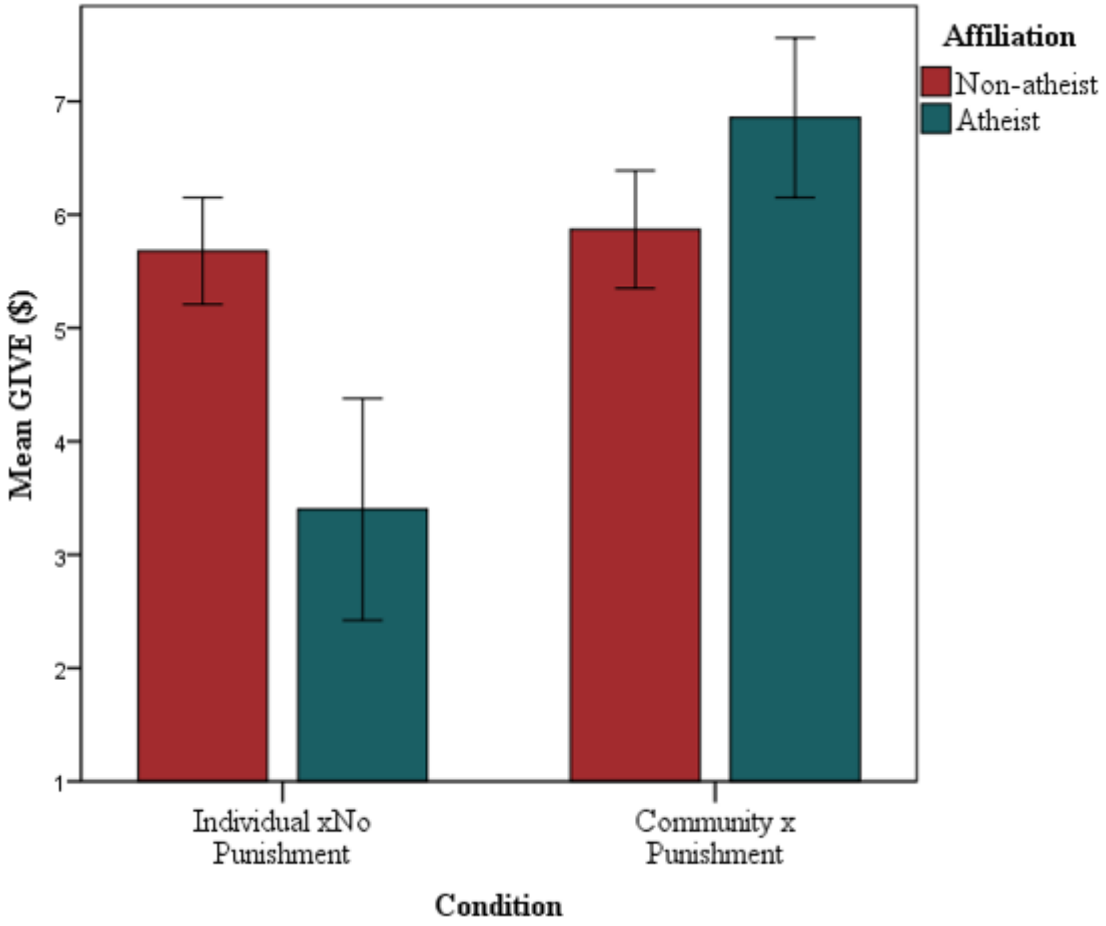


*Figure 4.* Average amount given ($) by compound condition; atheists and non-atheists (error bars: +/- 2 SE)

### 3.2 Manipulation Checks

#### 3.2.1 Excluding the religiosity prime

The sentence unscrambling task (religiosity priming method) had no significant effect on giving overall. An independent samples t-test indicated that the overall difference in giving for participants in religious priming groups (M = 5.97, SD = 2.623) compared to neutral groups (M = 5.60, SD = 1.968) was insignificant; t(118) = -0.866, p = 0.388, d = 0.16.

Given distinct outcomes for atheists and non-atheists, this analysis was split further by affiliation. Independent samples t-tests indicated that giving was not statistically distinguishable for atheists in religious priming (M = 5.09, SD = 3.145) compared to neutral conditions (M = 5.44, SD = 1.825); t(25) = 0.363, p = 0.720, d = 0.14. Similarly, giving was not statistically distinguishable for non-atheists in religious priming (M = 6.16, SD = 2.486) compared to neutral conditions (M = 5.66, SD = 2.034); t(91) = -1.063, p = 0.291, d = 0.22.

A paired-samples t-test was used to measure the cognitive activation of the concept of religiosity via the Stroop task. Missing or incomplete Stroop data was excluded from analysis. For those in the religious prime condition, reaction time latency for religious words (M = 808.49, SD =292.84) compared to neutral words (M = 778.83, SD = 331.16) was not significantly distinguishable overall; t(53) = 0.673, p = -0.504, d = 0.095. Therefore, the null hypothesis was not rejected.

In order to test for affiliative confounds, paired-samples t-tests were examined independently for atheists and non-atheists. Given that this subset of analyses was unplanned, an adjusted alpha level of 0.01 is applied:

For atheists in the religious priming condition, naming latency (milliseconds) was not statistically significant for religious words (M = 776.98, SD = 97.09) compared to neutral words (M = 881.54, SD = 618.40); t(10) = 0.612, p = 0.554, d = 0.168. Similarly, for non-atheists in the religious priming condition, naming latency was not statistically significant for religious words (M = 816.55, SD = 325.03) compared to neutral words (M = 752.56, SD = 209.44); t(42) = 1.878, p = -0.067, d = 0.210.

### 3.2.2 Self-report manipulation checks (Community and Punishment)

Independent samples t-tests revealed no significant differences in responses to any of the six questions for atheists compared to non-atheists. Overall, self-reports of Community

and Punishment manipulations revealed no explicit effect on behavioural outcomes, including responses regarding the direct behavioural impact of the manipulations:

*Community: "I would have offered less if the exchange was between only me and a single receiver."*

In response to this item, 59% of the sample selected 'Disagree' or 'Strongly Disagree,' compared to only 20% 'Agree' or 'Strongly Agree' (67% compared to 13% respectively, for atheists; 56% compared to 22% respectively, for non-atheists).

*Punishment: "I would have offered less if the receiver(s) did not have the option of rejecting the offer."*

In response to this item, 49% of the sample selected 'Disagree' or 'Strongly Disagree,' compared to only 17% 'Agree' or 'Strongly Agree' (56% compared to 22% respectively, for atheists; 46% compared to 31% respectively, for non-atheists).

Overall, observation of reports revealed no trends of explicitly-reported behavioural manipulation, and did not reflect the variables' differential impacts on measured prosociality, for atheists compared to non-atheists. Given the unavoidability of the manipulations, and the significance of their measured impact, participant tendency to disagree with the notion of personal nefariousness in null conditions may reflect bias or demand characteristics.

### 3.3 Religiosity Scales

The CRED's exposure scale and supernatural belief scale were implemented as measures of religious affiliation complementary to explicit categorisation as 'atheist' or 'non-atheist.' Given a lack of independence, participant scores from each scale cannot be concurrently included in analysis. Examination of scores from these two scales via boxplots and t-tests was undertaken in order to evaluate their discriminant validity in the current study

(for atheists versus non-atheists), and subsequent capacity to act as predictive or discriminant factors in models of giving.

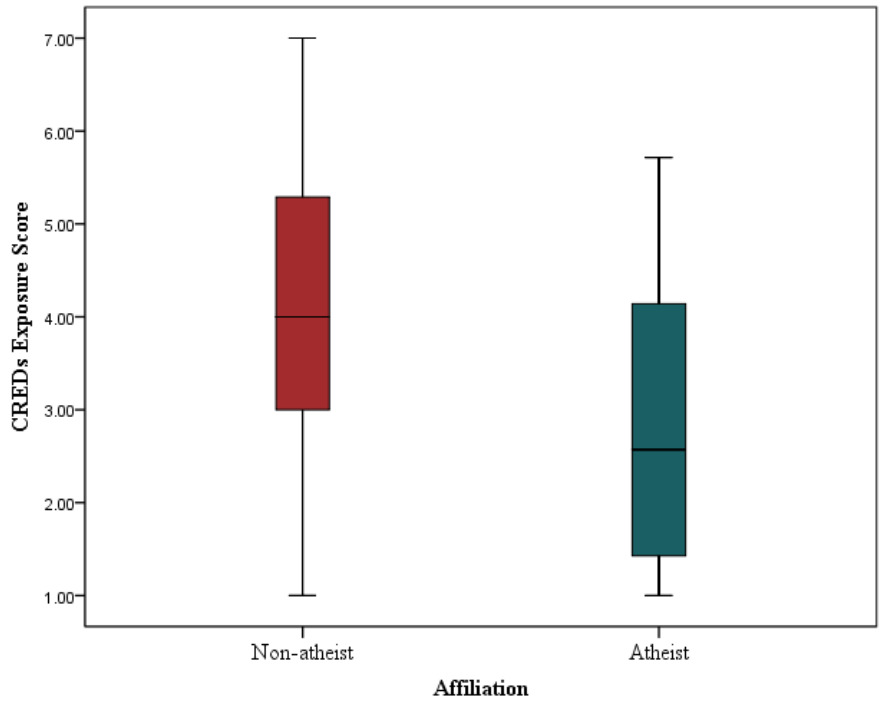


*Figure 5.* Distribution of CRED exposure scores for atheists and non-atheists (boxplots)

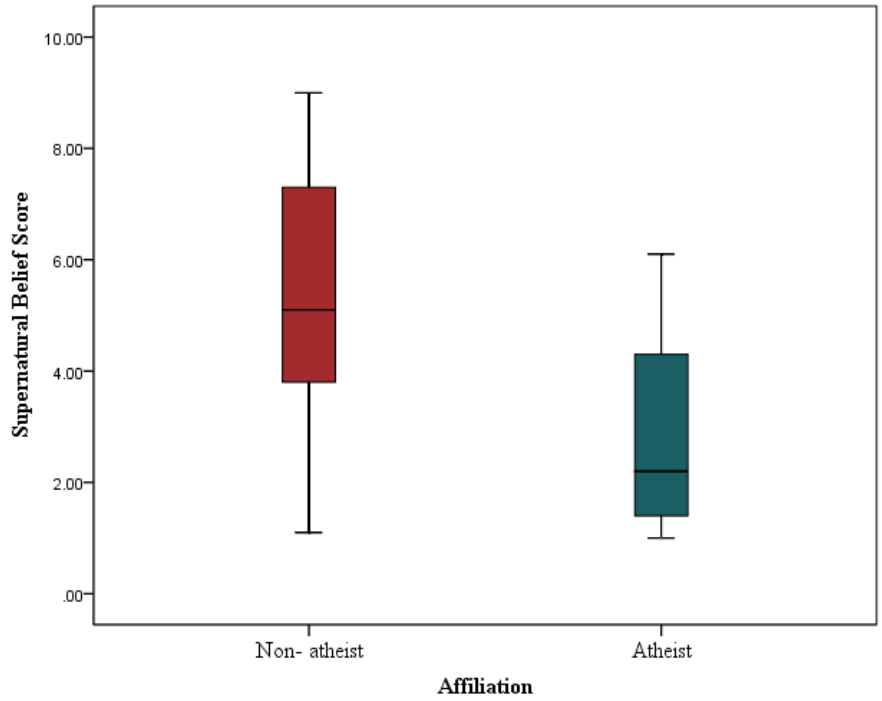


*Figure 6.* Distribution of supernatural belief scores for atheists and non-atheists (boxplots)

Figures 5 and 6 display expected differences in distribution of scores for atheists compared to non-atheists. However, supernatural belief score displays most considerable and distinguishable differences by observation.

### 3.3.1 Analysis of discriminant capacity

The capacity for each scale to distinguish atheists and non-atheists in the current sample is statistically examined:

An independent samples t-test indicated that differences in CREDs exposure score for atheists ($M = 2.84$, $SD = 1.58$) compared to non-atheists ($M = 4.12$, $SD = 1.69$) was significant; $t(118) = 3.509$, $p = 0.001$, $d = 0.78$.

An independent samples t-test indicated that differences in supernatural belief score for atheists ($M = 2.77$, $SD = 1.67$) compared to non-atheists ($M = 5.37$, $SD = 2.23$) was significant; $t(118) = 5.625$, $p < 0.001$, $d = 1.32$.

Analysis of descriptive and statistical data for the CREDs and Supernatural Belief scores suggests a discriminant capacity of both scales. However, observation of distributions by affiliation (figures 5 and 6), and comparison of effect size (0.78 and 1.32, respectively) suggests that supernatural belief is the most powerful measure of religious affiliation with which to proceed.

## 3.4 Statistical Analysis

Analysis of the data continues with acknowledgement of the statistical limitations imposed by the small number of atheists in the sample. Complementary analysis of effect sizes provides additional insight in to the potential significance of measured trends, with acknowledgement that these results may not be reliable (may disappear or change) in a larger sample.

The small number of atheists within and across conditions also places restrictions on the complexity of statistical analysis employed to test hypotheses. Comparison of two distinct models of giving for atheists and non-atheists in the current sample is the most appropriate option; meaningful inference from an integrative model inclusive of main effects and interactions requires a larger sample.

### 3.4.1 The key hypothesis

*For both atheists and non-atheists, the combination of the Community and Punishment conditions will result in the highest levels of prosociality, and the combination of the Individual and No Punishment conditions will result in the lowest levels of prosociality (despite measures of religious affiliation).*

An independent samples t-test indicated that the overall difference in giving in the IxNP condition (M = 5.30, SD = 2.45) compared to the CxP condition (M = 6.10, SD = 2.37) was not significant; t(58) = 1.285, p = 0.204, d = 0.33.

An independent samples t-test indicated that the difference in giving for non-atheists in the IxNP condition (M = 5.68, SD = 2.358) compared to the CxP condition (M = 5.87, SD = 2.492) was not significant; t(46) = .271, p = 0.788, d = 0.078.

An independent samples t-test indicated that the difference in giving for atheists in the IxNP condition (M = 3.40, SD = 2.191) compared to the CxP condition (M = 6.86, SD = 1.864) was significant; t(10) = 2.950, p = 0.015, d = 1.701. This large effect size reflected a compelling and sizeable difference between the groups, despite a small sample of atheists, and considerable variability in their giving responses within this condition (figure 4).

### 3.4.2 Examination of the difference

Unexpected differences in the manifestation of scores across conditions, for atheists compared to non-atheists, invited examination of the difference in giving scores for each compound condition (Individual x No Punishment, and Community x Punishment). Given that this subset of analyses was unplanned, an adjusted alpha level of 0.01 is applied:

An independent samples t-test indicated that differences in giving for atheists (M = 3.40, SD = 2.191) compared to non-atheists (M = 5.68, SD = 2.358) in the 'Individual x No Punishment' condition did not reach statistical significance; $t(28) = 1.993$, $p = 0.056$, $d = 1.002$. However, including a small sample of atheist participants, a p-value approaching 0.05 and a strong effect size ($d > 1$) indicates the possibility of a considerable difference.

An independent samples t-test indicated that differences in giving for atheists (M = 6.86, SD = 1.864) compared to non-atheists (M = 5.87, SD = 2.492) in the 'Community x Punishment' condition was not significant; $t(28) = -0.965$, $p = 0.343$, $d = 0.450$.

### 3.4.3 Hypothesis two

*Significantly lower giving scores in the No Punishment conditions, compared to the Punishment conditions, will reflect the phenomenon of societal-level selfishness, integral to the claim that human agents would not have thrived cooperatively in the absence of punishment.*

An independent samples t-test indicated that the overall difference in giving in the Punishment conditions (M = 6.02, SD = 2.10) compared to the No Punishment conditions (M = 5.55, SD = 2.51) was not significant; $t(118) = -1.105$, $p = 0.272$, $d = 0.20$.

However, given a lack of consistency in giving for atheists and non-atheists, variability in only atheist giving scores was problematic for this comparison. Combined mean

scores within Punishment conditions cannot account for unexpected differences between affiliative groups. Observation of giving means by affiliation *and* condition revealed only atheists in the Individual x No Punishment condition kept more for themselves than was sacrificed in the economic task (a mean of $3.40).

### 3.4.4 Hypothesis three

*Given the absence of priming effects, models of giving behaviour will be the same across affiliative groups. Community and Punishment, as opposed to any measure of religious belief, are expected to predict giving for all groups. This is consistent with the notion that religious standards affect behaviour only when cognitively salient; the second principle of Big Gods, 'religion is more in the situation than in the person*.

***Overall Model:*** Via the general linear model, only supernatural belief score explains a significant amount of the overall variance in participant giving; $F(1, 118) = 4.216$, $p = 0.042$, $\eta^2 = 0.034$. Community and Punishment conditions are not significant predictors overall; $F(1, 118) = 0.619$, $p = 0.432$, $\eta^2_p = 0.005$; and $F(1, 118) = 1.220$, $p = 0.272$, $\eta^2_p = 0.010$, respectively.

***By Affiliation*:**

For atheists, only a combination of the 'Individual/Community' and 'Punishment/No Punishment' conditions explains a significant amount of the overall variance in participant giving; $F(1,24) = 3.775$, $p = 0.038$, $\eta^2 = 0.239$. Distinctly, Punishment contributes significantly to the overall model for atheists; $p = 0.031$, $\eta^2_p = 0.179$, and Community approaches significance; $p = 0.088$, $\eta^2_p = 0.116$. Supernatural belief score is not a significant predictor; $F(1, 25) = 0.544$, $p = 0.468$, $\eta^2 = 0.021$. The imposition of Community and Punishment significantly increase giving scores for atheists.

For non-atheists, a group distinguished by high scores on the supernatural belief scale, only supernatural belief score explains a significant amount of the variance in participant giving; $F(1, 91) = 4.573$, $p = 0.035$, $\eta^2 = 0.048$. Although overall variation in belief scores and giving scores is not large for this group, higher belief scores *within* this group predict higher giving scores. Community and Punishment conditions are not significant predictors; $F(1, 91) = 0.046$, $p = 0.830$, $\eta^2 = 0.001$; and $F(1, 91) = 0.049$, $p = 0.825$, $\eta^2 = 0.001$, respectively.

### 3.5 Analysis of the Agnostic/Religious Integration

Distinct models of giving for atheists and non-atheists invites examination of the agnostic/religious integration underlying the hypotheses. Atheists and non-atheists in the sample displayed indistinguishable giving means overall. However, this observation was reliant on the composition of distinct scores. The possibility of distinct giving scores for agnostic and religious participants to demonstrate illusory consistency in means was examined.

Table 2 demonstrates that giving means between the groups did not differ by more than $1 in any given condition.

*Table 2*

*Mean amount given ($) by condition for agnostic and religious participants*

| | Agnostic (n= 22) | | Religious (n= 71) | | Difference (Religious –Agnostic) | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | *p* |
| Amount given overall ($) | 5.82 | 2.152 | 5.96 | 2.34 | 0.14 | .804 |
| Amount given (I x NP) | 5.75 | 2.96 | 5.65 | 2.12 | **-0.10** | .921 |
| Amount given (C x NP) | 6.80 | 2.17 | 5.88 | 2.50 | **-0.92** | .467 |
| Amount given (I x P) | 5.50 | 1.23 | 6.29 | 2.17 | **0.79** | .410 |
| Amount given (C x P) | 5.00 | 1.00 | 6.00 | 2.64 | **1.00** | .529 |

Furthermore, scores on the supernatural belief scale were examined for agnostic versus religious participants. Consistent with intuitive expectations, agnostic participants (M = 4.07, SD = 1.780) scored significantly higher on the supernatural belief scale than did atheists (M = 2.77, SD = 1.665); t(47) = 2.640, p = 0.011, d = 0.756. Agnostic participants (M = 4.07, SD = 1.780) also scored significantly lower on the belief scale than did religious participants (M = 5.77, SD = 2.207); t(91) = -3.296, p = 0.001, d = 0.849. Lower mean scores for agnostics *within* the non-atheist group are addressed via the regression model (higher supernatural belief predicts higher giving scores on average).

### 3.6 Summary of Results

Initial observation revealed giving trends for non-atheists in opposition to the key hypothesis (figures 3 and 4). The hypothesised difference in giving scores across the two compound conditions (IxNP and CxP) was strongly supported for atheists, and not evident for non-atheists.

Statistically indistinguishable giving scores for Punishment compared to No Punishment conditions did not support the notion of nefariousness integral to hypothesis two. However, comparison of overall means is problematic for atheists compared to non-atheists, given possibly confounding variability in responses.

Distinct models of giving for atheists and non-atheists provided opposition to hypothesis three, and a more holistic understanding of differences by affiliation. Community and Punishment were the only significant predictors in a model of atheist giving (consistent with relative increases in giving across conditions). Conversely, supernatural belief score was the only significant predictor in a model of non-atheist giving (consistent with statistically indistinguishable giving scores across conditions).

# 4. Discussion

## 4.1 Fate of the Hypothesis

Overall giving in this sample directly opposed the hypothesised selfishness of participants in No Punishment conditions, who gave $5.55 on average, compared to $6.02 in the Punishment conditions ($p = 0.248$, $d = 0.2$). On average, participants demonstrated generosity at least consistent with the notion of equality. However, distinct models of giving for atheists compared to non-atheists provided partial opposition to the second principle, 'religion is more in the situation than in the person.' The combination of the Community and Punishment conditions resulted in the highest levels of prosociality, significantly higher than the combined Individual and No Punishment conditions, for atheists only. Community and Punishment had no effect on non-atheist giving, which was predicted instead only by supernatural belief score. This outcome resulted in the addition of a third consideration regarding the necessity of the supernatural; reconciling the ideomotor versus supernatural

punishment accounts of priming in light of these results. Although a religious priming technique was ineffectual, the possibility that contextual priming occurred via the presentation of the cooperative task was considered. Integration of the ideomotor and supernatural monitoring accounts within a constructionist framework suggest that common contextual associations may play a role in schematic induction for non-atheists, just as more disparate secular institutions may contribute to cooperative associations for schematic induction in atheists. High variability in giving scores for atheists in the Individual x No Punishment condition, which decreased with the imposition of contextual guides (standard error bars, figure 4) provides some support for this suggestion. Consideration of these three sub-analyses in light of the current results, and the established literature, reveals that supernatural belief may contribute to the maintenance of a modern cooperative sphere for non-atheists, whilst bound by the cognitive and social learning mechanisms responsible for schematic transference in cooperative contexts more generally.

Exposure to Community and Punishment variables in this study was explicit and unavoidable. However, the reality of expanding society size in Norenzayan's thesis reflects a lack of certainty about secular punishment. Methodological certainty was necessary in order to deduce the possible, concrete effects of secular punishment in a community setting, in the absence of religiosity. Explicit imposition worked to deduce differential outcomes. The novel modification of the economic measure to include a Community component required potentially subjective inference. Community significantly predicted prosociality in the model, and is a central factor in Norenzayan's *Big Gods.* Additionally, unavoidable punishment in a community context intuitively denotes cohesion in the avoidance of punishment. However, the relationship between a community context and increased prosociality may be subject to an alternative explanation. In the individual condition, providing that an offer was not rejected under the Punishment manipulation, participants were guaranteed the amount of

money they chose to keep. In the Community condition, participants make an offer as part of a group, and rely on the mean offer from all givers not being rejected under the Punishment manipulation. The distinction between *relying on* others in this context (the possibility of freeriding), and working *with others* towards a common goal, is undetermined. However, increased, as opposed to decreased, generosity within a community context provides support for the latter, consistent with the aims of the manipulation.

### 4.2 The Assumption of Nefariousness

The *Big Gods* hypothesis relies on the assumption that human beings would not have thrived cooperatively on a large scale without perceived supernatural punishment, among other social, cultural and cognitive factors. Experimental results have demonstrated a tendency for nefarious behaviour in the absence of punishment (e.g. Shariff & Norenzayan, 2007). The economic task used in the current study was a modified replication of that from Shariff and Norenzayan's study (2007; study one), in which reminders of religious authorities were shown to increase giving to a mean of $4, approximately twice that of those who received a neutral prime. Participants in the control condition gave $1.84 on average, 52% left $1 or less, and no participant gave more than $5.

In the current sample, giving in the absence of punishment revealed different trends. Mean giving across all participants in No Punishment conditions was $5.55, compared to $6.02 in the Punishment conditions. Contrary to expectations of nefariousness, and expected repetition of experimental findings, participants in the No Punishment conditions demonstrated generosity at least consistent with the notion of equality. To some extent, this undermined the assumption of nefariousness inherent to Norenzayan's hypothesis. However, in *Big Gods*, this assumption is relevant only to the historical context of 'pre-religion.' Atheist giving in the No Punishment conditions was less than non-atheist giving in the No

Punishment conditions ($4.56 and $5.87, respectively), but not statistically distinguishable. Further splitting the sample with consideration of the Community condition, however, revealed selfish giving tendencies for atheists in the null condition (the absence of Community *and* Punishment), consistent with the historical context of *Big Gods*. In order to provide evidence for the existence of nefariousness via a discrepancy between atheist ('pre-religious') and non-atheist (peri-religious') giving, however, these results reflect opposition to Norenzayan's second principle, 'religion is more in the situation than in the person.'

### 4.3 Theoretical Implications for Atheists and Non-atheists

Measurement of prosociality by religious affiliation (atheist versus non-atheist), *and* across conditions (I, C, P, NP), revealed an expansion of contextual variables from which to infer causation. Figure 3 highlights four intersections with experimental context for both atheists and non-atheists. Analysis of only one intersection for all participants (for example, atheists and non-atheists, in the Community x No Punishment condition) may appear consistent with the established literature. For example, consistent with the results of Shariff & Norenzayan (2007), atheists may typically give less (true in three of the four conditions for atheists), though differences in giving by affiliation are not statistically distinguishable (true in three of the four conditions). The effects of priming techniques within a narrowed scope of extrapolation provide results often consistent with principles one and two. Perceived supernatural monitoring is thought to increase generosity for all participants ('watched people are nice people'), though most reliably for believers ('religion is more in the situation than in the person'). The results of the current study suggest not that established hypotheses are incorrect, but that artificial boundaries may be imposed by the scope of context and inference. In the current study, the lens through which to extrapolate meaning is widened by the manipulation of context, most importantly allowing the construction of behavioural *models* by affiliation. Differences between atheists and non-atheists at any intersection, significant or

non-significant, are not most integral to the affiliative distinctions found. Most saliently, without the effective induction of perceived supernatural monitoring, behavioural models of giving for atheists and non-atheists are entirely distinct. Given the capacity for secular variables to significantly increase prosociality in atheists, the necessity of the supernatural within a strictly catalytic approach to *Big Gods* is not supported. This is consistent with opposition to the historical timeline (e.g. Fuentes, 2013) and with increased uncertainty surrounding the causal relationship between religion and large-scale cooperation (e.g. Norenzayan et al., 2016). Conversely, given that supernatural belief predicts consistently fair or generous giving scores for non-atheists, the capacity for religion to act as an adaptive cooperative contributor (e.g. Bulbulia, 2012) is concurrently supported.

### 4.3.1 Non-atheists

The model of non-atheist giving provides support for a model directly in opposition of Norenzayan's second principle, 'religion is more in the situation than in the person,' for a population reliant on supernatural institutions and markers of trust. Religious belief, operationalised by participants' supernatural belief scores, was the only significant predictor in a model of giving behaviour, regardless of the manipulation of independent variables. On average, non-atheists gave $5.77. This was at least consistent with an intuitive notion of 'fairness' or equality, in which the split would leave both parties with equal assets. Determinable effects of priming, context or manipulation were absent for this group, and results therefore support the notion of intrinsic religiosity, or 'moralising' rather than situational theories of religious belief.

Intrinsic religiosity is typically dismissed given a lack of evidence for the relationship between self-reported belief and measures of prosociality (Galen's 'halo effect'; 2012), and the tendency for prosociality to increase with religious reminders, regardless of affiliative

scores (e.g. Randolph-Seng & Nielsen, 2007). The 'fundamental attribution error' (Ross, 1977) refers to the tendency to attribute an agent's behaviour to intrinsic and relatively inflexible personality dispositions, as opposed to the notion that a social standard will affect behaviour only via cognitive activation of its relevance (Norenzayan's second principle). Results for non-atheists in the current study appear consistent with 'fundamental attribution,' or internalisation of social standards, and inconsistent with experimental data of *Big Gods*.

Explaining these results in light of the established literature relies on an important distinction; the role of supernatural belief in the rise of large-scale cooperation historically, versus the role of religion in the maintenance of a modern ('peri-religious') cooperative sphere. Norenzayan's *Big Gods* refers directly to the former, though this study provides support for the latter. Unrelated to the primitive benefits of religiosity, some evidence provides support for the claim that religion is inherently beneficial for believers in modern societies, including positive associations with both physical and mental health (e.g. Myers, 2000). Importantly, however, the effects of religious involvement on positive outcomes are often moderated by personal factors. Ellison and Levin (1998) provide a model to represent the relationship between stressors, religiosity, and health. Though religious involvement has no direct impact on outcomes, the model suggests health benefits may increase as a result of moderating stressors for the individual, especially relevant to those in more stressful circumstances. Conversely, religious devotion may be less influential among those who are relatively stress-free. Mochon, Norton and Ariely (2011) demonstrate that the relationship between religion and well-being is further moderated by extent of devotion. Subjective well-being in an American sample of almost 6500 revealed a positive correlation between religious devotion and subjective well-being. However, this correlation existed only for the most devout believers. Less devout respondents, with weaker systems of supernatural belief, reported lower levels of well-being that non-believers.

Overall, results suggest that supernatural belief may play a role in sustaining and maintaining cooperation in a peri-religious population. However, inferring direct effects is problematic. The existence of moderating variables in the current experiment is possible. Stereotypes regarding an association between religious belief and benevolence are widespread (Gervais et al., 2011). Meanwhile, associations consistent with the 'halo effect' (Galen, 2012) exist between belief, self-reported prosociality and self-enhancement (Sedikides & Gebauer, 2010**)**. Similar to the uncertainty regarding cognitive activation of target concepts in the priming literature, the presentation of a cooperative task to non-atheist participants could activate schematic notions of cooperation; a possibility unaccounted for by the data.

Just as priming techniques have demonstrated the ability to simultaneously increase prosocial behaviour, and activate perceptions of a supernatural monitor (Shariff & Norenzayan, 2007; Gervais & Norenzayan, 2012), cooperative tasks conceivably hold the potential to guide prosocial behaviour, whilst activating learned associations for non-atheists. The novel implementation of the Community manipulation alone cannot account for differences in giving behaviour in the current study, given that results were consistent for non-atheists also across the two null (Individual) groups. The distinction between these results and the existing literature, therefore, is assumed to lie within the current sample, as opposed to methodological novelty. To postulate an inherent difference between the social and cognitive manifestation of religiosity within this Australian sample, compared to its manifestation in a Canadian sample, for example, is unjustified. Furthermore, there is no reason to suggest that existing statistical trends in opposition to this phenomenon are inaccurate or unreliable.

Experience of a cooperative context could, however, conceivably act as a contextual prime, conceptually linked to prior analogues of endorsed benevolence in similar

circumstances. That is, the secular context of the economic task may be analogically and schematically linked to consistent and pre-existing notions of appropriate behaviour in a cooperative paradigm, considering the source of adopted secular schemas to be common across non-theists; religion. Gick and Holyoak (1983) experimentally examined schema induction in terms of capacity for analogical transfer; a process by which a basic paradigm is acquired through experience and subsequently rationalised in terms of a related instance. The prediction that general schematic induction from a concrete problem solving task would facilitate analogical transfer for a subsequent task was not initially supported. Subjects displayed analogous transfer of solutions to a similar problem only after experiencing *more* than one prior analogue.

Therefore, 'intrinsic religiosity' may be explained in light of schematic associations, whereby cooperative tasks activate secularly manifested standards of behaviour, reliant on learned associations from religiously affiliated sources. That is, a source of analogues on which to implicitly base future behaviour. Measurement of exposure to credibility enhancing religious displays (seemingly costly actions in the absence of verbally expressed beliefs; Henrich, 2009) reliably predicts levels of supernatural belief via social and cultural mechanisms of learning (Lanman & Buhrmester, 2016). Scores on the CREDs Exposure Scale were significantly higher for non-atheists in the current study, consistent with well-established trends (Lanman & Buhrmester, 2016). Such disparity could explain the presentation of a seemingly direct relationship between belief and behaviour in the current study, suggestive of experiential moderation. This theorised association removes opposition to Norenzayan's second principle, 'religion is more in the situation than in the person.' The presentation of the task itself (regardless of Community and Punishment manipulations) may act as a reminder of learned associations for non-atheists only. McIntosh (1995) determined

that a schematic foundation of religion is a promising approach to understanding both the structure and function of religious beliefs.

Klein (2008) collated contributions of the naturalistic decision making framework, whereby agents make complex decisions in real-world settings. Results emphasised the importance of previous experience in individual capacity to categorise situations and make decisions quickly and effectively. Giving in the current study was designed to obtain an honest indication of prosociality, conducted anonymously with real monetary consequences (Shariff & Norenzayan, 2007). Theories of decision making dictate, therefore, that the economic decision presented to participants did not exist in a vacuum.

Consideration of cultural and geographical disparity may explain possible divergences in the salience of behavioural schemas adopted via religious rituals, as well as experiences, teachings, readings and interactions more generally. A comprehensive model of differential manifestations of religious orientation, as they relate to five foundations of moral behaviour (moral foundations theory; Graham et al., 2012) was generated via the quantification of responses from over 1500 religious participants in New Zealand (Bulbulia, Osborne, & Sibley, 2013). Analysis of the association between religion and community suggested the capacity for within-country variation in moral foundations to predict variation in categorisation of religious orientation (Quest, Personal Extrinsic, Social Extrinsic, or Intrinsic; see Bulbulia et al., 2013 for a review). The five sub-categories from which orientation type was predicted are care/harm, and fairness/cheating (two individualising foundations; Graham et al., 2012), and loyalty/betrayal, authority/subversion, and sanctity/degradation (three binding, community-focused, foundations). For non-atheist students in the current Australian sample, any number of these associations may be directly related to, or implicitly activated by, the context of a cooperative task. The activation of cooperative schemas suggested by the data may relate differentially to the individualising

versus binding foundations of the moral foundations theory, relative to the Individual versus Community conditions respectively. The capacity for these non-supernatural distinctions to predict the categorisation of supernatural belief type across a representative sample of New Zealand, strongly suggests that religious belief exists within a tangible realm of cognitive explanation. Bulbulia et al. (2013) acknowledge, however, that the translation of reported associations in to observable, behavioural outcomes is yet to be determined within and across cultures.

Furthermore, evidence suggests that individual perceptions of God, as loving and compassionate, or as angry and punishing, differentially predict cheating behaviour in an experimental task. Shariff and Norenzayan (2011) demonstrated that cheating behaviours were unrelated to levels of religiosity more generally, but individual perceptions of God as more punishing and less loving was reliably predictive of less cheating. Perception of God, therefore, may be a moderating third variable, impacting the direct relationship between cognitive activation of religious concepts, and measured prosociality. The possibility that students may differentially conceive the stereotypical standards of religious belief cross-culturally is plausible under the theory of a third variable. For example, prosocial tendencies are not associated with self-reported belief in the absence of a prime for students in Canada (Shariff & Norenzayan, 2007), though Canadian theists are less likely to cheat dependent on perception of an angry God. Schematic outcomes of divergent salience in religious manifestations cross-culturally could conceivably account for these results. That is, a lack of distinction between prosocial tendencies for atheists and non-atheists in the absence of priming effects, compared to a perceptually-dependent difference in cheating behaviours, could depend on conceptually distinct manifestations in the intrinsic salience of theistic stereotypes and communal associations.

Some evidence for a similar distinction in the current study lies in the raw giving scores of participants, compared to those from the same task in Shariff & Norenzayan's (2007) study. As discussed in section 4.2, a comparison of the null conditions across studies revealed giving scores for non-atheists in the current study were considerably higher in the absence of any religious prime or experimental manipulation. Again, given the instrumental mutuality of the economic task across studies, this contradiction to previously measured nefarious tendencies is suggestive of novelty related to the sample, as opposed to the methodology. This claim is reinforced by the absence of integrative capacities for atheist versus non-atheist models of giving in this study. Though the possibility of an aberrant sample cannot be confidently excluded, the suggestion of novelty is not solely reliant on the significance of a p-value, but on the construction of distinct, predictive models. For participants identifying as non-atheists in this sample, the observation of considerably higher giving scores in the null condition is consistent with an observed notion of 'intrinsic religiosity.' However, it may provide support also for implicitly activated, learned associations between the presentation of a cooperative context and standards of fairness; 'blanket rules' for action, inflexible against experimental manipulation, and common to non-atheists in this sample given the possibility of mutual provenance. This notion is supported by extensive differences in schema-relevant values related to religion for believers compared to non-believers, a distinction comparable to atheists and non-atheists in the current study. Non-believers display schematic induction of moral and relational religious values, but less on the 'personal-extrinsic' values of competency and ego, whereas non-believers are generally aschematic overall with respect to religion (Lau, 1989).

Schematic and analogous transference as a possibly *confounding* variable in the measurement of direct, hypothesised relationships has not been integral to the modern study of religiosity. However, the capacity for religious identification to directly impact social and

cognitive associations within the boundaries of secular equivalents is supported. For example, Xygalatas et al. (2013) demonstrate an association between extreme 'high-ordeal' rituals and prosocial behaviour, linking these results to the established, non-supernatural literature. Xygalatas et al. (2013) postulate that experiences of pain, either direct or empathic, may moderate the direct link between extreme rituals and prosocial outcomes. This is consistent with evidenced associations between the perception of pain and increased prosociality (e.g. Olivola & Shafir, 2013). Additionally, functional changes in neural activity are measured as a result of religious ritual, and shown to moderate associative capacities via the same cognitive mechanisms responsible for the induction of secular associations. For highly religious participants, the frequent repetition of prayer has a measurable impact on reward processing centres of the brain, commonly associated with habit formation (Schjodta, Stodkilde-Jorgensenb, Geertza, & Roepstorffc, 2008).

Proposing an expansion of inference, beyond direct, hypothesised relationships, is a means by which to reconcile the novelty of the current results in light of Norenzayan's experimentally well-established principle, 'religion is more in the situation than in the person.' The novel results from this sample cannot be attributed to geographical, environmental, cultural or experiential differences more generally, given the distinction between atheist and non-atheist models of giving. The data suggests an intrinsic motivator for standards of giving, but only for those who share a common precursor of supernatural belief. The possibility that religious experience is a medium for schema induction, a set of 'prior analogues' for non-atheists, may actually provide further opposition to the necessity of the supernatural in *Big Gods*. Institutionally derived models of knowledge and behaviour are not bound by religious ties. Norenzayan's 'ladder of religiosity' and the results of secular priming reinforce that the sources of cognitive and behavioural analogues for cooperation are varied.

The absence of consistency in behavioural outcomes for atheists in this sample may relate to the results of Gick & Holyoak's (1983) experiment. If multiple and consistent analogues are required to reliably retain and transfer analogous paradigms, the absence of a common force for those bound not by supernatural motivation may be disparate. The 'kicking away' of the ladder in Australian society is far from achieved. An absence of affiliation with supernatural institutions does not necessarily denote a consistently positive and reliable association with a secular alternative. If atheists are commonly bound only by a lack of supernatural belief, flexibility of atheist behaviour in this sample may reflect a lack of consistency in schematic induction, and a lack of commonality in the source of analogical transference.

### 4.3.2 Atheists

The model of atheist giving provides some insight in to the validity of contributing factors in a population reliant on non-supernatural institutions and markers of trust. Given that the secular imposition of punishment on a community scale raised mean participant giving to $6.86, from $3.40 in an individual context with no threat of punishment, the capacity for a significant supernatural influence within this sample is restricted. In order to avoid rejection, and secure the remaining amount for distribution amongst their own group, participants in the Community x Punishment condition gave approximately $7 for distribution amongst another group. These amounts are higher than an intuitive notion of 'fairness' or equality, in which the split would leave both parties with equal assets. Atheist participants in this condition are demonstrating generosity. Only a $3 increase in giving, the maximum allowable change attributable to a religious reminder over and above the existing model, would demonstrate complete sacrifice.

Furthermore, for atheists, the combined Community/Punishment condition resulted in more giving than the religious prime condition in Shariff & Norenzayan's (2007) experiment ($6.86 versus $4.56). Baseline statistics of giving in the dictator game across the two studies in the absence of a prime (Shariff & Norenzayan, 2007) and in the absence of Community and Punishment in the current study, are comparably measured, but not equal. Therefore, comparing raw giving scores after the implementation of the prime, versus after the implementation of Community/Punishment, is problematic. Instead, comparison of percentage increases in giving across the two studies after implementation of the prime, compared to implementation of Community/Punishment, reveals increases of 148% and 102% respectively. Consideration of percentages accounts for lower initial giving scores, and reveals that the implementation of each method at least doubled mean giving. Perceived supernatural punishment may be directly responsible for increases in prosocial behaviour via the perception of a supernatural monitor. Although priming has been shown to increase generosity, generally regardless of participants' religious belief, manipulation checks are absent from the religiosity priming literature. If stereotypes regarding religion and benevolence are general and widespread, and the absence of manipulation checks necessarily determines that understanding of cognitively activated associations are poorly understood, the possibility that religious priming activates secular notions of social cohesion and/or communal consequence is undetermined. At least some overlap is probable.

The results of Shariff & Norenzayan's (2007; study two) priming experiment provide some grounds for this claim, over and above comparison of their religiosity prime and Community x Punishment in the current thesis. The addition of a third priming group in the 2007 study, conceptually primed with secular institutions of morality (e.g. 'court', 'police'), allowed examination of giving behaviour relative to religious and neutral priming groups from the first study. The secular prime had a positive impact on giving that was statistically

indistinguishable from that of the religiosity prime. Participants in the secular priming group gave $4.44 on average, and $4.56 in the religious prime group, compared to $2.56 in the control condition. These results are consistent with Norenzayan's advocacy of the 'ladder of religiosity,' the capacity for post-industrial societies under certain social circumstances to 'climb the ladder of religion, and then kick it away' (p. 172), replaced with secularly equivalent foundations for cooperation and trust. For example, experimental research has begun to examine the capacity for secular authority to reduce distrust towards atheists (Gervais & Norenzayan, 2012; Norenzayan & Gervais, 2013).

The Community and Punishment variables manipulated in the current experiment, in the absence of determinable religiosity prime effects, hold weight intuitively equivalent to notions of secular authority. Experimental manipulation of Community (imposing anonymity within a large group, including the subsequent threat of free-riding), and the manipulation of Punishment (unavoidable consequences for behaviour perceived to be selfish or unfair), is directly reflective of a society in which secular authority is a reliable foundation for cooperation and trust. Under the hypothesis of the 'ladder of religiosity,' religion and secular authority have equivalent capacities to affect cooperation, though not at the same time. The results of study two (2007), however, reveal equivalent effects of religious and secular priming in a randomly allocated, cross-sectional sample. Therefore, rather than the results pertaining to individual perception of a supernatural versus secular monitor, a common moderating variable may be considered. Simultaneous activation of cooperative schemas may explain mutuality of behaviour, if supernatural and secular institutions equivalently endorse associations between cooperative contexts and appropriate outcomes.

The implicit activation of learned associations in this case is consistent with theorisation of non-atheist data, contributing to a holistic account of schematic induction and giving for all participants. These conclusions are inherently tentative, but allow the

construction of a logical framework for the current data without complete and unjustified opposition to well-established experimental findings. This thesis suggests the possibility of inferential adaptation, from supernatural versus secular, to experientially-bound sources of learned associations. This approach denotes that the supernatural foundation of Norenzayan's theory is not a necessary requirement, but that religion has the capacity to influence schematic induction, experience of analogues, and subsequent behavioural outcomes via the mechanisms responsible for secular equivalents.

### 4.4 Integrating Accounts of Ideomotor and Supernatural Monitoring

Religiosity priming effects have previously provided evidence for the validity of supernatural monitoring in the *Big Gods* hypothesis. Especially for believers, and specifically absent for participants with deficits in mind perception, priming simultaneously increases prosociality and feelings of being monitored (Gray et al., 2011; Norenzayan et al., 2012). The supernatural monitoring account correctly predicts these distinctions. Increases in prosociality are not reliably measured in primed non-believers, explained by the absence of perceived supernatural surveillance. Conversely, an ideomotor framework would account for prosocial priming effects as implicit and reflexive, reliant on only widespread awareness of stereotypical associations between religion and benevolence (Gervais et al., 2011). This account concerns a traditional view of behavioural priming, a model of passive association whereby specific mental content is made accessible in order to subsequently enhance the likelihood of a targeted response (Srull & Wyer, 1980; Dijksterhuis & Bargh, 2001). Given distinctions in self-reported perception of monitoring and prosocial outcomes for believers and non-believers, this account is not endorsed.

These disparate approaches have been related to the manipulation of priming in experimental research. Although religious priming techniques were ineffectual in the current

study, distinct results are assumed to rely on implicitly activated schematic associations via the context of the cooperative task. Results of the current experiment are not holistically consistent with either framework. The ideomotor approach cannot account for differences in atheist and non-atheist giving behaviour. Conversely, the absence of an effective God prime problematises the supernatural monitoring account. Instead, an integrated approach may explain the data. While consistency in non-atheist giving suggests a cohesive motivation for this group, distinctly endorsed by non-atheists, this does not necessarily point to primed perceptions of being watched. Instead, perceived supernatural monitoring could fall within a wider sphere of cognitively activated schemas for non-atheists, possibly including but not limited to, feelings of kinship and brotherhood (Atran & Henrich, 2010; Atran & Norenzayan, 2004). Conceivably, this modified notion of the supernatural monitoring account could lie within a wider, ideomotor-relative sphere of experientially bound schemas for all participants.

This model of schematic activation is most consistent with more recently proposed constructionist models of priming effects, which emphasise an active construction of interpretation and meaning as integral to the priming process. The accessibility of conceptually primed concepts may determine the best response in order to achieve goals (Cesario, Plaks, Hagiwara, Navarette, & Higgins, 2010; Cesario & Jonas, 2014; Cesario et al. 2010). Most salient to the results of the current study is the situated-inference model. This constructionist framework considers an agent's attribution about the source of the accessible concept, as internal versus external, to be most influential for its outcome (Loersch & Payne, 2011; 2014). Attributions to external environment often result in dismissal of the accessible prime and have little impact on responses. Only when attribution is internal, including personal values or desires, does accessible knowledge form the foundation for decision making (Wheeler et al. 2014). Conceivably, a general relationship exists between devotion to

a religious belief and internal attribution in a cooperative context. However, this notion is far from substantiated in the current literature.

Overall, integration of the ideomotor and supernatural monitoring accounts within a constructionist framework suggest schematic associations may be implicitly influential for all participants (consistent with the ideomotor account), though selective activation is dependent on associative experience (consistent with the supernatural monitoring account). Inference of the current data within a constructionist framework does not provide general opposition to the established literature, especially the raw results of experiments which contribute to the *Big Gods* hypothesis. However, an expansion of the boundaries of inference is suggested by the results from this Australian sample. Previous studies which hypothesise an effect of religious priming on prosocial behaviour, and more specifically supernatural monitoring, specifically for theists, tend to find evidence in support of this phenomenon. The direct, positive relationship between perceived monitoring and prosocial tendencies, however, may be understood as partial detection of a wider manifestation of religious schemas, which measured effects are subsequently and wholly attributed to.

## 4.5 Conclusions

### 1. The assumption of nefariousness:

Though instrumentally comparable, mean giving in the current sample was considerably higher than previously demonstrated in the absence of priming or manipulation. Contrary to the assumption of inherent nefariousness in the *Big Gods* hypothesis, and to previous experimental results, participants in the No Punishment conditions actually demonstrated behaviour consistent with fairness or generosity.

**2. Distinct models of giving (atheists versus non-atheists):**

The key hypothesis was partially supported. For atheists only, the combination of the Community and Punishment conditions resulted in the highest levels of prosociality, and the combination of the Individual and No Punishment conditions resulted in the lowest levels of prosociality, as measured by monetary sacrifice in the economic task. Given that theists displayed giving trends consistent with notions of intrinsic religiosity, distinct models of giving provided opposition to the second principle of Big Gods, 'religion is more in the situation than in the person.' However, with traditional theories of priming and knowledge association (ideomotor and supernatural monitoring accounts) unable to account for novelty in the non-atheist sample, this conclusion was modified in light of an integrative, constructionist framework.

**3. Ideomotor versus supernatural monitoring**

Results of the current study were not wholly consistent with the ideomotor or supernatural monitoring accounts. The ideomotor approach could not account for affiliative discrepancies in giving, and the supernatural monitoring account was not consistent with the absence of the effect of a religious prime. Interpretation of the data relies on an integrative, constructionist approach to these frameworks; schematic transference influences participant behaviour implicitly (ideomotor), though schematic induction exists within boundaries of personal religious experience (an expansion of supernatural monitoring). This is a tentative framework to account for differences in measured behaviour, which attributes conceptual activation of cooperative schemas to the presentation of a cooperative context in this study. With a reliance on associative knowledge, it removes opposition to the second principle of *Big Gods.* However, this framework places supernatural associations within a wider sphere of

possible schematic sources for cooperation, problematising the general necessity of the supernatural in *Big Gods*.

**4. Contribution of the supernatural**

The possibility that religious experience may act as a set of 'prior analogues,' in the capacity for analogous transfer, and as a medium for schematic induction, provides opposition to the necessity of the supernatural in *Big Gods.* This approach denotes, not that supernatural belief has no impact, but that religion has the capacity to influence behavioural outcomes only via the mechanisms responsible for secular equivalents.

### 4.6 Limitations and Future Directions

Empirical investigation of a large-scale phenomenon within the laboratory imposed restriction. Positive conditions (Community and Punishment) paired with negative conditions (Individual and No Punishment) allowed for the comparison of Big Gods' three main variables within a manageable experiment. However, the distinctions between each of these pairs is more complex than simple opposition, and not without flaws. Notably, comparison of prosocial outcomes in the Community and Individual conditions regard the need for big gods in large-scale, but not small-scale societies, respectively. Although not historically integral to small-scale groups, following their advent in large-scale societies, big gods are thought to support cooperation in non-repetitive, one-off interactions with strangers on any scale. Both the Individual and Community conditions fit this description. This experiment begins to tease apart the effects of small- versus large-scale interaction in the experimental production of behavioural outcomes. However, to more realistically form a distinction between these two groups, future research could clarify the distinction by fostering a perception that participants in the Individual group will encounter this partner/group again in future.

Unintended differences in strategic complexity and cognitive demand across conditions poses concern unaccounted for by the current experiment. Groups differ by the consideration of one target compared to many (Individual versus Community), and the concurrent consideration of a rejection threshold compared to no threat of rejection (Punishment versus No Punishment). Some research suggests that an insensitivity to strategic complexity is predicted by evolutionary theories of religion (e.g. Bulbulia, 2009; 2012). However, future research should consider the possible confounds of strategic requirements and cognitive demand, and aim to determine their role in anonymous prosociality.

A coherent narrative exists to explain the results of the current study, and a proposition for expansion of inference within the established literature. However, given the novel and unforeseen invalidation of the hypothesis for non-atheists in this sample, examination of results is necessarily tentative. Most noticeably and consistently absent from the religiosity literature, specifically relevant to the inference of the supernatural in the *Big Gods* hypothesis, is the use of manipulation checks for priming techniques (a separate measure of the independent variable's intended implementation, often of the mediating effects). Shariff et al. (2016) highlight limitations and benefits of priming techniques, including minimisation of suspicion and demand characteristics, or potential for generalisability via experimentation in laboratory compared to naturalistic environments.

The abstract nature of religious belief is a consideration which is often overlooked. Random allocation to religious versus secular conditions is complicated not only by the extent to which previous and current beliefs can be captured via self-report methods, but by the ability to initially construct these experimental groups. To claim the combined efficacy of four priming techniques based on similar robustness of the data from each condition is problematic. Meta-analyses address issues of the 'what,' but not the 'how.' That is, we understand that religious primes are implemented as the independent variables in each case,

and that subsequent results are approximately equal in effect size and significance, but we gain no insight into the underlying psychological mechanisms at work. Four equally flawed methods, or four groups suffering equally from the influence of a third variable, will result in comparable data. The possibility of a third variable problem is acknowledged in the religious literature, though the experimental manipulation of priming techniques is considered a reliable solution (Shariff et al., 2016; Willard, Shariff, & Norenzayan, 2016). Given that priming allows for random group assignment, the technique is described as a mechanism by which to reap measurable effects of religiosity with minimal interference from an array of confounding variables. This includes disentangling participant demographics, religious affiliation and baseline personality traits from cognitively salient religious concepts in order to establish causality. Though the possibility of a spurious relationship remains, the validity of religious priming is highlighted by convergent evidence for its effects (Willard et al, 2016); the suggestion that theory-informed convergence of results across the literature is sufficient to dismiss risks of a third variable influence. However, evidence reflecting consistent misinterpretation or universality of overstated inference may logically converge in any number of studies.

Disciplinary and theoretical division in the emerging field of religious research is both advantageous and dangerous. Model-specific evidence for the efficacy of religious priming may allow for manageable experiments and less complexity in the inference of results, whilst omitting theoretical convergence and comparisons. Theoretical discrepancies in the inference of published, significant results may raise more questions from a holistic perspective than they can answer independently. For example, religious priming increases agency detection tendencies in participants, supporting the notion that hyperactive agency detection is a catalyst of supernatural belief (Ma-Kellams, 2015; Nieuwboer, van Schie, & Wigboldus, 2014); religious priming is shown to increase dependent measures of prosocial behaviour due

to the felt presence of supernatural watchers (Shariff & Norenzayan, 2007); and religious priming increases risk-taking behaviour, providing evidence for the mediating effect of increased psychological control (Chan, Tong, & Tan, 2014). This small subset of published research highlights the theoretically fragmented nature of results. Given that the theoretical framework on which each experiment relies is independent, these results can be shown to neither complement nor invalidate one another.

An achievable step towards progress therefore lies in collaborative, interdisciplinary, and comparative research. The implementation of manipulation checks is of further importance here. These measures can assess the conceptual activation of concurrent and confounding variables, independent of the activation of the target variable. Testing only for a hypothesised effect in light of a specific model may reap significant results, whilst neglecting the possibility of wider and more complex interactions.

The attempted implementation of a priming technique in the current study (sentence unscrambling task; from Shariff & Norenzayan, 2007) had no impact on giving behaviour, and targeted cognitive activation was indiscernible via implementation of a manipulation check. Failure to replicate the behavioural effects of an established priming technique, coupled with the inability to discern measures of targeted activation via the modified Stroop paradigm, suggests that the implementation of manipulation checks in successfully manipulated priming groups could be invaluable. For example, increases in prosociality for religiously primed groups, combined with hypothesised naming latency for related words, would provide some indication that the concept of religion has been successfully activated in these studies. More crucial though, is the capacity to implement manipulation checks to account for the possible activation of confounding or moderating variables. For example, the current study suggests the possibility of differentially effective cooperative schemas for atheists compared to non-atheists, consistent with a constructionist approach to associative

priming, and conceptually activated via the presentation of a cooperative task. In future, the Stroop task may be used to test these claims beyond the measurement of naming latencies for religious words in general (e.g. 'God' or 'spirit'). Latency may reflect differential activation of more specific, and potentially spurious, schematically related cooperative concepts (such as benevolence, kinship and brotherhood). Measured salience of these concepts in atheist versus non-atheist samples after exposure to the economic task, or decisions regarding cooperation and prosociality more generally, may overcome more narrow and direct inferences of observed data.

Self-report manipulation checks did not reveal expected differences in explicitly-reported manipulation, and did not reflect the differential outcomes of experimental manipulation for atheists compared to non-atheists. Given the unavoidability of the manipulations, and the significance of measured differences across conditions, the tendency for participants to disagree with the notion of personal nefariousness (regardless of condition) may have been due to demand characteristics. In hindsight, important questions absent from these checks regard participant belief in the task. Whether participants believed they were interacting with another person or group, and whether they believed that the consequences of the Punishment condition would be implemented, are salient factors. The expectation of deception would be a confounding factor which should be controlled for in future.

The familiar problem of WEIRD populations (Henrich, Heyne, & Norenzayan, 2010) poses a further threat to the inference of priming results. The phenomenon of religiosity has varied universal implications, with an array of similarities and differences in its manifestation globally. The Western, Educated, Industrialised, Rich and Democratic individuals typically included in research are providing ideas about the phenomenon of religiosity in human beings, with minimal understanding of cross-cultural implications. As evidenced in figure 1 (page 20 of Introduction; from Pew Research Centre, 2015), religious devotion in the United

States exists in opposition to a general trend; higher GDP is associated with less religiosity. Predominantly Canadian samples from Norenzayan's research are comparable to Australian samples in terms of the expected relationship between wealth and religiosity. Therefore, generalisability is restricted even *within* WEIRD populations, and many possible contributing factors remain undetermined. Universality or discrepancy in comparable results across borders could shed light on the distinct roles of cognition and culture respectively. The pursuit to tease apart these factors has begun within sub-populations of WEIRD participants, and efforts to replicate findings across diverse cultures are invaluable (e.g. Purzycki et al., 2016). Controlling for participants' baseline levels of belief and self-reported exposure to religiosity (specifically via exposure to credibility enhancing displays; see Lanman, 2012; Lanman & Buhrmester, 2016) may provide insight in to the extent of learned versus innate factors in priming response.

The equivocal suggestion that the presentation of the cooperative task in the current experiment was responsible for contextual priming effects, and for the transference of schematic associations relative to cooperation and prosociality, is reflective of general uncertainty regarding the direct effects of priming. The use of religious priming methods is not inherently problematic. In the absence of evidence-based theoretical underpinnings, the extent to which results and subjective interpretations are consistently extrapolated throughout the literature is dangerous. In an attempt to further understand priming manipulations, specifically in relation to a phenomenon as universal and intangible as that of religiosity, the robustness of measurable effects should be evaluated across methodological, contextual and cultural boundaries (Willard et al., 2016), combined with the rigorous implementation of manipulation checks.

The results of the current experiment provide evidence for the expansion of methodological comparisons, modelling and inference of results. Affiliative comparisons

within each of the four conditions are much less informative in the absence of more inclusive behavioural models. Restrictions of inference imposed by the subjective fragmentation of analysis should be considered a threat to progress within the scientific study of religiosity.

References

Atran, S. & Norenzayan, A. (2004). Religion's evolutionary landscape: Counterintuition, commitment, compassion, communion. *Behavioral and Brain Sciences, 27,* 713–770. doi: 10.1017/S0140525X04000172

Atran, S., & Henrich, J. (2010). The evolution of religion: How cognitive by-products, adaptive learning heuristics, ritual displays, and group competition generate deep commitments to prosocial religions. *Biological Theory, 5,* 18-30. doi: 10.1162/BIOT_a_00018

Bateson, M., Nettle, D., & Roberts, G. (2006). Cues of being watched enhance cooperation in a real-world setting. *Biology Letters, 2*(3), 412-414. doi: 10.1098/rsbl.2006.0509

Baumard, N., & Boyer, P. (2013). Explaining moral religions. *Trends in Cognitive sciences, 17,* 272-280. doi: 10.1016/j.tics.2013.04.003

Baumard, N., Hyafil, A., Morris, I., & Boyer, P. (2015). Increased affluence explains the emergence of ascetic wisdoms and moralizing religions. *Current Biology, 25,* 10-15. doi: 10.1016/j.cub.2014.10.063

Blume, M. (2009). *The reproductive benefits of religious affiliation*. In R. Voland & W. Schiefenhovel (Eds.), *The biological evolution of religious mind and behaviour* (pp. 117-126). New York, NY: Springer.

Bulbulia, J. (2008). Meme infection or religious niche construction? An adaptationist alternative to the cultural maladaptationist hypothesis. *Method and Theory in the Study of Religion, 20,* 67-107. doi: 10.1163/157006808X260241

Bulbulia, J. (2009). Charismatic Signalling. *Journal for the Study of Religion, Nature, Culture, 3,* 518-551. doi: 10.1558/jsrnc.v3i4.518

Bulbulia, J. (2012). Spreading order: Religion, cooperative niche construction, and risky coordination problems. *Biology and Philosophy, 27,* 1-27. doi: 10.1007/s10539-011-9295-x

Bulbulia, J., Osborne, D., & Sibley, C. G. (2013). Moral foundations predict religious orientations in New Zealand. *PLoS ONE, 8*(12), e80224. doi:10.1371/journal.pone.0080224

Chan, K. Q., Tong, E. M. W., & Tan, Y. L. (2014). Taking a leap of faith: Reminders of god lead to greater risk taking. *Social Psychological and Personality Science, 5*, 1-9. doi: 10.1177/1948550614537309

Cesario, J., Plaks, J. E., Hagiwara, N., Navarette, C. D., & Higgins, E.T. (2010). The ecology of automaticity. How situational contingencies shape action semantics and social behavior. *Psychological Science, 21,* 1311-1317. doi: 10.1177/0956797610378685

Cesario, J. & Jonas, K. J. (2014). Replicability and models of priming: What a resource computation framework can tell us about expectations of replicability. *Social Cognition, 32,* 124-136. doi: 10.1521/soco.2014.32.supp.124

Churchland, M. M., Cunningham, J. P., Kaufman, M. T., Foster, J. D., Nuyujukian, P., Ryu, S. I., & Shenoy, K. V. (2012) Neural population dynamics during reaching. *Nature, 487,* 51–56. doi: 10.1038/nature11129

Darwin, C. (1859). *On the origin of species by means of natural selection, or the preservation of favoured races in the struggle for life*. London, England: J. Murray.

Dawkins, R. (1976). *The selfish gene.* Oxford, England: Oxford University Press.

De Waal, F. B. M. (2008). Putting the altruism back into altruism: The evolution of empathy. *Annual Review of Psychology, 59,* 279-300. doi: 10.1146/annurev.psych.59.103006.093625

Dijksterhuis, A., & Bargh, J.A., (2001). The perception-behaviour expressway: Automatic effects of social perception on social behaviour. *Advances in Experimental Social Psychology, 33,* 1-40. doi: 10.1016/S0065-2601(01)80003-4

Dugatkin, L.A. (2006). *The altruism equation: Seven scientists search for the origins of goodness*. Princeton, NJ: Princeton University Press.

Duhaime, E.P. (2015). Is the call to prayer a call to cooperate? A field experiment on the impact of religious salience on prosocial behavior. *Judgment and Decision Making, 10*, 593–596. Retrieved from http://journal.sjdm.org/15/15623/jdm15623.html

Durkheim, E. (1912). *The elementary forms of the religious life*. New York, NY: Free Press.

Ellison, C. G., & Levin, J. S. (1998). The religion-health connection: Evidence, theory, and future directions. *Health, Education & Behaviour, 25,* 700-720. doi: 10.1177/109019819802500603

Epp, A. M., Dobson, K. S., Dozois, D. J., & Frewen, P. A. (2012). A systematic meta-analysis of the Stroop task in depression. *Clinical Psychology Review, 32,* 316-328. doi: 10.1016/j.cpr.2012.02.005

Fehr, E., & Gächter, S. (2000). Cooperation and Punishment in Public Goods Experiments. *The American Economic Review*, *90*(4), 980–994. doi: 10.1257/aer.90.4.980

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18,* 39–50. doi: 10.2307/3151312

Fuentes, A. (2013). *Cooperation, conflict, and niche construction in the genus homo.* In D. Fry (Ed.), *War, peace and human nature* (pp.78-94). Oxford, England: Oxford University Press.

Fuentes, A. (2014). Hyper-cooperation is deep in our evolutionary history and individual perception of belief matters. *Religion, Brain & Behaviour, 5*, 284-290. doi*:* 10.1080/2153599X.2014.928350

Galen, L. W. (2012). Does religious belief promote prosociality? A critical examination. *Psychological Bulletin, 138,* 876-906. doi: 10.1037/a0028251

Gervais, W. M., Shariff, A. F., & Norenzayan, A. (2011). Do you believe in atheists? Distrust is central to anti-atheist prejudice. *Journal of Personality and Social Psychology, 101*, 1189-1206. doi: 10.1037/a0025882

Gervais, W. M., & Norenzayan, A. (2012). Reminders of secular authority reduce believers' distrust of atheists. *Psychological Science, 23,* 483 - 491. doi: 10.1177/0956797611429711

Gick, M. L., & Holyoak, K. J. (1983). Schema induction and analogical transfer. *Cognitive Psychology,* 15, 1-38. doi: 10.1016/0010-0285(83)90002-6

Graham, J., Haidt, J., Koleva, S., Motyl, M. Iyer, R., Wojcik, S. P., & Ditto, P. H. (2012). Moral foundations theory: The pragmatic validity of moral pluralism. *Advances in Experimental Social Psychology, 47,* 55-130. doi: 10.1016/B978-0-12-407236-7.00002-4

Gray, K., Knobe, J., Sheskin, M., Bloom, P., & Barrett, L.F. (2011). More than a body: Mind perception and the nature of objectification. *Journal of Personality and Social Psychology, 101,* 1207-1220. doi: 10.1037/a0025883

Hafer, C. L. (2000). Do innocent victims threaten the belief in a just world? Evidence from a modified Stroop task. *Journal of Personality and Social Psychology, 79,* 165-173. doi: 10.1037/0022-3514.79.2.165

Henrich, J., Boyd, R., Bowles, S., Camerer, C., & Fehr, E. (2004). *Foundations of human sociality: Economic experiments and ethnographic evidence from fifteen small-scale societies.* Oxford, England: Oxford University Press.

Henrich, J. (2009). The evolution of costly displays, cooperation and religion: Credibility enhancing displays and their implications for cultural evolution. *Evolution and Human Behavior, 30,* 244–260. doi: 10.1016/j.evolhumbehav.2009.03.005

Henrich, J., Heyne, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioural and Brain Sciences, 33,* 61-135. doi: 10.1017/S0140525X0999152X

Hoffman, E., McCabe, K., Shachat, K., & Smith, V. (1994). Preferences, property rights and anonymity in bargaining games. *Games and Economic Behavior, 7,* 346-380. doi: 10.1006/game.1994.1056

Hove, M. J., & Risen, J. L. (2009). It's all in the timing: Interpersonal synchrony increases affiliation. *Social Cognition, 27,* 949-960. doi: 10.1521/soco.2009.27.6.949

Hrdy, S. B. (2009). *Mothers and others: The evolutionary origins of mutual understanding.* Cambridge, MA: Harvard University Press.

Jarvis, B. G. (2014). DirectRT (Version 2014.1.102) [Computer Software]. New York, NY: Empirisoft Corporation.

Johnson, A.W., & Earle, T. (2000). *The Evolution of Human Societies: From Foraging Group to Agrarian State.* Palo Alto, CA: Stanford University Press.

Johnson, B., & Bering, J. M. (2006). Hand of god, mind of man: Punishment and cognition in the evolution of cooperation. *Evolutionary Psychology, 4,* 219-233. doi: 10.1177/147470490600400119

Jong, J., Bluemke, M., & Halberstadt, J. (2013). Fear of death and supernatural beliefs: Developing a new supernatural belief scale to test the relationship. *European Journal of Personality, 27,* 495-506. doi: 10.1002/per.1898/

Kleider, H. M., Pezdek, K., Goldinger, S. D., & Kirk, A. (2008). Schema-driven source misattribution errors: Remembering the expected from a witnessed event. *Applied Cognitive Psychology, 22,* 1-20. doi: 10.1002/acp.1361

Klein, G. (2008). Naturalistic decision making. *Human Factors, 50,* 456-460. doi: 10.1518/001872008X288385.

Kramer, D. A., & Goldman, M. S. (2003). Using a modified Stroop task to implicitly discern the cognitive organization of alcohol expectancies. *Journal of Abnormal Psychology, 112,* 171-175. doi: 10.1037/0021-843X.112.1.171

Langergraber, K. E., Prufer, K., Rowney, C., Boesch, C., Crockford, C., Fawcett, K., … Vigiliant, L. (2012). Generation times in wild chimpanzees and gorillas suggest earlier divergence times in great ape and human evolution. *Proceedings of the National Academy of Sciences, 109,* 15716–15721. doi: 10.1073/pnas.1211740109

Lanman, J. A. (2012). The importance of religious displays for belief acquisition and secularization. *Journal of Contemporary Religion, 27,* 49-65. doi: 10.1080/13537903.2012.642726

Lanman, J. A., & Buhrmester, M. D. (2016). Religious actions speak louder than words: Exposure to credibility enhancing displays predicts theism. *Religion, Brain & Behaviour,* 1-14. doi: 10.1080/2153599X.2015.1117011

Lau, S. (1989). Religious schema and values. *International Journal of Psychology, 24,* 137-156. doi: 10.1080/00207594.1989.10600039

Loersch, C., & Payne, K. (2011). The situated inference model: An integrative account of the effects of primes on perception, behavior, and motivation. *Perspectives on Psychological Science, 6,* 234-252. doi: 10.1177/1745691611406921

Loersch, C., & Payne, K. (2014). Situated inferences and the what, who, and where of priming. *Social Cognition, 32,* 137-151. doi: 10.1521/soco.2014.32.supp.137

Ma-Kellams, C. (2015). When perceiving the supernatural changes the natural: Religion and agency detection. *Journal of Cognition and Culture, 15,* 337-343. doi: 10.1163/15685373-12342154

MacKinnon, K.C., & Fuentes, A. (2011). *Primates, niche construction, and social complexity: The roles of social cooperation and altruism*. In R.W. Sussman & R.C. Cloninger (Eds.), *Origins of altruism and cooperation. Developments in primatology: Progress and prospects* (volume 36, part 2, pp. 121–143). New York, NY: Springer.

Malhotra, D. (2010). (When) are religious people nicer? Religious salience and the "Sunday Effect" on pro-social behaviour. *Judgment and Decision Making, 5,* 138-143. doi: 10.2139/ssrn.1297275

McCleary, R. M. & Barro, R. J. (2006). Religion and economy. *The Journal of Economic Perspectives, 20,* 49–72. doi: 10.1257/jep.20.2.49

McIntosh, D. N. (1995). Religion-as-schema, with implications for the relation between religion and coping. *The International Journal for the Psychology of Religion, 5,* 1-16. doi: 10.1207/s15327582ijpr0501_1

McNeill, W. H. (1982). *Pursuit of power: Technology, armed force, and society since A.D. 1000*. Chicago, Il: University of Chicago Press.

Mochon, D., Norton, M., & Ariely, D. (2011). Who benefits from religion? *Social Indicators Research, 101*(1), 1–15. doi: 10.1007/s11205-010-9637-0

Myers, D. G. (2000). The funds, friends, and faith of happy people. *American Psychologist, 55*, 56-67. doi: 10.1037/0003-066X.55.1.56

Nieuwboer, W., van Schie, H. T., & Wigboldus, D. (2014). Priming with religion and supernatural agency enhances the perception of intentionality in natural phenomena. *Journal for the Cognitive Science of Religion, 2,* 97-119. doi:10.1558/jcsr.v2i2.24483

Norenzayan, A. (2013). *Big gods: How religion transformed cooperation and conflict.* Princeton, NJ: Princeton University Press.

Norenzayan, A. (2014). Does religion make people moral? *Behaviour, 151,* 365-384.

Norenzayan, A., & Shariff, A. F. (2008). The origin and evolution of religious prosociality. *Science, 322,* 58-62. doi: 10.1126/science.1158757

Norenzayan, A., Gervais, W. M., & Trzesniewski, K. H. (2012). Mentalizing deficits constrain belief in a personal god. *PLoS ONE, 7*, e36880. doi: 10.1371/journal.pone.0036880

Norenzayan, A., & Gervais, W.M. (2013). The origins of religious disbelief. *Trends in Cognitive Sciences, 17,* 20-25. doi: 10.1016/j.tics.2012.11.006 T

Norenzayan, A., Henrich, J., & Slingerland, E. (2013). *Religious prosociality: A synthesis*. In P. J. Richerson & M. H. Christiansen (Eds.), *Cultural evolution: Society, technology, language and religion* (pp. 365-378). Cambridge, MA: MIT Press.

Norenzayan, A., Shariff, A., Gervais, W. M., Willard, A. K., McNamara, R. A., Slingerland, E., & Henrich, J. (2016). The cultural evolution of prosocial religions. *Behavioural and Brain Sciences, 39,* 1-65. doi: 10.1017/S0140525X14001356

Northover, S.B., Pedersen, W.C., Cohen, A.B., & Andrews, P.W. (2016). Artificial surveillance cues do not increase generosity: two meta-analyses. *Evolution and Human Behaviour, 38,* 144-153. doi: 10.1016/j.evolhumbehav.2016.07.001

Olivola, C. Y., & Shafir, E. (2013). The martyrdom effect: When pain and effort increase prosocial contributions. *Journal of Behavioral Decision Making, 26*, 91–105. doi: 10.1002/bdm.767

Pew Research Centre (2012). *Forum on Religious and Public Life: Global Religious Landscape*. Retrieved from http://www.pewforum.org/2012/12/18/global-religious-landscape-exec/

Pew Research Centre (2015). *Spring 2015 Global Attitudes Survey*. Retrieved from http://www.pewresearch.org/fact-tank/2015/12/23/americans-are-in-the-middle-of-the-pack-globally-when-it-comes-to-importance-of-religion/

Purzycki, B.G., Apicella, C., Atkinson, Q.D., Cohen, E., McNamara, R.A., Willard, A.K. … Henrich, J. (2016). Moralistic gods, supernatural punishment and the expansion of human sociality. *Nature, 530,* 327-330. doi:10.1038/nature16980

Randolph-Seng, B., & Nielsen, M. (2007). Honesty: One effect of primed religious representations. *The International Journal for the Psychology of Religion, 17,* 303-315. doi: 10.1080/10508610701572812

Raykov, T., & Shrout, P. E. (2002). Reliability of scales with general structure: Point and interval estimation using a structural equation modeling approach. *Structural Equation Modeling, 9,* 195–212.

Reddish, P., Fischer, R., & Bulbulia, J. (2013). Let's dance together: Synchrony, shared intentionality and cooperation. *PLoS ONE, 8*(8)*:* e71182. doi:10.1371/journal.pone.0071182

Reddish, P., Tok, P., & Kundt, R. (2016). Religious cognition and behaviour in autism: The role of mentalizing. *The International Journal for the Psychology of Religion, 26,* 95-112. doi: 10.1080/10508619.2014.1003518

Revelle, W., & Zinbarg, R. (2009). Coefficients Alpha, Beta, Omega, and the glb: Comments on Sijtsma. *Psychometrika, 74,* 145–154.

Roelofs, J., Peters, M. L., Zeegers, M. P., & Vlaeyen, J. W. (2002). The modified Stroop paradigm as a measure of selective attention towards pain-related stimuli among chronic pain patients: A meta-analysis. *European Journal of Pain, 6,* 273-281. doi: 10.1053/eujp.2002.0337

Ross, L. (1977) The intuitive psychologist and his shortcomings: Distortions in the attribution process. *Advances in Experimental Social Psychology, 10,* 173–220.

Sedikides, C., & Gebauer, J. (2010). Religiosity as self-enhancement: A meta-analysis of the relation between socially desirable responding and religiosity. *Personality and Social Psychology Review, 14,* 17-36. doi: 10.1177/1088868309351002

Schjodta, U., Stodkilde-Jorgensenb, H., Geertza, A.W., & Roepstorffc, A. (2008). Rewarding prayers. *Neuroscience Letters, 443,* 165-168. doi: 10.1016/j.neulet.2008.07.068

Shariff, A. F., & Norenzayan, A. (2007). God is watching you – Priming god concepts increases prosocial behavior in an anonymous economic game. *Psychological Science, 18*, 803–809. doi: 10.1111/j.1467-9280.2007.01983.x

Shariff, A. F., & Norenzayan, A. (2011). Mean gods make good people: Different views of god predict cheating behaviour. *International Journal for the Psychology of Religion, 21*, 85 – 96. doi: 10.1080/10508619.2011.556990

Shariff, A. F., Willard, A. K., Andersen T, Norenzayan, A. (2016). Religious priming—a meta-analysis with a focus on prosociality. *Personality and Social Psychology Review, 20*, 27–48. doi:10.1177/1088868314568811

Sosis, R. (2000). Religion and intragroup cooperation: Preliminary results of a comparative analysis of utopian communities. *Cross-Cultural Research, 34*, 70–87. doi: 10.1177/106939710003400105

Srull, T. K., & Wyer, R. S. (1980). Category accessibility and social perception: Some implications for the study of person memory and interpersonal judgments. *Journal of Personality and Social Psychology, 38*, 841-856. doi: 10.1037/0022-3514.38.6.841

Sterelny, K. (2012). *The evolved apprentice: How evolution made humans unique*. Cambridge, MA: MIT Press.

Sussman, R.W., & Cloninger, R.C. (Eds.). (2011). *Origins of altruism and cooperation. Developments in primatology: Progress and prospects*. Volume 36, Part 2. New York, NY: Springer.

Swann, W. B., Gomez, A., Seyle, D. C., Morales, J. F. & Huici, C. (2009). Identity fusion: The interplay of personal and social identities in extreme group behavior. *Journal of Personality and Social Psychology, 96*, 995–1011. doi: 10.1037/a0013668.

Swanson, A. (1960). *The birth of the gods: The origin of primitive beliefs*. Ann Arbor, MI: University of Michigan Press.

Wadley, L. (2013). Recognizing complex cognition through innovative technology in stone age and Palaeolithic sites. *Cambridge Archaeological Journal, 23*, 163–183. doi:10.1017/S0959774313000309

Wheeler, S. C., DeMarree, K. G., & Petty, R. E. (2014). Understanding prime-to-behavior effects: Insights from the active-self account. *Social Cognition, 32* (Special Issue), 109–123. doi: 10.1521/soco.2014.32.supp.109

Willard, A., & Norenzayan, A. (2013). Cognitive biases explain religious belief, paranormal belief, and belief in life's purpose. *Cognition, 129,* 379-391. doi: 10.1016/j.cognition.2013.07.016

Willard, A. K., Shariff, A. F., & Norenzayan, A. (2016). Religious priming as a research tool for studying religion: Evidentiary value, current Issues, and future directions. *Current Opinion in Psychology, 12*, 71-75. doi: 10.1016/j.copsyc.2016.06.003

Wiltermuth, S. S., & Heath, C. (2009) Synchrony and cooperation. *Psychological Science, 20*, 1-5.doi: 10.1111/j.1467-9280.2008.02253. x.

Xygalatas (2012). Effects of religious setting on cooperative behaviour: A case study from Mauritius. *Religion, Brain & Behaviour, 3,* 1-12. doi: 10.1080/2153599X.2012.724547

Xygalatas, D., Mitkidis, P., Fischer, R., Reddish, P. Skewes, J., Geertiz, A.W. … & Bulbulia, J. (2013). Extreme rituals promote prosociality. *Psychological Science, 24,* 1602-1605. doi: 10.1177/0956797612472910

Zhong, C, Bohns, V., & Gino, F. (2010). Good lamps are the best police: Darkness increases dishonesty and self-interested behaviour. *Psychological Science, 21*, 311-314. doi: 10.1177/0956797609360754

Zuckerman, P. (2008). *Society without God: What the least religious nations can tell us about contentment*. New York, NY: NYU Press.

**APPENDIX A:** Ethics approval letter

Office of the Deputy Vice-Chancellor
(Research)
Research Office
Research Hub, Building C5C East
Macquarie University
NSW 2109 Australia
T: +61 (2) 9850 4459
http://www.research.mq.edu.au/
ABN 90 952 801 237

21 April 2016
Associate Professor Colin Wastell
Department of Psychology
Faculty of Human Sciences
Macquarie University
NSW 2109

Dear Associate Professor Wastell

**Reference No**: 5201600211

**Title:** A Big Assumption of Big Gods: The Intrinsic Nefariousness of Human Beings

Thank you for submitting the above application for ethical and scientific review. Your application was considered by the Macquarie University Human Research Ethics Committee (HREC (Human Sciences & Humanities)) at its meeting on 1 April 2016.

I am pleased to advise that ethical and scientific approval has been granted for this project to be conducted at:

• Macquarie University

This research meets the requirements set out in the National Statement on Ethical Conduct in Human Research (2007 – Updated May 2015) (the National Statement).

This letter constitutes ethical and scientific approval only.

**Standard Conditions of Approval:**

1. Continuing compliance with the requirements of the National Statement, which is available at the following website:

http://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research

2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol.

3. All adverse events, including events which might affect the continued ethical and scientific acceptability of the project, must be reported to the HREC within 72 hours.

4. Proposed changes to the protocol must be submitted to the Committee for approval before implementation.

It is the responsibility of the Chief investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the Ethics Secretariat on 9850 4194 or by email ethics.secretariat@mq.edu.au

The HREC (Human Sciences and Humanities) Terms of Reference and Standard Operating Procedures are available from the Research Office website at:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics

The HREC (Human Sciences and Humanities) wishes you every success in your research.

Yours sincerely,

**Dr Karolyn White**

Director, Research Ethics & Integrity,

Chair, Human Research Ethics Committee (Human Sciences and Humanities)

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007) and the CPMP/ICH Note for Guidance on Good Clinical Practice.

**Details of this approval are as follows:**

**Approval Date:** 13 April 2016

The following documentation has been reviewed and approved by the HREC (Human Sciences & Humanities):

| Documents reviewed | Version no. | Date |
|---|---|---|
| Macquarie University Ethics Application Form | 3 | July 2015 |
| Response received | | 11/04/2016 & 12/04/2016 |
| Participant Information and Consent Form | | 11/04/2016 |
| Written Debrief | | 12/04/2016 |
| Verbal Debrief | | 11/04/2016 |
| SONA Advertisement | | 11/04/2016 |
| Game theory instructions by group | | 09/03/2016 |
| Sentence unscrambling task | | 09/03/2016 |
| Modified Stroop task | | 09/03/2016 |
| Self-report manipulation checks | | 09/03/2016 |
| CRED's Exposure Scale | | 09/03/2016 |
| Supernatural Belief Scale | | 09/03/2016 |
| Demographic questions | | 09/03/2016 |

**APPENDIX B:** Breakdown of atheists and non-atheists by condition

Condition*Affiliation Crosstabulation:

| | | Affiliation | | |
|---|---|---|---|---|
| | | Non-atheist | Atheist | Total |
| **Condition** | IxNP | 25 | 5 | 30 |
| | IxP | 23 | 7 | 30 |
| | CxNP | 22 | 8 | 30 |
| | CxP | 23 | 7 | 30 |
| Total | | 93 | 27 | 120 |

**APPENDIX C:** CRED's exposure scale (Lanman & Buhrmester, 2016)

*Instructions:* 'The following questions ask about experiences during your upbringing that relate to religion. Specifically, the questions ask about your perceptions of your primary caregiver or caregivers (i.e. parents or guardians). Please answer each of the following according to your overall impression of your caregiver(s) on the following scale:'

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| | To no extent at all | | | Neutral | | | To an extreme extent |
| To what extent did your caregiver(s) attend religious services or meetings? | | | | | | | |
| To what extent did your caregiver(s) engage in religious volunteer or charity work? | | | | | | | |
| Overall, to what extent did your caregiver(s) act as good religious role models? | | | | | | | |
| Overall, to what extent did your caregiver(s) make personal sacrifices to religion? | | | | | | | |
| To what extent did your caregiver(s) act fairly to others because their religion taught them so? | | | | | | | |
| Overall, to what extent did your caregiver(s) live a religiously pure life? | | | | | | | |
| Overall, to what extent did your caregiver(s) avoid harming others because their religion taught them so? | | | | | | | |

**APPENDIX D**: Supernatural belief scale (Jong, Bluemke, & Halberstadt, 2013)

*Instructions:* Please indicate your agreement with the following statements.

Note: the scale runs from strongly disagree to strongly agree, you need to choose the level of agreement that matches your personal beliefs.

| | Strongly disagree | | | | Neither agree nor disagree | | | | Strongly agree |
|---|---|---|---|---|---|---|---|---|---|
| There exists an all-powerful, all-knowing, loving God. | | | | | | | | | |
| There exists an evil personal spiritual being, whom we might call the Devil. | | | | | | | | | |
| There exist good personal spiritual beings, whom we might call angels. | | | | | | | | | |
| There exist evil personal spiritual beings, whom we might call demons. | | | | | | | | | |
| Human beings have immaterial, immortal souls. | | | | | | | | | |
| There is a spiritual realm besides the physical one. | | | | | | | | | |
| Some people will be rewarded in an afterlife when they die. | | | | | | | | | |
| Some people will be punished in an afterlife when they die. | | | | | | | | | |
| Miracles – divinely-caused events that have no natural explanation – can and do happen. | | | | | | | | | |
| There are individuals who are messengers of God and/or can foresee the future. | | | | | | | | | |

**APPENDIX E:** Self-report manipulation checks

*Instructions:* The following statements relate to your experience of the economic task. Please indicate your agreement with each statement on a scale of 1 (strongly disagree) to 7 (strongly agree).

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| **ITEMS FOR COMMUNITY MANIPULATION** | Strongly Disagree | | | Neutral | | | Strongly Agree |
| I considered the probable actions of the other 99 participants in the giving group. | | | | | | | |
| I worried that the other givers would act selfishly. | | | | | | | |
| I would have offered less if the exchange was between only me and a single receiver. | | | | | | | |
| **ITEMS FOR PUNISHMENT MANIPULATION** | | | | | | | |
| I considered the amount that would likely be accepted by the receiver. | | | | | | | |
| I worried about the offer being rejected. | | | | | | | |
| I would have offered less if the receiver did not have the option of rejecting the offer. | | | | | | | |

**APPENDIX F:** Economic task (Community and Punishment modifications)

Group 1: **Individual x No Punishment (from Shariff & Norenzayan, 2007):**

"You have been chosen as **the giver** in this economic decision-making task. You will find 10 one-dollar coins. Your role is to take **and keep** as many of these coins as you would like, knowing that however many you leave, if any, will be given to the receiver subject to keep."

Group 2: **Individual x Punishment:**

"You have been chosen as **the giver** in this economic decision-making task. You will find 10 one-dollar coins. Your role is to take **and keep** as many of these coins as you would like, knowing that however many you leave, if any, will be offered to the receiver subject. The receiver subject is aware of how many coins the giver (you) is dividing and they may choose to accept or reject the offer you make. **If the receiver subject accepts your offer, you will both keep the allocated amounts. However, if the receiver subject rejects your offer, you will both sacrifice all coins and receive nothing.**"

Group 3: **Community x No Punishment:**

"You have been randomly allocated to a **group of 100 givers** in this economic decision-making task. You, like each of the other 99 givers in this group, will find 10 one-dollar coins. Your role is to take **and keep** as many of these coins as you would like, knowing that however many you leave, if any, will be added to a pool of contributions from all 100 givers in this group, and divided amongst the receiving group of 100 participants."

Group 4: **Community x Punishment:**

"You have been randomly allocated to a **group of 100 givers** in this economic decision-making task. You, like each of the other 99 givers in this group, will find 10 one-dollar coins. Your role is to take **and keep** as many of these coins as you would like, knowing that however many you leave, if any, will be added to a pool of contributions from all 100 givers in this group; these coins will be offered for division amongst the receiving group of 100 participants. Each participant in the receiving group will be aware of how many coins were available, and will accept or reject the offer. **If the majority of the receiving group accepts the combined offer, you (and each other giver) will retain the amount of money you chose to keep. However, if the majority of the receiving group rejects your offer, all coins will be sacrificed and all participants in the experiment will receive nothing."**

**APPENDIX G.** Methodological Exclusions (Religiosity Prime and Manipulation Check)

**DirectRT Version 2014** ***(materials):*** Direct RT by Empirisoft (Jarvis, 2014) is a software program designed to create cognitive and perception tasks with reaction time measured precisely in milliseconds. This program was used to create and implement the modified Stroop paradigm in the current experiment.

**Sentence Unscrambling Task (Implicit Priming Method):** Participants were instructed to complete a 'literacy task' in the form of a sentence unscrambling task (a disguised priming technique) before playing the game. The original version of this task (from Srull & Wyer, 1979; Shariff & Norenzayan, 2007) was used to prime religiosity in half of the sample, and was adapted to prime the neutral concept of furniture in the remaining sample. Five target words in each case were embedded within five of ten sentences in the unscrambling task. The task was adapted for the neutral condition by replacing the original five target words with cognitively equivalent, furniture-related words in the neutral condition.

**Modified Stroop Paradigm (Manipulation Check*)***: In a traditional Stroop task, participants are asked to say the colours in which colour names are written, as quickly as possible, and without reading the written word. For example, if the word "RED" is printed in yellow, a participant should say "YELLOW". When the colour name and the colour of the word are incongruent, cognitive interference occurs, and the task should take significantly longer. That is, colour identification latencies are longer when the colour and the colour name do not match.

The modified Stroop task has been used more recently to test the cognitive activation of concepts including concern with justice (Hafer, 2000), pain-related words among sufferers of chronic pain (Roelofs, Peters, Zeegers & Vlaeyen, 2002) and to discern the cognitive

organisation of specific expectancies (Kramer & Goldman, 2003). The task is most prominent in the mental health literature, specifically to discern the cognitive salience of depression and anxiety-related words (Epp, Dobson, Dozois & Frewen, 2013; a meta-analysis of the Stroop task in depression). In these tasks, the colour identification latency is no longer calculated for congruent versus incongruent colour pairs, but for colour naming latency in cognitively salient (or primed) versus less salient (or neutral) words. The underlying theory remains the same as in the original task. Naming latency should be higher for those words which are most cognitively salient for the participant at the time of testing, or for those words which defy expectancy. Difficulty occurs in naming only the colour of the word, given that the word meaning is cognitively distracting, and more likely to cause a significant delay in colour identification. Although the modified Stroop task has not been used previously within the scientific religiosity literature, the principle is transferrable.

In the current experiment, the modified Stroop paradigm was used as a manipulation check for the implicit priming technique (excluded from the analysis). The purpose of the sentence task was to temporarily increase cognitive activation of religious concepts. However, given the implicit nature of the prime, its effect cannot be assumed and is not easily measurable. A significant colour identification latency in primed words compared to neutral words would provide evidence for the successful cognitive activation of the target concept. The set of religious words used for the Stroop manipulation check is different to those used for the sentence task. This is to ensure that any latency effects are due to the cognitive salience of the concept in general terms, and not simply memory for words in the initial task. The order of words displayed in the Stroop task was randomised using Direct RT in order to combat order and practice effects across participants.

**APPENDIX H.** Sentence unscrambling task (Shariff & Norenzayan, 2007)

Note: the five target sentences in the control (furniture) condition were created as a comparable control for the purposes of the current study – they are not quotes from the 2007 paper.

*Please complete the following verbal fluency task. Do your best to complete every item.*

*Unscramble the following groups of words to make a four-word phrase or sentence by dropping the irrelevant word.* For example,

high winds the flies plane --> the plane flies high

**Religious Primes**

1. felt she eradicate **spirit** the _____
2. dessert **divine** was fork the _____
3. appreciated presence was imagine her _____
4. more paper it once do _____
5. send I over it mailed _____
6. evil thanks give **God** to _____
7. yesterday it finished track he _____
8. **sacred** was book refer the _____
9. reveal the future simple **prophets** _____
10. prepared somewhat I was retired _____

**Control Primes (furniture)**

1. was sit **couch** comfortable the_____
2. **table** goes the used they_____
3. appreciated presence was imagine her _____
4. more paper it once do _____
5. send I over it mailed _____
6. was broken today **chair** the_____
7. yesterday it finished track he _____
8. with the made **bed** she_____
9. **drawers** opened he the soft_____
10. prepared somewhat I was retired _____

**APPENDIX I**: Modified Stroop paradigm (manipulation check)

**Religion words**

**holy**

**religion**

**faith**

**pray**

**miracle**

**warmer**

**tall**

**aeroplane**

**chess**

**kitten**

**Control words**

**lounge**

**desk**

**seat**

**stool**

**cupboard**

**warmer**

**tall**

**aeroplane**

**chess**

**kitten**