OPTIMISM AS AN ADAPTIVE OUTCOME OF RELIGIOSITY

A Thesis Submitted for the

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Abstract

Previous research has found that in conditions of high inequality, individuals appear to express higher levels of religious engagement. However, areas where there is high inequality often also have high levels of deprivation, making it unclear as to whether it is inequality or deprivation that drives the positive association between inequality and religiosity. The original aims of this thesis were to investigate the relationship between religiosity and inequality in the hope of gaining insight into the nature of the relationship between economic variables and religiosity, and to investigate why inequality or deprivation would increase religiosity. The first study conducted for this thesis used two waves of the Religious Landscape Survey conducted by the Pew Research Centre combined with economic information to investigate relationships between income, state-level affluence, state-level inequality and religiosity in the USA. Two hierarchical linear models, each containing over 35k US citizens, indicated that state wealth and state inequality were both associated with religiosity.

The second study conducted for this thesis had several aims and so, for clarity is referred to in the thesis proper as study 2a and study 2b which are split across chapters 5 and 6. The first aim which is explored in chapter 5 as study 2a, was to test a newly developed scale designed to measure the extent to which individuals believe in the existence of a universal causal force which is both purposeful and intentional, a trait which is referred to in this thesis as transcendent teleological thinking (TTT). It is argued in this thesis that TTT represents the cognitive core of religious and spiritual thinking, and measuring this trait may offer insights into the evolution of religion. The second aim of this study, explored in chapter 6 and referred to in the thesis proper as study 2b, was to take a closer look at the psychological responses to economic inequality and deprivation. The aim of this study was to

see how economic variables influence subjective feelings of financial strain, feelings of deprivation and to investigate whether these variables are associated with increases in behavioural religiosity, and TTT. study 2b did not find compelling evidence that economic variables or experience of financial strain and deprivation were strongly associated with levels of behavioural religiosity or TTT. However, study 2b also included a measure of well-being, and closer analysis of the results revealed positive associations between optimism and behavioural religiosity, and a positive association between optimism and TTT.

The results of study 2b prompted a change of course, resulting in a shift away from inequality as a predictor of religiosity and towards optimism as a possible outcome of religiosity. The third study, presented in chapter 9, was designed to take a more deliberate look at the relationship between TTT and optimism. This study found a significant positive relationship between TTT and optimism, and this association was not explained by social support or religious attendance.

The fourth study presented in chapter 10 of this thesis was a survey experiment designed to look at whether TTT may have a causal relationship with optimism. In this study, participants answered questions on the TTT measure or answered questions taken from the systemising quotient (SQ). After exposure to one of these two measures, participants answered questions to assess their levels of state and trait optimism. The results of this experiment found that participants in the TTT condition had significantly higher levels of state optimism than individuals in the SQ condition, indicating that TTT can increase optimism.

This thesis offers several unique contributions to the scientific study of religion. Firstly, it presents evidence that TTT is at the core of religious and spiritual thinking and that measuring this specific trait may offer more insight into religious cognition than the often-

used measures included in surveys like the ones conducted by Pew, the European Social Survey and the General Social Survey. This thesis also argues that measuring TTT is a good cross-culturally applicable measure of cognitive religiosity that has the potential to offer increased insight into patterns of religious cognition in a range of cultures and belief systems. Finally, this thesis also presents initial evidence that the adaptive value of religion is in its potential to increase levels of optimism among the religious.

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Chapter 1 General Introduction

At conception, the original aim of this thesis was to explore the link between economic inequality and religiosity. As presented in Chapter 3, there is a well-documented positive association between economic inequality and religiosity (Barber, 2011; Barro & McCleary, 2003; Glock & Stark, 1965; Healy & Breen, 2014; Norris & Inglehart, 2004; Stark, 1972; Storm, 2017; Solt et al., 2011). The intention was to explore this link from an evolutionary perspective in the hope of evaluating the likelihood that there exists a causal link between economic inequality and religiosity and that this link is rooted in our evolved psychology. One question was whether economic inequality results in increased religiosity on an individual level, and if so, whether this relationship leads to adaptive outcomes. Further, if individual religiosity does increase as a direct response to economic inequality, is this due to specific adaptations for dealing with inequality? As the project progressed, it became increasingly clear that pursuing these questions would not lead to any new scientific insights. Results of empirical studies conducted for this thesis, designed to explore whether there exists an individual level link between economic inequality and religiosity were not producing interesting results. Furthermore, there is no good evolutionary reason why increased religiosity would be a response to economic inequality specifically. However, religiosity does increase in times of hardship and stress more generally (Stephens et al., 2012). This observation naturally leads to the question of why: If religiosity is a response to stress and hardship more generally, is it an adaptive response? The research detailed in Chapter 6, presented as study 2b, represents the point at which it became clear that looking at individual responses to economic inequality was not going to be fruitful. However, it is also the point at which a link between religiosity and optimism became apparent. This link offered an exciting path forward: while both optimism and religion have been studied through an evolutionary lens, it appears that no previous attempt has been made to integrate evolutionary

explanations of optimism and religion. From there on, the aim of the research presented in this thesis was to explore optimism as an outcome of religiosity. This change in emphasis away from causes of increases in religiosity and towards the outcomes of increased religiosity has resulted in the slightly unorthodox structure of this thesis, with two literature review sections, one presented at the front in Chapters 2 and 3, and one in the middle in Chapters 7 and 8.

One of the contributions this thesis offers is an attempt to identify, define and operationalise a key aspect of religiosity by focusing on what may be at the core of religious and spiritual thinking. While there has been much research into religiosity from various perspectives, there is no unifying definition of religion, nor is there any consensus on how best to operationalise and study religiosity. Indeed, there is debate over whether it is possible to define religion and whether religion can be thought of as an ontological category, or whether religion is better thought of as a collection of phenomena that often co-occur in a variety of different combinations and degrees (Harrison, 2006; Jong, 2015; Schaffalitzky de Muckadell, 2014; Shariff et al., 2011). This debate over whether it is possible to define religion in a meaningful way may go some way to explaining why much of the literature looking into changing levels of religiosity doesn't specify what the researchers or authors mean when they use the term "religion". This difficulty in defining religion is reflected in the variety of ways one could choose to measure religion and various aspects of religiosity. There are hundreds of different inventories available to researchers who wish to study religion, religious beliefs, religious behaviours and/or spirituality (Cutting & Walsh, 2008; Fisher, 2015, Hill & Paragment, 2003). Some researchers simply ask whether participants identify as religious or how important their religion is to them. Others have used multiple questions which ask about attendance at places of worship and prayer frequency. Multiple item

measures often include questions that tap into arguably different aspects of religion; for example, it could be argued that prayer frequency and frequency of attendance at places of worship reflect different aspects of religious behaviour. A further difficulty is caused by the fact that much of the research into religion and spirituality is conducted by western researchers who focus heavily on ideas or concepts relating to monotheistic religions or religious traditions more common to western, educated, industrialised, rich, democratic societies (W.E.I.R.D: Henrich et al., 2010; Wulff, 2019.)

Within this thesis, while every effort has been made to ensure that what is meant by "religion" and "religiosity" is consistent, where this has not been possible, what is meant by religion, religiosity or how religion has been measured by researchers referenced will be clear. The remaining inconsistencies in this thesis are due in part to the inconsistency in the literature and in part to the use of secondary data and commonly used inventories in the early stages of the research conducted for this thesis. In Chapter 5, this thesis attempts to define "religiosity" in a strictly cognitive way which will be referred to as transcendent teleological thinking (TTT). Transcendent teleological thinking is the belief that there exists a universal causal force that is purposeful and intentional. This force may be thought of as being controlled by a sentient being, or it may be conceptualised as a non-sentient force that acts in a way that is similar to a natural force such as gravity, but unlike gravity, does not necessarily adhere to any explicit or discernible laws. Conceptualising religious cognition in this way is very much in the spirit of William James' description of religion as "belief in an unseen order", which is benevolent and teleological (1902/2011). In this thesis, evidence is presented that transcendent teleological thinking can be measured on a novel scale, which was developed during the research completed for this thesis. The benefit of this approach is that transcendent teleological thinking is not specific to Abrahamic religions. It does not limit religiosity to a specific doctrine, does not measure engagement with rituals, nor does it

privilege belief systems that include one or more deities, ancestors or any sentient supernatural being. It is designed to be a measure of a way of thinking and making sense of the world. Thus, measuring transcendent teleological thinking is likely to be an approach that could be used across cultures and belief systems. The cross-cultural applicability of existing measures in religion research is an important problem to solve if researchers wish to investigate religion from an evolutionary perspective. If one wishes to make the argument that any aspect or aspects of religion are the product of a species-typical biological adaptation, then one must also provide good evidence that the feature in question is potentially observable in all human cultures (Buss, 2008; Cosmides & Tooby, 1997).

Developing a measure that specifically homes in on the core of religious cognition and spirituality in a way that is not bound to one culture or tradition is an important step in studying religion from an adaptationist perspective. By being specific and identifying the exact trait of interest, it ought to be easier to look for the presence of this trait in a variety of cultures and settings. Furthermore, by being precise in the trait we are describing, we can assess whether this specific trait reliably performs one specific function under predictable conditions. In short, we can look more closely at whether this trait has the appearance of "special design" (Williams, 1966). Furthermore, by focusing on the core of religiosity and spirituality and looking at transcendent teleological thinking, it is possible to look beyond superficial differences in how religiosity is expressed. To draw on language as an analogy, while culture may determine whether a person speaks in English or in French, the adaptation for language is still a species-typical trait; English and French are just two of the myriad ways this adaptation expresses itself. It could be the same with transcendent teleological thinking; while culture may determine whether one is Christian or Buddhist, Christianity and Buddhism may be just two of the many possible ways transcendent teleological thinking can express itself.

When studying human cognition from an evolutionary perspective, we ought to be diligent in our evaluations. It is important that we do not make the mistake George Williams (1966) outlines in Adaptation and Natural Selection, where he observes that "in many published discussions it is not clear whether the author regards a particular effect as the specific function of the causal mechanism or merely as an incidental consequence" (p. 8). We should heed his warning that "one should never imply that an effect is a function unless he can show that it is produced by design and not by happenstance. The mere fact of the effect being beneficial from one or another point of view should not be taken as evidence of adaptation" (p 261). We should also bear in mind Tinbergen's four questions (1963) and seek to explain the causation, development, function, and evolution of any trait we believe may be an adaptation. It is beyond the scope of this thesis to evaluate the causation, development, function and evolution of transcendent teleological thinking. However, a full evolutionary account of religion, especially an account that wishes to argue that religion, or any aspect of religious cognition or behaviour, is caused by an adaptation must be able to demonstrate that the feature in question reliably manifests in response to specific input, that it has a predictable pattern of development which is consistent across individuals and cultures, that under normal functioning it reliably elicits the same benefit, and that this benefit enhanced the survival or reproduction of individuals who displayed the feature ancestrally.

While this thesis does not seek to answer all of these questions, it does present evidence that transcendent teleological thinking is an adaptation that functions to boost optimism, and that engagement in transcendent teleological thinking increases under conditions of hardship (i.e., when optimism is most needed).

The structure of the remainder of this thesis is as follows:

Chapter 2 starts with a brief overview of the philosophical challenges of defining the term "religion". It also presents and reviews literature on popular evolutionary explanations

of religion. These include arguments that propose religion is a byproduct of adaptations for social cognition, and arguments that propose that aspects of religion are the direct result of adaptations.

Chapter 3 presents literature and research investigating the link between economic variance and religiosity. Several theories which seek to explain and predict how economic variants influence population-level variation in religious engagement are presented, and the evidence for each is discussed.

Chapter 4 is the first empirical chapter. This chapter details an original study conducted using data from two waves of the Religious Landscape Survey conducted by the Pew Institute. These data are used to explore the relationship between individual and group levels of wealth, economic inequality, and religiosity in the USA.

In Chapter 5, problems with operationalising religion, religiosity and spirituality are discussed. An alternative to regularly used measures of religiosity is presented and tested. This alternative measure, transcendent teleological thinking, was developed as part of the research for this thesis.

Chapter 6 is another empirical chapter. This chapter expands on the findings of Chapter 4 and explores possible individual-level psychological explanations for the reported link between economic hardship and religiosity. The results presented in Chapter 6 did not show particularly strong evidence of a direct link between economic inequality or financial deprivation and religion. However, a link between optimism and religiosity was found.

Chapter 7 presents and reviews literature exploring research looking at the psychological importance of optimism and discusses several different ways in which optimism can be conceptualised and measured. This chapter also reviews literature that looks at optimism from an evolutionary perspective and presents existing evidence that optimism is

a species-typical human trait. Evidence that optimism is somewhat malleable and that more optimistic individuals appear to have adaptive advantages is also presented and discussed.

Chapter 8 discusses research exploring the link between religion and optimism. Evidence from longitudinal, cross-sectional and meta-analytic studies is reviewed. This chapter looks at research exploring the link between religion and optimism and assesses the evidence that religious engagement is associated with higher levels of optimism across cultures.

Chapter 9 is an empirical chapter reporting the results of a survey explicitly designed to explore the link between optimism and transcendent teleological thinking, using participants from the USA. This study allowed for a close and deliberate look at the separate associations between religious attendance, social support, engagement with transcendent teleological thinking and optimism.

Chapter 10 is an initial attempt to test, using experimental methods, whether a causal relationship exists between transcendent teleological thinking and optimism. In this survey experiment, U.S. participants were presented with a measure of either transcendent teleological thinking or the systemizing quotient before answering optimism measures. Levels of optimism among participants in the transcendent teleological thinking condition were compared to those of participants in the systemising quotient condition.

Chapter 11 is the general discussion, in which the findings of the research conducted for this thesis will be brought together and discussed. There will also be a discussion of how the findings of this thesis relate to previous research, and suggestions for future directions will be presented.

Chapter 2 : The Scientific Study of Religion

Defining Religion

Most recorded societies appear to have what one would recognise as religion (Gervais, 2013; Lindenfors & Svensson, 2021; Norenzayan et al., 2012; Sterelny, 2018; Tuasela, 2018). However, while there is no shortage of "religions" or research into "religion", there is no single unifying definition of religion on which scholars agree (Harrison, 2006; Jong, 2015 Schaffalitzky de Muckadell, 2014; Shariff et al., 2011; Sosis, 2009). Religion is a vague and multifaceted concept and while it appears easy to intuitively distinguish religious activities and institutions from secular ones, providing a definition that describes religion effectively, inclusively, and simply is no easy task (Harrison, 2006; Schaffalitzky de Muckadell, 2014). A definition of religion should ideally highlight what separates the religious from the secular by identifying what is common to all religions while also being exclusive to religions (Harrison, 2006). This is a task which some scholars suggest is impossible (Harrison, 2006; Jong, 2015; Schaffalitzky de Muckadell, 2014). Existing definitions which seek to describe religion tend to come up against one of two problems which Jong (2015) refers to as the Buddhism problem and the Football problem. The Buddhism problem describes a situation where a given definition of religion is so narrow that it would not include Buddhism as a religion, due to Buddhism typically not including supernatural beings. Conversely, the Football problem is where given definitions of religion are so broad that they would include activities, belief systems or institutions which are ostensibly secular – such as football, political ideologies, or social clubs – as religions, because they can often fulfil the same social and psychological functions as religions (Jong, 2015).

Definitions of religion, by and large, can be categorised as one of three types: substantive definitions, functional definitions, and phenomenological definitions. However,

there is some debate over whether phenomenological definitions are a subclass of substantive definitions (Schaffalitzky de Muckadell, 2014). Substantive definitions focus on the content of religious beliefs, such as belief in supernatural agents (Harrison, 2006; Jong, 2015; Schaffalitzky de Muckadell, 2014). One example of a substantive definition of religion is the definition offered by Martineau (1805-1900, cited in Harrison, 2006), which states, "Religion is the belief in an ever-living God". This definition falls foul of the Buddhism problem (Jong, 2015), as it excludes any religion which has no god from the category of "Religion" (Harrison, 2006).

Functional definitions focus on the social or psychological functions that religion performs. One example of a functional definition of religion put forward by Yandell (1999, cited in Harrison 2006) states, "A religion is a conceptual system that provides an interpretation of the world and the place of human beings in it, bases an account of how life should be lived given that interpretation and expresses this interpretation and lifestyle on a set of rituals, institutions and practices". However, this definition, and many other functional definitions, falls foul of the Football Problem, as anything which fulfils the stated function of religion could, by definition, count as a religion. Indeed, one criticism of the above-quoted definition offered by Yandell is that it could easily be applied to Maoism (Harrison, 2006).

The third main category of definition of religion is phenomenological definitions which highlight emotional experiences or states as central to religion. One such definition is that put forward by Schleiermacher (1928), which states "the essence of religion consists in the feeling of absolute dependence" (cited in Harrison, 2006). However, this definition, and many other phenomenological definitions, fall foul of both the Buddhism problem and the Football problem.

It has been argued that "religion" cannot be thought of as an ontological category (Schaffalitzky de Muckadell, 2014) and instead should be considered as a folk category

(Jong, 2015). While the idea of considering religion to be a "folk category" may sound like a call to abandon the effort to define, study and understand religion, this is not necessarily the case. Instead, a different solution to the scientific study of religion would be to approach religion not as a single phenomenon with one defining essential trait but as a set of separate traits that commonly present together in various combinations (Jong, 2015; Shariff et al., 2011). Research into the cognitive science of religion often appears to implicitly endorse this approach and tends to break "religion" down into its constituent parts (Jong, 2015; Lindenfors & Svensson, 2021). By doing so, researchers who focus on the cognitive science of religion can offer distinct hypotheses about individual features that may be common to many but not all religions, and features that present in both religious and secular institutions, activities, or behaviours. This approach requires that researchers accept that explanations offered for the features of interest will not be exclusive to religion (Jong, 2015).

With this in mind, it seems practical to separate out and give different definitions for what will be referred to in the rest of this chapter as "cognitive religiosity" and "behavioural religiosity". Henceforth, cognitive religiosity refers to the belief in supernatural or spiritual entities or forces that are not "natural" but can influence the natural world. Behavioural religiosity refers to engagement with rituals, institutions and practices which appear to be related to supernatural beliefs but serve no clear, practical function.

Evolution and Religion

From an evolutionary perspective, behavioural religiosity and cognitive religiosity present quite the challenge. Engaging in behavioural religiosity and rituals can be quite costly (Irons, 2001; Sosis & Bressler, 2003; Sosis, 2009). Time spent engaging in rituals could be spent on endeavours that directly impact Darwinian fitness, such as hunting, foraging, farming, attracting mates or tending to kin. However, it is not just time and opportunity costs

that humans face when engaging in religious behaviour. Some religions encourage the religious to engage in behaviour that could be considered actively harmful, such as long periods of fasting, going on long, dangerous pilgrimages or body modification rituals which could lead to infections or death (Alcorta & Sosis, 2005; Atran & Henrich, 2010; Bulbulia, 2007; Lindenfors & Svensson, 2021; Pyysiainen & Hauser, 2010; Sterelny, 2018). In some instances, religious leaders are expected to totally abstain from sex, which from an evolutionary perspective is a very high cost indeed. The high costs of religious engagement have led evolutionarily minded researchers to question how something so potentially harmful has become a persistent and ubiquitous feature of human culture (Alcorta & Sosis, 2005; Shariff et al., 2011; Sosis, 2009; Sterelny, 2018).

This is not a straightforward question. A complete evolutionary account of any aspect of religion needs to tackle several separate but interlinked problems. Firstly, engaging in rituals connected to religious beliefs is often a highly costly behaviour (Alcorta & Sosis, 2005; Bulbulia & Sosis, 2011; Shariff et al., 2011; Sterelny, 2018). Behaviours which carry a high cost to individual genetic fitness are unlikely to persist unless the cost of the behaviour is less than its benefits to individual-level genetic fitness. Highly costly behaviour, in theory, ought to be selected against if the costs to an individual's genetic fitness outweigh the fitness benefits (Bulbulia, 2007; Dawkins, 1976/2006; Williams, 1966/1992). The ubiquity of religious behaviour, taken together with its high costs, indicates that there may be real fitness benefits to engaging in religious behaviour (Bulbulia & Sosis, 2011; Johnson, 2009). This raises the questions of whether there are indeed benefits to engaging in religious behaviour, and if so, what these benefits are.

Identifying the benefits of religious behaviour and/or cognition may give clues as to how religions evolved. However, behaviours and traits which have adaptive benefits are not

necessarily the direct results of adaptations. The ability to use written language is an excellent illustration of this problem. The ability to read and write brings a myriad of advantages, such as keeping records and passing on knowledge. The written word allows humans to develop cumulative knowledge which can be transmitted across generations and cultures with high fidelity. The ability to use the written word has led to entire industries based on reading and writing, such as academia, and fields devoted to creating and disseminating fiction and non-fiction literature. The ability to read and write is highly beneficial to individuals, as, in most industrialised societies, these skills are essential for most jobs. Further, with the modern advent of online dating, literacy skills can directly influence one's ability to attract a mate (Brand et al., 2012). However, despite the adaptive advantages that one gains by being able to read and write, reading and writing are unlikely to be adaptations. While most children acquire spoken language organically and their skills in using spoken language develop in a predictable way, the ability to read and write must be actively taught (Bjorklund & Pellegrini, 2000). Furthermore, written language appears to have been invented independently in several different cultures relatively recently in evolutionary terms; by Sumerians around 3000BC, by Mexican Indians around 600BC, and by Chinese around 1300BC (Diamond, 1998, cited in Mesoudi et al., 2004; Gross, 2012). The relatively recent invention of written language and the difficulty individuals show in acquiring literacy skills indicates that the ability to read and write are not biological adaptations, but instead are more likely to be byproducts of adaptations (Bjorklund & Pellegrini, 2000; Cosmides & Tooby, 2007; Heyes, 2012). Researchers face a similar problem with religious behaviour; evidence of adaptive benefits is not necessarily evidence of an adaptation. As George Williams argues, we should not consider a feature an adaptation unless there is clear evidence that the feature is not just the result of a happy accident but shows evidence of "special design" to perform a specific function (Williams, 1966).

While Williams focuses on biological adaptations (i.e. genetically encoded, species-typical traits), when studying human behaviour from an evolutionary perspective, biological evolution is not the only proposed mechanism of adaptive change (Creanza et al., 2017; Henrich & McElreath, 2003, 2007; Richerson & Boyd, 1978). The study of cumulative cultural evolution also holds great explanatory power for human behaviour. Cumulative cultural evolution posits that group-level traditions, beliefs and behaviours arise and evolve through the non-genetic transmission of information. For cumulative cultural evolution to affect change, first, a behaviour change arises through asocial learning, such as associative learning, creativity or problem-solving. Then, the novel behaviour may be transmitted to other individuals through social learning (Creanza et al., 2017; Henrich & McElreath, 2003, 2007; Shariff et al., 2011). If the new behaviour endows those exhibiting it with fitness advantage through improvement in behaviours relevant to survival or reproduction, such as mating or foraging, this behaviour will likely spread through the group as more individuals learn and adopt the improved strategy. As this process repeats, innovations are refined, improved on, and proliferate (Henrich & McElreath, 2007; Mesoudi & Thornton, 2018).

Cumulative cultural evolution is the proposed mechanism through which cultural adaptations develop. Cultural adaptations improve survival in the local environment in which they develop, for example, taboos around what food pregnant and lactating women are allowed to consume in Fiji encourage women to avoid potentially toxic marine animals and reduce the risk of fish poisoning by between 30 to 60% (Henrich & Henrich, 2010). Thus, these culturally specific food taboos increase the adaptive fitness of the individuals living in that culture and environment. It is suggested that cultural evolution can lead to change more rapidly than genetic evolution, as new "behavioural mutations" can pass horizontally to conspecifics as well as vertically to offspring, while genetic mutations can only be passed

from parent to offspring. Cultural evolution can lead to the development of highly complex behaviours (Birch & Heyes, 2021; Boyd & Richerson, 1996; Henrich & McElreath, 2007). Cultural adaptations are not independent of biological adaptations and often build upon the foundations laid by biological evolution (Henrich & McElreath, 2007). If we revisit language as an example, the ability to learn how to use written language is only possible due to biologically evolved adaptations such as the ability to use symbols, development of shared attention, and theory of mind, among others. Furthermore, cumulative cultural evolution can result in behaviours that fulfil the same function in different contexts but appear at first glance to be very different; French and Japanese sound different and, when written, use different symbols, but they are both just language expressed differently but fulfilling the same function.

Benefits of Religion

As noted above, when looking at whether human traits may be adaptations, one needs to consider whether there is evidence that the trait endows the individual possessing the trait with adaptive benefits. However, when studying human psychology and behaviour from an evolutionary perspective, it is important to consider the traits in the context of the environment of evolutionary adaptation and consider whether the trait in question would have been of adaptive benefit to ancestral humans (Cosmides & Tooby, 2007; Tooby & Cosmides, 1990). While some adaptations continue to be beneficial in modern environments, language again being an example, some traits which were of great benefit to ancestral humans can be harmful in modern environments. For example, humans have evolved a strong drive for foods which are high in protein, sugars, and fats. In ancestral environments strong desires for foods high in protein, sugars and fats likely provided the motivation needed to obtain calorically dense but scarce foods. In modern environments, where calorically dense food can be

obtained with relative ease, this drive for high sugar and high fat foods results in high levels of obesity and a myriad of physical health problems. Thus, an adaptation which throughout evolutionary history conveyed a survival benefit, in modern affluent cultures is not only non-beneficial, but potentially harmful (De Ridder &Van Den Bos, 2006; Lieberman, 2006; Ostan et al., 2010; Ramirez, 1990; Wiss et al., 2018).

While it is more important to consider whether a trait has been beneficial to ancestral humans, looking at whether traits are beneficial in modern day environments can still be illuminating, and there is evidence that religion is associated with a variety of physical and mental health benefits to individuals in modern environments. However, these findings frequently indicate that it is not religious cognition, but instead religious attendance, which is associated with improvements to health.

In a review of studies focusing on the link between religion, spirituality and physical health, Powell et al. (2003) identified 11 longitudinal studies, with a collective sample in excess of 52,000 participants, which investigated the relationship between church or service attendance and physical health. Of those eleven studies, only two focused on clinical populations. Of the nine studies focusing on healthy populations, seven reported lower mortality rates among individuals who regularly attended church or religious services. This relationship was significant even when socioeconomic, demographic and health-related confounds were controlled for. After further controlling for healthy lifestyle, social support, and depression, six of the studies continued to show a significant reduction in mortality rate among individuals who regularly attended church or religious services. The reduction in mortality reported in regular attenders was, on average, 30%. Further, there even appeared to be a dose-response relationship, with higher attendance predicting greater reductions in mortality, even when other religious measures, such as frequency of private prayer, were

controlled for. Similarly, Sullivan (2010) conducted a longitudinal study of a representative sample of 18,129 adults over 50 years of age to study the relationship between religious variables and health. Using data from the health retirement study, Sullivan (1950) found that religiously affiliated individuals had an average life expectancy six years longer than individuals who reported no religious affiliation.

Schnall et al. (2011) conducted a cross-sectional study on 92,539 post-menopausal women. They found that women who reported attending weekly religious services in the month leading up to the study were less likely to report depressive symptoms and more likely to be optimistic. Women who had been attending religious services also reported higher overall and positive social support and were less likely to report experiencing social strain. Further evidence that religious engagement is associated with health benefits comes from McCullough et al. (2000), who conducted a meta-analysis of 42 studies that included 125,826 participants in total. Again, there was a significant reduction in all-cause mortality even when 15 known confounding variables were controlled for. In addition, McCullough et al. (2000) found that measures of public participation in religious activities had a stronger relationship with reduced mortality than any other religious measure.

A study conducted by Kim et al. (2014) utilised the General Social Survey – National Death Index (GSS-NDI) dataset to explore the relationship between religious measures and mortality. The general social survey is a large cross-national survey that interviews a representative sample of adult U.S residents. The GSS-NDI dataset is comprised of data from the General Social Survey from 1978-2002 and death certificates from 1979-2008. A probabilistic matching algorithm is used to match participant-provided information from the General Social Survey to information provided on death certificates. As not all waves of the GSS included the same suite of questions, Kim et al. had usable data from a total of 32,583

individuals from an original pool of 32,830. They found that religious attendance was associated with a reduction in all-cause mortality. However, it was also found that the benefits of religious attendance varied considerably by religious affiliation, with Jewish and Catholic individuals appearing to have the lowest mortality rates. In contrast, Black Protestants and Evangelical Protestants had similar mortality rates as the non-religiously affiliated.

The large number of studies reporting that it is the social support one gains through attendance at religious services, and not necessarily more cognitive aspects of religious engagement such as belief in God or belief in an afterlife, implies that the reported health benefit of religion is not unique to religion. Although samples of individuals who identify as religious are often compared to non-religious individuals, it has been argued by Galen (2015) that not all non-religion is the same and that secular pursuits could also provide individuals with benefits comparable to religious engagement. Galen also argues that when religious individuals who show high levels of participation in religious group activities are compared to non-religious individuals who show high engagement in secular group activities, religious individuals no longer appear to have a notable health advantage over the non-religious. Galen argues that this is evidence that religion has no special effect on health and suggests "it is beneficial to have a coherent world view and to engage in regular, meaningful interactions with others who share this view in a supportive environment that allows for prosocial engagement with the broader community". Religious groups, Galen argues, simply provide an opportunity for individuals to have these sorts of interactions. Evidence that individuals can benefit from social interaction with like-minded others in a secular setting is provided by Price and Launay (2018). They conducted a longitudinal study on members of the Sunday Assembly, an international secular organisation that holds regular church-like services on

Sundays. The study found that although attendance at the Sunday Assembly did not appear to improve well-being over the course of the study, individuals reported that attending Sunday Assembly facilitated the establishment of close relationships. They also found that participation in small group activities (such as crafting and beer-tasting groups) with other individuals from Sunday Assembly significantly predicted well-being.

Taken together, the evidence reviewed above suggests that the often-reported health benefits of religion are not unique to religion and that it is the social support that religion provides, as opposed to any aspect of religious cognition, that explains the positive relationship between religiosity and health. While this research is interesting, it leaves us no closer to understanding how or why religious cognition and behaviour has become a ubiquitous feature of human society. Indeed, arguably these findings make the persistence of religion more mysterious, as they raise the question: if the benefits of religion can be gained in a less costly way, such as through secular communities which are less likely to demand costly displays of commitment, why has religion persisted and not been out-competed by behaviours that provide the same individual-level benefits but with lower costs?

Another line of enquiry that may shed light on the origins and potential functions of religiosity is looking at large-scale patterns of religious cognition and behaviour. By identifying population-level patterns of cognitive and behavioural religious engagement, and the conditions under which they most commonly manifest, we may find clues as to the function(s) of religious behaviour and cognition, if indeed there are any. Similarly, individual-level investigations of the conditions under which behavioural or cognitive religiosity are likely to increase may also give us insight into what problems of survival or reproduction religious behaviour and cognition may solve, if any. One category of variables that do appear to impact population levels of religious engagement are economic variables.

The focus of Chapter 3, therefore, will be the relationship between economic variables and religious engagement.

Detailed accounts of the benefits of religion and the conditions under which religion is likely to become more commonplace may still fail to answer the question of whether religious cognition or religious behaviour can be considered a biological adaptation or a by-product of adaptations. Whether religious behaviour and cognition are caused by adaptations for religion at the individual or group level or caused by by-products of adaptations for social functioning is an ongoing debate, with compelling evidence presented for each stance. There is also the question of whether religion propagates through biological evolution, cultural evolution, or a combination of the two; this is also an open question in religion research (Schloss & Murray, 2011; Sosis, 2009; Sterelny, 2018).

Evolutionary Explanations for Religion

Evolutionary accounts for the origin of religion tend to fall into one of two categories; these are byproduct explanations (Atran, 2005; Barrett, 2000; Boyer, 1992; Guthrie, 1993) and adaptationist explanations (Bulbulia, 2008; Johnson, 2011; Johnson & Bering, 2006; Johnson & Kruger, 2004; Norenzayan & Shariff, 2008 Byproduct accounts argue that the belief in supernatural agents should be seen not as an adaptation, even if it can result in adaptive benefits, but instead as an inevitable, or at least highly probable, byproduct of a mind keenly adapted for social living (Atran, 2002; Barrett, 2000, 2004; Boyer, 1992, 2001; Boyer & Ramble, 2001; Lindenfors & Svensson, 2021; Pyysiainen & Hauser, 2010; Sosis, 2009) As well as human development index scores. Broadly, byproduct explanations of religion focus predominantly on cognitive religiosity, in that they present explanations for widespread belief in supernatural agents but often fail to provide persuasive explanations for behavioural religiosity or for the presence or development of religious rituals (Atran, 2005;

Barrett, 2000; Boyer, 1992; Guthrie, 1993). One notable exception is the work of Boyer and Liénard (2006), which proposes that religious ritual is a byproduct of a hazard precaution system, which proposes that rituals are a reaction to inferred threats to fitness. Boyer and Liénard propose that engagement in rituals may reduce anxiety in individuals, by swamping their working memory and distracting them from the inferred threat.

There are several separate but overlapping adaptations for social cognition which are often invoked when explanations for supernatural beliefs are offered. These are hyperactive agency detection device (HADD: Barrett, 2000), theory of mind (ToM: Baron-Cohen, 1995), existential theory of mind (EToM: Bering, 2002) and teleological thinking (Kelemen et al., 2013). These will be discussed in detail below. While byproduct explanations give highly plausible and well-supported accounts of how the cognitive architecture allowing for religious thought may have originated, many fail to account for how or why religion has persisted despite the potentially high costs of religious behaviour (Johnson, 2009). If religious behaviour is the result of non-functional byproducts of adaptations, one would expect that the forces of natural selection would have fine-tuned these adaptations, reducing the costs of the non-functional byproducts (Dawkins, 1976/2006; Williams, 1966/1992). However, natural selection has not weeded out religious behaviour, which suggests that throughout human evolutionary history, religious engagement has resulted in benefits equal to or greater than the costs of engagement (Bulbulia, 2007; Johnson, 2009). Byproduct explanations appear to hinge on the notion that the costs of religious behaviour have been evolutionarily negligible, that is, too low to have become a target for natural selection. Yet, as noted before, in some instances, religion comes with very high costs indeed (Alcorta & Sosis, 2005; Johnson, 2009; Shariff et al., 2011; Sterelny, 2018).

Adaptationist explanations often position religion as either an individual-level (Johnson & Bering, 2011; Johnson & Kruger, 2004) or group-level adaptation for cooperation (Henrich, 2009; Norenzayan, 2013; Norenzayan et al., 2014). Adaptationist accounts of religion are to some extent compatible with byproduct explanations of the origin of religious cognition, which suggest that religious cognition did emerge originally as byproducts of adaptations for social cognition (Atran & Henrich, 2010; Pyysiainen & Hauser, 2010; Schloss & Murray, 2011). However, adaptationist explanations argue that these byproducts for social cognition had adaptive outcomes of their own. In other words, even if religious thinking originated as the byproduct of adaptations for social cognition, it ultimately led to the production of novel adaptive benefits related to cooperation, thus becoming a target for natural selection (Atran & Henrich, 2010; Henrich, 2009; Johnson & Bering, 2011; Johnson & Kruger, 2004; Norenzayan, 2013; Norenzayan et al., 2014; Pyysiainen & Hauser, 2010; Schloss & Murray, 2011). Unlike byproduct explanations that focus only on cognitive religiosity, some adaptationist explanations offer explanations for cognitive religiosity and some aspects of behavioural religiosity, like engagement in rituals. For example, some adaptationist accounts of religious behaviour invoke costly signalling theory, suggesting that engagement with rituals associated with supernatural beliefs may act as costly signals, providing reliable evidence that individuals engaged in such rituals genuinely hold supernatural beliefs, (Soler, 2012; Sosis & Bressler, 2003). It is argued that signalling evidence of genuinely held beliefs can lead to social benefits for the signaller. If the beliefs one is signalling are in line with the beliefs held by a specific group or community, this may be taken as evidence of group commitment and cooperative intent on the part of the signaller, indicating to receivers that the signaller is a good cooperative partner (Murray & Moore, 2009). Alternatively, engagement with religion may signal belief in moralising “big gods” and belief in supernatural punishment. Individuals who believe in supernatural punishment

may be considered as more trustworthy and less likely to defect than non-religious individuals, and therefore considered to be a trustworthy partner in trade or in one-shot cooperative transactions (Norenzayan, 2013)

While evolutionary accounts can be subdivided into byproduct and adaptationist explanations, it seems logical to approach prominent evolutionary accounts of religion by further subdividing these accounts into explanations that are more applicable to cognitive religiosity and those that are most applicable to behavioural religiosity. A summary of the evolutionary explanations offered for religion is presented at the end of this chapter in **Error! Reference source not found.**.

Cognitive Religiosity Byproduct Accounts

Hyperactive Agency Detection

It has been argued that religious beliefs and experiences result from a tendency in humans to overgeneralise agency (Guthrie, 1993). It has been suggested that we are hypersensitive to agency and will quite readily attribute agency to ambiguous stimuli, leading us to attribute agency inappropriately. It is hypothesised that the over attribution of agency has proliferated among humans through biological evolution as, when it comes to detecting agents in the environment, false positives are less costly than false negatives, especially because failure to detect another living being in the environment could result in death if the other agent is hostile. This cost asymmetry could have resulted in an evolved cognitive mechanism, which has been named the hyperactive agency detection device (HADD; Barrett,

2000). HADD causes us not only to detect agency in ambient noises and movements, but also to anthropomorphise non-human animals and inanimate objects.

One criticism of the HADD theory, put forward by Sterelny (2018), is that it implies that our hominid ancestors were timid and skittish creatures in a state of constant vigilance, which Sterelny argues is not a description befitting the intelligent apex predators our recent hominid ancestors likely were. However, awareness does not necessarily mean fear, and one could argue that ancestral humans likely needed to be aware of all sorts of agents in their surroundings, including prey, potential predators, and potentially hostile conspecifics.

Another criticism of HADD is that mistakes regarding agency can be easily corrected. HADD may explain why we mistakenly see agency where none is present, but not how or why these mistakes are attributed to a supernatural agent, why these mistakes aren't corrected, or how these mistakes can lead to complex systems of belief and elaborate rituals. Furthermore, as has been noted, humans do not just readily attribute ambiguous evidence to natural agents, they also often attribute events to supernatural agents, and HADD does not fully account for this (Willard, 2019). Such criticisms need not render HADD irrelevant to the story of the evolution of religion, as HADD could potentially identify one cognitive adaptation which allows for religion to exist. However, HADD fails to comprehensively explain the existence and persistence of beliefs in supernatural agency, cognitive or behavioural religiosity.

As well as criticisms regarding the role HADD may or may not have in the forming of supernatural beliefs, the very existence of HADD has been called into question. While the argument that HADD exists makes intuitive sense and fits well with the literature on error management theory (Haselton & Buss, 2000), direct evidence for a HADD is lacking. Experiments designed to test hypotheses generated on the assumption that HADD exists, and

is an error management adaptation which detects agents in noisy or ambiguous signals, often garner null results (Andersen, 2017). There is mounting evidence that the hypothesis that beliefs in supernatural agents are a result of HADD has the causal relationship between beliefs and agency detection backwards. In other words, there is good evidence that people who believe in supernatural agents interpret ambiguous stimuli as evidence of agents because of their prior beliefs; hyperactive agency detection doesn't cause supernatural beliefs, rather, supernatural beliefs predispose individuals to detect agents. If it is the case that prior beliefs cause agency detection, then HADD holds no explanatory power regarding the origin of supernatural and religious beliefs (Maij et al, 2017; Willard et al. 2022).

Teleological Thinking

Teleological thinking describes a sort of reasoning wherein the consequence of an event or function of an item is sighted as its purpose or cause (Kundert & Edman, 2017). An example of such reasoning would be the statement a "chair is for sitting on" (Roberts et al., 2020). However, the statement that "a chair is for sitting on" is only true if a designer created the chair with this specific function in mind (Roberts et al., 2020). Teleological thinking is often an appropriate way to make sense of the world, and an accurate way of explaining the existence of artefacts such as chairs or toasters, or accounting for the actions of agents (Banerjee & Bloom, 2014). However, the application of teleological thinking beyond artefacts and agent, but to the natural world and the existence of life could be considered largely inappropriate. For example, stating that "clouds rain so that plants can grow" (Roberts et al., 2020) would be an inappropriate application of teleological reasoning. The consequences of an event or the utility of an object cannot be the causal force of the event or the explanation of an object's existence unless an intentional agent orchestrated the event or created the object. The inappropriate attribution of events such as earthquakes, rain, or natural

systems, to, for example “the universe” or “mother nature”, which should not be considered purposeful, is common and has been recorded in diverse cultures (Diesendruck & Haber, 2009; Kundert & Edman, 2017; Rottman et al., 2017).

It seems that teleological thinking occurs easily and spontaneously in young children. Children seem to reliably prefer teleological explanations for natural objects and phenomena and will spontaneously generate teleological explanations (DiYanni & Kelemen, 2005). In a forced-choice experiment conducted by Kelemen (1999), preschool children were presented with images of natural objects, living organisms, and artefacts. They were then presented with two statements about each item, one suggesting that the item existed for a purpose (a teleological explanation) and an alternative non-teleological explanation. The children were then asked to indicate which statement they agreed with. Kelemen found that 77% of the children’s responses favoured teleological explanations for organisms, 73% of the responses endorsed teleological explanations for natural objects, and 83% of the responses favoured teleological explanations for artefacts. This evidence, along with the finding that people with Alzheimer’s disease regress back to teleological thinking (Kelemen et al., 2013), suggest that teleological thinking is intuitive and that making a move from inappropriate teleological thinking to a more logical approach is learned and takes conscious cognitive resources. Moreover, this finding in Alzheimer’s patients suggests that teleological explanations are not revised or removed but instead are actively inhibited (Kelemen et al., 2013; Lombrozo et al., 2007).

In a study designed specifically to test the hypothesis that teleological explanations exist as the intuitive default, Kelemen et al. (2012) recruited professional physical scientists from prestigious American universities. These individuals were chosen as physical scientists are well-practised in rejecting teleological explanations in favour of causal, mechanistic

explanations. The scientists generally accepted false teleological explanations at a lower rate than college undergraduates and members of the local community. However, when put under time pressure, the scientists accepted inaccurate teleological explanations at twice the rate that they did when presented with the same information but without being subjected to time constraints. This provides further evidence that there is an innate cognitive bias towards teleological explanations, and that such explanations can be consciously rejected but nevertheless re-emerge under pressure.

Given the tendency of religious explanations to evoke unseen sources of agency, one might expect there to be a positive relationship between religiosity and teleological thinking. There is some evidence to support this expectation. In an experiment with no enforced time constraint, Diesendruck and Haber (2009) found that orthodox Israeli Jewish children were more likely to give teleological explanations for human and animal categories than secular Israeli Jewish children. This finding suggests that religion, or being raised in a religious environment, could enhance a tendency towards teleological explanations. On the other hand, under conditions of greater time pressure, religiosity-related differences in teleological thinking seem more difficult to detect. Rottman et al. (2017), for instance, found that when under time pressure, Chinese adults were as prone to endorse teleological explanations for natural phenomena as western adults, despite considerable cultural differences including China's history of state-enforced atheism. This finding suggests that teleological thinking is not just a consequence of Judeo-Christian or Western philosophical tradition, but is instead a reliably occurring human trait, regardless of culture.

Further evidence that teleological thinking may be a general cognitive bias which is present in most individuals, but higher among individuals who believe in god, comes from Banerjee and Bloom (2014). Banerjee and Bloom investigated the relationship between god

beliefs and teleological reasoning, using a survey design. Participants were asked to indicate the extent to which they agreed with the statement “I believe in god” and answer questions designed to assess beliefs about fate and engagement with teleological thinking. It was found that individuals who believed in god expressed higher levels of belief in fate than individuals who did not believe in god. This difference was statistically significant, however, among those who did not believe in god 54.3% indicated some degree of belief in fate. Banerjee and Bloom also looked at the nature of fate beliefs among individuals who believed in god and believed in fate, compared to the nature of fate beliefs in individuals who did not believe in god but did believe in fate. It was found that individuals who believed in fate and god believed that fate was determined by god, whereas individuals who did not believe in god but did believe in fate, considered fate to be an agentic force in the universe. To assess levels of teleological reasoning about life events, participants were asked to indicate on Likert scales the extent to which they saw signs in life events, the extent to which they believed that “everything works out for the best in the end” and the extent to which they believed there is “order in the universe”. Across all three measures, individuals who believed in god had significantly higher levels of agreement with the above listed statements than individuals who did not believe in god. However, while individuals who did not believe in god showed significantly less agreement with the above statements, individuals who did not believe in god did on average show some agreement with the above statements. These findings appear to illustrate that individuals who believe in god are more likely to believe in fate, see fate as being the will of a conscious agent and agree with teleological statements regarding the universe and life events. However, it also illustrates that teleological reasoning and fate beliefs are not absent among individuals who do not believe in god. This could be interpreted as evidence that teleological reasoning in indeed present in most people, as one would expect

if it were a general cognitive bias, but teleological reasoning is more marked among individuals who believe in god.

Existential Theory of Mind

The existential theory of mind (Bering, 2002) suggests that our tendency to see causality and implicit agency is not due to teleological thinking writ large but is born out of an over-application of theory of mind (ToM). ToM is the ability to attribute mental states to other beings (Premack & Woodruff, 1978). This ability is proposed to be an important development in human evolution and is thought to be essential in the development of other human attributes crucial to the development of culture, such as the abilities to imitate, teach, and use language (Bering, 2002). ToM systems allow humans to make inferences about the causes of people's actions. This ability to explain other people's actions may arise through the development and application of a sophisticated set of rules governed by a "behavioural grammar", or by reflecting on one's own experiences and internal life and projecting it on to others to form ideas of what the other agent's mental state might be (Carrington & Bailey, 2009; Mitchell, 2009). Through this ability to make inferences about mental states, humans are not only able to make inferences about the causes of another's actions, but also to make predictions about how others may react in novel situations, through imagining one's own response to hypothetical situations (Mitchell, 2009).

Existential theory of mind (EToM; Bering, 2002) posits that our ability to perceive the minds of others is developed to the point that we perceive minds where there are none and project ToM onto the universe at large. This explanation is similar to the explanation that belief in supernatural forces is a byproduct of teleological thinking and the human tendency to see purpose where there is none; however, EToM suggests it is not just purpose humans see, but purposeful minds. Further, while teleological thinking is used to make sense of

objects or events through explaining their purpose, which implies the presence of a mind, EToM attempts to explain what has happened and predict what may happen in terms of intentionality, which more explicitly refers to the presence of a conscious mind.

Evidence that religious cognition is related to ToM comes from the finding that beliefs about god appear to recruit the same brain areas that are used in thinking about human beings (Grafman et al., 2020; Kapogiannis, 2009; Schjoedt et al., 2009). This finding, that god concepts do not have their own unique circuitry, has been interpreted as evidence to support the notion that god concepts are the byproduct of social cognition. Further support for the hypothesis that religious belief is connected to ToM comes from the finding that individuals with mentalising deficits associated with autism are less likely to believe in god (Norenzyan et al., 2012). However, a study conducted on healthy Japanese participants found that scores on the 'autism quotient' (Baron-Cohen et al., 2001) had no significant relationship with religious beliefs, but that scores on the 'empathy quotient' did have a positive relationship with religious belief (Kunihira et al., 2006). The connection between autism and abilities or deficits in the formation of ToM is an area of controversy, with some researchers suggesting that deficits in mentalizing ability are neither unique to nor universal to autistic individuals (Gernsbacher & Yergeau, 2019). Further, studies which use questionnaires to assess empathy quotient and autistic traits often rely on self-report. This is particularly important to note when looking at mentalizing ability and empathy, as one might self-report as being highly empathetic or as having well developed mentalising abilities but be inaccurate in their self-assessment (Gernsbacher & Yergeau, 2019). If there is a problem in the accuracy of self-report on measures of empathy and mentalising ability, conclusions based on self-reports of these attributes and religious belief are potentially of little use when investigating the relationship between mentalizing and religious belief.

Minimally Counter-Intuitive Ideas

One possible explanation for the persistence and spread of religious ideas, if not the origin of religion, is that religion is full of minimally counter-intuitive ideas. Boyer (1992) posits that religious ideas are often minimally counter-intuitive; that is, they centre around common categories of objects or beings which predominantly behave as expected, however, they also violate expectations to a minimal extent (e.g. in one or two ways). For instance, such ideas may describe trees that can listen, statues that bleed, or humans who are non-corporeal and thus can walk through walls. The minimally counter-intuitive quality of these ideas makes these concepts easy to grasp, but alarming enough to capture attention, leading us to remember and recall them. Experimental evidence suggests that minimally counter-intuitive ideas are retained and recalled more than overly elaborate ideas which violate multiple assumptions. Minimally counter-intuitive ideas are also retained and recalled more than ideas that violate no assumptions (Boyer & Ramble, 2001). While this may explain why ideas and stories about supernatural agents are memorable, it does not explain why they are believed. This is commonly described as the Micky Mouse problem, which, put briefly, states that Micky Mouse as an anthropomorphic mouse that talks and wears trousers is a minimally counter-intuitive figure, but despite Micky Mouse's fame, he is not considered a deity. The Micky Mouse problem clearly illustrates that just because a concept is easily embedded in our memories, it does not necessarily mean that we will believe the concept or consider the information to be sacred (Gervais & Henrich, 2010).

Minimally counter-intuitive ideas can be thought of as highly effective memes. Meme theory suggests that memes, which are units of cultural information, can be subject to selection pressures in a way that is analogous to natural selection (Dawkins, 1976). Memes that are easily remembered and transmitted survive and increase in frequency, out competing memes that are not easily remembered. Meme theory may explain the way in which some

religious ideas propagate and spread while others do not, which is entirely compatible with the minimally counter-intuitive explanation, which describes the nature of the religious ideas that do propagate and spread. Meme theory and minimally counter-intuitive ideas are compatible with both byproduct explanations and explanations rooted in cumulative cultural evolution. However, meme theory, and the hypothesis that religions are based on minimally counter-intuitive ideas, don't explain how religion has become such a persistent and important feature of human cultures (Purzycki & Willard, 2016).

Cognitive Religiosity: Adaptationist Accounts

Explanations of supernatural beliefs as adaptations for life in complex, highly cooperative social groups do not necessarily dispute the importance of features such as teleological thinking, HADD and ToM in the story of the evolution of supernatural beliefs as a species-typical trait. However, adaptationist explanations argue that while belief in supernatural agents may have first arisen as a byproduct of adaptations for social functioning, these byproducts themselves came to convey adaptive benefits and thus became the target of selection (Bulbulia, 2008; Johnson, 2011; Johnson & Bering, 2006; Johnson & Kruger, 2004; Norenzayan & Shariff, 2008).

Humans have a remarkable ability to work cooperatively in extended groups of non-kin (Purzycki et al., 2016; Shariff et al., 2011). This capacity for cooperation has resulted in humans being able to succeed in endeavours which one individual couldn't achieve alone, such as coordinated ambush hunting. In the modern world, humans have created societies and institutions at a level of such complexity that they simply would not be possible without large scale cooperation (Norenzyan, 2013; Schloss & Murray, 2011). While humans are by no means alone in their ability to cooperate, they certainly stand out in terms of complexity,

individual specialisation, and interdependence (Maynard Smith & Szathmary, 2001; Michod & Herron, 2006; Michod, 1997; Schloss & Murray, 2011).

Cooperation is often explained in terms of kin altruism (Hamilton, 1964) or reciprocal altruism (Trivers, 1971), which are sufficient in small groups of minimal complexity or groups with high levels of genetic relatedness (Johnson & Bering, 2011; Johnson & Kruger, 2004; Purzycki et al., 2016; Shariff et al., 2011). However, systems of kin and reciprocal altruism are not sufficient for explaining the high level of cooperation of which humans are capable. With an increase in cooperation comes an increased vulnerability to free-riders, that is, individuals who benefit from the collective action of the group while contributing relatively little to group endeavours, thereby acquiring relatively high net benefits (Congleton, 2015; Haag & Lagunoff, 2003; Ozono et al., 2017; Patel et al., 2010; Price, 2005, 2006; Price et al., 2002; Shariff et al., 2011) This relatively high cost-benefit ratio makes free-riding a potentially lucrative strategy. However, unchecked, high levels of free-riding would make cooperation an unsustainable strategy. Therefore, the maintenance of highly cooperative complex groups presents a puzzle. It raises the questions of how humans have evolved the capacity to cooperate to the extent that they do, and why selfish free-riding individuals haven't out-competed co-operators, rendering cooperation obsolete (Shariff et al., 2011). One way in which cheaters are deterred is through punishment. However, punishment can be costly, individuals who punish are potentially vulnerable to revenge, and systems of punishment can themselves be corrupted or cheated, creating second-order free-rider problems (Haag & Lagunoff, 2003; Henrich & Boyd, 2001; Patel et al., 2010; Sasaki et al., 2016). Furthermore, punishment systems are only as good as the cheater detection systems they rely on (Schloss & Murray, 2011). So arguably, the presence of cheater detection systems and a willingness to engage in altruistic punishment might reduce freeriding (Boyd et

al., 2003; Fowler, 2005), but it could also create a selection pressure to become more adept at avoiding detection.

It has been argued that belief in moralising supernatural agents is an adaptation that solves this puzzle (Johnson & Bering, 2006; Johnson & Kruger, 2004; Watts et al., 2015). There are two prominent theories for how belief in moralising supernatural agents solves the problem of maintaining high levels of cooperation in complex groups. Although these theories have several theoretical similarities, they also have several subtle but important differences. While both argue that belief in supernatural punishment is important, one theory argues that this belief is an individual-level biological adaptation for self-regulation, with an emphasis on punishment avoidance (Bering & Johnson, 2006). The other argues that the belief in moralising supernatural agents is a group-level cultural adaptation and emphasises the cooperation-enhancing aspect of supernatural beliefs (Schloss & Murray, 2011; Shariff et al., 2011).

Individual-Level Biological Adaptation

The perspective that belief in supernatural agents who punish immoral behaviour leads to an individual-level fitness advantage argues that an important selection pressure in the evolution of religion has been the need to maintain one's reputation (Johnson & Bering, 2006). Having evolved both language and high-level mentalizing abilities, humans can learn of the behaviour of others, such as an incident of unscrupulous behaviour, without directly witnessing such incidents. Because of this, humans have reputations, and a bad reputation could lead to an individual being subject to punishments which could be administered at low cost to the group but high cost to the defector, such as being isolated from the group (Johnson, 2018). Given the high level of social interdependence among ancestral humans, being ostracised from one's group can have negative fitness consequences. This means that

reputation control becomes an important factor in an individual's fitness. Belief in an all-seeing moralising God encourages individuals to self-regulate and avoid transgressions, thus protecting their reputation and acting in the best interest of their genes (Bering, 2009; Johnson, 2005; Johnson & Bering, 2009; Johnson & Kruger, 2004). This belief in an omniscient God, from whom nothing can be hidden, acts as a counterweight to the general optimistic bias that humans have and prevents individuals from underestimating their chances of being caught cheating (Johnson, 2005, 2018; Johnson & Bering, 2009; Johnson & Kruger, 2004; Schloss & Murray, 2011). Furthermore, belief in a supernatural agent who can mete out punishment maintains the threat of punishment for non-cooperation, without any individual having to bear the costs of implementing the punishment (Schloss & Murray, 2011).

It is possible, on the other hand, that belief in a supernatural agent who will punish individuals who act immorally could be undermined if an individual acts in an immoral way and does not appear to receive punishment (Murray, 2009). However, such punishment is not always expected to be instantaneous, and there is evidence that humans do indeed tend to interpret misfortune as being a consequence of misbehaviour (Bering, 2005; Murdock, 1980; Pragamet, 1977; Swanson, 1960). This belief that misfortune is caused by supernatural forces appears to be common. In a study of 186 societies conducted by Murdock (1980), members of all 186 tended to ascribe physical illness to supernatural causes. Similarly, Swanson (1960) analysed beliefs in 50 societies and found that the majority conceptualised good fortune or misfortune as supernatural reward or punishment, respectively. These findings can be interpreted as evidence that supernatural beliefs could function to encourage individuals to avoid transgressions in order to minimise their risk of supernatural punishment, which is believed to be a realistic threat. By behaving in a way that reduces the risk of supernatural punishment, individuals also avoid behaviours that would lead to punishment from other

human beings. This tendency to avoid transgressions due to belief in supernatural punishment would convey a survival advantage, leading to the proliferation of belief in supernatural punishment as a genetically-encoded trait.

Group Level Cultural Adaptation

The argument that belief in supernatural punishment is a cultural adaptation suggests that such beliefs are a group-level response to life in large complex societies (Norenzyan & Shariff, 2008). According to this view, under conditions of large complex societies, where anonymity and instances of one-shot cooperation are possible, the threat of reputational damage is not a sufficient deterrent to ensure cooperative behaviour. Belief in what Norenzayan refers to as "big gods" – gods, that is, which are characterised as omnipotent, omniscient, and omnipresent – would ensure cooperation. The cultural adaptation argument suggests that belief in big gods or moralising high gods (Shariff et al., 2011) spread not through biological evolution but through cultural selection, working on pre-existing supernatural beliefs which initially arose as byproducts of social cognition. Through the process of cultural selection, beliefs that facilitated and enhanced cooperation proliferated. This explanation focuses more on religion's ability to promote trust between sometimes unfamiliar individuals (Shariff et al., 2011), rather than religion's ability to enhance cooperation through encouraging individuals to avoid punishment (Schloss & Murray, 2011; Shariff et al., 2011).

Cultural evolution can adjust the content of God beliefs by selecting beliefs that enhance survival in differing environments, which may well explain the high level of cultural diversity of supernatural beliefs. An example of beliefs enhancing adaptedness to the environment comes from research by Snary (1996), who found that societies facing water scarcity were more likely to have Gods which were concerned with and encouraged the pro-

social use of natural resources. This belief would likely aid the survival of groups who hold these beliefs in the face of such challenges. Cultural evolution is theorized to respond to selection pressure more quickly than biological evolution can, as cultural changes can spread horizontally to existing individuals as well as vertically to offspring, whereas genetically encoded biological adaptations can only spread vertically through reproduction and the passing of genes from one generation to the next (Birch & Heyes, 2021; Boyd & Richardson, 1996; Henrich & McElreath, 2007; Richardson & Boyd, 1978).

The punishment avoidance argument potentially puts the emergence of this biological adaptation earlier than the group level cooperation argument. The group cooperation argument for big moralising Gods suggests that big Gods would be a more recent cultural adaptation, only emerging once highly complex societies came to exist. It further argues that the development of large-scale societies, where kin altruism and reciprocal altruism were not enough to stabilize cooperation, and the threat of reputational damage was not enough to dissuade defection, provided the selection pressure favouring big Gods (Shariff et al., 2011). Evidence that supports the theory that belief in big Gods is a response to large scale societies is the finding that most small-scale societies do not have omnipotent, omnipresent gods who are interested in the morality of humans (Roes & Reymond, 2003). Shariff et al., (2011) further argue that belief in supernatural punishment is unlikely to be a genetic adaptation, as any individual who did not believe in supernatural punishment could engage in selfish behaviour and out compete altruistic individuals as long as they were sufficiently adept at covering up their selfish actions.

Behavioural Religiosity: Adaptationist Accounts

Adaptationist explanations of behavioural religiosity often invoke costly signalling theory. Costly signalling theory explanations of religious behaviour suggest that high-cost

religious behaviours have not persisted simply because the high cost of religious engagement is offset by the benefits of religious engagement, but that the high costs of religious engagement act as costly signals and are thus integral to the adaptive benefit of religious behaviour (Soler, 2012). Costly signalling theories of religious engagement suggest that religious engagement functions either as a reliable signal of one's commitment to one's group, or as a reliable signal that the signaller genuinely believes in supernatural punishment, and thus that the signaller is likely to be trustworthy. (Alcorta & Sosis, 2005; Bulbulia, 2004; Murray & Moore, 2009; Pyysiainen & Hauser, 2010; Schloss & Murray, 2011; Sosis, 2003, 2004).

Signal theory has grown out of research in animal behaviour and attempts to explain the evolution of honest signalling. Honest signalling presents a problem as there is often conflict between organisms who send signals (signallers) and the organisms which receive signals (receivers). It is in the best interest of receivers to accurately discern which signals reliably convey adaptively relevant information, especially if the information being signalled cannot be directly observed (e.g., genetic quality of a potential mate) (Mathews, 2012; Soler, 2012). If signals always result in signallers gaining benefits regardless of how reliable the signal is, it becomes beneficial to signallers to produce dishonest signals, but dishonest signals are of no use to receivers, and a high prevalence of dishonest signals would undermine the system (Alcorta & Sosis, 2005; Murray & Moore, 2011). For the signalling system to retain utility, there needs to be some mechanism that allows receivers to discern which signals are honest signals of adaptively relevant information. One proposed solution to this problem is for receivers to only pay attention to signals which are hard to fake. Arguably the most influential theorist in this area is Zahavi, who proposed the handicap hypothesis in 1975. The handicap hypothesis suggests that signals are reliable if they are costly to produce and result in a survival disadvantage. The classic example of the handicap hypothesis is the

peacock's tail – the elaborate tail feathers of a peacock may attract the attention of potential mates, but they may also attract the attention of potential predators. Continued survival despite the handicap provides evidence that the peacock is of high quality, verifying the honesty of the signal (Zahavi, 1975). Costly signal theory builds on this idea but suggests that signals do not need to result in a fitness handicap to ensure the signals are honest; instead, honesty can be assured when the cost of producing the signal is so high that only high-quality individuals can produce the signal (Rands et al., 2011; Soler, 2012; Zahavi & Zahavi, 1997), or when the cost to benefit ratio is different for honest and dishonest signallers (Bulbulia et al., 2015; Murray & Moore, 2009).

As noted above, humans live in large cooperative groups and with that comes many benefits, as groups can often accomplish things no one individual could accomplish alone, such as successfully hunting big game. However, large cooperative groups are vulnerable to free-riders, who stand to benefit from the group's endeavours while making less than average contributions to the group. Free-riding could be a highly beneficial strategy for the defector, but a high proportion of defectors would undermine group stability making large cooperative groups unsustainable, as defectors outcompete co-operators. It has been proposed that costly religious behaviours are an adaptation to solve this problem, as such behaviours function as the price individuals must pay to gain admittance to a group or to secure continued acceptance within the group, and these high costs deter potential cheaters who would be unwilling to pay the costs of group membership (Norenzayan, 2010; Murray & Moore, 2009)

However, costly signalling theory often stipulates that for a signal to be honest, the signal needs to be extremely difficult to produce in the absence of the biological information it is signalling. Taking the peacock's tail as an example again, only healthy individuals can afford the biological energetic costs of producing and maintaining a large tail; the cost of the signal is prohibitive to lesser quality peacocks. Alternatively, the cost to benefit ratio needs to

be different for honest and dishonest signallers. It is debatable whether either of these apply to behavioural religiosity. While behavioural religiosity can take the form of highly costly behaviours, such as bodily mutilation and celibacy, it usually involves lesser costs, (Mathews, 2012; Murray & Moore, 2009). The alternative to religious signals being prohibitively costly to non-believers, is that the net benefit of engagement with religious behaviours is higher for people producing honest signals than it is for dishonest signallers. However, it is unclear how engagement in religious behaviour can have a material benefit which is higher for honest signallers than dishonest signallers, as the costs of engaging in religious rituals are the same regardless of whether the signaller does or doesn't intend to defect (Murray & Moore, 2011).

It has been argued that there doesn't need to be a material cost-benefit asymmetry for honest and dishonest signallers to ensure that signals remain reliable, because a perceived asymmetry would be sufficient to deter non-committed individuals from producing deceptive signals. It has been suggested that belief in an afterlife, for instance, could function as one belief that could create a perceived cost-benefit differential between believers and non-believers (Soler, 2012; Sosis & Alcorta 2003). For individuals who genuinely believe in eternal reward or punishment, the costs of religious ritual are worth paying in return for eternal reward or avoidance of punishment. However, that argument depends on the belief in supernatural reward and punishment, which does not appear to be a universal facet of cognitive religiosity (Roes & Reymond, 2003; Shariff et al., 2011). Furthermore, in situations where the cost of failing to produce the culturally appropriate display is higher than the cost of producing the displays, the displays will always be worth producing, regardless of the internal state of the signaller (Schloss & Murray, 2011). Although it isn't clear how costly signals enforce honesty in the context of religious rituals, there is empirical evidence that costly signalling in the form of behavioural religiosity is beneficial at the group level. In a

study comparing the longevity of secular and religious communes in 19th century USA, Sosis and Bressler (2003) found that religious communes outlasted secular ones by a factor of four.

Table 2.1 *Evolutionary Explanations for Religion*

Theory	Level of explanation	Type of explanation	Evolutionary process	Explanatory focus	Byproduct	Biological Adaptation	Cultural Adaptation
HADD	Individual	Cognitive	Biological	Why humans perceive agency where there is none	X		
Teleological thinking	Individual	Cognitive	Biological	Why humans perceive purpose where there is none	X		
EToM	Individual	Cognitive	Biological	Why humans perceive minds where there are none	X		
Minimally counter-intuitive ideas	Individual	Cognitive	Cultural	What ideas are remembered	X		
Adaptation for self-regulation	Individual	Cognitive and behavioural	Biological	Adaptation for reputation control		X	
Adaptation for cooperation	Group	Cognitive and behavioural	Cultural	Adaptation for increased cooperation			X
Costly Signalling Theory	Group and individual	Behavioural	Biological and/or cultural	Why costly rituals exist		X	X

"HADD" = Hyperactive Agency Detection Device. "EToM" = Existential Theory of Mind.

Chapter 3 : Economic Variables and Religious Engagement

It has been observed that more economically developed countries have lower levels of religiosity than less economically developed countries (Barber, 2011; Barro & McCleary, 2003; Norris & Inglehart, 2004), with the USA frequently being identified as an outlier (Norris & Inglehart, 2004). A 2015 report by the Pew Centre highlights this; they report, as many others have, that in countries with lower per capita GDP, a greater percentage of the population report that religion is very important in their lives. However, according to the Pew (2015) report, 53% of US citizens consider religion to be a very important part of their lives. Compare this to Australia, the second-largest economy as measured by per capita GDP of the countries included in their report, where 18% of citizens consider religion to be very important, and Germany, the third-largest economy as measured by per capita GDP of the countries in this report, where 21% of citizens consider religion to be a very important part of their lives. In fact, America is just above the global median for the percentage of citizens reporting religion to be very important despite having the highest per capita GDP of any nation included in this report, at above $50,000 GDP per capita (Pew, 2015). These figures illustrate that either the USA is a strange outlier or that per capita GDP alone is not a sufficient predictor of religiosity.

A variety of potential explanations have been put forward for the finding that overall wealthier countries tend to be less religious. These include the secularisation hypothesis, the deprivation hypothesis, the existential security hypothesis, and relative power theory.

Secularisation Hypothesis

The secularisation hypothesis or secularisation theory refers to the idea that secularisation – “a systematic erosion of religious practices and beliefs” (Norris & Inglehart, 2011: p5) will occur in response to increased economic development, industrialisation, and

modernity (Norris & Inglehart, 2011; Stark, 1999). The idea that increases in industrialisation would automatically lead to a reduction of the influence of religion in public life and a reduction in the rates of personal beliefs has been predicted by some of the 19th century's most prominent social thinkers and philosophers, including Emile Durkheim, Max Weber, Karl Marx, and Sigmund Freud (Norris & Inglehart 2011; Stark, 1999). The supposed inevitable demise of religion has also been predicted by the likes of Voltaire and Thomas Jefferson (Stark, 1999). Indeed, the secularisation hypothesis is by no means new. However, early writings tend to be phrased more as general predictions and do not provide empirical evidence to support the hypothesis. However, more recently, researchers have made attempts to generate testable hypothesises and conduct empirical research to assess whether economic development and industrialisation have indeed led to a reduction in religious beliefs as per the secularisation hypothesis.

One such attempt to formalise the secularisation hypothesis comes from Barro and McCleary (2003), who argue that according to economic reasoning, as the cost of religious activity increases, religious engagement should reduce. Barro & McCleary reason that as societies transform from agrarian to industrial and then to post-industrial societies, this economic development results in an increase in the average wage. As the average wage increases, this, in turn, increases the opportunity cost of time spent in places of worship rather than in places of work. They acknowledge this argument does not take into account the possibility that the opportunity and financial cost of attending places of worship is counterbalanced by less obvious benefits. While attending church may not result in productivity gains, the benefits of attending church may be more subtle, subjective, and less amenable to measurement than hourly wage. For example, it could be that church attendance increases one's social capital. Perhaps as one's time becomes more valuable as measured by

hourly wage, spending time on conspicuous religiosity becomes a more costly signal, potentially bolstering one's social standing and reputation within the local church-going community.

In order to assess the secularisation hypothesis, Barro and McCleary (2003) used a cross-country data set of economic, political and social indicators and data regarding religiosity from The World Values Survey, the International Social Survey Programme, and the Gallup Millennium Survey to investigate the relationship between national-level economic development and religiosity. Barro and McCleary found that the relationship between economic development (gauged by per capita GDP) and measures of religiosity was significantly negative. The estimated coefficient on the log of per capita GDP and monthly church attendance is -0.52, meaning that an increase of one standard deviation in the log of per capita GDP reduces church attendance rate by 9%. The estimated coefficient for belief in heaven was -0.80, and one standard deviation increase of GDP per capita resulted in a 15% reduction in belief in heaven. Barro and McCleary stated that their results suggested that the overall effect of economic development is to reduce religiosity. However, they noted that economic development has various dimensions, including increases in education, urbanisation and life expectancy and a decrease in fertility rates. Thus, Barro and McCleary sought to isolate the different dimensions of economic development in order to study their relationships with religiosity. They found that "once other economic and demographic variables are held constant, the relationship between religiosity and per capita GDP is insignificant". They conclude that increases in per capita GDP do not directly result in reductions in religiosity, thus this relationship must be due to other social, political, and demographic changes that occur as a result of an increase in per capita GDP.

One possible reason why increases in per capita GDP may not directly result in reductions in religiosity is that rather than increases in hourly wage leading to time spent in church being a larger opportunity cost, one could argue that the opportunity cost of attending church is greater for individuals reliant on agriculture as their main source of income, especially in a Christian society. If one considers the fact that the traditional time of worship for those of Christian faith is Sunday morning, this is potentially valuable time that could be spent tending to crops or livestock, activities that are presumably more easily done in daylight, thus the time lost to church is not easily made up later in the day. On the other hand, work that is predominately conducted indoors can, at least in post-industrial societies, be completed at any time regardless of the presence or lack of natural light. Furthermore, in post-industrial societies where the opportunity cost of dedicating time to spiritual practice as measured by hourly wage is higher, it is likely to be individuals who are earning more money per hour who are more able to afford the cost of taking time away from work to engage in religious pursuits. Therefore, it is debatable whether income per hour is an appropriate yardstick for measuring the opportunity cost of taking time away from work to visit a place of worship.

Furthermore, while there does appear to be a link between a country's economic development and levels of religiosity, it has been observed that religiosity does not necessarily show a steady decrease over time as nations become more developed; rather, religiosity, while declining overall, shows considerable peaks and troughs within its downward trajectory (Healy & Breen, 2014). That said, societies do not always develop in a linear way. Times of crisis can cause an economic recession or depression, and living standards may reduce, a scenario that the secularisation theory fails to make specific predictions about (Healy & Breen, 2014).

Deprivation Hypothesis

The central tenet of the deprivation hypothesis is that religion offers hope to the hopeless. Individuals in disadvantaged socioeconomic conditions are purportedly more likely to construct a bond with the divine, supposedly to compensate for their plight and acquire otherwise unattainable rewards (Glock & Stark, 1965; Stark, 1972). It has been suggested that higher levels of religious involvement reduce the distress individuals of low socioeconomic status (SES) experience as a result of financial hardship (Bradshaw & Ellison, 2010; Hoverd et al., 2013)

Researchers have found that low SES individuals tend to report higher levels of divine interaction (Pollner, 1989). They are also more likely to report that they feel connected with god (Krause, 2002), and to engage in religious coping (Krause, 2003, 1995). Low SES individuals also report higher levels of god-mediated control, which is the belief that one can control one's own life prospects through working with god (Krause, 2005, 2007). Low SES individuals are more likely to believe in divine control, the belief that everything that happens is part of God's plan (Schieman et al., 2006). Moreover, low SES groups tend to derive greater psychological benefit from religiosity than higher SES counterparts (Ellison, 1991; Krause, 1995; Pollner, 1989).

To look at the relationships between religious involvement, belief in divine control and socioeconomic status (SES) as indexed by education and income, Schieman (2010) used two national surveys of American adults conducted in 2005, namely the Baylor Religion Survey (BRS) and the Work, Stress and Health Survey (WSH). The BRS was conducted by the Gallop Organization and recruited a nationally representative sample of 1,721 adults over the age of 18. Participants of the BRS were asked to indicate the extent to which they agreed with a series of statements, including "God is directly involved in my personal affairs".

Participants of the BRS were also asked to indicate their level of education and their income before taxes for the previous year on a scale of 1 ($10,000 or less) to 7 ($150,001 or more). The BRS also asked participants to indicate prayer frequency and frequency of attendance at religious services. After deleting cases with missing values, Schieman had usable data from 1,558 participants of the BRS. The WSH was conducted in 2005 and had a total of 1,800 participants, all of whom were over the age of 18 and gainfully employed. Participants of the WSH were asked to indicate the extent to which they agreed with a series of statements, including "god has decided what your life should be". They were also asked to indicate their level of education, and their total income before taxes for the previous year (2004). (Unlike the BRS, income was recorded as a continuous measure for participants of the WSH). The WSH also asked participants to indicate prayer frequency and frequency of attendance at religious services. Once participants with missing values were deleted from the WSH dataset, the WHS provided Schieman with data for a further 1,709 individuals. Data from the BRS and WSH were analysed separately due to the differences in the questions used in each survey. Schieman found that individuals of lower SES reported significantly higher beliefs in divine involvement in the BRS dataset, and belief in divine control in the WHS dataset. It was also found that frequency of prayer and frequency of religious attendance were each independently and positively associated with belief in divine involvement among respondents in the BRS data set. Frequency of prayer and frequency of attendance each had independent positive associations with belief in divine control in the WSH data set. However, it was also found that the negative relationship between SES and belief in divine control was less marked in high SES individuals who reported higher levels of prayer and attendance. So, while lower SES was associated with increased belief in divine involvement and control even among individuals who do not regularly pray or attend religious gatherings, the relationship between

SES and belief in divine control and divine involvement was less negative among individuals who reported higher levels of prayer and religious attendance.

In research designed to test deprivation theory, Hoverd et al. (2013) used data gathered in the 2009 wave of the New Zealand Attitudes and Values Survey (NZAVS), which gathered responses from 6,518 individuals. This data was combined with information from the New Zealand Deprivation Index 2006, which uses information from the census to calculate levels of deprivation for each census area in New Zealand. Respondents to the NZAVS provided their postal addresses, which allowed Hoverd et al., to match participants to their census area and allocate participants with a deprivation score based on the neighbourhoods they lived in. Hoverd et al., found that neighbourhood deprivation did not predict whether or not participants were religious, but did predict the strength of religious identification among those who were religious, finding that religious individuals in areas of higher deprivation had higher levels of religious identification, even after age, ethnicity and gender were controlled for.

Existential Security Hypothesis

The existential security hypothesis, promoted by Norris and Inglehart (2004), expands on the secularisation and deprivation hypotheses. While the secularisation hypothesis implies that religiosity should consistently and steadily decrease as countries develop from agricultural to industrial and post-industrial societies, and the deprivation hypothesis suggests that religion increases in response to socioeconomic deprivation, the existential security hypothesis instead suggests that religiosity does not decline as a direct response to national economic development and modernisation or personal financial standing alone, but rather as a response to increasing existential security, which Norris and Inglehart defined as "the feeling that survival is secure enough that it can be taken for granted" (2004: 4). While

existential security is closely linked to the deprivation hypothesis, in that it makes specific predictions about the effects of economic development and modernisation, the existential security hypothesis is more nuanced and more able to take into account a greater range of factors such as the economic status of the country as a whole, overall levels of human development in a nation, and the effect of the relative status of individuals within a country. It is also more able to make predictions about non-economic existential risks such as epidemics, natural disasters, and terrorism (Norris and Inglehart, 2004). Thus, the existential security hypothesis can be applied to both individual-level variations in security and changes that impact larger sections of society. At the individual level, insecurity could be linked to a lack of basic resources such as housing, food, water, personal safety, health, economic security, and political security in terms of immigrant/refugee status. At the contextual level, insecurity could be linked to pollution, inequality, war, natural disaster, and economic recession/depression.

Consistent with the prediction that population-level threats to existential security could result in increases in religiosity, Sibley and Bulbulia (2012) found that, despite an overall trend towards declining religious faith in New Zealand, religious faith increased in Christchurch after the city experienced a devastating earthquake in 2011. Similarly, Chen (2010) found that enrolment in Islamic schools in Indonesia increased directly after an economic downturn in the area between 1997 and 1998, despite the fact that in the sample, Islamic schools were more expensive than secular alternatives. Furthermore, pupils of Islamic schools in Indonesia have lower earning potential than individuals who attended secular schools (Berman & Stepanyan, 2003)

The human development index (HDI) produced by the United Nations development programme provides a standardised measure of human development and societal

modernisation by combining levels of adult literacy and education, life expectancy at birth, and standard of living as indicated by per capita GDP (Norris & Inglehart, 2004). All indicators of human development have a significant, negative relationship with engagement in private prayer and attending religious services, with the correlation coefficients ranging from -.40 to -.74 depending on the particular measure used (Norris & Inglehart 2004). Norris and Inglehart suggest that as society improves its levels of human development, the citizens of the society in question face fewer threats to their survival and thus experience greater levels of existential security, which in turn leads to a reduced desire for the reassurance religion provides. This suggestion is supported by the finding that data from the World Values Survey, 1981-2001, appear to show a consistent and significant pattern, with post-industrial nations being by far the most secular in their beliefs, values, and behaviours than less developed nations. In agrarian societies, which have the lowest scores on the HDI, 44% of the population attended a religious service at least once a week, whereas in industrial societies, which tend to have higher scores on the HDI than agrarian societies, this figure dropped to approximately 25%, and further reduced in post-industrial societies, which tend to have the highest scores on the HDI, to 20%. In other words, agrarian societies showed more than twice as much religious participation as post-industrial societies. This pattern is consistent with the finding that individuals are less religious in societies with higher scores on the human development index.

However, while the human development index appears to negatively predict levels of religiosity when comparing agrarian, industrial, and post-industrial nations, according to Norris and Inglehart (2004), this index loses its predictive power when comparing post-industrial societies alone. Norris and Inglehart suggest that the correlation is lost due to the

fact that all post-industrial nations are highly developed and show little variation in their human development index score.

As well as human development index scores, Norris and Inglehart (2004) utilise the Gini index. The Gini index is a single statistic that indicates how equitably a resource is distributed in a population. The Gini index is presented as a single number between 0 and 1, where 0 represents absolute equality and 1 represents complete inequality. Applied to household income within one country, a Gini index of 0 would indicate a perfectly equal distribution of national income among all households, and 1 would represent one household receiving all income. The Gini index is calculated by comparing the distance between perfectly equal distribution and the observed distribution of a given resource in a given population (Ceriani & Verme, 2012; Farris, 2010; Lerman & Yitzhaki, 1984). Norris and Inglehart report a clear cross-national positive correlation between Gini index and religiosity, a finding that may well be considered consistent with the existential security hypothesis in that while inequality increases, individuals of low socio-economic status become relatively worse off and more vulnerable to existential threat, which may result in them turning to religion as a source of comfort and optimism while they face increasing hardships. Thus, cross-national positive correlations between religiosity and inequality could be driven by those of low SES.

From a financial perspective, deprivation and inequality can appear very similar; a person who is deprived and living in a society where all individuals are experiencing deprivation faces very similar problems to a person who is experiencing deprivation in a society with high levels of economic inequality; essentially, they are both lacking in resources. However, it has been argued that being deprived and surrounded by others who are also experiencing deprivation is psychologically different to being deprived in conditions of

high inequality, in which one is exposed to or aware of individuals who are not experiencing the same level of deprivation. Furthermore, inequality has been shown to have a strong influence on a society's structure, because, as argued by Wilkinson & Pickett (2009), inequality introduces a hierarchy. Economic inequality doesn't just concentrate more money into the hands of fewer individuals, it also causes a power imbalance, leading to an uneven distribution of public goods. Because of this imbalance, life in a deprived society may be materially different to life in an unequal society in a number of ways.

Economic inequality appears to impact how much environmental degradation and pollution one is exposed to (Boyce et al. 1999; Nafziger 2006; Ridzuan, 2021; Torras & Boyce, 1998; Vornovytskyy & Boyce, 2010). The wealthy are able to move further away from sources of industrial pollution and have the political power to ensure that new sources of industrial pollution do not appear in their neighbourhoods (Roca, 2003). Wealthy individuals are more able to advocate for environmental regulations, further protecting them from environmental degradation. Furthermore, both international and interregional trade allows for pollution shifting, whereby consumers increasingly import goods whose production causes pollution elsewhere. This pollution shifting means the rich and powerful are able to make their own local environment more pleasant while also making the environment in areas of deprivation less habitable.

Indeed, studies looking directly at economic inequality and environmental degradation have found evidence that under conditions of economic inequality, areas of higher economic deprivation do appear to have higher exposure to environmental pollutants. A study looking at air pollution in 2000-2005 in Russia found that regions with greater economic inequality as measured by differences in per capita income had higher levels of air

pollution due to “pollution shifting”. The smaller the share of income held by individuals in the bottom quintile, the higher the levels of regional air pollution (Vornovytskyy & Boyce, 2010). A time series study looking at water pollution in India found that increases in inequality predicted increases in levels of water pollution (Ridzuan, 2021). Holland et al. (2009) found that income inequality is a statistically significant predictor of biodiversity loss, and in an analysis of the 50 US states, Boyce et al. (1999) found that unequal distribution of power –as indicated by voter participation, educational attainment, and fiscal policies – adversely affects the strength of environmental policies and environmental quality.

In addition to affecting environmental quality, economic inequality also appears to result in an imbalance in the provision of other public goods. Vornovytskyy & Boyce (2010) found that as well as predicting higher levels of air pollution, under conditions of high economic inequality, areas of deprivation had fewer hospital beds per person. Similarly, a study by Hossinpoor (2012) looking at international levels of economic inequality and oral health found that higher inequality is associated with lower oral healthcare coverage.

Economic inequality also predicts higher levels of violent crime, including homicide rates, and the brunt of this violence affects the more deprived individuals in unequal societies. The research on economic variables and violent crime has repeatedly found that it is economic inequality, not deprivation, which is associated with higher levels of violent crime (Daly, Wilson, & Vasdev, 2001; Gartner, 1990; Kelly, 2000; Krohn, 1976; Wilson & Daly, 1997). Thus, there is good evidence that economic inequality causes social ills that cannot be explained by deprivation alone, and these social ills may contribute to feelings of existential insecurity.

Further evidence supporting the existential security hypothesis comes from Gill and Lundsgaarde (2004), who found that levels of welfare expenditure show a significant negative relationship with church attendance, even when indicators of modernisation are controlled for. This indicates that the existence of a welfare safety net reduces religious values and behaviours by providing individuals with extra protection from existential threats. This finding may go some way towards explaining the USA's status as somewhat of an outlier. The USA has much higher levels of religiosity than one would expect for a nation as developed and wealthy as the USA is. However, the USA has much lower social security spending and a less comprehensive welfare system than most other countries of similar development. Thus, despite the USA's high level of development, US citizens face higher levels of existential threat than citizens of other similarly advanced nations (Norris & Inglehart 2004).

In research designed to further investigate the existential security hypothesis, Healy and Breen (2014) investigated the impact of the global economic downturn on religiosity in Europe. Due in part to the global economic crisis of 2008, three European countries, namely Ireland, Spain, and Portugal, found themselves in such precarious economic circumstances they needed financial bailouts from the EC-IMF-ECB of 85 billion euro, 100 billion euro and 78 million euro respectively. With these bailouts came the condition that the countries in question must go into austerity budget measures. This, in turn, resulted in cuts in funding to government services, increasing levels of unemployment, increasing tax burdens on the average household, and effective salary decreases for those working in the public sector (Healy & Breen, 2014). Thus, those living in Ireland, Spain and Portugal faced a sudden increase in levels of uncertainty, which, according to the existential security hypothesis, should increase levels of religiosity. Healy and Breen (2014) used data from six waves of the

European Social Survey from 2002 to 2012 to investigate whether Ireland, Spain and Portugal became more religious after the financial crisis as the existential security hypothesis would predict. There was no significant change in religiosity for Portugal or Spain, while there was, in fact, a significant decrease in levels of religiosity in Ireland, contrary to the predictions of the uncertainty hypothesis. However, within the period reviewed by Healy and Breen (2014), revelations of widespread child abuse within the Catholic Church and religiously affiliated institutions in Ireland gained extensive media attention in 2009 after the publication of The Commission to Inquire into Child Abuse Report (Donnelly & Inglis, 2010). The reduction in religiosity in Ireland reported by Healy and Breen (2014) may be due to the impact of the scandal rather than economic factors, although such scandals do not always suppress religious affiliation (Mancini & Shields, 2013).

It has been suggested that while there does appear to be a strong relationship between GDP per capita and religion, given that economic inequality has been shown to have a strong influence in many aspects of a society's structure and function (Wilkinson & Pickett, 2009), it may be the case that it is economic inequality that influences a country's religion, not GDP per capita. With this in mind, it is interesting to note that, according to data made available by The World Bank, Ireland's Gini Index score was falling year on year from approximately 33.55 in 2005 to approximately 31.0 in 2008. In 2009 it rose to approximately 32.7 and reduced again to approximately 32.25 in 2010. Similarly, between 2004 and 2009, Portugal's Gini Index fell from approximately 38.55 to 35.0, increasing in 2009 to 35.58 and 36.4 in 2011 and dropping again in 2012 to 36.0. Spain, on the other hand, is a different story; the Gini Index for Spain was at a low of approximately 32.5 in 2005 and steadily increased to approximately 36.1 in 2011 and dropped to approximately 35.6 in 2012 (The World Bank, n.d.). Put simply, although the economies in these nations were struggling, overall inequality

in Ireland and Portugal reduced after the economic downturn. If religiosity is driven by inequality and relative security compared to others in their nation rather than overall wealth, this could in part explain why the extreme economic uncertainty faced by Ireland, Spain and Portugal didn't result in an increase in religiosity in these nations.

Another study that sought to investigate the effect the global economic crisis had on national levels of religiosity in Europe and thereby test the explanatory power of the Existential Security Hypothesis was conducted by Storm (2017). This was done by using data collected in seven waves of the European Social Survey from 2002 to 2014, which collects information regarding individual religious attendance and self-identified religiosity, as well as information about individual-level income, employment status, education, and demographic variables, including gender and age. These data were combined with country-level economic data, including gross domestic product per capita in purchasing power standard against the Euro. The data were analysed using a hierarchical linear model to account for data being nested both in country and country-years. Storm found that as individual-level wealth increased, two measures of religiosity, namely self-identification and attendance at religious services decreased, supporting the hypothesis that poorer individuals are more religious. Both measures of religiosity also had a negative association with country-level GDP, supporting the hypothesis that poorer nations are more religious. It was also found that nations with lower welfare spending had higher levels of religiosity. Taken together, the findings of Storm provide strong support for the existential security hypothesis. However, Storm also notes that the financial crisis does not appear to have had a clear and consistent impact on national level religiosity. That said, despite the financial crisis of 2008, GDP has tended to increase in the countries studied over the ten years since the financial crisis. So, while the financial crisis did create uncertainty, countries have recovered well overall and

have tended to become wealthier. This increase in overall wealth could explain the overall decrease in religiosity.

Relatively little research has been conducted on the link between religiosity and existential insecurity as measured by economic inequality at the individual level. However, Norris and Inglehart (2004) reported that pooled data from the 1981-2001 waves of the World Values Survey indicates that religiosity is systematically related to the distribution of income in post-industrial societies, with the poor being almost twice as religious as the rich. A similar pattern is found in the US, with 66% of the least well-off income group praying on a daily basis, compared with 47% of the most well-off. Norris and Inglehart (2004) propose that this is because individuals who are less well-off face more hardship and less existential security than their wealthier counterparts.

Further evidence that personal financial insecurity influences personal religiosity is illustrated by the finding that the lived poverty scale, which measures "the extent to which people have had to go without basic necessities in the past year" (Norris & Inglehart, 2004: p257), is strongly correlated with religious values ($R = 0.54$, $p < .001$) (Norris & Inglehart, 2004). "Roughly nine out of ten people who lack the most basic necessities of life report that religion is an important part of their daily lives, this drops to six in ten of people who feel they have their basic necessities met." (Norris & Inglehart, 2004: p260). "Amongst the poorest segments of society in America almost everyone reports that religion is an important part of their lives, but among the affluent segment, only six out of ten do." (Norris & Inglehart, 2004: p261).

Rees (2009) found across a broad multinational panel, countries with shorter life expectancy, higher rates of violent crime, more corruption, and less peace tend to have higher levels of personal religiosity, as measured by the frequency of prayer. Furthermore, these

indicators of personal insecurity also correlate with income inequality, allowing income inequality to serve as a widely available proxy for insecurity as it pertains to religiosity. Using this proxy, personal insecurity is shown to be at least as important in the determination of national average religiosity as the factors that are conventionally considered important such as wealth, urbanization, and governmental regulation; indeed, personal insecurity appears to be the most important determinant.

In a cross-national investigation of the existential security hypothesis, Barber (2011) looked at the relationship between economic development, as measured by the proportion of the population employed in agricultural work and the proportion of young people enrolled in third-level education, economic security as indicated by Gini coefficient, welfare state development as indicated by level of taxation, and religious belief measured by responses to the question "Do you believe in God?" or "Do you believe God exists?" across 137 countries. It was found that as distribution of income became more equal and taxation rates increased, which he interpreted as indicating increased economic security, religiosity decreased. These findings are interpreted as supporting the hypothesis that religiosity decreases as existential security increases.

Van Tubergen and Sindradottir (2011) looked at the existential security theory and religiosity using data from the European Social Survey, but only including immigrants in their analysis. They found that the individual-level insecurity variables of unemployment and education were related to higher levels of religiosity, but found no link between contextual insecurity and national levels of religiosity. They also found that religiosity was higher among immigrants who had recently arrived in their country of residence, relative to those who had arrived earlier. Healy and Breen (2014) suggest that while van Tubergen and Sindradottir (2011) interpreted this finding as support for social integration theory, which

suggests that migrants will over time adopt the predominant beliefs and values of their host culture, that these findings could also be seen as supporting existential security theory. However, one could argue that these explanations are not mutually exclusive. It is possible that as migrants become more acculturated and established in their host culture, they start assimilating to the host culture's religious norms while also accumulating financial capital, further enhancing their sense of security. Furthermore, as they do become more established in their local community, they may rely less upon the ready-made community present in their local places of worship. If religious attendance is driven by a need for social support, then changes in such attendance may reflect not changes in belief, but rather that this need for social support is being met elsewhere.

Relative Power Theory

It has been noted that greater economic inequality means that while the poor get poorer, the rich get richer. Thus, if religion is predominantly a comfort to those who are suffering from economic deprivation, then as inequality increases, religiosity should either decrease or remain unchanged among the richer (Solt et al., 2011).

Solt et al. (2011) advance the relative power theory, which acknowledges that religion can be a source of comfort to the deprived but views the deprivation theory as incomplete. They argue that, while religion may well be a source of comfort to the economically deprived, religion may also present a tool of social control which the rich can utilise to maintain their position of power. Furthermore, increases in wealth among the rich enhance their ability to disseminate and promote religious belief among the rest of the population.

Solt et al. (2011) analysed data collected in the five waves of the World Values Survey and the three waves of the European Values Survey from 1981 to 2007, as well as data from the Standardised World Income Inequality Database (SWIID: Solt, 2009), a large

cross-national database of inequality estimates (Solt, 2021). These combined datasets provided relevant data from over 200,000 individuals in 76 different societies. Using these data, Solt et al. (2011) plotted the average for 12 different measures of religiosity against levels of inequality as measured by the Gini index and found that the weakest relationship showed a correlation of 0.45 and the strongest showed a correlation of 0.69, indicating that nearly half of the variation in cross-national religiosity tracked levels of income inequality.

Solt et al. (2011) also analysed the impact of economic inequality on levels of religiosity of those in the highest and lowest income quartiles. They found that in conditions of higher inequality, both the richest and the poorest members of society displayed higher levels of religiosity, with the richest displaying higher religiosity than the poorest on some measures. These findings contradict the deprivation theory explanation of the relationship between religion and economic inequality and offer evidence in support of relative power theory. However, as the data used in this research were cross-sectional, one cannot infer causality.

In order to investigate the causal direction of the relationship between economic inequality and religiosity, Solt et al. (2011) conducted a time-series analysis of changes in levels of religiosity in the United States from 1955-2005. As income in the US increased steadily during these 50 years, if the deprivation hypothesis is correct, then religiosity should have fallen at a similar rate over the same period. However, what they found was that over the 50 year period, although religiosity declined overall, it was not a regular steady decline but instead one marked by sudden increases and decreases along the way. Furthermore, they found that an increase in inequality in one year tended to be followed by an increase in religiosity in the following year, whereas changes in religiosity were not followed by changes

in inequality. These results suggest that changes in equality lead to changes in religiosity, but not vice versa.

The relative power theory gains anecdotal support from Nanda (2011), who documented that economic liberalisation in India is spurring the growth of economic inequality. As India's rich have grown richer, they have also become more religious. In turn, temples and statues of popular gods have become larger and more extravagant; the result, Nada (2011) argues, is a particularly vivid example of social control. Within a few years of the upsurge in religiosity among India's rich, the poor have also become more religious, including those among the Scheduled Castes – those whom Hindu belief insists be segregated on the bottom of the social hierarchy with no hope of advancement. The observation that even those with no hope of advancement are turning towards a religion that does not offer hope, but reinforces their own low status, indicates that, at least in this case, the poorest are not turning to religion in order to elicit help from a higher power.

Solt (2013) used data from the Standardised World Income Inequality Database (SWIID) and information regarding the frequency of weekly church attendance in the US and in Germany to investigate changes in religiosity and economic inequality over time. In data regarding the US, Solt (2013) found results very similar to those of Solt et al. (2011) in that past values of inequality were estimated to have strong positive effects on subsequent values of religiosity. A one-point increase in the SWIID Gini index was found to increase self-reported weekly church attendance by 1.4% (+/- 0.9%) in the following year. However, past values of religiosity had a near-zero effect on inequality the following year. Solt (2013) also found that increases in average income in one year were followed by a reduction in religiosity the following year, a finding consistent with the secularisation hypothesis.

Solt (2013) conducted a similar investigation with data from Germany in order to test whether the US findings would replicate in another country. The findings from the German data were very similar to those of the US data; specifically, an increase in economic inequality preceded an increase in religiosity. Solt (2013) argues that the finding that increases in inequality precede increases in religiosity in both the US and Germany provides further support for the relative power theory. However, as Solt points out, there are some cultural similarities between the US and Germany; not only are they both western, educated, industrialised, rich, and democratic (W.E.I.R.D: Henrich et al., 2010), but they both have a Protestant history and a large Catholic minority (Solt, 2013).

Solt (2013) conducted a further time analysis study including data from 34 different countries and again found that increases in economic inequality were followed in subsequent years by increases in religiosity. This finding remained statistically significant even when the US and German data were removed from the analysis. Furthermore, as with the US and German data, there was no evidence that changes in religiosity precipitated changes in economic inequality.

Solt et al. (2011) suggest that the positive association between inequality and religiosity is driven by rich members of society embracing religion because religion offers a potential method of social control. They argue that the rich engage with religion and promote religion to other people to maintain the status quo and ensure they maintain their position of power in society. However, this suggestion is made in the absence of psychological research designed specifically to address this hypothesis. There could be other explanations as to why rich people become more religious in conditions of inequality. One possible explanation is that being well off while surrounded by people who are struggling could cause a sense of being “blessed”. Or perhaps being rich and surrounded by deprivation could cause anxiety

and a sense of unsteadiness, as those around serve as an illustration of how difficult life would be should they lose it all. Alternatively, religion could relieve guilt at the sight of others' misfortune because others' misery could be construed as being part of some higher plan. Or perhaps rich people have more invested in the stock market, which can be turbulent and unpredictable, meaning that the lives of the rich can be filled with financial uncertainty. In short, there is a myriad of possible explanations for this finding, and it is not possible, in the absence of psychological research, to assess which explanation best reflects reality.

The focus of the next chapter will be an analysis conducted on secondary data, to investigate whether the data support the predictions of the deprivation hypothesis, existential security hypothesis or relative power theory.

Chapter 4 Study 1: Income, Economic Inequality, and Religion in the USA

Introduction

The global pattern of rates of religiosity is a topic that has attracted the attention of researchers from a variety of different disciplines, and thanks to the World Values Survey, the European Social Survey, and the Pew Religious Landscape Survey, there is a wealth of information concerning religious engagement on national and international scales, providing rich data for researchers to analyse.

It has been observed that more economically developed countries have comparatively lower levels of religiosity than less economically developed countries, while countries with lower per capita GDP tend to be more religious (Barber, 2011; Barro & McCleary, 2003; Norris & Inglehart, 2004; Rees, 2009; Solt et al., 2011; Storm, 2017). However, economic inequality is also co-present with higher levels of religiosity (Barber, 2011; Norris & Inglehart, 2004; Rees, 2009). Given that less economically developed countries also tend to have high levels of economic inequality (Rees, 2009), it is difficult to separate the effects of inequality from the effects of absolute deprivation.

Although previous research has consistently found evidence that economic factors and population-level religiosity are linked, correlations between economic factors and religious engagement do not provide much insight as to the proximate mechanisms driving the relationship or about which individuals in society drive this relationship. Nor do they provide strong enough evidence to draw conclusions regarding the directionality of the relationships.

Findings from psychological research suggest that religiosity is frequently used as a tool to cope with negative life events (Manglos, 2013; Sibley & Bulbulia, 2012). This finding is consistent with the Existential Security Hypothesis, which suggests that religion helps people cope with the anxiety one experiences when one's survival is uncertain (Barber, 2011;

Norris & Inglehart, 2004). It is therefore reasonable to suggest that individuals of low socioeconomic status, who experience vulnerability to hardship, might drive the relationship between economic inequality and religiosity. Even in countries with a stable economy, being of low socioeconomic status is a source of uncertainty and insecurity (Wilkinson & Pickett, 2010), which, according to both the Existential Security Hypothesis and the Deprivation hypothesis, can increase the likelihood of turning to religion (Barber, 2011; Glock & Stark, 1965; Norris & Inglehart, 2004; Schieman, 2010; Stark, 1972).

Evidence that changes in economic variables cause changes in religious engagement has been found by Solt et al. (2011), who used longitudinal data to examine changes in economic inequality and changes in religiosity in the United States over a 50 year period. They found that increases in inequality in one year preceded substantial gains in religiosity in the following year. This finding indicates that it is, in fact, changes in the economy that lead to changes in religiosity, not the other way around.

The finding that economic changes appear to influence population levels of religiosity is congruent with the findings of previous researchers investigating the relationship between economic inequality and religiosity (Barber, 2011; Barro & McCleary, 2003; Berman & Stepanyan, 2003; Norris & Inglehart, 2004; Storm, 2017). However, Solt et al. (2011) argue that while there does appear to be a causal link between increases in inequality and increases in religiosity, it doesn't necessarily follow that it is the poorer members of society driving this relationship; data suggest that as inequality increases, all members of society become more religious. Additionally, in conditions of increasing inequality, not only do the poor get poorer, but the rich also get richer and accumulate more power and influence by virtue of their increasing wealth. Thus, it may not be the poorer members of unequal societies that drive the increasing levels of religiosity in poor nations, but rather the richer members, who

have a vested interest in maintaining the status quo and so use their power and influence to promote religion as a way of maintaining their place in the social order.

In order to further explore relative power theory, the deprivation hypothesis and the existential security hypothesis, US data collected by the Pew institute and the Census Bureau were used. The use of US data presents an excellent opportunity to test the relative power theory due to the fact that, while the United States is one of the world's largest economies and has one of the highest GDPs per capita, which is well in excess of $50,000 (Pew, 2015), it is also one of the most unequal wealthy countries in the world. According to World Bank estimates, the USA is the 51st most unequal country out of 159 **(**The World Bank. N.D.**)** with a Gini Index of approximately 40, compared to the average Gini index for Western Europe at 31 (Federal Reserve Bank of St Louis 2016). Thus, the USA provides the perfect context in which to explore the relationships between income, inequality, deprivation, and religiosity.

Hypotheses

The deprivation hypothesis, the existential security hypothesis, and relative power theory each predict different relationships between economic variables and religiosity. Below are the predicted relationships according to each hypothesis/theory. Predicted relationships are also presented in Table 4.1.

Deprivation Hypothesis: 1. Increases in affluence should reduce religiosity.

Existential Security Hypothesis: 1. Increases in affluence should reduce religiosity. 2. Decreases in inequality should reduce religiosity.

Relative Power Theory: 1. Increases in affluence should increase religiosity. 2. Increases in inequality should increase religiosity. 3. Interaction effect of increases in affluence and increases in inequality should increase religiosity.

Table 4.1 *Predictions made by the three different hypotheses/theories*

Hypothesis/Theory	Predicted relationship with religiosity			
	Individual Income	Relative Individual Income	State Median Income	State Inequality (Gini)
Deprivation Hypothesis	Negative Correlation	Negative Correlation	Negative Correlation	N/A
Existential Security Hypothesis	Negative Correlation	Negative Correlation	Negative Correlation	Positive Correlation
Relative Power Theory	Positive Correlation	Positive Correlation	N/A	Positive Correlation

Table 4.1 shows expected relationships between individual income, relative individual income, state median income and income inequality with religiosity according to the deprivation hypothesis, existential security hypothesis and relative power theory.
Note. [a] Relative Individual Income in the following data analysis is calculated by comparison to others in the same state in the USA. The deprivation hypothesis, existential security hypothesis and the relative power theory do not specify whether "relative" wealth should be compared at a national or more local level.

Method

To explore relative power theory, the existential security hypothesis, and the deprivation hypothesis, data from the Pew Religious Landscape Survey and the United States Census Bureau were combined and analysed.

The Pew Religious Landscape Survey is conducted over the phone (both landline and mobile) by the Pew Research Centre's Forum on Religion and Public Life. Each wave of the survey included a representative sample of more than 35,000 individuals from the United States of America who were recruited through random digit dial. To date, there have been two waves of the survey, one conducted in 2007 and one in 2014. The survey includes questions regarding socioeconomic status and religious behaviour. Data from the 2007 and 2014 waves of the Religious Landscape Survey and their respective code books were downloaded.

The combined sample of individuals from the 2007 and 2014 waves of the Religious Landscape Survey consists of 71,028 individuals. Participants were recruited from all 50 US states and the District of Columbia. The number of individuals recruited from each state was adjusted depending on the overall population of each state.

Participants

The 2007 wave of the Religious Landscape Survey consisted of 35,957 participants. Of those, 45.9% were male, and 54.1% were female. Participants identified ethnically as 71% White, 11% Black or African American, 3% Asian or Asian-American, 12% Latino and 3% Mixed or Other race. Participants identified religiously as 53.9% Protestant, 31.4% Catholic, 1.8% Mormon, 1.9% Jewish, 0.3% Muslim, 0.4% Buddhist, 0.4 % Hindu, 7.3 % Unaffiliated, 0.7% Don't know or Refused, 1.9% Other faiths. A full breakdown of participant religious identification is presented in Appendix A.

The 2014 wave of the Religious Landscape Survey took in 35,071 participants. Of those, 49.9% identified as male, 50.1% identified as female. Participants identified ethnically as 66% White, 12% Black or African American, 4% Asian or Asian American, 15% Latino and 4% Mixed or Other race. Participants identified religiously as 50.2% Protestant, 31.7% Catholic, 1.7% Mormon, 2.1% Jewish, 0.9% Muslim, 0.6% Buddhist, 0.7% Hindu, 9.2% Unaffiliated, 0.5% Don't know/Refused, 2.4% Other faiths. A full breakdown of participant religious identification is presented in Appendix A.

Variables

Individual Income

All participants were asked to indicate their income by identifying which income bracket they fell into. There were nine income brackets, covering a range of incomes from

less than $10,000 per year to $150,000 or more per year. Individuals who did not indicate their income had their income coded as *system missing* and were not included in any individual-level analysis. In 2007 a total of 6,171 participants declined to indicate their income. In 2014 a total of 4,581 participants declined to indicate their income. The full list of income brackets is presented in Appendix B.

Religiosity Measures

The following questions in the Pew Religious Landscape Survey were used to measure religiosity: 1) Aside from weddings and funerals, how often do you attend religious services? 2) How important is religion in your life? 3) People practice their religion in different ways. Outside of attending religious services, do you pray? 4) How often do you participate in prayer groups, scripture study groups or religious education programs? 5) How often do you read scripture outside of religious services? Each answer was recorded on a separate numerical scale. The items had initially been coded so that lower scores indicated more religious engagement, with the highest score representing "Don't know/Refused". "Don't know/Refused" was recoded for this study as *system missing,* and the remaining scores were reversed to make the results more amenable to interpretation. The five questions chosen for inclusion had a Cronbach's alpha of .85 for the 2007 data set and .90 for the 2014 data set. To create the variable "Religiosity" z-scores were created for each item as they had been recorded on different scales. The z-scores were then added together and then divided by five (the number of questions making up the composite variable). This mean value of the z-scores created the composite variable "Religiosity". This process was conducted in the same way for both the 2007 and 2014 data sets. Full questions and full scales are presented in Appendix C.

State-Level Religiosity

To calculate state level religiosity, the religiosity score (described above) for each individual in each state was summed then divided by the number of participants from each state. This gave each state its own unique religiosity score based on the results of the Pew Religious Landscape Survey.

State-Level Economic Factors

In order to assess whether inequality predicts religiosity, Gini scores and median income values for each state, taken from the American Census Bureau (n.d.) for the year before the Pew survey, were included. Gini scores or the Gini coefficient is a single score between 1 and 0 which indicates economic inequality, where 0 represents absolute equality and 1 represents absolute inequality. Median income is in US dollars and is an indication of state affluence. Financial information from the year before the survey was conducted was used because Solt et al. (2011) noted that increases in inequality in one year were followed by increases in religiosity in the following year.

Relative Income

Relative income was calculated by converting state median income into brackets, corresponding to the brackets used by Pew to measure individual income. The state median income value was then subtracted from each individual's income bracket number. This final number represented how far above or below their income was in relation to the state median.

Results

The data were analysed in several stages. Firstly, the relationship between state level economic factors and state level religiosity was investigated using correlation and regression. Then the relationship between individual financial variables and individual

religiosity was explored using correlation and regression. Finally, to look at state level economic data, individual level financial information and individual level religiosity simultaneously, data were analysed using a hierarchical linear model.

State Level Correlations

First, a state-level analysis was conducted to look at the relationships between state Gini and average religiosity, and state median income and average religiosity for participants from each state. The District of Columbia is a 'federal district', not a state, and unlike any U.S. state, it essentially constitutes a single large city. Due to this lack of comparability with U.S. states, results obtained from residents of the District of Columbia were not included, which removed 79 individuals from the 2007 data set and 303 individuals from the 2014 data set. Descriptive statistics and intercorrelations are presented in Table 4.2. For the 2007 sample, state Gini had a significant positive relationship with average religiosity. There was a significant positive relationship between Gini and religiosity among individuals earning above median income and individuals earning below state median income. For the 2014 sample, there was no significant relationship between state-level religiosity and Gini. There was a significant positive relationship between Gini and religiosity among individuals

earning below state median income, and no significant relationship between Gini and religiosity among individuals earning above state median income.

Table 4.2 *State Level Analysis: Intercorrelations and descriptive statistics*

	1.	2.	3.	4.	5.	*M*	*SD*	N
1. Gini	-	.56	.35*	.36**	.32*	.45	.02	50
2. Med. Inc.[1]	-.25	-	-.56**	-.53**	-.55**	$61k	$9k	50
3. Av. Relig.[2]	.23	-.60**	-	.96**	.98**	-.12	1.23	50
4. Av. Relig. Bel[3]	.34*	-.51**	.94**	-	.88**	.21	1.14	50
5. Av. Relig. Eq & Ab[4]	.14	-.63**	.97**	.83**	-	-.45	1.38	50
M	.46	$52k	-.09	.26	-.44			
SD	.02	$8k	1.13	1.01	1.35			
N	50	50	50	50	50			

*Note. * Correlation is significant at the 0.05 level. ** Correlation is significant at the 0.01 level. 2007 results are presented above the diagonal. 2014 results are presented below the diagonal. [1]Med. Inc. = Median income. [2]Av. Relig. = Average religiosity score for all individuals analysed. [3]*Av. Relig. Bel *= the average religiosity score for individuals earning below the state median income. [4]*Av. Relig. Eq & Ab *= the average religiosity score for individuals earning at or above the state median income.*

State median income had a significant negative relationship with average religiosity at the state level in both the 2007 sample and the 2014 sample. There was a significant negative relationship between state median income and average religiosity in the above median-income earners and in the below median-income earners in both the 2007 and 2014 samples. These results indicate that state median income, rather than inequality (as indicated by Gini), had a more consistent relationship with religiosity. This is consistent with the deprivation hypothesis and somewhat consistent with the existential security hypothesis.

State Level Regression

Results of the regression are presented below in Table 4.3. The regression analysis showed that religiosity had a significant negative relationship with state median income in both the 2007 and 2014 samples indicating that as state wealth increased, state-level religiosity decreased.

The regression analysis found the relationship between Gini and state average religiosity was significant and positive in the 2007 sample. The relationship between religiosity and Gini was significant and positive among above-average earners and below-average earners on the 2007 sample.

The relationship between Gini and average religiosity was non-significant for the 2014 sample. The relationship between Gini and religiosity was positive and significant for the below median income earners in 2014. The relationship between average religiosity and Gini was non-significant for the above median income group for the 2014 sample.

Table 4.3 *State Level Analysis: Average Religiosity Regressed on Gini and Median Income for 50 US States*

	2007					2014				
	R	R^{2a}	*p*	β	*t*	R	R^{2a}	*p*	β	T
Average Religiosity	.64	.35	<.001			.61	.35	<.001		
State Gini			.013	.35	2.57			.100	.23	1.67
State Median Income			<.001	-.58	-5.43			<.001	-.58	-4.88
Average Religiosity Among Below Median Earners	.66	.42	<.001			.55	.27	<.001		
State Gini			.010	.36	2.70			.020	.34	2.47
State Median Income			<.001	-.56	-5.9			.001	-.45	-3.58
Average Religiosity Among Above Median Earners	.66	.41	<.001			.63	.38	<.001	.63	.38
State Gini			.025	.32	2.32			.33	.14	0.98
State Median Income			<.001	-.57	-5.19			<.001	-.64	-5.47

Note [a] = Adjusted R^2

Individual Level Correlations

Further analysis was conducted on individual-level data to look at the relationship between individual income and individual level religiosity. Only individuals who indicated their income were included in individual-level analyses.

Table 4.4 *Individual-Level Analysis: Correlations, Means and Standard Deviations of Variables*

	1	2	3	4	5	*M*	*SD*	N
1. Religiosity	-	.12**	.17**	-.12**	-.08**	-0.03	4.08	29012
2. Age	.07**	-	.08**	-.10**	-.09**	6.75	3.40	29012
3. Sex[1]	.15**	.06**	-	-.13**	-.09**	1.53	0.49	29012
4. Income	-.12**	.01	-.14**	-	.77**	5.25	2.34	29012
5. Income group mean centred	-.06**	.09**	-.08**	-.08	-	1.36	0.48	29012
Mean	-.09	7.54	1.49	5.29	1.46			
SD	4.21	9.09	0.50	2.47	0.49			
N	29826	29826	29826	29826	29826			

*Note. ** Correlation is significant at the 0.01 level. 2007 data presented above diagonal. 2014 data presented below diagonal. [1]Sex is coded Female = 0, Male = 1.*

Individual Level Regression

Table 4.5 *Individual-Level Analysis: Regression of Religiosity on Income for the Years 2007 (N=2912) and 2014 (N=29826)*

	2007					2014				
	R	R^{2a}	β	*t*	*p*	*R*	R^{2a}	β	*t*	*p*
	.218	.47			<.001	.198	.39			<.001
Age			.11	15.14	<.001			.07	12.97	<.001
Sex[1]			.16	27.85	<.001			.14	24.77	<.001
Income			-.13	-13.75	<.001			-.16	-15.83	<.001
Relative income			.04	4.88	<.001			.07	6.53	<.001

a. Adjusted R^2. [1]Sex is coded Female = 0 Male = 1.

The results of the individual level regression presented above in Table 4.5 show that income had a significant negative relationship with religiosity, and relative income had a significant positive relationship with religiosity, for both 2007 and 2014.

Hierarchical Linear Model

A hierarchical linear model (HLM) was used to analyse the data. HLM was chosen because the data are nested, that is, individuals living in the same state are not entirely independent of each other. When investigating whether individual income, state wealth and state-level inequality relate to religiosity, HLM can control for the possibility that participants belonging to one particular state may display similar levels of religiosity that cannot be explained by the three variables of interest; thus, HLM can reveal to what extent the economic variables chosen for this model predict the religiosity of a resident of Alabama above and beyond what one could crudely refer to as “Alabamaness”. Furthermore, in the HLM individual relative income is used rather than individual income. The use of an HLM allowed for both individual-level and state-level variables to be considered in the same model and to explore interactions between state and individual-level variables.

Table 4.6 *Hierarchical Linear Model of Effects of Economic Variables on Religiosity in USA 2007*

Parameter						95% Confidence Interval	
	Estimate	*S.E.*	df	*t*	*p*	Lower Bound	Upper Bound
Intercept	-2.82	2.55	52.10	-1.11	.270	-7.92	2.29
Relative Inc[1]	0.76	0.30	48.9	2.50	.020	0.15	1.37
State Gini	17.29	5.68	51.43	3.05	<.010	5.90	28.68
State Med Inc[2]	< -.001	< .001	48.30	-6.69	<.010	< -.001	< -.001
RI*Gini[3]	-1.07	0.67	52.40	-1.60	.120	-2.42	0.27
RI* State Med Inc[4]	< -.001	< .001	49.47	-5.23	< .001	< -.001	< -.001

*Note. Dependent Variable: religiosity. [1]Relative Inc = relative income. [2]State Med Inc = state median income. [3]RI*Gini = Relative income multiplied by state Gini. [4]RI* State Med Inc = relative income multiplied by State median income.*

For the 2007 data, the estimates of fixed effects found that individual relative income had a significant positive relationship with individual religiosity. The results also showed a significant positive relationship between individual religiosity and state-level inequality (Gini). Further, state median income had a significant negative relationship with individual-level religiosity. Whereas the interaction between individual relative income and Gini did not have a significant effect on individual religiosity, the interaction of individual relative income with state median income was associated with a significant reduction in individual religiosity.

Table 4.7 *Hierarchical Linear Model of Effects of Economic Variables on Religiosity in USA 2014*

Parameter	Estimate	*S.E.*	*df*	*t*	*p*	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	2.33	3.15	47.96	0.74	.460	-3.99	8.66
Relative Inc[1]	1.59	0.32	44.03	4.90	< .001	.94	2.24
State Gini	3.87	6.37	48.01	0.61	.550	-8.92	16.67
State Med Inc[2]	< -.001	< .001	47.71	-5.34	< .001	< -.001	< -.001
RI * State Gini[3]	-2.60	0.66	45.25	-3.95	< .001	-3.93	-1.28
RI* State Med Inc[4]	< -.001	< .001	50.01	-6.46	< .001	< -.001	< -.001

*Note. Dependent Variable: Religiosity. [1]Relative Inc = relative income. [2]State Med Inc = state median income. [3]RI*Gini = Relative income multiplied by state Gini. [4]RI* State Med Inc = relative income multiplied by State median income.*

For the 2014 data, the estimates of fixed effects found that individual relative income had a positive relationship with religiosity which reached statistical significance. State-level inequality, as measured by the Gini index, had a non-significant relationship with religiosity. State median income had a negative relationship with individual-level religiosity which reached significance at the p <.001 level. The interaction effect of increased individual relative income and increased Gini was associated with a reduction in individual religiosity, this effect was significant at the p <.001 level. This could indicate that the relationship between higher Gini and higher levels of religiosity is driven by the less affluent residents of states with higher levels of economic inequality.

As with the 2007 data, the interaction effect of increases in individual relative income and state median income resulted in a significant reduction in individual religiosity. This

interaction suggests that the positive effect of increasing income is attenuated by increased state median income.

Discussion

The analysis conducted on the data collected by the Pew Institute has revealed some interesting results which do not strongly support nor contradict the deprivation hypothesis, the existential security hypothesis, or the relative power theory.

State-level correlations summarised in Table 4.3 indicate that in both the 2007 and 2014 samples, state median income had a significant negative relationship with average state-level religiosity. This relationship was present in the data looking at below state median and above state median earners together. The relationship between state-level median income and average religiosity was negative and significant among both the below-median income earners and the above-median income earners, in both the 2007 and 2014 samples.

The regression analysis on state-level data summarised in Table 4.5 found the relationship between religiosity and Gini was positive and significant in 2007 for the data looking at below state median and above state median earners. The relationship between Gini and average religiosity was significant and positive among the below state median earners and the above state median earners for the 2007 sample.

The relationship between average religiosity and Gini was non-significant for the data looking at below state median earners and above state median earners for the 2014 sample. However, this relationship was positive and significant among the below median earners, and non-significant among the above state median earners for the 2014 sample. This provides some evidence that in conditions of economic inequality it is individuals on lower incomes who drive the relationship between inequality and religiosity.

The finding that state median income had a negative correlation with religiosity is consistent with the deprivation hypothesis and the existential security hypothesis, which both suggest that religiosity increases in response to the strain of living on a lower income. The finding that Gini had a significant positive correlation with religiosity in 2007 is also consistent with what one would expect according to the existential security hypothesis. However, the finding that Gini and religiosity did not have a significant relationship in the overall 2014 sample is not consistent with the existential security hypothesis. One possible explanation for the inconsistency between the results from the 2007 wave and the 2014 wave is the fact that the second wave of the Religious Landscape Survey was conducted after the global financial crisis of 2008. According to data from the United States Census Bureau, the state median income for 48 of the 50 states was lower in 2013 than it was in 2006 by, on average, $8,965.52 (SD = $ 285.18). However, in that time the Gini score for the USA as a whole reduced by less than .02 (SD = .008), indicating that the decrease in wealth coincided with a small decrease in inequality.

Healy and Breen (2014) used data from six waves of the European Social Survey from 2002 to 2012 to investigate whether levels of religiosity in Ireland, Spain and Portugal had increased in response to the global economic crisis of 2008 as would be predicted by the existential security hypothesis. However, Healy and Breen (2014) found that there was no significant change in levels of religiosity in Spain or Portugal, furthermore they found there was a significant decrease in the levels of religiosity in Ireland. However, although the global economic crisis left Ireland, Spain and Portugal in such precarious economic circumstances that they needed substantial bailouts from the EC-IMF-ECB, inequality, as measured by the Gini index, was lower in each of these countries in 2012 than it was in 2005. So, while there was great economic uncertainty in these countries, the expected increase in religiosity was

perhaps curtailed by the accompanying decrease in inequality, this may be the case with the data presented above.

According to the individual correlations and regressions, increasing income reduces religiosity, which is consistent with what one would expect according to the deprivation hypothesis. However, this negative association between income and religiosity found in the individual level data in this sample may still be caused by state-level median income due to how Pew recruits participants. In states with higher median income, more people are earning more money, if state median income in one state is $50,000 per year, then 50% of the residents in that state are earning $50,000 per year or less and if the median income of another state is $25,000 per year, then 50% of the residents of that state are earning $25,000 per year or less. This means that when Pew calls a randomly selected participant living in a state where the median income is higher, the participant they reach is more likely to be in a higher income bracket than a person called at random in a state with a lower median income. If all participants, regardless of state of residence, are included in the same regression and state median income is not controlled for, then it is likely that there is an overrepresentation of participants from states with low median income in the lower income brackets and an over representation of participants from states with high median income values in the higher income brackets. For this reason, a negative relationship between income and average religiosity may be caused by a negative relationship between state median income and religiosity. Using relative income rather than income should to some extent control for this. This may explain why the HLM which used individual relative income rather than individual income revealed a positive relationship between individual relative income and religiosity once state-level effects were controlled for.

As briefly mentioned above, the relationship between individual income and individual religiosity revealed by conducting a simple correlation is different from the relationship revealed by the HLM which used individual relative income. The positive association between individual relative income and religiosity is a relationship that was predicted and found by Solt et al. (2011). The HLM also revealed some evidence of a positive association between religiosity and Gini in 2007, another finding consistent with that of Solt et al. (2011). Furthermore, the results of the HLM indicate that in states with higher Gini coefficients, richer people were more religious than richer people living in states with lower Gini coefficients. However, while many of the results from the HLM are similar to those found by Solt et al. (2011), the extent to which these results support the relative power theory is debatable, and one could argue that, in fact, the expected effects of wealth and economic inequality on religiosity predicted by the relative power theory are not substantially different from the effect one would expect based on the predictions of deprivation theory or the existential security hypothesis.

Solt et al. (2011) argue that the deprivation theory predicts that the relationship between economic inequality and religiosity should be positive. They also state that the deprivation hypothesis predicts a strong negative interaction effect between inequality and income and that the negative effect of increasing income on religiosity should be so strong that increasing inequality will have a negligible effect on the rich. Put simply, the deprivation hypothesis predicts that increased levels of religiosity found in conditions of high inequality are driven by poor members of society. Solt et al.'s relative power theory (2011) also predicts that inequality should increase religiosity. However, relative power theory predicts that the interaction between increasing income and increasing inequality should not be strongly negative, meaning that religiosity should increase among all members of unequal societies

regardless of individual income. Although Solt et al. (2011) refer to their relative power theory as being "substantially different" from the deprivation hypothesis, the main difference between these theories appears to be the predicted strength of the negative effect of the interaction between inequality and income; the deprivation hypothesis predicts that the interaction between inequality and income should be strongly negative while relative power theory predicts the interaction effect between inequality and income should be negligible. One may question whether the difference between the strength of a negative interaction is substantial enough to demand a separate theoretical explanation.

Solt et al. (2011) put forward a potential explanation as to why increasing income should increase religiosity, especially in conditions of inequality. They suggest that as the rich accumulate more income and more power, they rely on religion's ability to promote and maintain the status quo as a way to protect their claim to power. While it is not beyond the realms of possibility that this is indeed happening, it is a huge theoretical leap to claim that this is the case in the absence of psychological data. It is not possible to test this hypothesis without investigating the effects of wealth on religious cognition. Furthermore, the data Solt et al. (2011) use to support their Relative Power Theory is cross-sectional, thus it is not possible to assess whether increased levels of religiosity among the rich is a direct response to increasing wealth. Solt et al. (2011) do not present sufficient evidence to support their claim that the rich promote religion as a way to maintain power.

The existential security hypothesis offers a potential explanation as to why even wealthy people in unequal societies may well be more religious than wealthy people in equal societies. While at the individual level, existential insecurity caused by financial need could be linked to lack of basic resources such as housing, clothing, food, and water, at the group level (such as state or country level), insecurity could be linked to pollution, inequality, war,

natural disaster, and economic recession or depression. Living in an unequal society is likely to increase existential insecurity at the group level, not just at the individual level. Relative personal wealth can only offer limited protection from social and environmental existential threats which tend to co-present in unequal societies, such as war (Nafziger & Auvinen 2002; Nafziger, 2006), violent crime (Coccia, 2018; Stolzenberg et al., 2006), homicide (Chamlin & Cochran, 2006; Wilson & Daly, 1997) air and water pollution (Batisse et al., 2017; Berthe & Elie, 2015; Boyce et al., 1999; Fairburn et al., 2019; Ridzuan, 2021; Vornovytskyy & Boyce, 2010), civil unrest (Cramer, 2003) and political instability (Cicatiello, 2019; Giskemo, 2012). Thus, it may well be that the existential security hypothesis offers a full enough explanation of the effects of personal wealth, country-level economic strength and inequality on levels of personal religiosity of both rich and poor members of society. However, once again, this is not something that can be investigated in the absence of psychological data.

While the Pew data are rich, there is only so much insight one can gain from analysing secondary data, especially as the Pew Religious Landscape Survey was designed not to investigate links between wealth, inequality, and religiosity from a psychological perspective, but rather to gain a general insight into the demographic pattern of religious engagement. Furthermore, the questions used in the Pew research focus more on cultural and behavioural indicators of religious belief, and while these are important facets of religiosity, they do not offer much insight into the psychological aspects of religiosity, such as what function these beliefs may serve, and how beliefs may change with socioeconomic status, inequality, deprivation and financial insecurity. Ultimately, the Religious Landscape Survey offers a rich source of information regarding the pattern of religious engagement, but very little information regarding why the pattern is as it is.

In order to fully investigate the explanatory power of both the existential security hypothesis and relative power theory, or indeed any other hypothesis which intends to illuminate the relationship between economic conditions and religious thinking, it is necessary to perform psychological research with the express purpose of exploring the individual level psychology of individuals of varying degrees of personal wealth, living in societies of varying levels of economic inequality.

Chapter 5 Study 2a: Behavioural Religiosity and Transcendent Teleological Thinking

Introduction

This chapter seeks to assess the validity of a new measure designed to assess transcendent teleological thinking, which is defined here as the belief that there exists a universal causal force that is purposeful and intentional. This measure aims to capture a specifically cognitive, rather than behavioural, aspect of religiosity.

Religion and religiosity are difficult concepts to operationalise. Definitions of religion include a variety of cultural, behavioural, and cognitive aspects. As discussed in Chapters 1 and 2, religion has been defined and measured in a variety of different ways, and it is often difficult to identify exactly what researchers mean when they refer to religion. This is reflected in the number of inventories available to researchers who wish to measure religious belief. Cutting and Walsh (2008) conducted a review of the inventories available to researchers and found at least 177 scales available at the time of writing, and doubtlessly more scales have been created since. Cutting and Walsh also noted that there is a lack of clarity and consistency regarding what exactly is being measured in these scales. Similarly, Hill and Pargament (2003) noted that the use of single-item measures of religiosity, such as church attendance or denominational affiliation, may obscure as much as it reveals about religious engagement and argue that there is a need for more reliable and nuanced methods of investigating religion.

Historically, much of the early research on religion and religious experience has focused on Christians – with William James and Edwin Starbuck generally being considered pioneers in the field of the psychology of religion, the beginnings of the field predominantly studied religion as it appears within American Protestantism. This is a long-standing criticism

of the field and of the inventories created by researchers, including the often used intrinsic/extrinsic scale created by Allport and Ross (1967).

Within the academic study of religion and spirituality, many attempts have been made to improve how religiosity and/or spirituality is investigated, yet there still appears to be a lack of clarity. Wulff (2019) proposes the use of the Q-sort method, yet his proposed method includes 101 items that participants sort on a nine-category continuum. Furthermore, despite Wulff's conscious attempt to create a cross-culturally accessible means for assessing religious sentiment, Wulff's inventory includes statements that refer to God(s) and/or divine beings, rituals, behaviours, scriptures, locations, and traditions. Not all of these concepts will translate across cultures in a meaningful way. There is the further issue that by trying to encompass many different aspects of what one might consider religious engagement, belief, and behaviour, Wulff's inventory lacks specificity.

One of the aims of this thesis as a whole is to investigate whether religious cognition results in adaptive benefits and whether there is evidence that religious cognition is an adaptation. In order to do this, it is necessary to clearly define what is meant by cognitive religiosity and be sure to be precise when attempting to measure this specific aspect. Taking a more cognitive approach may also allow the detection of individuals who may not self-identify as being a member of any particular religion or as religious at all, but who still engage in religious or spiritual style thinking, such as those who engage in new-age practices.

It has been reported that over the last few decades in the USA, there has been a marked decline in religious affiliation and a reduction in the percentage of the population who consider themselves to be religious (Marler & Hadaway, 2002; Pew, 2019; Voas & Chaves, 2018). Data from the General Social Survey (GSS), a survey that only includes

individuals living in the USA, indicates that the percentage of individuals identifying as having no religion has increased from 6% in the early 1970s to 22% in the late 2010s (Pew, 2019).

As well as the decrease in individuals identifying as religious, there has also reportedly been an increase in the number of people who do not conform to any one particular or traditional religion and often identify as "spiritual but not religious" (Fuller, 2001). These people could be regarded as cognitively religious, as individuals who identify as "spiritual but not religious" often report that they believe in God or Gods, but they do not follow or engage with organised religion (Willard & Norenzyan, 2017). Individuals who identify as spiritual but not religious seem to emphasise the importance of the individual experience and relationship with supernatural forces, whereas the religious tend to place more emphasis on shared belief and institutions (Willard & Norenzyan, 2017).

One specific example, which highlights the eclectic approach some individuals take towards religious or spiritual practices, comes from a study by McGuire (1997), who reports interviewing a woman who had been raised within the Roman Catholic church. Although this woman still considers herself to be highly religious, she no longer attends church regularly and instead appears to have created her own pick-and-mix religion:

> *"She has a home altar that symbolises her personal spiritual beliefs. On this altar are 18 candles, an amulet attached to a photo of her grandmother, amethyst crystals used in healing meditations, oriental incense, a Tibetan prayer bowl, a representation of the Virgin of Guadalupe and some other Catholic items." - McGuire*

Despite the appropriation of objects and iconography attached to several different religions and spiritual practices, this individual might not be classed as highly religious by surveys such as the one used by Pew or the GSS, which tend to focus on behavioural signifiers of religious affiliation such as church attendance and prayer. These same surveys

may simultaneously identify individuals who attend church or engage in other traditional Christian religious behaviour, but who are not cognitively religious or do not engage in religious thinking, as being highly religious. If surveys that focus on behavioural religiosity do not accurately capture modern patterns of religious thinking, then any further inference will be similarly flawed.

This is no small problem as, according to Fuller (2001), up to 21% of all Americans are not affiliated with a church but could still be considered "spiritual". In an earlier study conducted by Roof (1993), 86% of participants considered themselves to be religious. Of the 14% who did not consider themselves religious, 65% considered themselves to be spiritual, meaning 9% of respondents in total identified as spiritual but not religious. Similarly, in a study conducted by the Gallup Organisation, of 1,037 adults surveyed, 54% of individuals identified as religious, 30% as spiritual but not religious, and 9% as neither. (Princeton Religion Research Centre 2000). However, as Marler and Hadaway (2002) note, in these surveys, participants were only given the option to identify as spiritual or religious and were not given the option of identifying as both spiritual and religious.

It has been convincingly argued by Marler and Hadaway (2002) that being spiritual and being religious are not mutually exclusive but instead are separate yet greatly overlapping concepts. Most religious individuals consider themselves to also be spiritual, but previous research, such as that conducted by Gallup (2000) and Roof (1993) gives an inaccurate picture of religious and spiritual beliefs by forcing participants to identify as either spiritual or religious. Marler and Hadaway (2002) conducted a study with 2,012 Protestant participants, of which 73.5% considered themselves to be religious and 82.4% considered themselves to be spiritual, with 64.2% of respondents identifying as both religious and

spiritual. This study also found that 18.5% of participants identified as spiritual only, 8.9% of participants identified as religious but not spiritual, and 8.4% of respondents were neither spiritual nor religious.

A recent report from the Pew centre found that 26% of the people they surveyed in 2018 and 2019 identified as atheist, agnostic or "nothing in particular", which is an increase from 17% in 2009 (Pew 2019). Pew also reports a decrease in people identifying as religious and an increase in individuals identifying themselves as spiritual. Evidence of this trend has also been reported by Marler and Hadaway (2002), who report differences between cohorts. They found that the youngest cohort in their study (described by Marler & Hadaway as "baby busters", this group is also sometimes referred to as "generation X, born between 1956 and 1981[Washburn, 2000]), had the highest percentage of individuals identifying as spiritual only, but also had the lowest percentage identifying as both spiritual and religious, and the highest percentage identifying as neither spiritual nor religious. These findings suggest that among this younger cohort, there has been a shift away from both religiosity and spirituality.

While research such as that by Marler and Hadaway (2002) gives a better picture of rates of religiosity and spirituality by allowing participants to identify as one, both, or neither, their research has the limitation that spiritual, religious, both, and neither are simply conventional categorical designations, so do not enlighten us as to what these labels mean from a cognitive perspective. Furthermore, while the above research all suggests that rates of spirituality and religiosity are decreasing in the general population, it doesn't enlighten us as to what is changing on the cognitive level and whether the way in which people make sense of the world is changing. It is not possible to tell whether people are shifting away from faith-based explanations of reality towards more scientific explanations, or just shifting away from

traditional religion while maintaining a belief in transcendent teleological explanations of life, such as the belief that life unfolds in accordance with the plans of some supernatural higher power.

While the analysis done on the Pew data in Chapter 4 did indicate that there are differences in levels of religious engagement among individuals in different economic conditions, these differences are predominantly behavioural and so limited by the issues outlined above. By taking a cognitive approach, it may become apparent that the differences in religiosity among individuals of varying economic stability are different to what has previously been reported. For example, it has been reported that in conditions of inequality, individuals tend to become more religious, however, this may mean that individuals in conditions of high economic inequality are behaving differently but not thinking differently to people in conditions of low economic inequality. Furthermore, it could be that two individuals who pray and attend a place of worship just as frequently as one another differ considerably in their religious cognition. Church attendance and praying could be mere habits for one but deep and meaningful experiences for the other. In other words, while they engage in the same behaviours, their cognitive experience or motivations may be quite different. It is particularly important to take a more cognitive approach to the study of religion if we are trying to detect a cognitive difference between wealthy and deprived individuals that could have some adaptive function. Taking an explicitly cognitive approach is necessary if we wish to carve nature at its joints and investigate the likelihood that a specific cognitive mechanism is responsible for increasing or decreasing religiosity in response to environmental input.

Taking a cognitive approach also allows us to focus on what the common cognitive hallmarks of religion and spiritual beliefs are, without being distracted by cultural differences

in how these cognitive differences are expressed and how they manifest. This approach, which aims to tap into the underlying cognition of religious or spiritual beliefs, has the additional benefit that it might result in developing a measure that would be more cross-culturally applicable than measures that are biased towards theism and other westernised concepts of religion and spirituality. This is a particularly important consideration when studying human behaviour from an evolutionary perspective, as any cognitive feature which one proposes to be a biological adaptation ought to be widely observable cross-culturally. While cultural influences may well alter how this feature presents, creating a measure that omits aspects of religiosity which are likely to be culturally-specific ought to allow for the measurement of the particular cognitive feature of interest.

In order to focus on religious and spiritual thinking rather than religious behaviour, it is first necessary to define what we mean by religious and spiritual thinking. William James defined religion as "belief in an unseen order" (James, 1902/2004, p. 57). This unseen order is transcendent, in as much as it is universal and exists beyond the physical or natural world. This unseen order is also teleological, in that it operates with purpose. James also emphasises the importance of living in harmony with this order (James 1902), however, the way in which individuals seek to gain or maintain harmony with this order is a likely point of cultural variation, so for now, at least, the focus will be specifically on whether individuals believe that an unseen transcendent teleological order exists. This very broad definition potentially gets to the nub of religious and spiritual thought in a way that is applicable across cultures. The challenge here is to not only think about religious or spiritual beliefs in terms that are broad enough to capture the essence of what it means to be religious or spiritual, but to also conceptualise this idea in a specific and measurable way. Belief in a force that is transcendent and teleological seems to be a good candidate.

Teleological Thinking

Teleological thinking describes a sort of reasoning wherein the consequence of an event or function of an item is sighted as its purpose or cause (Kundert & Edman, 2017). Teleological thinking is often an appropriate way to make sense of the world and a useful tool in explaining the existence of artefacts such as chairs or toasters, or the actions of agents with minds, internal states and desires (Banerjee & Bloom, 2014). However, the application of teleological thinking to natural events is largely inappropriate. For example, an earthquake is simply a sudden release of physical energy built up in the process of tectonic plates moving against each other. The interpretation of an earthquake as a message from "God" or "the universe" to warn against or encourage a specific course of action would be an inappropriate application of teleological thinking, because only agents with minds can be purposeful in their actions. However, the interpretation of such events as teleologically meaningful is common and has been recorded in several cultures (Diesendruck & Haber, 2009; Kundert & Edman, 2017; Rottman et al., 2017).

While the application of teleological thinking to the natural world and to life events is arguably the "default", choosing to explicitly endorse or actively reject teleological explanations could be a key cognitive difference between people who are in some way religious or spiritual and those who are non-religious or atheist. Thus, measuring transcendent teleological thinking could be a useful, cross-culturally applicable method of measuring cognitive religiosity and a good alternative or addition to more commonly used measures of religiosity.

Existing measures of cognitive religiosity

As mentioned previously, there are hundreds of scales designed for the measurement of religiosity, many of which do aim to focus on spirituality and spiritual wellbeing. However, many of these measures are not ideal for cross-cultural research, as they explicitly evoke "god". Use of relatively specific and concrete terminology such as god or gods to refer to religious power makes these measures less useful as measures of transcendent teleological thinking in individuals who do not believe in god or gods per se, but do believe in more conceptually abstract forms of religious power.

In a review of 259 available measures specifically looking at spirituality and/or spiritual health or wellbeing, Fisher (2015) notes that there are many instances in which research appears to confuse spirituality and religion. Fisher states that the aim of the review is to assess scales which have been developed and used for the purpose of measuring spirituality or spiritual health/wellbeing. The measures and scales reviewed by Fisher are assessed within the author's own theoretical framework of spiritual health and wellbeing, which argues that spirituality and spiritual wellbeing is made up of four key domains: relationship with self (personal), relationship with others (communal), relationship with the environment (environmental), and relationship with transcendent other/god (transcendental). Fisher presents a table of available inventories, reviews each inventory, and classifies each individual item as reflecting personal, communal, environmental, or transcendent aspects of spirituality. Fisher also records whether measures had items which reflected religion or religiosity without also referencing god or other people. Of the inventories reviewed by Fisher, 197 include items which are characterised as measuring transcendence, while only two are categorised as measuring only transcendent aspects of spirituality; these two are the Cancer and Deity Questionnaire (Bowman et al., 2009), which is described by Bowman et al.

as a 12-item measure designed to assess perceived relationship with god after a cancer diagnosis, and the Culturally Appropriate Positive Mental Health Measure (Vaingankar, 2011) which is designed to focus on mental health in a Singaporean population. Of the 197 which do include items which measure transcendence, 52 had items which cross loaded with personal, communal, or environmental domains. Furthermore, of the 197 inventories which included transcendent measures, 150 included measures which Fisher identified as religious. Examples of inventories which do include items measuring transcendent aspects of spirituality/religiosity include the Self-Transcendence Scale, a subscale of 15 items taken from the Temperament and Character Inventory developed by Cloninger et al. (1993), the Spiritual Transcendence Index (STI, Seidlitz et al., 2002), and the Spiritual Wellbeing Scale (Ellison, 1983).

The Spiritual Transcendence Index (STI, presented below in Table 5.1) created by Seidlitz et al. (2002), was identified by Fisher as including items which measured transcendence, and not including items which cross loaded with personal, communal, or environmental domains, which Fisher has not classified as religious. However, several items in the STI mention god, a construct which is not applicable to all religions and cultures, thus reducing its utility in measuring transcendent teleological belief among individuals who are not monotheistic or whose culture or religion do not include god concepts. While the STI consists of two subscales, the god subscale and the spirit subscale (meaning it is possible to remove all items mentioning god), the remaining 'spirit' items appear to presuppose not just the presence of spiritual beliefs, but also the functional or other secondary aspects of these beliefs. This makes the responses harder to clearly interpret. For example, if a participant responds "strongly disagree" to the item "my spirituality helps me to understand my life's purpose", this could indicate that although the respondent is spiritual, their spirituality does

not give them a sense of purpose or help them understand what purpose their life may have. Similarly, the response "strongly disagree" to the item "maintaining my spirituality is important to me" may indicate that the participant does not consider themselves to be spiritual, or that they do consider themselves to be spiritual but do not see value in maintaining or enhancing this aspect of themselves. Due to the wording of such items, it is difficult to identify which interpretations would be most accurate. Moreover, these items do not just detect the presence of belief, but arguably presuppose the presence of belief and seek to identify its function or importance to the respondent.

Table 5.1 *Spiritual Transcendence Index (STI) by Seidlitz et al. (2002)*

Please indicate how much you agree or disagree with the following statements
1) My spirituality gives me a feeling of fulfilment 2) I maintain an inner awareness of God's presence in my life 3) Even when I experience problems, I can find a spiritual peace within 4) I try to strengthen my relationship with god 5) Maintaining my spirituality is important to me 6) God helps me rise above my immediate circumstances 7) My spirituality helps me understand my life's purpose 8) I experience a deep communion with god
Responses given on a 6 point Likert scale from strongly disagree to strongly agree.

The Spiritual Wellbeing Scale developed by Ellison et al. (1983) is a 20-item scale, which Fisher identifies as having ten items relating to the personal and ten relating to the transcendent. Of the 20 items, ten include explicit reference to god and many of the items don't appear to measure spirituality at all. For example, one item asks participants to indicate the extent to which they agree or disagree with the statement "I feel that life is full of conflict and unhappiness". Another item which doesn't appear to directly relate to spiritual beliefs is "I don't know who I am, where I am, where I came from, or where I am going"; this

particular item seems very un-focused and poorly worded, and it is unclear whether high levels of agreement with this item would indicate philosophical angst or acute amnesia.

Other measures which do focus on cognitive religiosity do not appear to include items which focus on both teleology and transcendence simultaneously. For example, the Self-Transcendence Scale, a subscale of 15 items taken from the Temperament and Character Inventory developed by Cloninger et al. (1993, presented below in Table 5.2), is identified by Fisher as including items with measured transcendence, and not including items which cross loaded with personal, communal or environmental domains, which Fisher has not classified as religious. The Self-Transcendence Scale was designed with the aim of measuring spirituality as a character trait. Responses to all items on the inventory are recorded as either true or false. Some of the items on the Self-Transcendence Scale lack face validity; for example one item, "I often become so engrossed I what I am doing I get lost in the moment – it is as if I'm detached from time and place" appears to describe hyperfocus, a cognitive state of complete absorption within a task. While most people will experience hyperfocus at some point in their lives, experiencing regular and/or intense periods of hyperfocus is often discussed as a facet of autism, schizophrenia and attention deficit hyperactivity disorder (Ashinoff & Abu-Akel, 2021). Another questionable aspect of the Self-Transcendence Scale is that some items ask whether the respondent has ever felt as though they are connected to all living beings in a spiritual way. The phrasing of these items may present a problem as, arguably, it is possible to feel as if one is connected to a great spiritual force while still consciously believing that no such force really exists. Furthermore, recognising the interconnectedness of all living creatures and even all objects in existence is an appreciation one can gain through an understanding of scientific concepts such as evolution and the big bang theory, and reflecting on these concepts can induce a state of awe. While this may

indicate an ability to transcend the self, it is not necessarily indicative of beliefs in anything which could be considered “supernatural” or in conflict with observable or measurable reality. A further limitation of the Self-Transcendence Scale is that some of the items appear to describe pro-social behaviour rather than spirituality, for example, agreement with the item “I have made real personal sacrifice in order to make the world a better place – like trying to prevent war, poverty and injustice” could indicate high levels of altruism and prosociality rather than spirituality. While one could argue that engagement with self-transcendence may well increase altruism, it is inappropriate to measure a possible outcome of the presence of a belief, attitude, or personality trait, in this case altruism as an outcome of self-transcendence, and then cite that as evidence that the belief, attitude or personality trait is actually present. Overall, the only item which appears to reflect transcendent teleological thinking is item 9, “sometimes I have felt that my life was being directed by a spiritual force greater than any human being”.

Table 5.2 *Self-transcendence scale of the Temperament and character Inventory Cloninger et al (1993)*

1) Often I have unexpected flashes of insight or understanding while relaxing 2) I often feel a strong spiritual or emotional connection with all the people around me 3) I often feel that I am a part of the spiritual force on which all life depends 4) I love the blooming of flowers in spring as much as seeing an old friend again 5) I sometimes feel so connected to nature that everything seems to be part of one living organism 6) I seem to have a "sixth-sense" that sometimes allows me to know what is going to happen 7) Sometimes I have felt as if I was part of something with no limits or boundaries in time or space 8) I sometimes feel a spiritual connection to other people that I cannot explain in words 9) sometimes I have felt that my life was being directed by a spiritual force greater than any human being 10) I often become so fascinated with what I am doing that I get lost in the moment – as if I'm detached from time and place 11) I have made real personal sacrifice in order to make the world a better place – like trying to prevent war, poverty and injustice 12) I have had personal experiences in which I felt in contact with a divine and wonderful spiritual power 13) I have had moments of great joy in which I suddenly had a clear, deep feeling of oneness with all that exists 14) I believe that all life depends on some spiritual order or power that cannot be completely explained 15) Often when I look at an ordinary thing, something wonderful happens – I get the feeling that I am seeing it fresh for the first time
Answers given as True or False

The Multidimensional Measurement of Religiousness/Spiritualty for Use in Health Research (2003) is a report created by a national working group, supported by the Fetzer Institute and the National Institute on Aging. The report seeks to review multiple scales and inventories designed to measure different dimensions of spirituality and religiosity with a particular focus on dimensions which the working group considered most likely to be relevant to health. The report consists of twelve papers, each focusing on a different dimension of religiosity and spirituality and recommended instrument for measuring the discussed dimension. The twelve dimensions discussed are; Daily Spiritual Experiences, Meaning, Values, Beliefs, Forgiveness, Private Religious Practices, Religious/Spiritual Coping, Religious Support, Religious/Spiritual History, Commitment, Organisational Religiousness, and Religious Preference.

The Daily Spiritual Experiences Scale (DSES; Underwood & Teresi, 2002) is presented below in Table 5.3. The DSES aims to measure spirituality, with a focus on participants' experience of the transcendent in daily life. However, the DSES conceptualises transcendent as god or "the divine", and so includes many items which explicitly refer to god. The DSES has the added limitation that some of the items do not appear to assess religiosity or spirituality but instead appear to measure mental wellbeing; for example, "I feel a deep inner peace or harmony" may reflect mental wellness or high levels of life satisfaction rather than spirituality. Furthermore, while it is possible that spirituality may increase feelings of deep inner peace, experiencing deep inner peace is not necessarily indicative of spirituality, nor is it a state exclusive to individuals who are spiritual.

Table 5.3 *Daily Spiritual Experiences Scale (Underwood & Teresi 2002).*

1) I feel God's presence 2) I experience a connection to all of my life 3) During worship, or at other times when connecting with God I feel joy which lifts me out of my daily concerns 4) I find strength in my religion or spirituality 5) I find comfort in my religion or spirituality 6) I feel a deep inner peace or harmony 7) I ask for God's help in the midst of daily activities 8) I feel guided by God in the midst of daily activities 9) I feel god's love for me directly 10) I feel god's love for me through others 11) I am spiritually touched by the beauty of creation 12) I feel thankful for my blessings 13) I feel a selfless caring for others 14) I accept others even when they do things I think are wrong 15) I desire to be closer to god or in union with the divine
Answers given on a 6-point scale were 1 = Many times a day 2 = Every day 3 = most days 4 = some days 5 = once in a while 6 = never

One section of The Multidimensional Measurement of Religiousness/Spiritualty for use in Health Research focuses on belief. In this section, Idler (2003) notes that belief is the central cognitive dimension of religiousness, and that different religions differ in their central beliefs. Despite seemingly suggesting that finding beliefs common to all religions and

spirituality is impossible, Idler nevertheless recommends seven items to measure belief. Four of these items directly refer to god or religion, and of the remaining three, one asks whether the participant believes in life after death, and one asks individuals the extent to which they agree with the statement "Despite all the things that go wrong, the world is still moved by love". The final item asks participants to indicate how strongly they agree with the statement "I think everything that happens has a purpose", and this item does appear to touch on transcendent teleological thinking. A chapter written by Koenig et al. (2015) similarly sets out with the aim to review several inventories designed to measure religiosity. In total, fifteen measures are presented and reviewed. Of these fifteen measures, seven are single dimension scales, three are multidimensional scales and five are religion specific scales. The seven single dimensional scales are the Attachment to God Scale, Trust/Mistrust in God Scale, Dailly Spiritual Experiences Scale (reviewed above), Religious Coping Index, Religious Coping Scale, Faith Maturity Scale, and Religious History Scale. Again, none of these scales appear to offer appropriate items for measuring transcendent teleological thinking.

While it is clear from the above presented scales that there are inventories available for measuring cognitive religiosity/spirituality, there are limitations to existing measures such as references to god, and inclusion of items which measure constructs which are not necessary aspects of spirituality or cognitive religiosity per se, such as altruism and mental health. Further, none of the above reviewed scales appear to measure cognitive religiosity as it is conceptualised in this thesis, that is, as an explicit belief that there is a universal causal force which is both purposeful and transcendent. Thus, an original measure was created with the expressed intention of measuring such belief. This original measure, Transcendent Teleological Thinking (TTT), is described below and presented in full in Appendix F. This measure is constructed of items which have high face validity and appear to reflect beliefs

which are common to most if not all religions, and which are reflected in everyday aphorisms such as “everything happens for a reason”.

Hypotheses

Hypothesis 1: Transcendent teleological thinking (TTT) and religious behaviour should be highly positively correlated.

Hypothesis 2: TTT should be significantly higher in individuals who identify as religious or spiritual than in people who identify as non-religious or atheist.

Hypothesis 3: There will be no significant difference in levels of TTT between individuals who identify as religious and individuals who identify as spiritual.

Method

Participants

Participants were recruited through Amazon M-Turk and paid US$0.50 to complete the survey that had been created on Qualtrics. All participants were required to be residents of the USA aged 18 or older. In total, 389 participants were recruited, of these, 220 were male, and 169 were female. Participants were aged between 19 and 75 (M= 35.93, SD = 11.29). Ethnically, 316 participants identified as white, 28 as Black or African American, 21 as Asian, 18 as Hispanic, 6 as Filipino, 5 as Vietnamese, 3 as Asian Indian and 1 as American Indian or Alaskan Native. Participants were also asked to indicate their religious affiliation, 50.4% of participants identified as Christian, 0.8% as Muslim, 1.3% as Hindu, 1.3% as Jewish, 1.8% as Buddhist, 4.1% as Spiritual, 15.9% as Agnostic, 14.7% as Atheist, 6.2% as ‘No Religion’, 0.5% as “other” and 3.1% as “believe in some kind of higher power (but unsure how to describe it)”. Participants were also asked to indicate which state they were residents of, full details of participant state can be found in Appendix D.

Procedure

The survey was created in Qualtrics and accessed through a link on Amazon MTurk. All questions were presented as either categorical or scale. Where possible, responses to scale variables were given on a 5-point Likert scale, with 1 indicating "strongly disagree" and 5 indicating "strongly agree". However, questions taken from the Pew Institute's Religious Landscape Survey were presented with the same response scales used by Pew.

Variables

Religious Identification

Religious identification was measured in several different ways. Participants were asked to select from a series of options "Which of the following best describes your belief system?" the options were Christian, Muslim, Hindu, Jewish, Buddhist, Spiritual, Believe in some kind of higher power but unsure how to describe it, Agnostic, Atheist, No religion, Other. As well as these categorical measures, individuals were also asked to indicate on a 5-point Likert scale the extent to which they agreed with the following statements: I am religious; I am spiritual; I believe in god (or gods); I am agnostic; I am non-religious; I am an atheist. Questions are presented in Appendix E.

Transcendent Teleological Thinking

TTT was measured on an original 9-item scale designed to measure belief in the existence of an unseen transcendent teleological power, without making reference to any God, gods or religion. Participants were asked to indicate how much they agreed or disagreed with a list of 9 statements, including, e.g., "Everything happens for a reason" and "The universe exists to serve some higher purpose". Answers were given on a 5-point Likert scale from "strongly disagree" to "strongly agree", with higher scores indicating higher levels of

agreement. Of the 9 items, 4 items were reverse coded. TTT had high internal consistency (α = 0.92). The full scale is presented in Appendix F.

Behavioural Religiosity

Five questions were included to measure religious behaviour. For continuity, these questions were the same as the questions used in the Pew Institute's Religious Landscape survey presented in the study described in Chapter 4. The decision to use the same questions was made so that levels of religiosity, as measured in previous research, could be compared to levels of teleological thinking among participants. These items had high internal consistency (α = 0.90). These items were used to create the composite variable "Behavioural Religiosity". This was done using the same method used to create the composite variable "religiosity" described in the method section in Chapter 4. Full scale and measures are presented in Appendix G.

Group

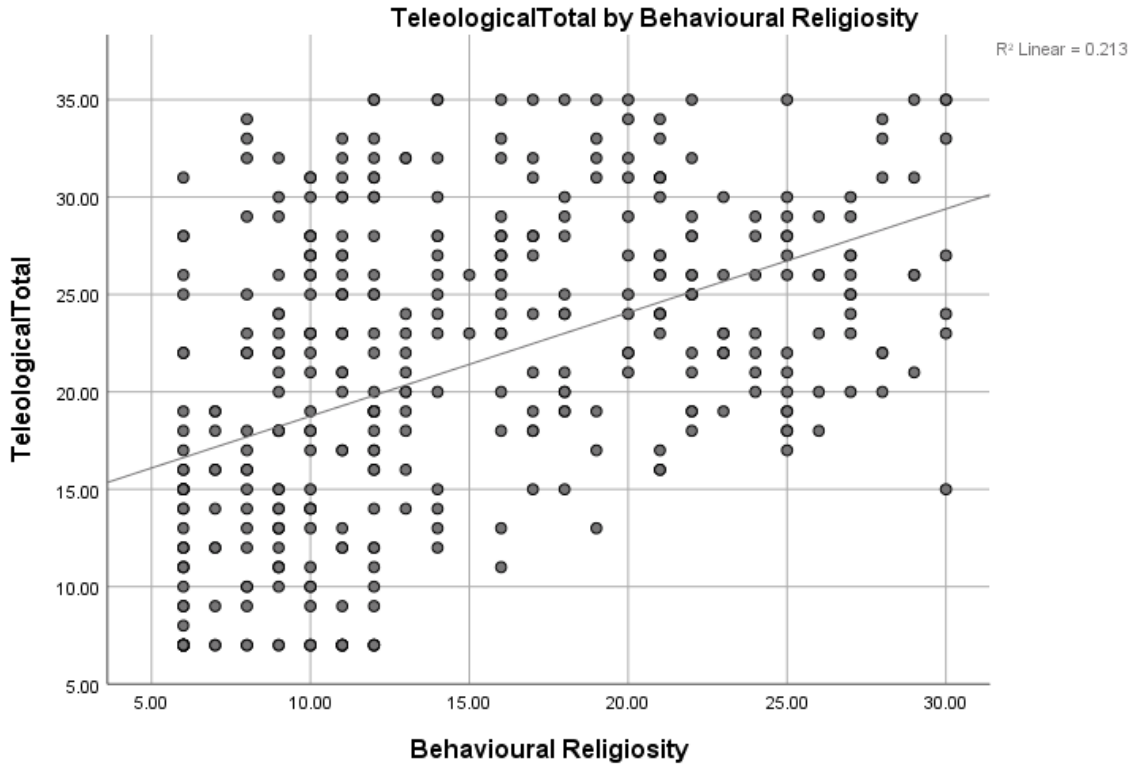
Using responses to the religious identification question, individuals who identified as Christian, Muslim, Hindu, Jewish or Buddhist were coded in a new variable as "Organised Religion", individuals who identified as Spiritual or who indicated that they "Believe in some kind of higher power but unsure how to describe it" were grouped together as "Spiritual", individuals who identified as Atheist or No Religion were grouped together as "Atheist & Non", Agnostics constituted a group of their own, and individuals who selected "Other" were coded as "system missing". Full scale and measures are presented in Appendix H.

Results

Correlations

To test hypothesis 1, a correlation was performed between TTT and behavioural religiosity in all participants. The correlation coefficient between TTT and behavioural religiosity was significantly positive r (389) = 0.46, $p < .01$. A scatter graph of the relationship between transcendent teleological thinking and behavioural religiosity is presented below in Figure 5.1.

Figure 5.1 ***Scatter Graph Illustrating the Correlation Between Transcendent Teleological Thinking and Behavioural Religiosity***



Note. Scatter graph illustrating the correlation between teleological thinking and behavioural religiosity in all participants r (389) = .46, p < .01. Teleological total is total score on TTT measure

To test hypothesis 2, a correlation was conducted to see the relationship between participants responses to questions on religious identity and their TTT. Intercorrelations and descriptive statistics are shown in table 5.1 below.

Table 5.4 *Intercorrelations and Descriptive Statistics for Behavioural Religiosity, Transcendent Teleological Thinking and Self-Described Religious and Spiritual identity*

Variable	1	2	3	4	5	6	7	*M*	*SD*	N
1. TTT	-							21.26	7.84	389
2. BR	.46**	-						14.71	6.80	389
3. I am religious	.52**	.76**	-					2.53	1.53	389
4. I am spiritual	.61**	.54**	.63**	-				3.17	1.56	389
5. Believe God(s)[1]	.59**	.55**	.72**	.74**	-			3.23	1.67	389
6. I am agnostic	-.31**	-.37**	-.43**	-.38**	-.44**	-		2.42	1.51	389
7. I am non-religious	-.50**	-.59**	-.79**	-.52**	-.67**	.53**		3.07	1.70	389
8. I am an atheist	-.51**	-.30**	-.46**	-.53**	-.67**	.31**	.61**	2.31	1.58	389

*Note: TTT = transcendent teleological thinking, BR = behavioural religiosity. [1]Believe God(s) = I believe in God (or Gods) ** p< 0.01 (two-tailed)*

The correlations presented in table 5.1 above show that both TTT and behavioural religiosity have a significant positive relationship with the extent to which people consider themselves to be religious, spiritual and the extent to which they believe in god or gods. TTT and behavioural religiosity both have a significant negative relationship with the extent to which people identify as agnostic, non-religious, and atheist.

ANOVA

TTT

To take a closer look at the variation in TTT by religious identity, a one-way ANOVA was performed, using the variable "group" as the independent variable. As presented in Table 5.2, the ANOVA looking at variation in TTT by group showed that there was a statistically significant difference between groups, F (3,383) = 55.64, $p < .001$. $\eta^2 = 0.30$. Post hoc comparisons were conducted with Bonferroni adjustments, which reduced the significance threshold to 0.008. Post hoc comparisons indicated that there was no significant difference in mean TTT between the organised religion group (M = 24.36, SD 6.38) and the spiritual group (M = 25.39, SD = 6.21). There was a significant difference between the organised religion and the agnostic group (M = 17.50, SD = 7.06,). There was a significant difference between the organised religion and atheist group (M = 14.41, SD = 6.86). There was a significant difference between the spiritual and agnostic group. There was a significant difference between the spiritual and atheist group. There was no significant difference between the agnostic and atheist group. Results of post-hoc comparisons with Bonferroni adjustments are presented in Table 5.3

Table 5.5 *Results of ANOVA comparing TTT between group*

Predictor	Df	Sum of Squares	Mean Square	F	*P*	Partial η^2
Between groups	3	7235.62	2411.87	55.64	<.001	0.03
Within groups	383	43.35				
Total	386	23834.18				

Table 5.6 *Multiple comparisons of between group variance of TTT with Bonferroni adjustments*

Group	1	2	3	M	SD	N
1.Organised	-			24.36	6.38	268
2. Spiritual	-1.03	-		25.39	6.21	28
3. Agnostic	6.86***	3.92***	-	17.50	7.06	62
4. Atheist	8.56***	7.16***	6.04	14.41	6.86	81

***p<.001

Behavioural Religiosity

To take a closer look at the variation in behavioural religiosity by religious identity, a one way ANOVA was performed, using the variable "group" as the independent variable. The ANOVA looking at variation in behavioural religiosity by group showed that there was a statistically significant difference between groups, F (3,383) = 100.43, $p < 0.001$. $\eta^2 = 0.44$, as shown in Table 5.4. Post hoc comparisons were conducted with Bonferroni adjustments, which reduced the significance threshold to 0.008. Post hoc comparisons presented in Table 5.5 indicated that there was a significant difference in mean behavioural religiosity between the organised religion group (M = 18.71, SD 6.30) and the spiritual group (M = 11.86, SD = 3.00). There was a significant difference between the organised religion and the agnostic group (M = 9.10, SD = 3.21). There was a significant difference between the organised religion and atheist group (M = 9.44, SD = 2.77). There was a significant difference between

the spiritual and agnostic group. There was a significant difference between the spiritual and atheist group. There was no significant difference between the agnostic and atheist group.

Table 5.7 *Results of ANOVA comparing Behavioural Religiosity between group*

Predictor	Df	Sum of Squares	Mean Square	F	P	Partial η^2
Between groups	3	7888.07	2629.36	100.43	<.001	0.44
Within groups	383	100027.05	26.18			
Total	386	17915.12				

Table 5.8 *Multiple comparisons of between group variance in Behavioural Religiosity with Bonferroni adjustments*

Group	1	2	3	*M*	*SD*	N
1.Organised	-			18.71	6.30	268
2. Spiritual	6.86***	-		11.86	3.00	28
3. Agnostic	9.61***	2.76***	-	9.10	3.21	62
4. Atheist	9.27***	2.41***	-.35	9.44	2.77	81

***p<.001

As summarised in table 5.6, individuals in the organised religion group and the spiritual group showed significantly different levels of behavioural religiosity, with the organised religion group displaying significantly higher levels of behavioural religiosity. However, there was no significant difference in levels of teleological thinking between the organised group and the spiritual group. These findings suggest that individuals in the organised and spiritual groups think in a similar way but behave differently.

Table 5.9 *Differences in TTT and Behavioural Religiosity between groups*

	Spiritual		Atheist		Agnostic	
	TTT	Behavioural Religiosity	TTT	Behavioural Religiosity	TTT	Behavioural Religiosity
Organised Religion	No Significant Difference	Significant Difference	Significant Difference	Significant Difference	Significant Difference	Significant Difference
Spiritual			Significant Difference	Significant Difference	Significant Difference	Significant Difference
Atheist					No Significant Difference	No Significant Difference

Discussion

A lot of previous research into religion uses measures that focus primarily on measuring behavioural signifiers of religion such as attendance at places of worship and prayer frequency (Barber, 2011; Barro & McCleary, 2003, Kim et al., 2014; Norris & Inglehart, 2004; Solt et al., 2011; Sullivan, 2010). Research which uses alternative measures which do seek to focus on the cognitive aspects of religiosity, such as the STI (Seidlitz et al 2002), or The Daily Spiritual Experiences Scale (DSES, Underwood & Teresi 2002) often include items which explicitly mention god, limiting their applicability across cultures as not all religions feature a god or gods, or include measures which do not assess belief in an unseen transcendent teleological force, as is the case with the self-transcendence subscale of the Temperament and Character Inventory developed by Cloninger et al (1993). The original study reported here aimed to explore whether TTT could be used as a good alternative or addition to commonly used, primarily behavioural, measures of religiosity. The measures of

religiosity used in large national and cross-national surveys may not be suitable for research investigating religious cognition. In this study, it was also possible to take a close look at and compare religious behaviour and TTT between groups.

As expected, behavioural religiosity and TTT were highly correlated, indicating that the behavioural religiosity measures and TTT items measure related but distinct concepts. This study also found no significant difference in TTT between those in the organised religion group and those in the spiritual group. There is, however, a significant difference in the behavioural religiosity measure between those in the organised religion group and those in the spiritual group. This finding indicates that people who identify as "spiritual" or "as believing in some kind of higher power" (individuals in the spiritual group) and people who identify as being members of a specific religion (individuals in the organised religion group) seem to engage in similar thoughts but different behaviours. Although behavioural religiosity appears to be a key difference between individuals who identify as belonging to a specific religion and those who do not, levels of TTT appear to be a valuable aspect of what differentiates the secular from the sacred. The findings presented in this chapter suggest that the standard religion questions such as the ones used in Pew, the General Social Survey (GSS) and the European Social Survey (ESS) are measuring behaviour but not really getting at cognition, thus reports based on these surveys give an incomplete picture of participants' cognition. For example, there are numerous reports finding a reduction in religion in the western world (Fuller, 2001; Gallup, 2000; Marler & Hadaway, 2002; Pew, 2019; Roof, 1993; Voas & Chaves, 2018), however, while research has found that people are behaving differently, they may not be thinking in a radically different way. It could be that although behavioural religiosity and engagement with organised religion are on the decline, TTT is holding relatively steady. Alternatively, reported reductions in religious attendance and

affiliation could be the result of changes in cognition. Without research, however – preferably longitudinal research, designed specifically to address this issue – it is not possible to know if this is the case.

Pew (2019) reports that between 2009 and 2019, the percentage of respondents to surveys conducted by Pew who identify as atheist, agnostic or "nothing in particular" increased from 17% to 26%. However, the study reported here indicates that atheists and agnostics differ significantly from people who self-report as spiritual or "believe in something" in the extent to which they engage in TTT, despite showing no significant differences in their behavioural religiosity. Arguably, reporting the percentage change in the number of individuals who identify as atheist, agnostic or "nothing in particular" as a single change, as Pew (2019) has done, obscures as much as it reveals about changes in beliefs and religious identification. This is because someone who believes in "nothing in particular" could still believe in "something" akin to a transcendent teleological force, but just be unsure what to call it (e.g., an ambiguous spiritual force akin to fate or karma, or some sort of naturally occurring force which through some unknown mechanism controls the general trajectory of the universe). An increase in individuals identifying as "nothing in particular" probably does illustrate a shift away from traditional religious engagement, but not necessarily a shift away from less traditional, more ambiguous forms of TTT. This further illustrates that questions regarding behavioural religiosity give an incomplete picture of the differences and similarities between individuals who do or do not consider themselves to be religious.

Multiple investigations have reported a marked decrease in religious affiliation, but it is difficult to conclude from this whether there has also been a marked shift in cognition at the population level. Conversely, research that suggests that rates of religiosity increase under

conditions of hardship may also be painting an incomplete picture, as increased behavioural religiosity may not reflect cognitive changes. It is possible, for instance, that individuals who start going to church under conditions of hardship may have always been high in TTT but have not been engaging with organised religion. Alternatively, increased engagement with organised religion may in fact reflect an increase in TTT; again, it is impossible to know without investigating TTT specifically and directly. The finding that levels of behavioural religiosity increase in times of hardship and crisis may well be related to changes in TTT or may reflect an increased desire to be part of a community and thus be unrelated to TTT.

There has been research suggesting that there are physical and psychological benefits to religion (Powell et al., 2003; Schnall et al., 2011; Sullivan, 2010), however, it is unclear whether these benefits are caused by the social aspects of religious engagement, therapeutic aspects of ritual behaviour, or cognitive aspects of religion such as TTT, or indeed a combination of these elements. Separating out these elements may allow us to isolate them and get a clearer look at cause-and-effect relationships, without confounding variables confusing the picture.

Chapter 6 Study 2b: Finance, Deprivation, Well-being, Behavioural Religiosity and Transcendent Teleological Thinking

Introduction

As detailed in Chapter 4, the HLM analysis of the Pew data demonstrates several relationships between economic factors and the measures of religious engagement used by the Pew Institute. Firstly, the results indicate that relative income positively correlates with the religiosity composite variable, which is referred to in this thesis as "behavioural religiosity". This finding provides some support for Solt et al.'s (2011) relative power theory, which suggests that wealthier members of society drive the positive relationship between inequality and religiosity (Solt et al., 2011). The HLM also revealed that increases in state median income, a measure indicating state wealth, correlated with decreases in religiosity. This provides some support for the existential security hypothesis promoted by Norris and Inglehart, who argue that religiosity is a response to insecurity (Norris & Inglehart, 2004), and the deprivation hypothesis, which suggests that religiosity is a response to deprivation (Glock & Stark, 1965, Stark, 1972). In the HLM, the interaction between income and Gini was not significant. The interaction between individual income and state median income was associated with decreases in religiosity, suggesting that richer individuals in wealthier states are less religious than rich people in poorer states. These results give mixed support for both the existential security hypothesis and the relative power theory. Also, as discussed in Chapter 5, these findings shed no light on the cognitive aspect of the relationship between inequality and religiosity.

Although the relationships between income, state median income, state Gini and religiosity on occasion reached statistical significance, when they did reach significance, the effect sizes were small. Due to the nature of the data collected by Pew, the analysis conducted

and detailed in Chapter 4 does not illuminate what cognitive differences are present with financial differences that could explain or drive the relationship between economic inequality and religiosity. The HLM analysis detailed in Chapter 4 also only uses objective measures of wealth and inequality. While it is useful to look at income and relative income, by looking at this information alone, it is difficult to assess whether a person is experiencing financial strain, as this is dependent on both income and outgoings. For example, a couple with no children would likely have more disposable income and experience less financial strain than a couple who are, as a household, earning the same wage but have two children. Similarly, both rent and cost of living can vary greatly by area, which will affect how much of one's income is disposable. As well as looking at objective measures of wealth and inequality, it may be worth looking at more subjective measures such as self-reported experience of financial strain and deprivation. Looking at these more subjective measures also gives us the opportunity to take a closer look at the existential security hypothesis and deprivation theory; if religious engagement is a response to deprivation and/or insecurity, individuals who report experiencing deprivation and financial strain ought to be more religious than individuals who are not experiencing deprivation or financial strain. Alternatively, according to relative power theory, individuals who are experiencing the least deprivation and financial strain ought to be the most religious.

Also, as discussed in Chapter 5, the religiosity measures used in the Pew research focus on behavioural indicators of religiosity, which are highly correlated with, but not the same as, transcendent teleological thinking (TTT). Introducing TTT as a new measure gives us the opportunity to look at both behavioural and cognitive aspects of religiosity and look at whether it is just religious behaviour that changes with inequality or whether cognitive markers of religiosity, such as belief in transcendent teleological order, also change.

Having a better understanding of the circumstances under which individuals are more likely to engage in religious behaviour and/or religious cognition may help to identify whether engaging in religious behaviour and cognition can be considered a cognitively adaptive strategy by highlighting what adaptive problems, if any, religiosity seems to help solve. The study presented in this chapter also included a measure of well-being. As discussed in Chapter 2, there is a well-documented relationship between religion and well-being. This study presented the opportunity to investigate whether the relationship between religiosity and well-being is driven by behavioural religiosity or by engagement in TTT.

Aims

This study was largely exploratory in the hope that the findings would inform how best to progress the thesis as a whole. To do this, this study was designed to look at the relationship between wealth, inequality, and behavioural religiosity and transcendent teleological thinking on the individual level. This study also aims to also look at more subjective measures of financial strain and deprivation as well as objective measures of income. A further aim of this study was to look at whether there is a relationship between religious engagement, TTT, and well-being.

Method

The data used for this study are the same data collected for the study detailed in Chapter 5. The analysis conducted on the data for Chapter 5 and Chapter 6 are treated here as separate studies and presented in separate chapters. The decision to present these analyses separately was made to increase clarity; given that the foci of Chapters 5 and 6 are different, presenting the contents of Chapters 5 and 6 together would have made for an unwieldy and unfocused chapter. The participant characteristics and some of the variable descriptions are as

described in Chapter 5, however, those which are duplicates are presented again below for ease of access.

Participants

As described in Chapter 5, participants were recruited through Amazon M-Turk and paid US$0.50 to complete the survey which had been created on Qualtrics. Details of participant characteristics are presented in Chapter 5.

Procedure

As described in Chapter 5, the survey was created in Qualtrics and accessed through a link on Amazon MTurk. All questions were either presented as categorical or scale. Where possible, responses to scale variables were given on a 5-point Likert scale, with 1 indicating "strongly disagree" and 5 indicating "strongly agree". However, questions taken from the Pew Institutes religious landscape survey were unaltered. Questions regarding religious identity were asked at the beginning of the survey, and the demographic data presented above was collected at the end of the survey. Participants were also asked which state they were currently living in. The rest of the questions were presented as follows.

Variables

Religious Behaviour

As described in Chapter 5, five questions were included to measure religious behaviour. For continuity, these questions were the same as the questions used in the Pew Institute's Religious Landscape survey presented in the study described in Chapter 4. The decision to use the same questions was made so that levels of religiosity, as measured in previous research, could be compared to levels of teleological thinking among participants. These items had high internal consistency ($\alpha = 0.90$). These items were used to create the

composite variable “Behavioural Religiosity”. This was done using the same method used to create the composite variable “religiosity” described in the method section in Chapter 4. Full measures and scale presented in Appendix G.

Transcendent Teleological Thinking

As described in Chapter 5, TTT was measured on an original 9 question scale designed to measure belief in the existence of an unseen transcendent teleological power without making reference to any God, gods or religion. Participants were asked to indicate how much they agreed or disagreed with a list of 9 statements, including, e.g., “everything happens for a reason” and “the universe exists to serve some higher purpose”. Answers were given on a 5-point Likert scale from “strongly disagree” to “strongly agree”, with higher scores indicating higher levels of agreement. Of the 9 items, 4 items were reverse coded. These items had high internal consistency ($\alpha = .92$). The full scale is presented in Appendix F.

Mental Well-being

The Warwick-Edinburgh mental wellbeing scale short form was used to measure the participants’ mental well-being. The Warwick-Edinburgh mental wellbeing scale short form consists of 7 items, all positively coded. The scale asks participants to reflect on how they have been feeling over the last two weeks and indicate the extent to which they agree with a series of statements such as “I’ve been feeling useful” and “I’ve been dealing with my problems well”. These items had high internal consistency ($\alpha = .92$). The full scale is presented in Appendix I.

Financial Stress

To test levels of financial stress, an eight-item measure was taken from Batinic and Selenko (2011). This measure asks participants to indicate the extent to which they agree with a series of statements such as “Due to my financial situation I have to save considerably on food” and “Due to my financial situation I am restricted in my leisure activities”. The measure consists of eight items in total, seven items are positively coded and one item reverse coded. These items had high internal consistency (α =.90). The full scale is presented in Appendix J.

Subjective Deprivation

To test subjective perceptions of deprivation, a four-item measure of subjective deprivation was taken from Callan et al., (2011). This measure asks participants to indicate the extent to which they agree with a series of statements such as “I feel deprived when I think about what I have compared to what other people have”. Two items are positively coded, and two items are reverse coded. These items had high internal consistency (α =0.81). The full scale is presented in Appendix K.

Personal Income

Participants were asked to indicate their level of total personal income before tax for the previous financial year. Income was measured by asking participants to select one of 27 income brackets ranging from under $1,000 to $150,000 or more. The full scale is presented in Appendix L.

Family Income

Participants were asked to indicate their level of total family income before tax for the previous financial year. Income was measured by asking participants to select one of 27

income brackets ranging from under $1,000 to $150,000 or more. The full scale is presented in Appendix M.

State median income

Participants had indicated which state they were resident in, the full breakdown of participant state of residence can be found in Appendix D. This information was used to give each participant the variable State median income. State median income was taken from the American Census website and converted into brackets corresponding with the brackets and values participants used to indicate their personal income and their family income. This data was added to the data set. This information was used to calculate two new variables; these are personal income minus state median income and family income minus state median income.

Personal income minus state median income

This variable was calculated by subtracting state median income from personal income. This was done to give each participant a score indicating whether they were earning above or below the state median income and by how much.

Family income minus state median income

This variable was calculated by subtracting state median income from family income. This was done to give each participant a score indicating whether their family were earning above or below the state median income and by how much.

Results

Correlations

An initial correlational analysis was conducted on the data to see if any of the objective financial measures correlated with behavioural religiosity and transcendent teleological thinking. None of the objective financial measures had a significant relationship

with behavioural religiosity or teleological thinking. Intercorrelations and descriptive statistics are presented in Table 6.1. Analyses of correlations between behavioural religiosity and transcendent teleological thinking, mental well-being, financial strain, and deprivation revealed a significant positive relationship between behavioural religiosity and well-being, with a correlation coefficient of .10, which was statistically significant at the 0.05 level. Intercorrelations and descriptive statistics are presented in Table 6.2.

Table 6.1 *Intercorrelations and Descriptive Statistics for Behavioural Religiosity, Transcendent Teleological Thinking, and Income*

Variable	1	2	3	4	5	*M*	*SD*	N
1. BR	-					14.72	6.80	389
2. TTT	.46**	-				21.26	7.84	389
3. Fam Inc	-.02	-.03	-			19.21	5.71	389
4. Per Inc	.02	-.06	.62**	-		16.23	6.91	389
5. Fam Inc-S.med	-.01	-.03	.99**	.61**	-	-2.20	5.74	389
6. Per Inc-S.med	.02	-.06	.61**	.99**	.62**	-5.18	6.94	389

*Note. BR = Behavioural Religiosity. TTT = transcendent teleological thinking. Fam Inc = Family income. Per Inc = Personal Income. Fam Inc-S.med = Family income minus state median income. Per Inc-S.med = personal income minus state median income. ** Correlation is significant at the 0.01 level. TTT = transcendent teleological thinking.*

Table 6.2 *Intercorrelations and Descriptive Statistics for Behavioural Religiosity Transcendent Teleological Thinking, Well-being, Financial Strain and Deprivation*

Variables	1	2	3	4	*M*	*SD*	N
1. BR	-				14.71	6.80	389
2. TTT	.46**	-			21.26	7.84	389
3. Well-being[1]	.10*	.09			25.42	5.86	389
4. Finance [2]	.04	-.01	-.28**	-	21.29	7.28	389
5. Deprivation[3]	-.01	-.05	-.43**	.62**	10.97	3.96	389

*Note.BR = Behavioural Religiosity. TTT = transcendent teleological thinking. [1]Well-being = Score on the Warwick-Edinburgh Mental Wellbeing Scale. [2]Finance = Score on Financial Stress measure. [3]Deprivation = Score on Subjective Deprivation measure. *Correlation is significant at the 0.05 level **Correlation is significant at the 0.01 level.*

Further correlations were conducted to enable a closer look at the relationship between behavioural religiosity, TTT and the individual items which make up the subjective financial strain measure, the subjective deprivation measure, and the individual items on the Warwick-Edinburgh mental wellbeing scale. Intercorrelations and descriptive statistics for financial strain, behavioural religiosity and TTT are presented in Table 6.3. Three of the items which made up the financial strain measure have a statistically significant relationship with behavioural religiosity, but none of the items on the financial strain measure had a significant relationship with TTT. The three items which had a significant relationship with behavioural religiosity were “Due to my financial situation I have to save considerably on food”, “Due to my current financial situation I have difficulty paying for my home and utilities”, and “My financial situation is more of a strain than it was twelve months ago”.

Table 6.3 *Intercorrelations and Descriptive Statistics: Financial strain, Behavioural Religiosity and Transcendent Teleological Thinking*

Variable	1	2	F1	F2	F3	F4	F5	F6	F7	*M*	*SD*	N
BR	-									14.71	6.80	389
TTT	.46**	-								21.62	7.84	389
F1	-.01	-.03	-							3.04	1.35	389
F2	-.01	.05	.59**	-						3.70	1.20	389
$F3_R$	.06	.06	.57**	.40**	-					3.17	1.28	389
F4	.14**	.02	.63**	.45**	.67**	-				2.85	1.33	389
F5	.11*	<.01	.64**	.45**	.41**	.72**	-			2.56	1.30	389
F6	.05	.02	.66**	.52**	.42**	.67**	.63**	-		3.04	1.39	389
F7	<.01	-.03	.69**	.57**	.45**	.59**	.56**	.74**	-	3.26	1.37	389
F8	.11*	<.01	.56**	.43**	.35**	.48**	.51**	.54**	.56**	2.70	1.36	389

Note. BR = Behavioural Religiosity. TTT = transcendent teleological thinking. F = Measure of Financial Strain.
*$_R$ = Item is reverse scored *Significant at 0.05 level **Significant at 0.01 level*

Two of the items on the deprivation measure had a significant relationship with behavioural religiosity; these were "I feel deprived when I think about what I have compared to what other people like me have", which had a positive correlation with behavioural religiosity $r(387) = .14$, $p = .004$. Behavioural religiosity had a significant negative relationship with "I feel privileged compared to other people like me" $r(387) = -.14$, $p = .005$. These two items continue to be significant after Bonferroni adjustments were applied, which reduced the significance threshold from 0.05 to 0.006. TTT had a significant negative correlation with one reversed item on the deprivation measure, which was "when I compare what I have with what others like me have, I realise I am quite well off", $r(387) = -.10$, $p = .046$. However, after Bonferroni adjustments were applied this correlation no longer reached significance. All intercorrelations and descriptive statistics for subjective deprivation, behavioural religiosity and TTT are presented in Table 6.4.

Table 6.4 *Intercorrelations and Descriptive Statistics: Deprivation, Behavioural Religiosity and Transcendent Teleological Thinking*

Variables	1	2	D1	$D2_R$	$D3_R$	Mean	SD	N
1. BR	-					14.71	6.80	389
2. TTT	.46**					21.26	7.84	389
D1	.14**	.07				2.63	1.26	389
$D2_R$	-.14**	-.09	.35**			2.90	1.27	389
$D3_R$	-.12	-.10*	.36**	.70**		2.80	1.21	389
D4	.07	.05	.75**	.38**	.47**	2.64	1.26	389

Note. TTT = transcendent teleological thinking, B. Religiosity = behavioural religiosity. D is measure of deprivation. $_R$ *is Item Reversed. *Significant at the 0.05 level. **Significant at the 0.01 level.*

Behavioural religiosity had a positive correlation with two of the items on the Warwick-Edinburgh Mental Wellbeing Scale, these were "I have been feeling optimistic about the future" $r(387) = .14$, $p = .007$ and "I have been feeling close to other people", $r(387) = .11$, $p = .033$. However, once Bonferroni adjustments were made, reducing the significance threshold from 0.05 to 0.01, neither of these correlations were significant. TTT had a significant positive correlation with one item on the Warwick-Edinburgh Mental Wellbeing Scale, "I have been feeling optimistic about the future" $r(387) = .21$, $p < .001$. The correlation between this item and TTT remained significant after Bonferroni adjustments. All intercorrelations and descriptive statistics for the Warwick-Edinburgh Mental Wellbeing Scale, behavioural religiosity and TTT are presented in Table 6.5.

Table 6.5 *Intercorrelations and Descriptive Statistics: Religious Behaviour, Transcendent Teleological Thinking and Mental Well-being*

	1	2	W1	W2	W3	W4	W5	W6	*M*	*SD*	N
1. BR									14.72	6.80	389
2. TTT	.46**								21.26	7.84	389
W1	.14**	.21**							3.54	1.02	389
W2	.09	.01	.67**						3.62	1.06	389
W3	.07	.05	.64**	.65**					3.43	1.06	389
W4	.07	.01	.64**	.65**	.73**				3.58	1.02	389
W5	.03	.01	.57**	.61**	.64**	.64**			3.83	0.95	389
W6	.11*	.09	.64	.60**	.58**	.55**	.54**		3.51	1.13	389
W7	.05	.04	.53**	.59**	.60**	.60**	.68**	.50**	3.92	0.94	389

*Note. TTT = transcendent teleological thinking. BR = behavioural religiosity. W = Warwick-Edinburgh mental wellbeing scale. *Significant at the 0.05 level. **Significant at the 0.01 level.*

Multiple regression

A multiple regression analysis was conducted to look more closely at item one on the Warwick-Edinburgh Mental Wellbeing Scale, "I have been feeling optimistic about the future", (from here on referred to as "optimism" for brevity) and its relationships with TTT and behavioural religiosity (while controlling for the effects of age and sex on optimism). Model one, which regressed optimism on age, sex and behavioural religiosity reached significance $F(3, 385) = 3.29$, $p = .02$, $R^2 = .03$. This model accounts for 2% of the variance in optimism. Model two, which regressed optimism on age, sex, behavioural religiosity, and TTT, was significant $F(4,384) = 5.03$, $p = .001$, $R^2 = .04$. This model accounts for 4% of the variance in optimism. In model one, the beta value for behavioural religiosity is significant, indicating that behavioural religiosity accounts for a statistically significant degree of

variance in optimism. However, when TTT is added into the regression in model two, behavioural religiosity no longer has a significant beta value, suggesting that the positive association between behavioural religiosity and optimism is mediated by TTT. Results of the multiple regression are presented in Table 6.6.

Table 6.6 *Optimism Regressed on Behavioural Religiosity and Transcendent Teleological Thinking*

	β	$R^{2\text{-}adj}$	Δ *f*
Model 1		.02*	.02*
Sex[1]	-.08		
Age	-.01		
BR	.13*		
Model 2		.04**	.002**
Sex	-.05		
Age	-.02		
BR	.05		
TTT	.18**		

*Note. TTT = transcendent teleological thinking. BR = behavioural religiosity. *Significant at the .05 level. **Significant at the .01 level. [1]Sex is coded 0 = female, 1 = male.*

Moderation Analysis

To investigate whether TTT moderated the relationship between behavioural religiosity and the optimism measure, a moderation analysis was conducted in SPSS using the PROCESS custom dialogue box (Hayes, 2012). The model is significant; moderation is shown by a significant interaction effect, $\beta = 0.0037$, 95% *CI* [0.0015, 0.0060] $t = 3.27$, $p = .0012$, indicating that TTT moderates the relationship between behavioural religiosity and

optimism. The model summary is presented in Table 6.7 and results of the model are presented in Table 6.8.

Table 6.7 *Model Summary of Relationship Between Behavioural Religiosity and Optimism*

R	R^2	MSE	*F*	Df1	Df2	*P*
.27	.07	.97	10.12	3.00	385.00	< .001

Table 6.8 *Relationship Between Optimism, Behavioural Religiosity and Transcendent Teleological Thinking*

	Coefficient	*SE*	*T*	*p*	LLCI	ULCI
Constant	3.90	.33	11.48	< .001	3.23	4.56
B. Religiosity	-.08	.03	-2.86	<.005	-.13	-.03
TTT	-.02	.02	-1.33	.18	-.05	.01
Interaction	.0037	.01	3.27	.010	.002	.01

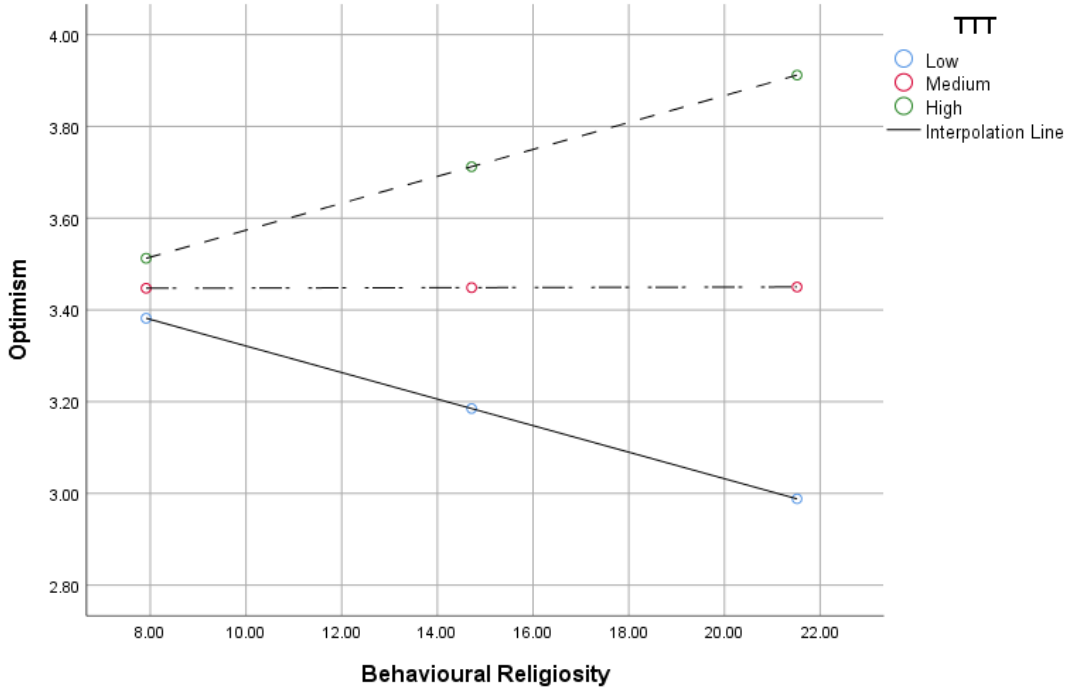
Table 6.9 Conditional Effects of Behavioural Religiosity on Optimism at Low, Medium, and High levels of Teleological Thinking

TTT	Effect	*SE*	*T*	*p*	LLCI	ULCI
13.42	-.03	.01	-2.1	.04	-.06	-.002
21.26	<.001	.01	.02	.98	-.02	.017
29.10	.03	.01	2.74	<.007	.01	.050

When TTT is low there is a significant negative relationship between Behavioural Religiosity and the optimism measure (β = -.0289, 95% *CI* [-0.0561, -0.0018], t = -2.0972, p = .04). At the mean value of TTT, there is a non-significant relationship between behavioural religiosity and the optimism measure (β = 0.0002, 95% *CI* [-0.0166, 0.0171], t = .0242, p = .9807). When TTT is high, there is a significant positive relationship between behavioural religiosity and the optimism measure (β = .0293, 95% *CI* [0.0083, 0.0504] t = 2.7351, p = .007). Results of the conditional effects of behavioural religiosity at different levels of TTT

are presented in Table 6.9. A graph illustrating the relationship between behavioural religiosity and the optimism measure is presented in Figure 6.1. The Johnson-Neyman significance regions indicate that the threshold for significance is above 14.34, indicating that once the TTT score is above 14.34, the moderation effect of TTT on the relationship between behavioural religiosity and optimism becomes significant. 22.62% of the participants fell below the significance region.

Figure 6.1: *The Relationship Between Optimism and Behavioural Religiosity at High, Medium, and Low Levels of Transcendent Teleological Thinking*



To investigate whether behavioural religiosity moderated the relationship between TTT and the optimism measure, moderation analysis was conducted in SPSS using the PROCESS custom dialogue box (Hayes, 2012). The model is significant; moderation is shown by a significant interaction effect, β = 0.0037, 95% *CI* [0.0015, 0.0060] t = 3.27, p =

.010, indicating that behavioural religiosity moderates the relationship between TTT and optimism. A model summary is presented in Table 6.10 and results of the model are presented in Table 6.11.

Table 6.10 *Model Summary of Relationship Between Transcendent Teleological Thinking and Optimism*

R	R^2	MSE	*F*	Df1	Df2	*P*
.27	.07	.97	10.12	3.00	385.00	< .001

Table 6.11 *Relationship Between Optimism, Transcendent Teleological Thinking and Behavioural Religiosity*

	Coefficient	*SE*	*t*	*p*	LLCI	ULCI
Constant	3.45	.06	60.20	< .001	3.34	3.56
TTT	0.03	.01	4.38	<.001	0.02	0.05
B. Religiosity	0.0002	.09	0.02	.980	-0.02	0.02
Interaction	0.0037	.01	3.27	.010	.002	0.01

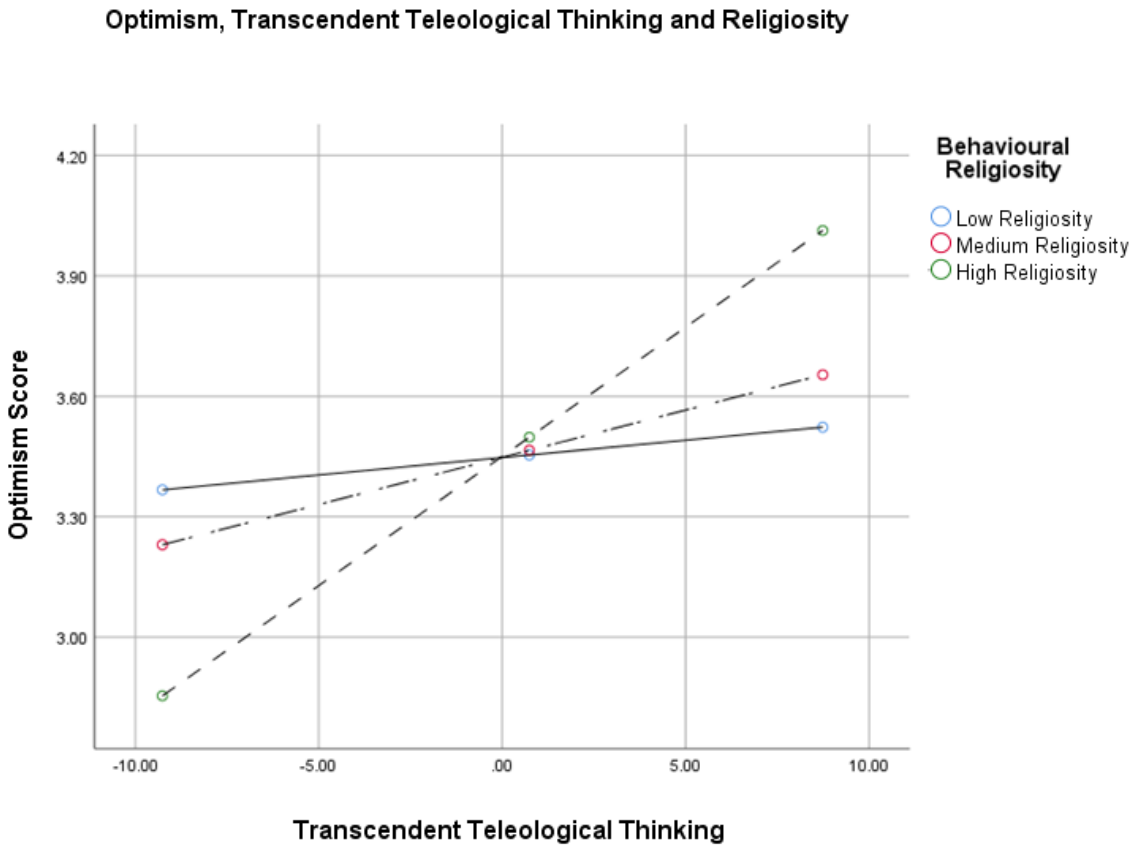
Table 6.12 *Conditional Effects of Teleological Thinking on Optimism at Low, Medium, and High levels of Behavioural Religiosity*

Behavioural Religiosity	Effect	*SE*	*t*	*p*	LLCI	ULCI
-6.71	.01	.01	.99	.32	-.01	.03
-2.71	.02	.01	3.26	.001	.01	.04
8.29	.06	.01	4.58	<.0001	.04	.09

When behavioural religiosity is low there is a non-significant relationship between TTT and the optimism measure (β = 0.009, 95% *CI* [-0.009, 0.026], t = .989, p = .32). At the mean value of behavioural religiosity, there is a significant positive relationship between TTT and the optimism measure (β = 0.024, 95% *CI* [0.009, 0.038], t = 3.2599, p = .0012). When behavioural religiosity is high, there is a significant positive relationship between TTT and

the optimism measure (β = 0.064, 95% *CI* [0.0368, 0.0920] t = 4.5847, p < .001). Results of the conditional effects of TTT at different levels of behavioural religiosity are presented in Table 6.12. A graph illustrating the relationship between TTT and the optimism measure is presented in Figure 6.2. The Johnson-Neyman significance regions indicate that the threshold for significance is above -4.93, indicating that once the behavioural religiosity score is above -4.93, the moderation effect of behavioural religiosity on the relationship between TTT and optimism becomes significant. 25.96% of the participants fell below the significance region.

Figure 6.2: The Relationship Between Optimism and Transcendent Teleological Thinking at High, Medium, and Low Levels of Behavioural Religiosity



Discussion

This study was largely exploratory, intended to evaluate the merit of several different potential future directions for the thesis as a whole. In this study, none of the objective financial measures correlated significantly with behavioural religiosity or TTT. While the analysis presented in Chapter 4 did find significant relationships between the religiosity measure and various measures of wealth and inequality, the effect sizes were small. This could indicate that the relationship between religious engagement and financial or economic factors are either indirect, or the relationships are consistent but weak, so they only become apparent in large scale data.

Some, but not all, of the measures of self-reported experience of financial strain showed a significant positive correlation with behavioural religiosity; however, although the correlations reached statistical significance, the correlation coefficients were small. According to the existential security hypothesis and deprivation theory discussed in Chapters 3 and 4, one would expect to see financial strain showing a positive relationship with religious engagement and/or cognition, while relative power theory might predict a negative relationship between financial strain and religious measures. These findings do not provide support for the relative power theory, and only weak support for the deprivation hypothesis and the existential security hypothesis.

Some of the measures of self-reported experience of deprivation showed a significant positive correlation with behavioural religiosity, which is consistent with the existential security hypothesis and deprivation theory. However, only one of the measures of deprivation had a significant positive correlation with TTT. This finding could be interpreted as evidence that individuals turn to organised religion and increase their religious engagement as a means

to increase their social support rather than due to changes in cognition. Alternatively, increasing levels of religious engagement could induce changes in religious cognition. However, it is not possible to assess the likelihood of any causal relationships between religious engagement and/or increases in social support or changes in cognition using cross-sectional data.

Taken together, the findings of this study, or rather the lack of findings, do not show any strong support for the existence of a direct link between economic inequality and/or economic deprivation and cognitive or behavioural religiosity. This lack of support indicated that further investigation into the relationship between these variables was unlikely to lead to any new or compelling findings to contribute to the cognitive evolutionary science of religion.

However, this study did find that behavioural religiosity correlated with two of the well-being measures, “I’ve been feeling optimistic about the future” and “I’ve been feeling close to other people”, while transcendent teleological thinking only correlates with the single item “I have been feeling optimistic about the future”. The correlation coefficient for behavioural religiosity and this single-item measure of optimism was .16, and the correlation coefficient between TTT and optimism was .21. These findings presented an intriguing direction forward. The reported relationship between religion and well-being could be driven by optimism, and specifically, it could be the teleological thinking aspect of religion that drives this relationship.

The results of the analysis suggested that TTT significantly moderated the relationship between behavioural religiosity and optimism. There was a significant negative relationship between behavioural religiosity and the single item optimism measure among

participants who had low TTT scores. However, there was a significant positive correlation between behavioural religiosity among individuals who had high TTT. The relationship between behavioural religiosity and optimism was not significant among individuals who had medium TTT scores. However, when behavioural religiosity is treated as the moderator, there is a positive relationship between TTT and optimism at every level of behavioural religiosity. At low levels of behavioural religiosity, the relationship between TTT and optimism is non-significant, but at medium and high levels of behavioural religiosity the relationship between TTT and optimism is significantly positive.

It has been proposed that one of the main benefits of religious engagement is the social support that comes with being part of a community (Galen, 2015, 2018; Lim & Putnam, 2010; Powell et al., 2003; Price & Launay, 2018; Schnall et al., 2012). The finding that high behavioural religiosity is not associated with optimism when TTT is low is somewhat contradictory to these explanations. If the main benefit of behavioural religiosity is the social support that one may gain through religious attendance, then behavioural religiosity ought to be associated with optimism regardless of an individual's level of engagement with TTT. These findings indicate that TTT also plays a role in the beneficial effects of religious engagement. Furthermore, the results of the moderation analysis indicated that the relationship between behavioural religiosity and optimism is moderated by TTT. This finding is inconsistent with the suggestion that the relationship between religious engagement and good physical and mental health is caused exclusively by the social support one gains through engagement with religious communities.

As this study uses non-experimental data, it is not possible to draw conclusions about causal relationships between optimism, behavioural religiosity, and TTT. While it is possible

that behavioural religiosity and TTT promote optimism, it is equally possible that people who are generally more optimistic are more likely to engage in behavioural religiosity and TTT.

The findings detailed in this chapter indicate that rather than continuing to focus on economic variables as potential causes of variations in behavioural religiosity and TTT, looking more closely at the relationships between behavioural religiosity, TTT, and optimism would likely result in a more compelling thesis with greater scientific impact.

Chapter 7 : Optimism

There are four well-studied "positive illusions": self-efficacy, the belief that one has control over one's life and outcomes (Taylor & Brown, 1988); the better than average effect, the belief that one is better than the average person on a host of skills and attributes (Taylor & Brown, 1988); overconfidence, where one over estimates the quality of one's own attributes and skills (Johnson & Fowler, 2011); and optimism (Scheier & Carver, 1985). Optimism can be further subdivided into three theoretically distinct constructs, namely, optimistic explanatory style, state optimism, and trait or dispositional optimism.

Optimistic explanatory style is characterised by a tendency to conceptualise negative events as "specific, temporary and external" while conceptualising positive events as "pervasive, permanent and internal". A pessimistic explanatory style, on the other hand, is marked by a tendency to conceptualise negative events as "pervasive, permanent and internal" and positive events as "specific, temporary and external" (Gilham et al., 2001). Explanatory style is measured using the Attributional Style Questionnaire (Peterson et al.1982; Seligman et al., 1979). The attributional style questionnaire consists of 12 hypothetical scenarios, six of which describe positive events and six of which describe negative events. Participants are asked to vividly imagine themselves in each scenario and are then asked to state what they think the predominant cause of the event was. Participants are then presented with follow-up questions designed to assess whether they see the event as specific or pervasive, temporary or permanent, and externally caused (i.e., caused by events beyond one's own control) or internally caused (i.e., caused by one's own character or actions). A composite score for the positive events and a separate composite score for the negative events is calculated, and an overall score is then calculated by subtracting the negative events score from the positive events score. The specific vs pervasive, permanent vs

temporary, and internal vs external ratings are calculated separately for positive and negative events, resulting in six subscales. Interestingly, there is little correlation between the subscales, meaning a person who conceptualises negative events as temporary may also conceptualise positive events as temporary (Peterson et al., 1982). This suggests that optimistic and pessimistic explanatory styles are not mutually exclusive, and individuals who have a pessimistic explanatory style for negative life events may also have an optimistic explanatory style for positive life events.

Dispositional optimism is characterised by the belief that most, if not all aspects of one's life will get better and progress along a general trajectory of improvement (Forgard & Seligman, 2012), or the belief that "good rather than bad things will happen in a person's life" (Scheier & Carver, 1993). Dispositional optimism is most commonly measured using the life orientation test revised (LOT-R; Scheier et al., 1994). The LOT-R is a six-item scale designed to assess the extent to which an individual has positive or negative expectations for their own future. Three items on the LOT-R measure negative (i.e., pessimistic) expectations and three measure positive (i.e., optimistic) expectations. The LOT-R is a more direct measure of optimism than the attribution style questionnaire and was originally designed as a unidimensional measure, with one overall score created by adding the scores for optimistic expectations to the reverse-coded scores for pessimistic expectations. However, some researchers argue that dispositional optimism should not be conceived as a unidimensional continuum from pessimism to optimism and that optimism and pessimism are instead separate, albeit highly correlated, constructs. These researchers therefore argue that rather than adding the reverse-coded scores of pessimism items to the scores of the optimism items, pessimism and optimism scores should instead be considered separately (Chang et al., 1994; Forgaed and Seligman, 2012; Herzberg et al., 2006; Robinson-Whelen et al., 1997).

Dispositional optimism appears to be a reasonably stable trait, with test-retest correlation coefficients of between .35 and .79 over periods from a few weeks to ten years (Atienzia et al., 2004; Lucas et al., 1996; Mathews et al., 2004; Scheier et al., 1994; Segerstrom, 2007). Some of the disparity between the higher and lower correlations may be due to the use of different test populations. For example, Mathews et al. (2004) reported a test-retest correlation of 0.71 over a ten-year period, while Segerstrom (2007) reported a test-retest correlation of 0.35 over a ten-year period. The participants in the Matthews et al. (2004) study were middle-aged women, whereas at time point one in the Segerstrom (2007) study, the participants were young law students. It is possible that the low test-retest correlation in the Segerstrom study is due in part to the fact that the participants were in the early stages of their careers, which can be a time of uncertainty and stress. Once one reaches middle age, however, perhaps one's life is more stable overall, and this stability of circumstance may lead to greater stability in traits such as optimism. Indeed, there is evidence that optimism does change somewhat over the course of one's life. Chopik et al. (2020) conducted a study combining three large panel studies, the Dutch Longitudinal Internet Study for the Social Sciences (LISS), the German Socio-economic Panel (G-SOEP) and the Health and Retirement study (HRS). These three studies take in a combined participant group of 74,886 individuals. The LISS and HRS both measured optimism using the LOT-R, whereas the G-SOEP used a single-item measure, asking participants, "When you think about the future, are you 1. Optimistic, 2. More optimistic than pessimistic 3. More pessimistic than optimistic. 4. Pessimistic." Chopik et al. found that overall, individuals in the HRS and LISS became more optimistic from early adulthood into middle age, then declined in later adulthood. Data from the G-SOEP indicated that younger adults were more optimistic than middle-aged adults, who were in turn more optimistic than older adults. Taken together, this

indicates that while optimism often has a good test-retest reliability, optimism does show some variability across the life span.

While many researchers have treated optimism as a dispositional construct that is reasonably stable across the lifespan, some have argued that optimism has both state and trait components. While trait optimism may represent a stable individual difference, state optimism may change based on situation and circumstance (Kluemper et al., 2009; Luthans 2002; Luthans & Yousseff, 2007). One method which has been used to measure optimism as a state is through making timeframe adjustments to the LOT-R (Huffman et al., 2019; Kluemper et al., 2009). Questions in the LOT-R are phrased in general terms, for example, "I am always optimistic about my future", with time frame adjustments becomes "right now I am optimistic about my future". However, adding the phrase "right now" to each item on the LOT-R in order to measure state optimism may not be particularly effective. In a study conducted by Huffman et al. (2019), cardiac patients responded to the LOT-R and a time frame adjusted LOT-R at three-time points over the course of a 16-week positive psychology intervention. Neither version of the LOT-R detected significant changes in optimism within the 16 week intervention period (Huffman et al., 2019), even though there were significant changes in participants' positive affect over this period (as measured by the positive affect items from the positive and negative affect schedule [Watson et al., 1988]). These results may suggest that the modified LOT-R is not effective at measuring state optimism. That said, these results may also reflect the fact that affect and optimism are separate constructs; while affect refers to how a person is feeling, optimism refers to a person's expectations for the future.

Further evidence that optimism is to some extent malleable, and has both state and trait components, comes in the form of a meta-analysis conducted by Mallouff and Schutte (2017). The meta-analysis looked at 29 randomised control trials of psychological interventions which aimed to increase optimism. Post-intervention, optimism was measured using either the LOT-R, an adjusted LOT-R, or a future expectancy measure. The future expectancy measure is a modified version of the subjective probability task, in which participants are asked to rate the likelihood that they will experience various positive and negative events (Hassen et al., 2013; MacLeod et al., 1996). Results of the meta-analysis indicated that while it is possible to increase optimism through psychological interventions, studies that used expectancy measures to measure optimism reported larger effect sizes than studies that used the LOT-R or modified LOT-R to measure optimism. This finding could be taken as further evidence that the LOT-R is not appropriate for measuring state optimism, even when the wording of its items have been adjusted to more effectively measure state optimism (Malouff & Schutte 2017).

While the extent to which an individual might be considered optimistic varies, optimism appears to be a near-universal trait (Fischer & Chalmers, 2008; Gallagher et al., 2013, Sharot, 2011; Scheier & Carver, 1985.) A meta-analysis of levels of optimism in more than 89,000 individuals in 22 countries classified individuals as optimistic if they scored above the mid-point on the Life Orientation Test (Scheier & Carver, 1985) or the LOT-R (Scheier et al., 1994). The conclusion from the meta-analysis was that, on average, people are optimistic and that overall, the populations of most countries are optimistic (Fischer & Chalmers, 2008).

There has also been a lack of socioeconomic diversity due to research rarely sampling from countries with lower GDP per capita or from populations with lower rates of education. One study which addresses this gap was conducted by Gallagher et al., (2013), who analysed data from 150,048 individuals who participated in the first wave of the Gallup World Poll (2005). Gallup samples approximately 1,000 people from 142 countries, providing a representative sample of more than 95% of the world population. The 2005 Gallup World Poll had collected information regarding participants positive and negative affect and perceived physical health. Cantril's Self-anchoring Striving Scale (1965) was also used to measure current life satisfaction and expectations for the future. Due to the data being nested, a hierarchical linear model was used to analyse the data. The preliminary analysis indicated that 87.7% of the variability in individual levels of optimism was due to differences between individuals and 12.3% was due to differences between countries, indicating that optimism is more strongly influenced by individual differences than by country, culture, and GDP per capita. Gallagher et al., (2013) also found that worldwide, only 10.91% of individuals expected their lives to be worse in five years than they were at the time of the study, while 19.64% expected their lives to be as good as it was at the time of questioning and 69.45% expected their life to be better five years hence. In every country surveyed, over 50% of the population expected their lives to improve over the course of the next five years, and in all but one of the countries surveyed, individuals expected to have higher life satisfaction in five years' time (the exception being Japan). These findings represent strong evidence that optimism is a nigh-on universal human trait, present in most individuals and countries around the world regardless of differences in GDP and culture.

It appears that people are not just optimistic in a general way but also hold an optimism bias when it comes to predicting the likelihood of specific future events (Garrett &

Sharot 2016; Sharot et al., 2011; Sharot & Garrett 2016). In multiple experiments where participants are asked to predict the likelihood that they will experience a range of positive and negative events, participants consistently underestimate their likelihood of experiencing negative life events and overestimate their likelihood of experiencing positive life events. These overestimations of positive events and underestimations of negative events persist in the face of evidence to the contrary (Garrett & Sharot, 2016; Sharot et al., 2011; Sharot & Garrett, 2016). These tendencies appear to be maintained by a persistent asymmetry in the way positive and negative information is processed: people tend to update their beliefs if they are given information that suggests their original beliefs were less optimistic than reality (e.g. they had previously underestimated their intelligence) but not if they are given information suggesting their previously held beliefs were more optimistic than reality (e.g. they had underestimated their likelihood of being involved in a motor accident). This asymmetry in how positive and negative information is integrated into prior beliefs indicates that failures in accurate belief-updating are not due to confirmation bias (Garrett & Sharot, 2017; Moutsiana et al., 2013; Sharot et al., 2011).

However, much of the experimental research into belief updating uses a variation on a paradigm referred to as the update method. The update method involves asking participants to estimate the likelihood that they will experience a specific event, be it positive or negative. Participants are then informed of the average likelihood that the average person will experience the event, which is referred to as the base rate probability. In some experiments the base rate probability is not an accurate figure, but is instead set higher or lower than the participant's original estimate. After participants have been informed of the base rate probability, they are again asked to estimate the likelihood that they will experience the event. The difference between a participant's initial estimate and the estimate they provide

after they have been informed of the base rate is used as a measure of belief updating. The update method itself has become the focus of debate, with some arguing that the method is flawed, and that the reported asymmetry in belief updating is caused by these flaws (Burton et al., 2021; Shah et al., 2016).

Frequently, experiments using the update method also use stimuli which are highly vulnerable to individuating factors (Shah et al., 2016). While the base rate probability of developing heart disease might be one number, individuating factors will cause an individual's personal likelihood of developing heart disease to deviate from the base rate. Individuals will likely be aware of factors that cause their personal probability of developing heart disease to deviate from the base rate. For example, a person who has no family history of heart disease, has never smoked, exercises regularly, and avoids foods known to increase risk factors for heart disease may estimate their likelihood of developing heart disease as being below the base rate. In an experimental setting, after being presented with an accurate or inaccurate base rate for heart disease, they may continue to predict their personal likelihood as being below the base rate because of the knowledge they possess regarding their own health and lifestyle. Thus, in this illustration our hypothetical participant may appear to have an optimism bias, and it may appear that the participant is failing to update their beliefs in response to undesirable evidence, yet this participant is not in fact showing an optimism bias in their belief updating but is being entirely rational.

The use of stimuli which uses information that can be influenced by individuating factors is also flawed because individuating information is likely to result in extremely low estimates more often than extremely high ones (Shah et al., 2016). One could confidently predict a 0% chance of experiencing an event, for instance, but could never confidently

predict a 100% chance of an event occurring. Take for example an individual who does not own a bike and does not intend to own one at any point; they can with confidence predict that they have a 0% chance of being the victim of bike theft. On the other hand, even an individual who knows for certain that they carry the gene for an illness which is caused by a single dominant gene, as is the case with Huntington's disease, cannot know with 100% certainty that they will develop the illness as it is possible that an effective cure will be found before they develop symptoms, or they they will die in a motor accident before they develop symptoms. In short, it is easier to confidently predict that something has a 0% chance of happening than it is to confidently predict that something with a non-zero chance, or even something with a very high chance of happening, will be certain to happen. Thus, there will be more people predicting an event has a 0% chance of happening than there will be people predicting an event has a 100% chance of happening, and this asymmetry will ultimately skew data, which, depending on the stimuli, will more likely produce results consistent with an optimism bias.

It has also been argued and demonstrated by Shah et al. (2016) that the results obtained through use of the update method in experiments with human participants may be due to a statistical artifact, and a similar pattern of results can be produced by purely rational agents in simulations. Burton et al. (2021) used experiments to demonstrate that asymmetric belief updating can be found when using the update method combined with neutral stimuli. If asymmetry in belief updating is caused by motivated reasoning, one should expect that neutral stimuli (i.e. events which are neither desirable nor undesirable) should lead participants to update their beliefs to align more closely with the base rate, regardless of whether this means reducing or increasing their predicted likelihood of experiencing the event. In this study, participants were presented with a series of life events and asked to

indicate whether they perceived the events to be positive, negative, or neutral, allowing Burton et al. to control for individual variation in the perceived valence of life events. Analysing only neutrally valanced events, participants showed significantly greater magnitude of belief updating when they had been informed that their initial estimate had been too high rather than too low. This indicates that participants had a bias towards reducing the odds of experiencing an event rather than increasing the odds of experiencing an event, and that this asymmetry is not caused by the valence of the information participants are presented with.

However, evidence supporting the existence of an optimism bias has been obtained in an experiment by Tappin et al. (2017), which teases apart optimism bias from confirmation bias, and uses stimuli that cannot be influenced by individuating information. In this experiment, conducted ahead of the 2016 presidential election in the USA, participants were recruited and asked to indicate, using nominal choice, who they would like to see win the presidential election. Participants were also asked to indicate on a sliding bipolar scale who they believed would win the election. This led to participants naturally splitting into four groups, two of which were participants whose hopes and beliefs were congruent (i.e., wanted Clinton to win and believed Clinton would win, or wanted Trump to win and believed Trump would win), and two groups whose hopes and beliefs were incongruent (i.e., wanted Clinton to win but believed Trump would win, or vice versa). Participants were then randomly allocated to one of two conditions where they either read a short passage about polling results which suggested Clinton was the likely winner or a passage which suggested Trump was likely to win. Participants were collapsed across candidates, creating a 2x2 design as participants saw evidence which either confirmed or disconfirmed their prior beliefs regarding who would win, and evidence which was either desirable (suggesting that their

favoured candidate would win) or undesirable (suggesting that their favoured candidate would lose). This allowed the researchers to empirically test whether participants were more likely to update their beliefs when they were shown information which was in line with their prior beliefs, thus showing confirmation bias, or more likely to update beliefs when shown information consistent with their desires, thus showing a desirability bias. The resulting analysis indicated that participants updated their beliefs more if the evidence they saw was desirable, i.e., evidence that their preferred candidate was likely to win. It was also found that participants updated their beliefs more when they were shown evidence which was incongruent with their prior beliefs, i.e., evidence that the candidate they believed would win would in fact lose. These results indicate that participants were showing not a confirmation bias but a disconfirmation bias. This disconfirmation bias was stronger when the disconfirming information was also desirable. This study elegantly illustrates that there is a desirability bias to belief updating – that is, an optimism bias – which is separate from and cannot be explained by confirmation bias. The universality of optimism is consistent with what one would expect if optimism were a species-typical trait, and there is good evidence indicating that high levels of optimism can result in advantages that are of adaptive value, such as good health (Lee et al., 2019; Mathews et al., 2004; Tindle et al., 2012). The anthropologist Tiger (1979) suggests that optimism has been a constant feature of all human cultures, that optimism has developed as part of our common evolutionary history, and that holding optimistic beliefs about the future is as biological as sexual fantasies. However, evidence that a trait is universal, or that it can be of benefit, is not alone sufficient evidence that the trait in question is an adaptation (Williams, 1966).

Claims for the universality of trait optimism, and of continued optimistic expectations in the face of contradictory evidence, are at odds with what one would expect according to

rational actor theory, which assumes that it is adaptive to accurately interpret the world and that an accurate assessment of reality will lead to optimum behaviour (Evans et al., 2003). Indeed, in many domains, it is likely maladaptive to hold false beliefs, but some positive illusions, including optimism, have been singled out as false beliefs which could be adaptive (McKay & Dennett, 2009). That said, there is a wealth of evidence that suggests that optimistic individuals fare better in many domains of life, and that positive illusions are an essential part of psychological well-being, supporting the suggestion that optimism engenders adaptive outcomes.

The topic of optimism has long been a subject of interest in the well-being literature. The positive relationship between optimism and well-being (i.e., physical and mental health) is well documented, with some research suggesting that this relationship may in part be causal. Links between optimism and better physical health have been found across a wide variety of objective measures. For example, it has been found that patients with high optimism undergoing coronary artery bypass graft surgery were less likely to have suffered heart attacks during surgery than less optimistic patients (Koenig, 2015). Similar results have been reported by Scheier et al. (1999), who found that optimistic patients were less likely to be hospitalised after coronary artery bypass graft surgery, findings which were replicated in a separate sample by Tindle et al. (2012). Further, Mathews et al. (2004) found that progression of atherosclerosis was faster in women with lower optimism, even after controlling for the effects of lifestyle and other covariates.

Tindale et al. (2009) conducted a longitudinal epidemiological study of over 95,000 women who, at the beginning of the study, were free of cancer and cardiovascular disease. Tindale et al. (2009) reported that compared to pessimists, optimists were less likely to

develop coronary heart disease, less likely to die of coronary heart disease-related causes and had lower total mortality from all causes throughout the eight-year study. Similarly, Giltay et al. (2006) followed 941 Dutch subjects aged 65-85 for 10 years. Controlling for major risk factors such as age, blood pressure, weight and smoking, it was found that, over the course of the study, the most optimistic participants were almost half as likely to die from all causes than the least optimistic participants. It was also reported that optimism appeared to be especially related to lower rates of cardiovascular mortality. Similarly, in an epidemiological study of over 70,000 women, Kim et al. (2016) found that individuals in the lowest quartile for optimism had a 9% greater risk of all-cause mortality than those in the top quartile for optimism over a six-year period.

Rasmussen, Scheier and Greenhouse (2009) conducted a meta-analysis of 84 studies investigating the relationship between optimism and well-being. In their analysis, they included data from 8,443 participants from cross-sectional studies, 5,692 participants in longitudinal studies and 15,998 participants in prospective design studies. They found that across all design types, the positive effect of optimism on well-being reached statistical significance. Rasmussen et al.(2009) also analysed the data by sample type, comparing results from healthy participants (N = 22,369) and patient samples (N = 7,864). The relationship between optimism and health was significant in both sample groups, and the effect size for the healthy sample was not significantly different than that for the patient sample. To compare the effects of optimism on health by type of outcome, the researchers also compared results from objective and subjective reports, finding that while there was a significant effect of optimism on participants whose well-being was recorded using subjective (N = 11,772) and objective (N = 18,361) measures, the effect size for subjective measures was significantly larger than for objective measures. The finding that optimism has

a significant effect on objective measures is particularly interesting, as, unlike subjective measures, objective measures are less likely to be influenced by reporter bias.

In a recent study looking at longevity, Lee et al. (2019) used data from the Nurses' Health Study and the Veterans Affairs Normative Ageing study. The Nurses' Health Study has been collecting data through biannual surveys since 1979. In 2004 participants completed an optimism assessment, and their mortality status was tracked until 2014. The Veterans Affairs Normative Aging study has been collecting data since 1961; participants completed optimism assessments in 1986, and their mortality status was tracked until 2016. Information regarding the physical and psychosocial health of participants had been collected in both the Nurses' Health Study and the Veterans Affairs Normative Aging study. Lee et al. (2019) used data from 69,744 women from the Nurses' Health Study and 1,429 men from the Veteran Affairs Normative Aging Study to analyse the relationship between optimism and longevity. In both cohorts, optimism was significantly associated with exceptional longevity, defined as survival past the age of 85. The relationship between optimism and longevity remained significant after adjusting for a variety of health and psychosocial measures, including variables known to be associated with longevity such as marital status, depression, smoking, alcohol use, and physical activity. Women from the Nurses' Health Study who were in the top quartile for optimism had 14.9% longer life spans than women in the lowest quartile for optimism. Similarly, men from the Veteran Affairs Normative Aging Study who were in the top quartile for optimism had a 10.9% longer lifespan than men in the lowest quartile for optimism.

Optimism appears to be linked to motivation as optimistic individuals appear to cope with adversity and uncertainty by using approach strategies, coping with problems by

actively trying to solve them (Carver et al., 1989; Forgeard & Seligman, 2012), whereas pessimists tend to cope through avoidance. The relationship between optimism and motivation could be key to explaining optimism's link with positive life outcomes. Optimists seem to be more successful than non-optimistic others, especially in jobs where they face a lot of failure (Forgeard & Seligman, 2012). Optimists also appear to have better marriages and larger social networks, which appears to be due to optimists being more active in pursuing and maintaining social relationships (Assad et al., 2007; Parise et al., 2017; Srivastava et al., 2006).

In most circumstances, optimism appears to be beneficial because it allows individuals to acquire resources, pursue goals, be persistent, be open to opportunities and guard against learned helplessness (Forgeard & Seligman, 2012). These findings, and the finding that most individuals display an optimism bias, have led to theorising regarding the evolution of optimism. It has been questioned how optimism could be adaptive, given that individuals who exhibit optimism often hold beliefs that they will be happier and luckier than the average person and that these beliefs are held despite probabilistic unlikelihood and even evidence to the contrary. These optimistic beliefs appear to encourage behaviour that one would not expect from a purely rational agent; for example, optimism and other positive illusions encourage individuals to overestimate their ability to perform a task or win in situations where statistics and rationality would suggest otherwise. This raises the question of whether and why natural selection would favour individuals who are not rational and therefore have a biased view of reality. One explanation is that confidence and persistence can often lead to success, meaning positive illusions can become self-fulfilling prophecies (Taylor & Brown, 1988). Furthermore, mathematical models indicate that in conditions of unpredictability, moderately optimistic agents outperform rational agents (Johnson & Fowler,

2007), suggesting that moderate optimism is an evolutionarily adaptive strategy. However, it has been argued that in mathematical models, Bayesian agents acting without biases can also produce fitness maximising behaviour (Marshall et al., 2013), thus there is no need for an optimism bias to evolve. Johnson and Fowler (2013) note that while it is the case that purely rational agents can in theory produce optimal behaviour, humans are not perfect Bayesians; furthermore, in order to behave optimally, the amount of information a Bayesian agent would need to have access to, and the amount of information processing a Bayesian agent would need to perform, seems prohibitively extensive. An optimism bias may evolve because it would allow a non-Bayesian agent with incomplete information to produce fitness maximising behaviour (Johnson & Fowler, 2013). Many of our most fitness-impacting decisions must be made without knowledge of all influential factors, and it is reasonable to suggest that humans have evolved under conditions of chronic and adaptively-relevant uncertainty. It is also important to note here that there is no reason natural selection would favour agents with an accurate view of reality, if an inaccurate view of reality enhanced adaptive fitness (McKay & Dennett, 2009).

Optimism is a particularly interesting concept to approach from an adaptationist perspective. Optimism, or the adoption of an optimistic strategy, could proliferate either through biological evolution, if there is a genetic element to optimism, or through cultural evolution, with more people adopting optimism as a strategy as they witness the success of optimistic others. Or optimism could proliferate through a combination of genetic and cultural evolution.

Regardless of whether optimism proliferates via biological or cultural evolution, or perhaps through a combination of the two, the cross-cultural prevalence of optimism among

the general population hints that it is a trait that has been selected for, and the evidence presented above strongly suggests that optimism has marked adaptive benefits. Bennett (2011) proposes that optimism is not only beneficial but essential, arguing that "optimism and the social function of optimism are so important that without them, society or civilisation would be unable to sustain itself." Bennett also argues that "the necessity of optimism has given rise to a complex of optimism promoters", of which, Bennett suggests, religion could be one.

Chapter 8 : Optimism and Religiosity

The previous section reviewed literature on optimism from an evolutionary perspective. The literature suggests that optimism is a cross-culturally universal human trait (Fischer & Chalmers, 2008; Gallagher et al., 2013; Sharot, 2011; Scheier & Carver, 1985.) which some argue is essential for survival (Tiger, 1979), through increasing motivation to pursue adaptive goals (Carver & Scheier, 2014; Sharot, 2011). Evidence for the importance of the optimism bias in motivating behaviour can be seen in clinically depressed individuals, in whom the optimism bias is absent or less marked than in healthy individuals. Individuals with depression often present with a marked loss of motivation to pursue goals and rewards (Dickson et al., 2017; Fussner et al., 2017; Smith, 2013). It has also been suggested that it is likely that humans have developed methods or institutions which serve to boost optimism and that religion could be one such human creation that serves to boost optimism (Bennett, 2011). This section reviews literature discussing and investigating possible links between religion and optimism.

It has been noted that religious individuals appear to be more optimistic than non-religious individuals (Koenig et al., 2012; Krause and Hayward 2014; Mattis et al., 2017; Sethi & Seligman, 1993, 1994), with those who identify as religious and consider religion to be an important or salient aspect of their identity being more likely to have high levels of optimism than non-religious individuals (Sethi & Seligman 1993, 1994). Indeed, using a questionnaire study, Sethi and Seligman (1993) found that among both Christian and Jewish participants, individuals who expressed more fundamentalist religious views displayed higher optimistic explanatory style than religious moderates, who in turn displayed a more optimistic explanatory style than religious liberals. Sethi and Seligman (1993) also conducted a content analysis on sermons delivered in fundamentalist, moderate and liberal churches and

synagogues, finding that congregations that expressed greater levels of fundamentalism were exposed to more optimistic sermons than were moderates, who in turn were exposed to more optimistic material than liberals. These findings indicate that there may be a positive dose-response relationship between religious fundamentalism and optimism. These results are echoed in research by Heyward et al. (2016), who found that individuals who described themselves as religious (both affiliated and unaffiliated) had higher levels of dispositional optimism than individuals who self-described as agnostics and atheists.

A paper by Koenig (2015) reiterates and updates the findings of a meta-analysis conducted in clinical populations on the relationship between religion, spirituality, and health. The original meta-analysis conducted in 2010 identified 326 studies that examined religion and spirituality and life satisfaction, or happiness. Of these 326 studies, 32 measured optimism, of which 26 reported a significant positive relationship between religion and optimism, six failed to find a significant positive or negative relationship, and none found a significant negative relationship. Although the participants included in the 32 studies measuring religion and optimism were all from clinical populations, it does provide evidence that a relationship exists between religion and optimism.

However, like in many areas of psychological research, American citizens are arguably overrepresented, which raises the question of whether the documented relationship between religion and optimism is peculiar to the Christian tradition or whether the relationship between religion and optimism can be found cross-culturally. Addressing this gap, Gebauer et al., (2013) conducted a study looking at religiosity, social self-esteem and psychological adjustment across cultures. They did this by using information about country-level religiosity collected by the 2007 Gallup poll and individual-level information about

personal religiosity, social self-esteem and psychological adjustment taken from 187,957 dating profiles on the website eDarling. They found that personal religiosity had a positive relationship with social self-esteem and a positive relationship with psychological adjustment regardless of country. However, the strength of the correlation between personal religiosity and social self-esteem and the correlation between personal religiosity and psychological adjustment was greater in more religious countries. This may suggest that religion has a positive relationship with social self-esteem and psychological adjustment regardless of culture. However, it is unclear whether all religious individuals in more religious countries have higher levels of social self-esteem and psychological adjustment regardless of which religion they identify with, or whether the corelations between personal religiosity, social self-esteem and psychological adjustment is driven by individuals who identify with the culturally dominant religion in their country. Psychological adjustment is not optimism; that said, optimism was used as a component of psychological adjustment in this study. The countries included in this study were Sweden, Germany, France, the Netherlands, Switzerland, Austria, Italy, Spain, Russia, Poland and Turkey. So, while this was a cross-cultural study, the participants involved were from countries that are predominantly W.E.I.R.D. and historically Christian. That said, this study found country-level religiosity to be highest in Turkey, a predominantly Muslim country, and the correlation between religious identity and psychological adjustment was also highest in Turkey.

In a study comparing participants from the USA and Kuwait, Abdel-Khalek and Lester (2007) found that optimism was significantly higher among Americans than Kuwaitis, however, they also found a significant positive correlation between optimism and religiosity among participants from the USA and Kuwait. In a study conducted among Ghanaian older adults, Aglozo et al. (2021) measured spirituality, dispositional optimism, meaning in life,

life satisfaction, and positive and negative affect. Data were analysed using structural equation modelling, revealing a significant positive relationship between spirituality and optimism. Although the majority of the 235 participants were Christians (216 Christian, 18 Muslim, 1 African Traditionalist), these results do represent evidence for a positive association in a non-European and non-American population. Taken together, the findings of Gebauer et al. (2013) and those of Aglozo et al. (2021) indicate that a positive relationship between religiosity and optimism is not peculiar to US samples.

However, the finding that religion and optimism are positively correlated is not ubiquitous. For example, in a survey study, Khallad (2010) found that dispositional optimism and religion were not significantly correlated for Americans or Jordanian student participants. Similarly, in a survey study by You et al., (2009), results showed no correlation between religiosity and dispositional optimism among Americans and Hong Kong Chinese participants. Another study providing mixed support for the notion that religion and optimism are positively correlated comes from Ai et al., (2003), who found that Kosovar and Bosnian Muslim refugees in the USA did not show a direct association between religiousness and optimism. However, this study did find that positive religious coping – where individuals use religion to find meaning in negative events or seek assistance from god (Pargament, 1997) was associated with positive coping, which was in turn associated with optimism, while negative religious coping, where individuals express anger or resentment towards god for causing their suffering (Pargament, 1997) was associated with helplessness. Similarly, Tarkeshwar et al. (2003) found positive religious coping was associated with good mental health among Hindu participants. Although optimism and good mental health are not synonymous, optimism is often considered to be central to good mental health (Achat et al., 2000; Burešová et al., 2020; Conversano et al., 2010), so these results may still be considered

as evidence of a positive association between positive religious coping and optimism in participants who adhere to a non-Abrahamic religion. A study by Schutte and Hosch (1996) also reported mixed results, finding a positive association between religion and optimism in Mexican Americans, no relationship among Americans and no relationship in Mexican citizens. Abdel-Khalek and Naceur (2007) found that among a sample of college students from Algeria, religiosity positively correlated with optimism among female participants but not male participants. Both of these studies indicate that optimism and religion may not be directly correlated in all instances.

Overall, while the evidence is by no means unanimous, there does seem to be a positive correlation between religiosity and optimism among adherents to Abrahamic and non-Abrahamic religions across multiple cultural contexts. In those studies that do not find a positive correlation between religion and optimism, it appears that no significant correlation of any kind is found, or a significant negative correlation is found in instances where individuals display negative religious coping. However, even if all research examining the relationship between optimism and religion found significant positive relationships, this alone would not be enough to infer cause and effect. While it is plausible that religion and religious adherence leads to increased levels of optimism in adherents, it is possible that optimistic people are more likely to engage with religion and believe in supernatural benevolence.

Furthermore, as has been noted in Chapter 5 of this thesis, one problem with much of the research into religion and religious belief is that the way in which religiosity is measured is variable from study to study, with some studies using single-item measures and others using several items which measure both behavioural aspects of religious engagement, such as attendance at places of worship, and psychological aspects, such as asking how important

individuals consider religion to be. As well as the way in which religiosity is measured being variable, these measures are often biased towards western concepts of monotheistic religion (Wulff 2019). As discussed in Chapter 5, the variation in measures used makes it harder to accurately compare and draw conclusions across multiple studies, and harder to identify what aspect of religion, be it cognitive or behavioural, is most impacting the variable of interest, in this case, optimism.

In the next two chapters, this thesis aims to measure the relationship between transcendent teleological thinking and optimism, and to then investigate whether optimism can be experimentally increased through exposure to transcendent teleological thinking.

Chapter 9 Study 3: Social Support, Transcendent Teleological Thinking, and Optimism

The study detailed in Chapter 6 indicated that the behavioural religiosity measure and the transcendent teleological thinking (TTT) measure were associated with optimism. When looking more closely at the findings, it appeared that individuals who had high behavioural religiosity and high TTT had the highest levels of optimism, while people with medium to low behavioural religiosity had higher levels of optimism if they had high TTT. Interestingly, the analysis in Chapter 6 also indicated that participants with high behavioural religiosity but low TTT had the lowest optimism scores. These findings could indicate that it is not just religious attendance that drives the positive association between religiosity and optimism discussed in Chapter 8 (Koenig et al., 2012; Krause and Hayward 2014; Mattis et al., 2017; Sethi and Seligman 1993;1994), but that TTT also plays a role in the association between religion and optimism. This would be an interesting finding, given that, as discussed in Chapter 2, much of the research looking at the benefits of religious engagement suggests that the reported psychological and physical health benefits reported in religious individuals is due to social support provided by the religious community (Galen 2015; McCullough et al., 2000, Schnall et al., 2011, Powell et al., 2003; Price & Launay, 2018). It has also been argued that the social support individuals gain from religious attendance is not unique and that secular groups can also provide a source of social support (Galen, 2015; Price & Launay, 2018). Therefore, in order to test whether TTT uniquely contributes to optimism, it is important to control for all sources of social support, not just religious social support.

However, the study detailed in Chapter 6 was largely exploratory in nature and had not set out to look at optimism as an outcome measure. In fact, in the study detailed in Chapter 6, optimism was measured on a single item on the Warwick-Edinburgh mental well-being scale, “I’ve been feeling optimistic about the future”, rather than being measured using

the Life Orientation Test Revised – an inventory designed specifically to measure dispositional optimism. The study detailed in this chapter is designed to take a closer, more deliberate look at the relationships between general social support, religious social support, TTT, and optimism.

The findings detailed in Chapter 6 also indicated that behavioural religiosity might moderate the relationship between TTT and optimism. Another aim of the research detailed in this chapter is to explore this further and tease apart the impact of religious attendance and general social support on optimism and the impact of TTT on optimism. This would allow for the comparison of optimism in people with similar levels of religious attendance and/or social support but different levels of TTT. If TTT can improve optimism independently of social support, then people with low social support but high TTT should have higher levels of optimism than individuals with low social support and low TTT. If social support can improve optimism independently of TTT, people with high social support and low TTT should also show higher levels of optimism than people with low social support and low TTT. This would provide support for the hypothesis that TTT and social support have separate associations with optimism independent of each other.

In order to look at optimism rather than well-being in general, the Warwick Edinburgh inventory used in the study detailed in Chapter 6 was replaced with the Life Orientation Test Revised (LOT-R, Scheier et al., 1994). As detailed in Chapter 7, the LOT-R is the most commonly used measure for dispositional optimism. While the LOT-R includes measures for both optimism and pessimism, some researchers suggest optimism and pessimism are two points on a bipolar scale, others argue that optimism and pessimism are separate yet highly correlated concepts. This study does not make any predictions regarding pessimism, moreover, the argument that optimism and pessimism are separate constructs is

persuasive (Chang et al., 1994; Forgaed & Seligman, 2012; Herzberg et al., 2006; Robinson-Whelen et al., 1997). For this study, therefore, only the optimism component of the LOT-R will be included in the analysis.

The TTT scale used in this study is an updated version of the one used in study 2a, presented in Chapter 5, and presented in full in Appendix F. The updated version used in this study is less impersonal and asks participants to reflect more on their own lives and life experiences. The updated TTT scale also becomes more focused on the way in which participants believe a transcendent teleological force influences their own lives. The alteration of the TTT measure to become more egocentric was done to make the measure more similar in phrasing to other scales used in this study, namely the SWLS and the LOT-R. In making the items on the TTT measure less abstract, and changing the phrasing of items to emphasise how participants feel about and relate to ideas which reflect transcendent teleological thinking (rather than asking what they explicitly believe), there was a risk of making the TTT scale somewhat less direct as a measure of individual belief. . However, overall, altering the TTT scale to make it more egocentric was deemed beneficial at this point in research. The updated TTT measure is presented in Appendix P.

Hypotheses

Hypothesis 1: TTT will have a positive association with optimism.

Hypothesis 2: Social support will have a positive association with optimism.

Hypothesis 3: TTT will be positively associated with optimism when social support and attendance at religious services are controlled for.

Hypothesis 4: Social support will have a positive association with optimism when TTT and attendance are controlled for.

Hypothesis 5: Religious attendance will not have a positive association with optimism when TTT and social support are controlled for.

Hypothesis 6: Attendance at religious services will moderate the relationship between TTT and optimism.

Hypothesis 7: Social support will not moderate the relationship between TTT and optimism.

Method

Participants

Participants were 999 residents of the USA. After removing all participants who failed attention checks or comprehension checks, this sample size was reduced to 932 (405 female, 525 male, 2 identifying as "other"), aged between 19 – 81 (*M* 38.77, SD 12.06). All participants had completed at least 500 previous M-Turk tasks and had an approval rating of at least 99%.

Ethnically, participants identified as Asian descent 7%, Black or African descent 6.1% Hispanic descent 5.4%, Middle Eastern descent 0.1%, Native American descent 0.4%, White European descent 77.9%, Mixed/Multiple Ethnic groups 2.8%, Other Ethnic group 0.3%.

Participants identified as Agnostic 24.4%, Atheist 21.5%, Buddhist 1.9%, Christian-Catholic 13.7%, Christian Protestant or Evangelical 14.1%, Christian – no specific denomination 6.7%, Christian – other denomination 1.5%, Hindu 0.3%, Jewish 1.3%, Muslim 0.3%, non-religious 3.5%, spiritual 5.9%, "believe in some kind of higher power but unsure how to describe it" 3.3%, Other belief system 1.6%.

Procedure

In order to take part in the survey, participants were required to be current residents of the USA aged 18 or older. The survey was created in Qualtrics and accessed through a link on M-Turk. Demographic data were collected at the end of the survey. All scale variables apart from "attendance" were measured on a 5-point Likert scale, response options were "disagree strongly", "disagree", "neither agree nor disagree", "agree", and "agree strongly". Measures were presented to participants in the order presented below.

Variables

Social Support

Participants answered a 6-item social support scale (Kliem et al., 2015), scored on a 5-point Likert scale. This measure included items such as "I receive a lot of understanding and security from others" and "If I'm very depressed, I know who I can turn to". All items on the social support scale are positively coded. These items had high internal consistency (α =.91). The full scale is presented in Appendix N.

Life Orientation Test Revised

The Life Orientation Test Revised (LOT-R, Scheier et al., 1994) was used to measure how optimistic participants felt about the future, it is a 10-item measure, four of which are filler questions and answers are given on a 5-point Likert scale. The LOT-R includes three reverse coded items which measure pessimism (Chang et al., 1994; Forgaed & Seligman, 2012; Herzberg et al., 2006; Robinson-Whelen et al., 1997). The pessimism measures were excluded from the analysis. Cronbach's alpha for the LOT-R was .92. The Cronbach's alpha

for the optimism measures on the LOT-R is 0.87. Cronbach' alpha for the pessimism items on the LOT-R was 0.88. The full scale is presented in Appendix O.

Transcendent Teleological Thinking

Participants answered a ten-item measure of TTT. This was an updated version of an original measure used and described in Chapters 5 and 6. The questions are designed to measure "belief in an unseen order" without reference to any specific god, gods or religion. Participants were asked to indicate how much they agreed with a series of statements, for example, "I have felt like events in my life were influenced by some kind of higher power" and "I can relate well to the idea that 'everything happens for a reason'". Answers were given on a five-point Likert scale. Eight items on the TTT scale are positively coded, with 1 being strongly disagree and 5 being strongly agree, and two items are reverse coded. These items had high internal consistency (α =.98). The full scale is presented in Appendix P.

Religious Identity

Religious identity was recorded by asking participants how much they agreed with the following statements "I am religious", "I am spiritual", "I am atheist", and "I am agnostic". Results were recorded on a 5-point Likert scale, ranging from "disagree strongly" to "agree strongly". The full scale is presented in Appendix Q.

Attendance

Attendance was recorded using a one-item measure of frequency of religious attendance. Participants were asked, "About how often do you attend gatherings (services, meetings, social events, etc.) related to a religious/spiritual affiliation?" Responses were recorded on a ten-point scale from "never" to "5 or more times a week". The full scale is presented in Appendix R.

Results

An initial correlation was conducted to look at the relationship between TTT, Optimism as measured by the optimism measures on the LOT-R, self-reported social support, attendance at religious services, age and sex. Intercorrelations and descriptive statistics are presented in Table 9.1.

Table 9.1 *Intercorrelations and Descriptive Statistics: Optimism, Transcendent Teleological Thinking, Social Support and Religious Attendance*

	1	2	3	4	5	*M*	*SD*	n
1. LOT-Opt	-					3.40	1.13	932
2. TTT	.29**	-				2.74	1.40	932
3. Attend	.20**	.57**	-			2.70	2.45	932
4. SS	.58**	.21**	.14**	-		3.78	0.94	932
5. Sex[1]	.07*	-.15**	< -.01	-.03	-	0.56	0.50	932
6. Age	.07*	.16**	.07*	.04	-.12**	38.77	12.06	932

*Note: LOT-Opt is optimism measures from the Life Orientation Test Revised. Attend is attendance at religious services. TTT is transcendent teleological thinking. SS is social Support. Sex[1] 0= female, 1=male. *Correlation is significant at the .05 level. **Correlation is significant at the .01 level*

Multiple Regression

To test for the effect of TTT on optimism, a multiple regression (enter method) was conducted. Age and sex were entered into the model to control for the influence of these variables. Social support was entered into block one. Attendance at religious gatherings was entered into block two. TTT was entered into block three. In model one social support accounts for significant variance in optimism ($\beta = .58$, $p < .001$.) When attendance is added in model two, attendance accounts for significant variance in optimism ($\beta = .12$ $p < .001$) and social support continues to account for significant variance in optimism ($\beta = .56$ $p < .001$).

When TTT is added into block three, social support remains significant (β = .54 p < .001), attendance is no longer significant (β = .03 p > .05) and TTT is significant (β = .17 p < .001).

Table 9.2 *Optimism Regressed on Attendance, Social Support, and Transcendent Teleological Thinking*

	β	*R*	R^2
Model 1		.59	.34***
Age	.05*		
Sex[1]	.08**		
SS	.58***		
Model 2		.60	.36***
Age	.05		
Sex[1]	.08**		
SS	.56***		
Attendance	.12***		
Model 3		.61	.37***
Age	.03		
Sex[1]	.10***		
SS	.54***		
Attendance	.03		
TTT	.17***		

Note: [1]Sex Male = 1 Female = 0. SS=Social Support. TTT= Transcendent teleological thinking *Significant at .05 level. **Significant at .01 level. ***Significant at .001 level.

Moderation Analysis

As the data in Chapter 6 presented some evidence that the relationship between transcendent teleological thinking and the optimism measure was moderated by behavioural religiosity, moderation analysis was conducted on this data to see if religious attendance moderated the relationship between TTT and optimism.

Moderation 1

To investigate whether religious attendance moderated the relationship between TTT and Optimism, a moderation analysis was conducted in SPSS using the PROCESS custom

dialogue box (Hayes, 2012). The overall model is significant, but there is no moderation, this is shown by a non-significant interaction effect, β = .03, 95% *CI* [-.003, .06] t = 1.77, p =.08, indicating that attendance does not moderate the relationship between TTT and optimism. The model summary is presented in Table 9.3 and results of the model are presented in Table 9.4.

Table 9.3 *Model Summary of relationship between Transcendent Teleological Thinking, Religious Attendance and Optimism*

R	R^2	MSE	*F*	Df1	Df2	*P*
.30	.09	1.16	30.18	3.00	928.	<.0001

Table 9.4 *Relationship Between Transcendent Teleological Thinking, Religious Attendance and Optimism*

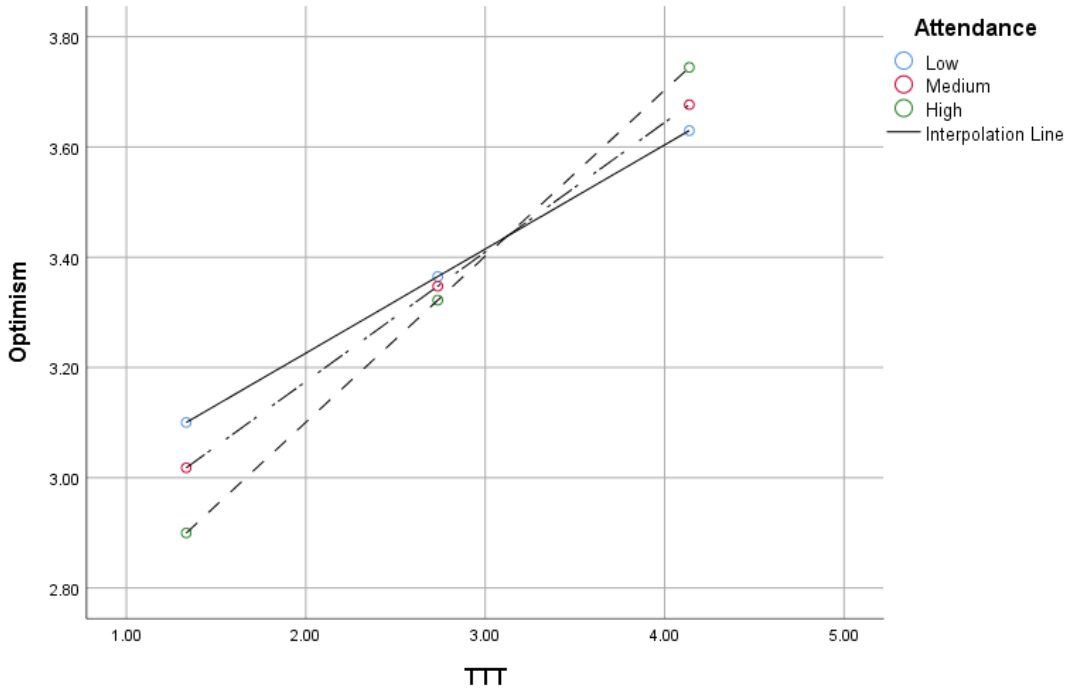
	Coefficient	*SE*	*T*	*p*	LLCI	ULCI
Constant	2.93	.12	23.97	<.0001	2.69	3.17
TTT	.16	.04	3.94	.0001	.08	.24
Attendance	-.08	.06	-1.34	.18	-.21	.04
Interaction	.03	.02	1.77	.08	-.003	.06

Table 9.5 *Conditional Effects of Transcendent Teleological Thinking on Optimism at Low, Medium, and High levels of Religious Attendance*

Attendance	Effect	*SE*	*T*	*p*	LLCI	ULCI
1.00	.19	.03	5.73	<.0001	.12	.25
2.70	.24	.03	6.97	<.0001	.17	.30
5.16	.30	.06	5.03	<.0001	.18	.42

The relationship between TTT and Optimism is significantly positive at every level of the moderator. Results of the conditional effects of TTT at different levels of religious attendance are presented in table 9.3. A graph illustrating the relationship between TTT and Optimism at different levels of religious attendance is presented in Figure 9.1.

Figure 9.1 *The Relationship Between Optimism and Transcendent Teleological Thinking at High Medium and Low Levels of Religious Attendance*



Note: High is median +1 standard deviation, medium is the median value, low is median -1 standard deviation

Moderation 2

To investigate whether TTT moderated the relationship between religious attendance and Optimism, a moderation analysis was conducted in SPSS using the PROCESS custom dialogue box (Hayes, 2012). The overall model is significant as illustrated in table 9.6, there is no significant moderation, the interaction effect is not significant, β = .03, 95% *CI* [-.003, .06] t = 1.77, p = .08, indicating that attendance does not moderate the relationship between TTT and optimism. The model summary is presented in Table 9.6 and results of the model are presented in Table 9.7.

Table 9.6 *Model Summary of Religious Attendance, Transcendent Teleological Thinking and Optimism*

R	R^2	MSE	*F*	Df1	Df2	*P*
.30	.09	1.16	30.18	3.00	928.00	<.0001

Table 9.7 *Relationship Between Religious Attendance, Transcendent Teleological Thinking and Optimism*

	Coefficient	*SE*	*T*	*p*	LLCI	ULCI
Constant	2.93	.12	23.97	<.0001	2.69	3.17
Attendance	-.08	.06	-1.34	.18	-.21	.04
TTT	.16	.04	3.94	.0001	.08	.24
Interaction	.03	.02	1.77	.08	-.003	.06

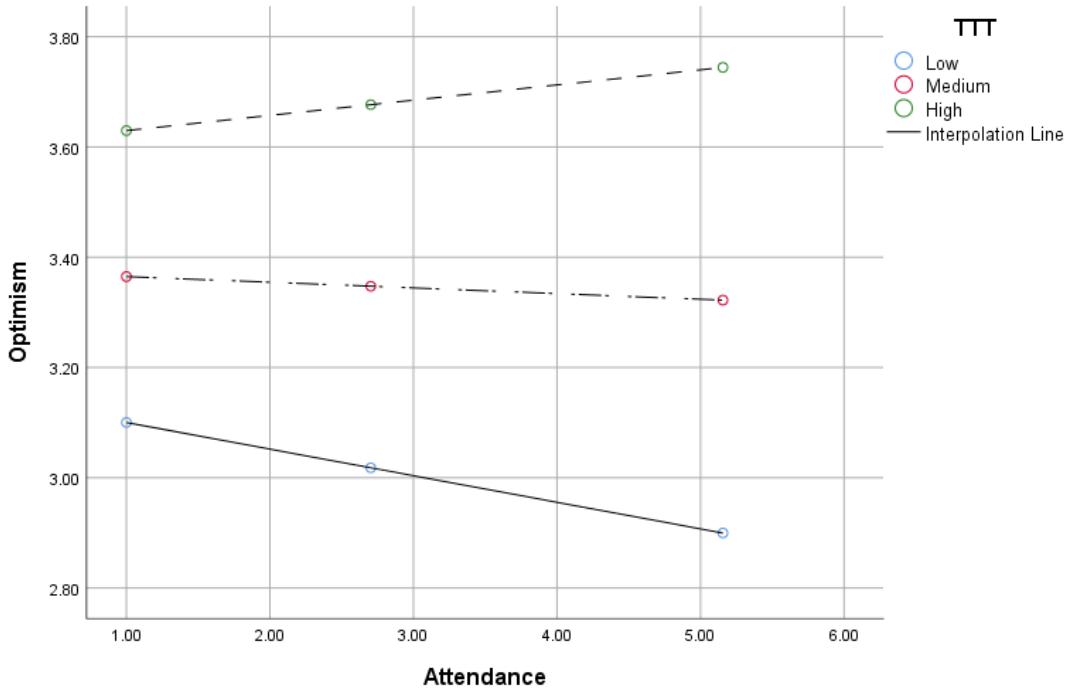
Table 9.8 *Conditional Effects of Religious Attendance on Optimism at Low, Medium, and High levels of Transcendent Teleological Thinking*

TTT	Effect	*SE*	*T*	*p*	LLCI	ULCI
1.33	-.05	.04	-1.10	.27	-.13	.04
2.74	-.01	.03	-.40	.69	-.06	.04
4.14	.03	.02	1.56	.12	-.01	.06

At every level of TTT, the relationship between religious attendance and optimism is non-significant, however, the Johnson-Neyman significance regions indicate that the threshold for significance is above 4.55, indicating that once the TTT score is above 4.55 the moderation effect of TTT on the relationship between religious attendance and optimism becomes significant. 88.6 % of the participants fell below the significance region, thus a significant interaction of TTT on the relationship between attendance and optimism is only present in 11.4% of participants. Results of the conditional effects of religious attendance at

different levels of TTT are presented in table 9.8. A graph illustrating the relationship between Attendance and Optimism at different levels of TTT is presented in Figure 9.2.

Figure 9.2 *The Relationship Between Optimism and Attendance at High Medium and Low Levels of Transcendent Teleological Thinking*



Note: High is median +1 standard deviation, medium is the median value, low is median -1 standard deviation

Moderation 3

To investigate whether social support moderated the relationship between TTT and Optimism, a moderation analysis was conducted in SPSS using the PROCESS custom dialogue box (Hayes, 2012). The overall model is significant, the interaction effect reaches marginal significance, β = -.05, 95% *CI* [-.09, -.0006] t = -1.99, p = 0.5, indicating that social support moderates the relationship between TTT and optimism. The model summary is presented in Table 9.9 and results of the model are presented in Table 9.10.

Table 9.9 *Model Summary of Transcendent Teleological Thinking, Social Support and Optimism*

R	R^2	MSE	*F*	Df1	Df2	*P*
.61	.37	.80	180.50	3.00	928.00	<.0001

Table 9.10 *Relationship Between Optimism, Transcendent Teleological Thinking and Social Support*

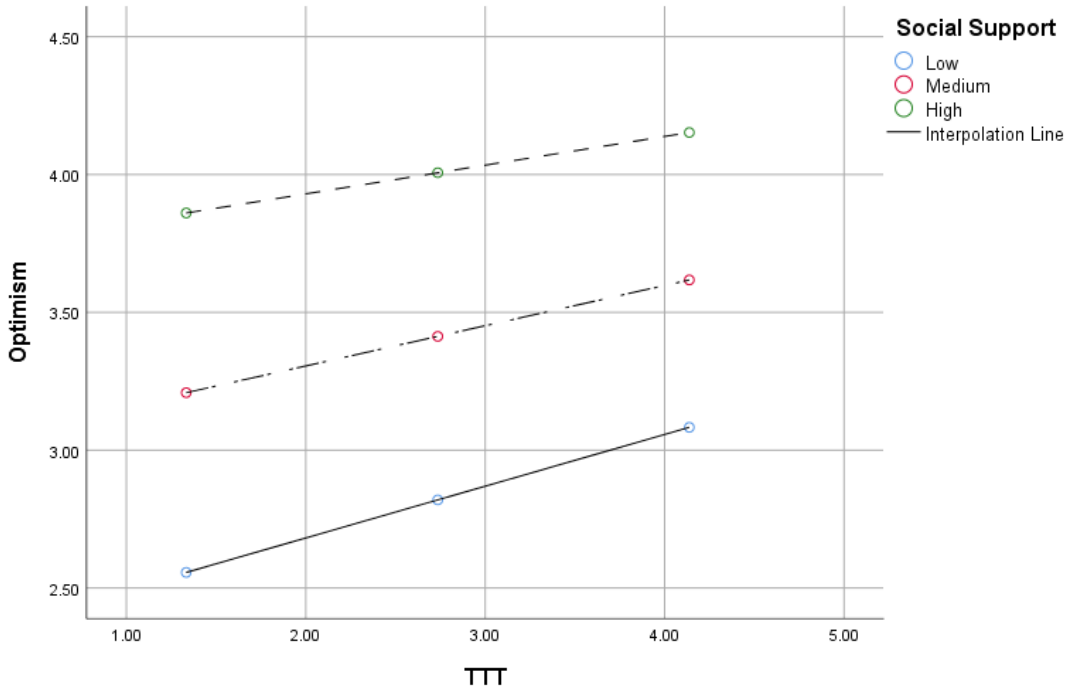
	Coefficient	*SE*	*T*	*p*	LLCI	ULCI
Constant	.16	.23	.69	.49	-.30	.63
TTT	.31	.09	3.48	.0005	.14	.49
SS	.75	.06	12.40	<.0001	.63	.87
Interaction	-.05	.02	-1.99	.05	-.09	-.0006

Table 9.11 *Conditional Effects of Transcendent Teleological Thinking on Optimism at Low, Medium, and High levels of Social Support*

SS	Effect	*SE*	*T*	*p*	LLCI	ULCI
2.84	.19	.03	5.83	<.0001	.12	.25
3.78	.15	.02	6.74	<.0001	.10	.19
4.72	.10	.03	3.72	.0002	.05	.16

The relationship between TTT and optimism is significantly positive at every level of social support. Results of the conditional effects of TTT at different levels of social support are presented in table 9.11. A graph illustrating the relationship between TTT and Optimism at different levels of social support is presented in Figure 9.3. Using the Johnson-Neyman method, there are no observed significance transition points within the data.

Figure 9.3 *The Relationship Between Optimism and Transcendent Teleological Thinking at High Medium and Low Levels of Social Support*



Note: High is median +1 standard deviation, medium is the median value, low is median -1 standard deviation

Moderation 4

To investigate whether TTT moderated the relationship between social support and Optimism, a moderation analysis was conducted in SPSS using the PROCESS custom dialogue box (Hayes, 2012). The overall model is significant, the interaction effect reaches marginal significance, β = -.04, 95% *CI* [-.09, -.0006] t = 0.2, p = .05, indicating that social support moderates the relationship between TTT and optimism. The model summary is presented in Table 9.12 and results of the model are presented in Table 9.13.

Table 9.12 *Model Summary of Social Support, Transcendent Teleological Thinking and Optimism*

R	R^2	MSE	*F*	Df1	Df2	*P*
.61	.37	.80	180.50	3.00	928.00	<.0001

Table 9.13 *Relationship Between Social Support, Transcendent Teleological Thinking and Optimism*

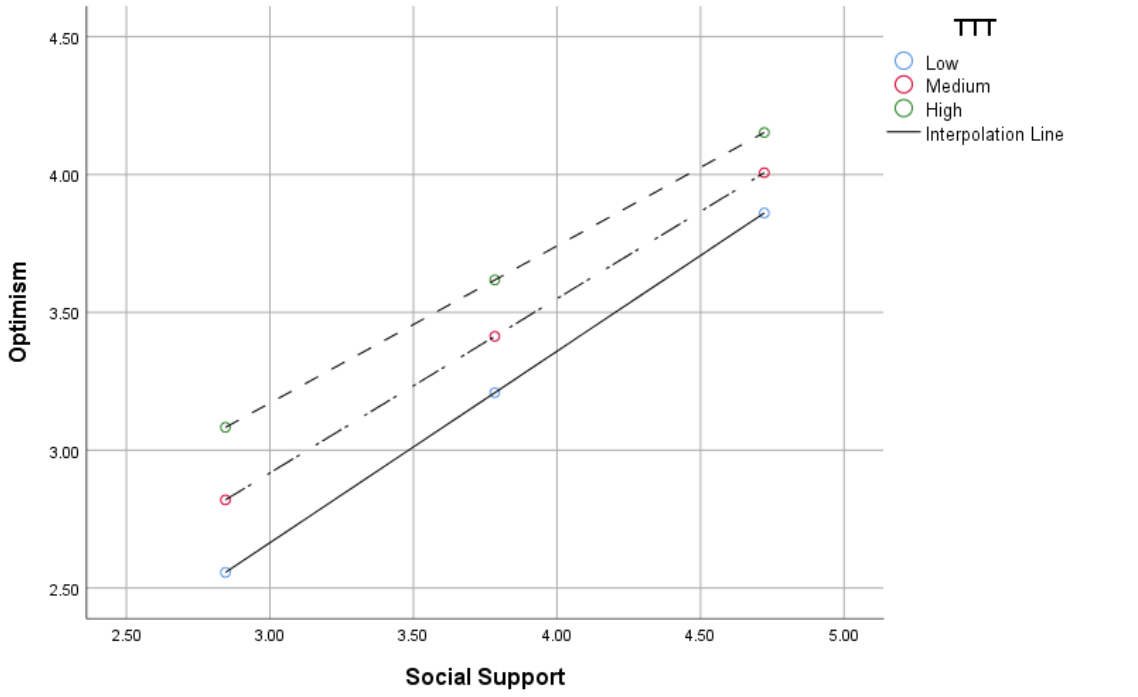
	Coefficient	*SE*	*T*	*p*	LLCI	ULCI
Constant	.16	.23	.69	.49	-.29	.62
SS	.75	.06	12.40	<.0001	.64	.87
TTT	.31	.09	3.99	.0005	.14	.49
Interaction	-.04	.02	0.2	.05	-.09	-.0006

Table 9.14 *Conditional Effects of Social Support on Optimism at Low, Medium, and High levels of Transcendent Teleological Thinking*

TTT	Effect	*SE*	*T*	*p*	LLCI	ULCI
1.33	.69	.04	17.92	<.0001	.62	.77
2.74	.63	.03	18.94	<.0001	.57	.70
4.14	.57	.05	10.98	<.0001	.47	.67

The relationship between social support and optimism is significant at every level of TTT, the Johnson-Neyman method found no statistical significance transition points in the data. Results of the conditional effects of social support on optimism at different levels of TTT are presented in table 9.14. A graph illustrating the relationship between social support and optimism at different levels of TTT is presented in Figure 9.4.

Figure 9.4 *The Relationship Between Optimism and Social Support at High Medium and Low Levels of Transcendent Teleological Thinking*



Note: High is median +1 standard deviation, medium is the median value, low is median -1 standard deviation

These results further illustrate that TTT has a positive relationship with optimism which cannot be explained by religious attendance or social support more generally. This goes against the suggestion that the reported relationship between religiosity and optimism is due to the social support individuals gain through attending religious gatherings.

Discussion

The findings of the study described in this chapter built on the findings detailed in Chapter 6, which suggested that both religious attendance and TTT were associated with optimism. This study was designed to take a deliberate look at the relationship between religious attendance, social support, TTT, and optimism. This study found further support for the hypothesis that TTT is associated with optimism.

The results of the multiple regression found that social support and attendance both had a significant positive association with optimism, however, it also revealed that once TTT was added into the model attendance no longer had a significant association with optimism, but social support continued to have a significant positive association with optimism. This indicates that the association between attendance and optimism is not explained by social support.

The moderation analysis looking at whether attendance moderated the relationship between TTT and optimism found a statistically significant relationship between TTT and optimism but did not find a significant relationship between attendance and optimism. While the graph in figure 9.1 indicated that there was an interaction effect, this was not statistically significant, and attendance did not moderate the relationship between TTT and Optimism.

The moderation analysis looking at whether social support moderated the relationship between TTT and optimism found that social support and TTT both had significant positive relationships with optimism and found that there was no interaction effect. Social support did not moderate the relationship between TTT and optimism. This suggests that TTT and social support both exert separate significant positive effects on optimism.

It is frequently reported that religious attendance is associated with higher optimism, and it is often suggested that this association is due to social support gained from other worshippers (Galen, 2015; McCullough et al., 2000; Powell et al., 2003; Price & Launay, 201; Schnall et al., 2011). However, taken together, the results presented above indicate that the relationship between optimism and religious attendance is not explained by social support gained through involvement with religious communities, but instead is explained by higher levels of TTT among individuals who attend religious gatherings.

As this study is a survey design, cause and effect cannot be established and so it is not possible to say based on these findings whether people who have high TTT are more likely to engage with religion, or whether attendance at religious services increases TTT.

In a study conducted by Sethi and Seligman (1993) it was found that among both Christian and Jewish participants, individuals who expressed more fundamentalist religious views displayed a more optimistic explanatory style than religious moderates, who in turn displayed a more optimistic explanatory style than religious liberals. Sethi and Seligman also conducted a content analysis on sermons delivered in fundamentalist, moderate and liberal churches and synagogues. It was found that congregations that expressed greater levels of fundamentalism were exposed to more optimistic sermons than were moderates, who in turn were exposed to more optimistic material than liberals. This research conducted by Sethi and Seligman can be interpreted as providing some evidence that individuals who are exposed to sermons with more optimistic content have a more optimistic explanatory style. Moreover, it may well suggest that it is not social support gained through religious attendance that explains the positive association between religious attendance and optimism, but instead it is the content of sermons and the ideas which one is exposed to at religious services which increases optimism. However, it is important to note that the research conducted by Sethi and Seligman assessing the explanatory style of religious individuals was a questionnaire study and a separate content analysis of religious sermons. Therefore, it is not possible to confidently infer a causal relationship between the levels of optimistic content of sermons and the levels of optimism expressed by individuals who attend religious services.

Chapter 10 Study 4: Experiment Looking at Transcendent Teleological Thinking and Optimism

Introduction

The findings detailed in Chapter 9 indicated that the positive association between transcendent teleological thinking (TTT) and optimism is significant, even after controlling for the effects of social support and religious attendance. This is consistent with the exploratory findings of Chapter 6, which also indicated that there is a positive relationship between TTT and optimism. However, the positive association between TTT in both Chapters 6 and 9 was found in cross-sectional, non-experimental data, so we cannot draw conclusions regarding cause and effect based on these results alone. It is theoretically possible that people with higher levels of optimism are more likely to engage in TTT, however, it is also possible that engaging in TTT encourages optimism. The aim of this chapter is to further explore the relationship between TTT and optimism through experimental methods. In order to do this, a survey-experiment was devised. Participants were randomly assigned to either answer a questionnaire that included a measure of TTT or to answer a questionnaire that included a measure of the systemising quotient. The systemising quotient designed by Baron-Cohen et al. (2003) is a scale measuring interest in inanimate systems. Apart from this, the surveys were identical. Answering the TTT questions may prime participants to engage in this type of thinking, whereas the systemising quotient questions would act as a control. In this experiment, as well as measuring dispositional optimism using the life orientation test revised (LOT-R), a 'future satisfaction with life scale' (F-SWLS) was also included. This was done as F-SWLS may be more experimentally malleable than dispositional optimism as measured by the LOT-R due to the fact that the LOT-R scale is designed to measure trait optimism – how a person usually feels – whereas

the F-SWLS is designed to measure state optimism – how optimistic the participant is feeling at the time of answering. A survey-experiment method was chosen to enable the recruitment of a large sample of US residents, thus maintaining continuity with the preceding research conducted for this thesis. This study was pre-registered at https://osf.io/6mrhw. However, the preregistration tends to focus on the study's more complex hypotheses and analysis aspects. The study presented below also includes some more basic hypotheses and analysis that, despite not being mentioned in the preregistration, were deemed foundational to the more complex aspects of the analysis.

Hypotheses

Hypothesis 1: Individuals randomly assigned to the TTT condition will have higher state optimism scores, as measured on the F-SWLS, than individuals assigned to the systemising quotient condition.

Hypothesis 2a and 2b: An interaction effect between religiosity and condition: in the TTT condition, high-religiosity participants will express higher state optimism as measured by F-SWLS than (a) participants in the control condition, and (b) low-religiosity participants in the TTT condition.

Method

Participants

Participants were recruited through Amazon MTurk and were paid US$0.60 to participate. All participants were U.S. residents aged 18 or over and had completed at least 500 previous MTurk tasks with an approval rate of at least 99%. The survey included two attention checks, these were "What day of the week comes between Tuesday and Thursday?"

and “How many times does the letter L appear in the word LULL?”. Any participant who failed either attention check was excluded from the analysis, leaving 870 viable participants out of an initial 890. Participants identified as 46% female, 54% male. Participants median age was 38 (*SD* = 12.) Participants identified as white/European descent (73%), Asian descent (8%), black/African descent (7%), Hispanic (6%), and other (6%). In terms of belief system, the sample was 45% Christian, 19% agnostic, 19% atheist, 6% spiritual, 6% other religion, 4% non-religious, and 2% “believe in some kind of higher power (but unsure how to describe it)”.

Procedure

The survey was created in Qualtrics and accessed via a link on MTurk. Participants were randomly assigned to either the TTT condition (in which case they did not see questions from the systemising quotient scale) or to the systemising quotient condition (in which case they did not see the TTT questions). Participants saw the TTT questions or the systemising quotient scale immediately before answering the LOT-R and F-SWLS.

Variables

Transcendent Teleological Thinking

Participants answered a ten-item measure of TTT. This was the updated version of the TTT, used and described previously in chapter 9. The questions are designed to measure “belief in an unseen order” without reference to any specific god, gods or religion. Participants were asked to indicate how much they agreed with a series of statements, for example, “I have felt like events in my life were influenced by some kind of higher power” and “I can relate well to the idea that ‘everything happens for a reason’”. Eight items on the TTT scale are positively coded, with 1 being strongly disagree and 5 being strongly agree,

and two items are reverse coded. These items had high internal consistency (α =.98). The full scale is presented in Appendix P.

Systemising Quotient

The systemising quotient (SQ) is a 40-item scale designed by Baron-Cohen et al. (2003) to measure participant interest in inanimate systems. In this experiment, to ensure that the scales used in each condition were comparable in length, the ten highest-loading items of the SQ-short (Wakabayashi et al., 2006) were used. Participants were asked to indicate how much they agreed with statements such as "I am fascinated by how machines work" and (reverse coded) "I find it difficult to read and understand maps". These items had good internal consistency (α =.76). The full scale is presented in Appendix S.

Future Satisfaction With Life Sale

The Future Satisfaction with Life Scale (F-SWLS) is an original measure based on the Satisfaction with Life Scale (SWLS; Diener et al., 1985; Pavot et al., 1991; Pavot & Diener, 1993). The SWLS is designed to measure current life satisfaction, while the F-SWIL is revised to measure expected future life satisfaction, for example, participants are asked, "Over the next 2-5 years I expect that in most ways my life will be closer to my ideal than it is right now". The F-SWIL is a 5-item measure, scored on a 5 point Likert scale from "disagree strongly" to "agree strongly". All items on the F-SWLS are positively coded. The F-SWLS items had high internal consistency (α = 0.92). The full scale is presented in Appendix T.

Life Orientation Test Revised

The Revised Life Orientation Test (LOT-R) is the most widely-used and well-validated measure of dispositional optimism (Scheier & Carver, 1985; Scheier et al., 1994).

The LOT-R measures an individual's positive and negative expectations for their own future. It measures both optimism and pessimism, however, it has been suggested that optimism and pessimism are not polar opposites but two separate constructs (Chang et al., 1994; Forgaed & Seligman, 2012; Herzberg et al., 2006; Robinson-Whelen et al., 1997). Therefore, this study will focus on the optimism component of the LOT-R. The optimism component of the LOT-R had high internal consistency (α =.93) The full scale is presented in Appendix O.

Religiosity

Religiosity was measured on an original scale composed of two items, "I am religious and/or spiritual" and (reverse coded) "I am atheist". These items had high internal consistency (α =.83) The full scale is presented in Appendix Q.

Attendance

Attendance was measured using a one-item measure. Participants were asked "about how often do you attend gatherings (services, meetings, social events etc.) related to a religious/spiritual affiliation?". Responses were recorded on a 10-point scale from "never" to "5 or more times a week". The full scale is presented in Appendix R.

Results

Before looking at the more complex pre-registered predictions described in Hypotheses 2a and 2b, a more fundamental initial analysis was conducted to check for a main effect of the conditions and to test whether F-SWLS is more experimentally malleable than LOT-R. These tests were not included in the preregistration.

T-test

There was no significant difference in LOT-R Optimism score between individuals in the TTT condition (M = 3.51, SD = 1.05) and the SQ condition (M = 3.41 SD = 1.07), t = 1.34, df = 868, p = 0.18. On average, individuals in the TTT condition had higher F-SWLS (M = 3.75, SD = 0.89) than individuals in the SQ condition (M = 3.60, SD = 0.85). This difference was statistically significant (t = 2.44, df = 868 p = 0.02). Results of t-tests comparing LOT-R and F-SWLS scores between conditions are summarised in table 10.1.

Table 10.1 *Results of T-Tests Comparing Optimism and Future Satisfaction with Life Between Experimental Conditions*

	LOT-Opt			F-SWLS		
	M	*SD*	*t*	*M*	*SD*	*t*
TTT (N=428)	3.51	1.05	1.34	3.75	.89	2.44 *
SQ (N=432)	3.41	1.10		3.60	.85	

*Note. "LOT-Opt" =Life Orientation test Optimism measure. "F-SWLS" = Future satisfaction with life scale. "TTT" = Transcendent teleological thinking. "SQ" =Systemising Quotient. *Significant at 0.05 level*

MANCOVA

A full factorial MANCOVA was chosen to investigate the effect allocation to experimental condition vs control group had on participant scores on F-SWLS and LOT-R Optimism when controlling for religiosity and religious attendance. The box test of equality of covariance matrices was not significant, therefore Wilks' Lambda was interpreted. Multivariate tests indicate that condition had a significant effect on outcome variables LOT-R Optimism and F-SWLS when attendance and religiosity are controlled for. There was a statistically significant difference between conditions on LOT-R Optimism and F-SWLS

score when religiosity and attendance were controlled for, F (2, 865) = 2.98, p = .051, Λ = .993 partial η^2 = .007. Lavene's test was not significant, so equal variance is assumed. Results of between-subject tests indicated that condition (SQ or TTT) had a significant effect on F-SFWLS, F (1,866) = 5.81, p = .02 but not LOT-Optimism, F (1,866) = .420, p = .52. The test of between-subject effects also found religiosity had a statistically significant relationship with F-SFWLS, F (1, 866) = 7.93, p = .01 and LOT-R Optimism F (1, 866) = 9.54, p = .002. Attendance did not have a significant relationship with F-SWLS, F (1, 886) = 0.89, p = .35 but did have a significant relationship with LOT-Optimism, F (1, 866) = 3.743, p = .053. As well as illustrating the presence of a main effect of condition on F-SWLS, these results further illustrate that F-SWLS is more malleable to manipulation than LOR-T. Tests of between-subject effects are presented in table 10.3 below.

Table 10.2 *Tests of Between-Subjects Effects for MANCOVA of effect of Experimental Condition on Optimism*

Source	Dependent Variable	Type III Sum of Squares	*df*	Mean Square	*F*	*P*
Corrected Model	F-SWLS	18.96	3	6.32	8.520	<.001
	OPT_LOT	35.52	3	11.84	11.26	<.001
Intercept	F-SWLS	1758.68	1	1758.68	2371.30	<.001
	OPT_LOT	1338.12	1	1338.12	1272.02	<.001
Religiosity	F-SWLS	5.88	1	5.88	7.93	.005
	OPT_LOT	10.04	1	10.04	9.54	.002
Attendance	F-SWLS	.66	1	.66	.89	.35
	OPT_LOT	3.94	1	3.94	3.74	.05
Condition[1]	F-SWLS	4.31	1	4.31	5.81	.02
	OPT_LOT	.44	1	.44	.42	.52
Error	F-SWLS	642.27	866	.74		
	OPT_LOT	911.00	866	1.05		
Total	F-SWLS	12457.84	870			
	OPT_LOT	10855.81	870			
Corrected Total	F-SWLS	661.23	869			
	OPT_LOT	946.52	869			

Note: OPT_LOT is the optimism measure on the Life Orientation Scale Revised. F-SWLS is the Future Satisfaction with Life Scale. [1]Condition = experimental condition coded as 0 = control condition, participants answered questions on the Systemising Quotient and 1 = experimental condition, participants answered questions on the Transcendent Teleological Thinking measure.

Multiple regression

Having established that there is a main effect of condition on F-SWLS, to test hypothesis 2a and 2b a multiple regression was conducted to investigate the predicted interaction between condition allocation and self-described religiosity on state optimism (as measured on the F-SWLS), while also controlling for age, sex and current satisfaction with life (as measured on the SWLS). To check for outliers and influential data points, Cook's distance and standardised residuals were checked. Data for the Cook's distance fell between 1 and -1. Some standardised residuals fell outside of the range of 3 to -3, so to correct for this, outliers were removed, reducing the N from 870 to 860.

A hierarchical linear regression using enter method was selected to predict F-SWLS based on religiosity, condition (0 = SQ, 1 = TTT), and the religiosity × condition interaction while controlling for SWLS, age and sex (0 = female, 1 = male). All control variables were entered in model 1. Model 1 was significant (f [3,856] = 119.81, R^2-adj = .29, $p < .001$). SWLS accounted for significant variance in F-SWLS ($\beta = .48$, $p < .001$), as did age ($\beta = -.27$, $p < .001$) and sex ($\beta = -.10$, $p = .001$). In block 2, condition and religiosity were added into the model. Model 2 was significant, (Δf [2,854] = 13.40, R^2-adj = .31, $\Delta R^2 = .02$, $p < .001$.) Religiosity accounted for significant variance in F-SWLS ($\beta = .14$, $p < .001$), while condition accounted for just-significant variance in F-SWLS ($\beta = .06$, $p < .05$.) In block 3 the interaction of religiosity and condition were added into the model (Δf [1,853] = 1.46, R^2-adj = .31, $\Delta R^2 = .001$, $\beta = .09$, $p = .23$). The addition of the condition × religiosity interaction did not explain significant additional variance in F-SWLS. Thus, contrary to the prediction, there was no evidence that participants who were higher in self-described religiosity experienced higher state optimism in the TTT versus the SQ condition, compared to participants who were lower in self-described religiosity.

Table 10.3 *Future Satisfaction With Life Scale regressed on control variables, experimental condition, religiosity, and condition × religiosity interaction*

	β	$R^{2\text{-}adj}$	Δf
Model 1			
Sex[1]	-.10**	.29***	119.81***
Age	-.27***		
SWLS	.48***		
Model 2			
Sex[1]	-.09**		
Age	-.29***		
SWLS	.46***	.31***	13.40***
Religiosity	.14***		
Condition[2]	.06*		
Model 3			
Sex[1]	-.09**		
Age	-.29***		
SWLS	.46***		
Religiosity	.10**	.32***	1.46
Condition[2]	-.02		
Condition[2] x Religiosity	.09		

Note: *$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. SWLS = Satisfaction With Life Scale. [1]0 = female, 1 = male. [2]0 = Systemising Quotient condition, 1 = Transcendent Teleological Thinking condition.

As predicted, participants in the TTT condition exhibited higher F-SWLS scores, compared to participants in the SQ condition. However, the predicted interaction effect between religiosity and condition was not significant.

Although the higher F-SWLS scores in the TTT condition could have resulted from an expected positive relationship between TTT exposure and F-SWLS, they also could have resulted from an unexpected negative relationship between SQ exposure and F-SWLS. To test between these two possible scenarios, two correlational analyses were conducted. Among

the 426 participants in the SQ condition, the partial correlation (controlling for age, sex and SWLS) between SQ and F-SWLS was significantly positive ($r[424] = .13$, $p = .008$). Among the 434 participants in the TTT condition, the partial correlation between TTT score and F-SWLS was also significantly positive ($r[432] = .24$, $p < .001$). Fisher's r to z test for independent samples was used to compare these two partial correlation coefficients, and the result suggested that F-SWLS's relationship with TTT was marginally more positive than its relationship with SQ ($z = -1.64$, p [1-tailed] = .051; a 1-tailed p seems acceptable here, as the result is in the predicted direction). This result seems to contradict the suggestion that higher F-SWLS scores in the TTT condition were the result of a negative association between SQ exposure and F-SWLS, and is instead more consistent with the existence of a positive association between TTT exposure and F-SWLS.

Discussion

The results of the MANCOVA conducted on the data collected in this experiment indicates that exposure to TTT may lead to increased optimism. In this case, it was found that participants who answered questions on TTT had significantly higher F-SWLS scores but did not have significantly higher LOT-R Optimism scores. This may be reflective of the fact that LOT-R Optimism is designed to measure dispositional optimism, whereas F-SFWLS was designed to measure current feelings of optimism. Further support for the hypothesis that exposure to TTT increases state optimism was found in the multiple regression, which also revealed a significant relationship between exposure to TTT and F-SWLS. These findings provide some initial support for the notion that exposure to transcendent teleological ideas may result in increased optimism.

The multiple regression did not find evidence to support Hypothesis 2a, which predicted that religiosity and condition would interact such that in the TTT condition, higher-religiosity participants would have higher F-SWLS scores than lower-religiosity participants. Hypothesis 2b predicted that high-religiosity participants in the TTT condition would also have higher F-SWLS scores than participants in the SQ condition. Hypothesis 2b was not contradicted by any results, but turned out be unnecessarily complex: all participants (and not just high-religiosity participants) in the TTT condition tended to have higher F-SWLS scores than participants in the SQ condition.

The results of the survey-experiment presented in this chapter does show initial evidence that exposure to TTT may increase state optimism, and this increase in optimism caused by exposure to or engagement with TTT could be an important aspect of explaining religion's persistence. As explored in Chapter 7, it has been argued that optimism is adaptive as individuals who are optimistic are more likely to take positive risks, which result in material gain. Furthermore, individuals with high levels of optimism on average have better physical health than individuals who display low levels of optimism. (Forgeard & Seligman, 2012; Lee et al., 2019; Rasmussen et al., 2009; Tindale et al., 2009). If TTT boosts optimism, it is plausible that religions that boost TTT, in turn, give religious individuals a survival advantage and these optimism boosting religions then proliferate through the population, either through biological or cultural evolution (Henrich & Henrich, 2010).

As discussed above, many current evolutionary explanations of belief in supernatural agents regard supernatural beliefs as a byproduct of adaptations for social functioning and suggest there is no adaptive benefit to believing in supernatural agents, but that these beliefs have historically been benign enough for them to have not been selected against (Barrett, 2000;

Boyer, 1992; Guthrie, 1993). Other contemporary evolutionary explanations regard belief in supernatural agents as biological or cultural adaptations which function to boost cooperation (Bering, 2009; Johnson, 2005; Johnson & Bering, 2009; Johnson & Kruger, 2004; Norenzyan & Shariff 2008, Shariff et al., 2011). There has been no previous literature that argues or presents evidence suggesting that belief in supernatural agents could endow believers with an adaptive advantage through encouraging optimism.

The findings of the experiment presented above could provide an important clue to the continued existence of religious and spiritual beliefs. If engagement in TTT boosts optimism, which is known to have adaptive advantages, this could explain why many extant religions appear to feature TTT. If the only adaptive benefit to the individual of engaging with religion is the increase in social support that comes with attending religious gatherings, then the supernatural element commonly present in religions is not necessary and is hard to explain from an evolutionary perspective, given that social support can be gained through engagement with secular social groups. Furthermore, behaviours associated with religious beliefs are often costly. Arguably, supernatural beliefs and behaviours associated with these beliefs might work as hard-to-fake signals. However, if TTT conveys no survival value, it raises the question of why TTT is so common when costly signals could theoretically take many other forms such as painful physical practices, material donations or sacrifice, which hold no transcendent meaning, but could still function as a signal of group commitment. However, in religions where costly signals are present in the form of abstinence, bodily mutilation, pilgrimages, rituals and so forth, these rituals and costly signals are present in addition to, rather than instead of, TTT.

The findings of the experiment detailed in this chapter indicate that the cognitive elements of religions, specifically TTT, are not just non-functional byproducts of evolved cognitive adaptations, but that engagement in TTT may have adaptive value and that a tendency to engage in TTT solves specific survival challenges, namely the maintenance of optimism. This suggestion is not in conflict with theories that propose supernatural beliefs originally arose as byproducts of adaptations for social functioning; it is possible that byproduct theories explain the origin of TTT, but the continued prevalence of this type of thinking may be explained if it conveyed a survival advantage and thus became the target of natural selection.

It is important to note, however, that all of the participants in this study were current US residents. It was a largely Christian sample, and all participants were living in a culture that is heavily influenced by Judeo-Christian traditions. It is possible that TTT and optimism may not be linked in other cultures. While it is possible that TTT is indeed an adaptation, it would be extremely ill-advised to draw such a conclusion from what is, realistically, very scant preliminary evidence. However, these findings do indicate that testing the hypothesis that TTT is an adaptation that functions to boost optimism may be an interesting path forward for exploring the evolution of religiosity.

Chapter 11 : General Discussion

The original aim of this thesis was to investigate the link between economic inequality and religiosity. Previous research has found that in regions with high economic inequality, levels of religious engagement are higher than in areas of low economic inequality (Norris & Inglehart, 2004; Solt et al., 2011; Storm, 2017). Although there is a well-documented association between economic inequality and religiosity, it is unclear why this relationship exists and whether there is a direct causal link between economic inequality and religiosity on the individual level. It is also unclear why economic inequality specifically would cause individuals to become more behaviourally or cognitively religious. Further, there is no good evolutionary reason why economic inequality specifically should cause individuals to become more religious. As research for this thesis progressed, studies looking at relationships between individual economic factors and religiosity were not producing interesting results, and it became apparent that researching the influence of economic variants on individual levels of religiosity was unlikely to provide any novel scientific insights. However, while conducting research for this thesis, it became apparent that there may be a link between religiosity and optimism. For these reasons, this thesis started with looking at economic variables as a potential causal factor in increases in religiosity, then shifted to looking at optimism as an effect of religiosity. This shift in focus led to a novel contribution. While religion and optimism have both separately been studied from an evolutionary perspective, it appears that there have been no previous attempts to integrate optimism and religion within the framework of human evolutionary behavioural studies.

The aim of the first study conducted for this thesis and detailed in Chapter 4 was to test the relative merits of the deprivation hypothesis (Glock & Stark, 1965; Hoverd et al., 2013; Krause, 2002; Schieman et al., 2006), the existential security hypothesis (Gill &

Lundsgaarde; 2004; Norris & Inglehart, 2004; Shibley & Bulbulia 2012), and relative power theory (Solt et al., 2011). The deprivation hypothesis suggests that religiosity increases in response to the experience of deprivation, and religion offers hope to those in desperate economic circumstances. According to this theory, the relationship between low GDP per capita and high rates of religiosity is driven by individuals experiencing deprivation (Hoverd et al., 2013; Schieman, 2010). The existential security hypothesis similarly suggests that religion is a response to difficult circumstances, but that it is not absolute deprivation that is key to the relationship between low GDP per capita. Instead, existential uncertainty, the feeling that one's future is not guaranteed, is theorised to be higher in conditions of inequality (Norris & Inlehart, 2004). However, levels of inequality tend to be higher in countries with low GDP per capita, and it is the effect of relative deprivation that is key to the relationship. The existential security hypothesis suggests that inequality and deprivation lead to feelings of existential insecurity, the stress of which people attempt to manage through religious engagement. According to the existential security hypothesis, it is poorer individuals in conditions of inequality who drive the relationship between the economy and rates of religiosity (Norris & Inglehart, 2004). The relative power theory suggests that increased religiosity in conditions of high inequality is not driven by the poorer members of the population, but that it is richer individuals who use their influence to promote religion, which acts as a mechanism of social control and helps the rich maintain their position of power (Solt et al., 2004).

To explore whether the deprivation hypothesis, the existential security hypothesis or the relative power theory best explained the relationship between economic factors and religiosity, results from two waves of The Religious Landscape Survey were downloaded and analysed. The Religious Landscape Survey conducted by the Pew institute is a large cross-

national survey that takes in a representative sample of citizens of the USA. Participants are contacted by telephone, and a random digit dial method is used to choose participants. The data used in the study conducted for this thesis were collected in 2007 and 2014. The Gini score for each state and the state median income was added to the Religious Landscape Survey data, resulting in a data set that included information regarding individual-level income, individual levels of religious engagement, state-level wealth, and state-level economic inequality.

Several analyses were conducted on the data to explore relationships between personal income and religiosity, state wealth and religiosity, and economic inequality and religiosity. Firstly, the state-level analysis looked at the Gini score for each state and the average religiosity score for each state based on the responses from the participants of the Religious Landscape Survey. Regression analysis found that state median income had a significant negative relationship with state-level average religiosity for both the 2007 and 2014 samples. This finding was congruent with what one would expect according to both the deprivation hypothesis and the existential security hypothesis.

A regression was used to look at the relationship between state average religiosity and state Gini, this revealed that religiosity had a significant and positive association with state Gini score for economic inequality in the 2007 sample. However, Gini and state average religiosity did not have a significant relationship in the 2014 sample. The 2007 results were consistent with what one would expect according to the existential security hypothesis, but the 2014 results were not.

The results from the Religious Landscape Survey were also used to look at individual variations in wealth and religiosity. To do this, individual levels of religiosity were analysed along with individual income levels, which had been recorded by Pew, and relative income.

Relative income was calculated by detracting state median income, which was taken from the US census bureau from each individual's reported income. Relative income was calculated in this way because had the data been group mean centred, this would have provided information regarding how participants compared to other participants, not how they compared to the average citizen living in the same state. Income, relative income and religiosity were analysed using regression. The regression found that income had a significant negative relationship with religiosity, which is consistent with the predictions of the deprivation hypothesis and the existential security hypothesis. The regression also found that relative income had a significant positive association with religiosity, which is not consistent with the deprivation hypothesis or the existential security hypothesis, but is consistent with what one would expect according to the relative power theory. At first glance, it isn't obvious why income would have a negative relationship with religiosity while relative income would have a positive relationship with religiosity using the same data, but this might be explained by the method Pew uses to collect data. When Pew contacts a potential participant in a state with one of the higher state median incomes, they are more likely to reach someone with a higher income than somebody contacted at random in a state with a lower state median income. Due to this, if the state median income is not taken into account when the relationship between income and religiosity is analysed, it looks like individuals with higher incomes have lower levels of religiosity when what may well be happening is individuals living in more affluent states have lower levels of religiosity.

To compare the effects of individual relative income, state-level inequality and state-level affluence on rates of religiosity, a hierarchical linear model (HLM) was used. Data from the 2007 and 2014 waves of the Religious Landscape Survey were analysed separately. The HLM conducted on the 2007 data revealed that relative income had a significant positive

relationship with religiosity. Gini also had a significant positive relationship with religiosity, while state median income had a significant negative relationship with religiosity. The HLM also found that the interaction of relative income and state Gini did not have a significant relationship with religiosity and that the interaction of relative income and state median income had a significant negative relationship with religiosity.

The HLM conducted on the 2014 data revealed that relative income had a significant positive relationship with religiosity, while state Gini had a non-significant relationship with religiosity and state median income had a significant negative relationship with religiosity. The HLM also found that the interaction effect of relative income and state Gini had a significant negative relationship with religiosity and the interaction effect of relative income and state median income had a significant negative relationship with religiosity. The results of the two HLM analyses indicate that increased wealth is associated with lower religiosity, higher levels of economic inequality are associated with higher religiosity, and higher than average income in overall less affluent areas is associated with higher religiosity. This is congruent with what one would expect according to the relative power theory.

While the Pew Religious Landscape Survey did provide a large volume of data allowing for an interesting and detailed analysis of the relationship between economic variants and religiosity in the USA, the data did not provide any insight into individual cognitive differences associated with economic variables. The findings discussed above reveal more about what the relationship between economic variables and religiosity looks like, but it doesn't provide much if any, insight into why the relationships exist or why they follow the patterns they do. In order to get a better understanding of why or how economic variants influence religious engagements, it is necessary to conduct psychological research

into what is cognitively different between individuals of varying wealth in conditions of varying affluence and inequality.

The measures of religiosity used by Pew in the religious landscape survey appear to focus more on religious behaviour, such as church attendance, frequency of prayer and how much individuals study religious texts. Although the answers to these questions are important, they do not give much insight into the cognitive differences between individuals who show high levels of behavioural religiosity. This is true of many large-scale surveys such as the Religious Landscape Survey, the General Social Survey and the European Social Survey. Many of the currently available tools for measuring religious engagement appear to focus on behavioural religiosity and do not give much insight into cognitive religiosity. Moreover, the data presented in Chapter 4 does not provide any insight into the differences between how religious and non-religious individuals make sense of the world. The need to focus specifically on cognition is particularly important when taking an evolutionary approach to the topic of religion. One important and unresolved question is whether religious cognition is likely to be an adaptation, but in order to answer this question, one needs to identify, define and operationalise what one means by religious cognition. This became the focus of study 2a, presented in Chapter 5.

As well as defining cognitive religiosity in a way that specifically homes in on the core of religious cognition and spirituality, being precise in defining the trait of interest is integral to investigating whether the trait reliably and predictably performs a specific function under specific conditions, thus showing good evidence of special design (Williams, 1969). Furthermore, it is important to define religious cognition in a way that is not bound to any one specific culture, tradition, or belief system, because when investigating whether a feature is likely to be an adaptation, it is important to conduct research in a variety of cultures. If one

wishes to argue that a feature is a biologically determined species-typical trait, one must also present evidence that the trait can be found in most, if not all cultures, and that it functions in the same way in the cultures where it is found.

With the above challenges in mind, it seemed necessary to create a new measure that got to the cognitive core of religious thinking in a way that didn't privilege any religion or belief system and would in the future be suitable for use in cross-cultural research. The definition of cognitive religiosity presented in this thesis came to be referred to as transcendent teleological thinking (TTT). TTT views cognitive religiosity as belief in a universal force that exists above and beyond the ordinary world ("transcendent"), and that is causal, purposeful, and intentional ("teleological"). Conceptualising religious cognition in this way is very much in the spirit of William James' description of religion as "belief in an unseen order" (1902/2011). Once this definition was decided upon, a novel scale was developed, which was designed to measure TTT.

One of the aims of the second study conducted for this thesis, which is split over Chapter 5 and Chapter 6 as study 2a and 2b respectively, was to test out the scale designed to measure TTT. The creation and first use of the new scale is the focus of study 2a, presented in chapter 5. This was done by recruiting participants who responded to an online hosted questionnaire study. Participants were presented with the questions which were used to make up the religiosity measure in the study presented in Chapter 4, as well as questions about their religious affiliations. Participants also answered the questions on the newly developed TTT scale. Participants were asked questions about their income, their self-reported levels of financial strain and their self-reported experience of deprivation. Chapter 5 only presented study 2a; the analysis of the relationships between behavioural religiosity and TTT. Analysis

of the relationships between behavioural religiosity, TTT, objective and subjective measures of wealth were presented in Chapter 6 as study 2b.

Results of study 2a comparing behavioural religiosity and TTT found that there was a significant positive correlation between behavioural religiosity and TTT. To further explore the data, levels of TTT were compared to participant responses to a series of questions regarding beliefs and religious identity. It was found that TTT had a significant positive relationship with the degree to which participants considered themselves to be religious, spiritual and the extent to which they agreed with the statement "I believe in god or gods". TTT had a significant negative relationship with the extent to which participants considered themselves to be atheist, agnostic or as having no religion. This indicates that TTT does appear to be an important aspect in of what sets the religious and spiritual apart from atheists, agnostics, and those with no religion.

Further analysis was conducted by organising participants into groups based on beliefs. Using responses to the religious identification question, individuals who identified as Christian, Muslim, Hindu, Jewish or Buddhist were coded in a new variable as "Organised Religion", individuals who identified as Spiritual or who indicated that they "Believe in some kind of higher power but unsure how to describe it" were grouped together as "Spiritual", individuals who identified as Atheist or No Religion were grouped together as "Atheist & Non", Agnostics remained in their own group, and individuals who selected "Other" were coded as "system missing". Two separate ANOVAs were performed, one to compare levels of TTT by group and one to compare behavioural religiosity by group. Results of the ANOVA looking at TTT indicated there was a significant difference in levels of TTT by group, and results of the ANOVA looking at behavioural religiosity by group also indicated that there was a significant difference in behavioural religiosity by group. Post-hoc

comparisons with Bonferroni adjustments indicated that there was no significant difference in levels of TTT between individuals who identified as spiritual and individuals who identified as religious. Individuals in the religious group had significantly higher levels of TTT than individuals in both the atheist and agnostic group. Individuals in the spiritual group also had significantly higher TTT than individuals in both the agnostic group and the atheist group. There was no significant difference in TTT between individuals in the atheist group and individuals in the agnostic group. Looking more closely at behavioural religiosity, post-hoc comparisons with Bonferroni adjustments indicated that individuals in the religious group showed significantly higher behavioural religiosity than individuals in the spiritual group, individuals in the agnostic group and individuals in the atheist group. Individuals in the spiritual group had significantly higher behavioural religiosity than individuals in the agnostic group and individuals in the atheist group. There was no significant difference in behavioural religiosity between the atheist and agnostic group.

Taken together, the results of the ANOVAs and post hoc multiple comparisons indicate that TTT is an important part of religion and spirituality. High levels of TTT seem to be what sets the religious and spiritual apart from atheists and agnostics, whereas levels of behavioural religiosity seem to set the religious apart from the spiritual. While TTT doesn't set organised religion completely apart from everything that is not an organised religion, it does seem to tap into what separates the secular from the non-secular. It also indicated that a key difference between individuals who consider themselves to be religious and those who consider themselves spiritual is based in behaviour, not cognition. The second aim of the second study was to take a closer look at the relationship between economic variables and religiosity, and this aspect of the second study is the focus of study 2b, presented in Chapter 6.

As well as gathering data on participant income and relative income, participants also answered measures of subjective financial strain and subjective feelings of deprivation. This was done to investigate relationships between objective financial measures, subjective feelings of strain and deprivation and levels of religious engagement. Levels of well-being were also measured. There was no clear relationship between objective financial variables, subjective feelings of financial strain and deprivation and levels of behavioural religiosity or with TTT. This, combined with the results of study one, may indicate that economic factors at the group level have a greater impact on religiosity than individual-level income. Alternatively, relationships between economic factors and individual-level religiosity may be consistent but weak, meaning they are only detectable in very large data sets. The study also found no discernible relationship between overall well-being and religious engagement, however, there was a positive relationship between levels of religious engagement and TTT with levels of optimism, as measured by a single item on the Warwick-Edinburgh Mental Wellbeing Scale.

The finding that behavioural religiosity and TTT both appeared to be correlated positively with optimism prompted the thesis to change course. While there is already a wealth of literature looking at the evolutionary importance of optimism and a large area of research looking at the link between religion, health, well-being and optimism, it appears there have been no previous attempts at integrating these two lines of enquiry under the lens of evolutionary behavioural studies. Integrating religiosity and optimism from an evolutionary perspective became the focus of the thesis from Chapter 6 onwards and shaped the aims of the latter two studies of the thesis.

Although the findings of study 2b presented in Chapter 6 did indicate that both behavioural religiosity and TTT had a positive relationship with optimism, optimism had

been measured using only a single item on the Warwick-Edinburgh mental wellbeing scale. Before any further research could be conducted on the nature of the links between behavioural religiosity, TTT and optimism, it was necessary to take a more deliberate, and focused look at the relationships between these variables. To do this, participants were recruited to take part in an online survey. Participants were asked to indicate whether they considered themselves to be religious, spiritual, atheist or agnostic. Participants were also presented with an updated version of the TTT measure, a single-item measure of frequency of religious attendance, and the life orientation test revised (LOT-R), the most widely used measure of dispositional optimism. The study presented in Chapter 9 also included a measure of social support. Previous research has indicated that the link between religious engagement and health may be due to the social support one receives through attending religious gatherings. By collecting information on social support, religious attendance, and TTT, it was possible to analyse the associations each of these measures individually had with optimism. A multiple regression was conducted on the data, revealing that social support and attendance both had a significant positive association with optimism, however, once TTT was added into the model, attendance no longer had a significant association with optimism, but social support continued to have a significant positive association with optimism. This indicates that the association between attendance and optimism is not explained by social support.

The first moderation analysis looked at whether attendance moderated the relationship between TTT and optimism. The model found a statistically significant relationship between TTT and optimism but did not find a significant relationship between attendance and optimism. While the graph in figure 9.1 indicated that there was an interaction effect, this was not statistically significant, and attendance did not moderate the relationship between TTT and Optimism.

The second moderation analysis looked at whether social support moderated the relationship between TTT and optimism. The model found that social support and TTT both had significant positive relationships with optimism and found that there was no interaction effect. Social support did not moderate the relationship between TTT and optimism. This suggests that TTT and social support both exert separate significant positive effects on optimism.

Taken together, the results of the study presented in Chapter 9 suggests that the relationship between religious attendance and positive outcomes such as better mental and physical health may not be caused by the social support one gains from a religious community, but instead is explained by higher levels of TTT among individuals who attend religious gatherings. However, these findings are based on data collected via a survey, so it is not possible to infer cause and effect between TTT and optimism. While TTT may encourage optimism, it is also possible that individuals who are optimistic are more likely to engage in TTT.

To investigate whether exposure to or engagement with TTT can lead to increases in optimism, a survey experiment was conducted. Participants were recruited online to take part in the survey experiment and randomly assigned to either the control group or the experimental group. Individuals in the experimental group answered questions on the TTT scale, while the control group answered questions from the systemising quotient (SQ). After answering either the TTT or the SQ, participants answered questions on the LOT-R and the future satisfaction with life scale (F-SWLS). The F-SWLS is an adapted version of the satisfaction with life scale (SWLS). While the SWLS measures current life satisfaction, the F-SWLS is re-worded to ask participants how satisfied they expect to be in the next 2-5 years. The F-SWLS was included to measure participants current feelings of optimism, or

their state optimism, while the LOTR was included as a measure of dispositional optimism. An initial t-test found that participants in the TTT condition on average had higher scores on the F-SWLS than individuals in the SQ condition, indicating that exposure to ideas relating to TTT increased current feelings of optimism. A t-test also found no significant difference in dispositional optimism as measured by the optimism subscale of the LOT-R (LOT-R Optimism).

Results were further analysed using a MANCOVA to explore the effect of experimental and control conditions had on F-SWLS and LOT-R Optimism when religiosity and religious attendance was controlled for. Results of the MANCOVA indicated that the experimental condition had a statistically significant relationship with the outcome variables. The results of the between subjects' effects indicated that participants who answered the TTT scale had significantly higher scores on the F-SWLS than participants who answered the SQ scale, there was no significant effect of condition on LOT-R Optimism scores. This indicates that exposure to TTT does indeed appear to increase current feelings of optimism. Results of the between-subject effects further indicated that religiosity had a significant positive relationship with F-SWLS and LOT-R Optimism and indicated that religious attendance has a significant positive relationship with LOT-R Optimism, but a non-significant relationship with F-SWLS.

The results of this experiment represent evidence that engagement with TTT can increase feelings of optimism. While this finding should be interpreted with caution, it is the first piece of experimental evidence to support the hypothesis that engagement with cognitive religiosity may increase optimism. While we should not interpret this beneficial outcome as confirmation that engagement in TTT is an adaptation that functions to increase optimism, it

is further indication that a relationship between cognitive religiosity and optimism does exist and warrants further investigation.

This thesis presents evidence of several interesting ideas. The results of study 1 presented in Chapters 4 and study 2b presented in chapter 6 6 taken together indicate that economic variables seem to influence group-level trends in religious engagement, and it appears to be group-level variation in economic variables, such as state-level median income rather than individual-level income, that influences trends in religiosity. Results of the two studies presented in Chapters 9 and 10 provide good evidence that not only is religious cognition associated with higher levels of optimism, but it also presents initial evidence that exposure to TTT can induce feelings of optimism. This thesis also presents a novel scale for measuring cognitive religiosity in a way that is amenable to cross-cultural use.

While the first half and the second half of this thesis may seem somewhat disconnected, the findings in the second half may actually provide some key insights as to why economic variables and levels of hardship more generally appear to influence religious engagement. If cognitive religiosity is a mechanism that functions to promote optimism, then one would expect that conditions that challenge optimism the most – such as those characterised by high levels of financial hardship and social inequality – would lead to individuals engaging in optimism-promoting strategies. These optimism promoting strategies may be key in maintaining the high levels of motivation one might need to overcome challenges and strive towards success in the face of challenging odds.

The current literature which views religion as an adaptation suggests, for the most part, that it is an adaptation to boost or maintain cooperation. The proposition that religiosity may instead function to generate optimism does not necessarily contradict, and may in fact nicely complement, this focus on cooperation. Adaptations can have more than one function

for example, mouths can be used for fighting, eating and communicating – , and it is possible that religion is an adaptation that promotes both cooperation and optimism. It is also possible that religion's role in promoting cooperation is in part achieved through boosting optimism. Investigating this possibility could result in an interesting avenue of research, as there is some evidence that low optimism is associated with non-cooperation strategies in economic games (Karamanoli & Fousiani, 2014).

To investigate the influence of optimism and TTT on cooperation, for example, one could devise a prisoner's dilemma or a dictator game with five conditions as follows. Condition 1 (Supernatural Optimism condition): Participants answer TTT questions, which should induce religious-like optimism without inducing the feeling of being watched. Condition 2(Secular Optimism condition): Best-possible-self or gratitude intervention, which should prime optimism without priming religious-like thoughts. Condition 3 (Supernatural Supervision Condition): Prime ideas of supernatural supervision. Condition 4 (Secular Supervision Condition): Prime ideas of secular systems of observation and justice (i.e. police and judges). Condition 5 (Control Condition): Participants answer questions on, e.g., the systemising quotient. After being exposed to one of the five conditions, participants should answer questions on the LOT-R and F-SWLS. This is to measure dispositional optimism and current state optimism. Results from the responses to the F-SWLS should indicate how effective the interventions are at increasing state optimism by comparing to the control SQ group. TTT and best-possible-self should have higher F-SWLS than the secular supervision group and the SQ control group. Supernatural supervision might increase F-SWLS as any primes around supernatural control could induce feelings of the universe having order. After answering the LOT-R and F-SWLS, participants then play the dictator game or the prisoner's dilemma. Results of the games should allow researchers to measure cooperation by groups.

Comparing levels of cooperation by levels of both state and trait optimism could give insight into the importance of optimism to cooperation. Comparing the F-SWLS in the supernatural supervision condition and the TTT condition to the secular supervision and control conditions could indicate whether any ideas pertaining to the supernatural is enough to promote feelings of optimism, or whether there is something special about TTT.

The finding that TTT may function to boost optimism may also be relevant to costly signalling theory accounts of religious engagement. One of the key criticisms of costly signal theory applied to religious ritual is there is no obvious cost asymmetry; individuals with genuinely held supernatural beliefs appear to face the same costs and benefits as individuals who do not have genuinely held supernatural beliefs (Murray & Moore, 2011). It has been argued that an individual's perception of the cost-benefit ratio will be different depending on whether the individual genuinely holds supernatural beliefs, and this perception is enough to cause signals to be honest (Soler, 2012; Sosis & Alcorta, 2003). However, this thesis presents some initial evidence that individuals who engage in TTT and engage in behavioural religiosity show higher levels of optimism than individuals who engage in religious behaviour but have low levels of religious cognition. Future research could investigate whether engagement with religious behaviours increases optimism for individuals with genuinely held supernatural or religious beliefs, but does not increase optimism in individuals who do not hold supernatural beliefs. If true believers do indeed gain more from religious engagement than non-believers do, this would create a cost-benefit differential which is key to costly signalling theory.

The findings in this thesis also have interesting implications for the suggestion that the reported health benefits of religious engagement are due to the social support one gains through attending religious gatherings. The results of the multiple regression conducted on

the data gathered for the study presented in Chapter 9 found that the positive relationship between optimism and attendance loses significance once TTT is entered into the model, but the association between social support more generally does not lose explanatory power once TTT is entered into the model. Furthermore, the association between religious attendance and optimism is significant when general social support is entered into the model. This suggests that although previous research has found a positive association between attendance and positive health outcomes, this is not explained by the social support one can gain through attending religious gatherings as many have argued (McCullough et al., 2000; Powell et al., 2003; Schnall et al., 2011). Galen (2015) has suggested that the benefit of religious attendance is not just that it provides individuals with social support but that it is beneficial to spend time with individuals who share one's worldview. An alternative explanation for the association between religious attendance and optimism is that perhaps attendance at religious gatherings could boost optimism through exposure to optimistic scripture. In a study conducted by Sethi and Seligman (1993), it was found that individuals with more fundamentalist religious beliefs had higher levels of optimism than individuals with more moderate or liberal beliefs. Sethi and Seligman (1993) also conducted a content analysis on the sermons from fundamentalist, moderate and liberal services and found that the fundamentalist sermons had the most optimistic content. This could explain why higher levels of religious attendance are associated with higher levels of optimism, which cannot be explained by social support. Regular religious attendance may lead to individuals being regularly exposed to religious ideas and TTT which boosts optimism.

The studies presented in this thesis which indicate TTT boosts levels of optimism only included participants who were residents of the USA. Before it is possible to make any claims about TTT being either a biologically or culturally evolved adaptation which functions

to boost optimism, research must be conducted in a variety of cultures to ensure that the link between TTT and optimism is not peculiar to the USA but is found in a variety of different cultures, including non-W.E.I.R.D. cultures, cultures where Abrahamic faiths do not have cultural dominance, and contemporary cultures that most closely resemble the environments of the human evolutionary past (e.g., small-scale hunter-gatherer and hunter-horticultural societies).

One important question which is yet to be addressed is that of why engagement in transcendent teleological thinking would increase optimism. A possible explanation for this relationship is that believers in TTT also believe that the transcendent teleological force is benevolent, in the sense that it will work to ensure that future events will ultimately turn out to be beneficial to the believer. Although the TTT measures used in this thesis do not characterise the transcendent teleological force as *necessarily* benevolent, it is plausible that most people who engage in TTT assume that it is. Research indicates that individuals who believe in god tend to conceptualise god in benevolent and generally positive terms far more than they conceptualise god in authoritarian and generally negative terms (Johnson et al., 2015, 2016), and the same could be true of those who engage in TTT more generally. To further investigate this idea, future research could investigate whether individuals who believe in some sort of transcendent teleological force also believe that this force is benevolent. If some do believe that there is a benevolent transcendent teleological force, while others believe that a transcendent teleological force exists but is indifferent or even malevolent, then it would be interesting to investigate whether those in the former category show higher levels of optimism than those in the latter.

If researchers wish to argue that TTT is a biologically evolved trait that functions to boost optimism, it is also important that they attempt to answer Tinbergen's four questions

(1963) in regard to this trait; by trying to produce plausible accounts for the ontogeny, mechanism, phylogeny and adaptive value of this trait. More specifically, when looking at ontogeny, or development, researcher need to assess whether TTT reliably emerges at a similar point of development in most humans. Language, under normal functioning, has a predictable pattern and timetable of development in children regardless of culture, research ought to explore whether the same is true of TTT, and whether children also develop a propensity towards TTT at a similar point of development in most or all cultures. Researchers should also seek to investigate how an individual's life history may influence the development of TTT. When looking to explain the mechanism or causation one must explain what internal or external conditions elicit the trait. With TTT, future research could look into whether there are circumstances that reliably increase the likelihood that the trait will manifest. On this point, as discussed previously in this thesis, it does appear that religious engagement increases under conditions of hardship, future research could investigate whether TTT also reliably increase under conditions of hardship. It is also necessary to give an account for why and how TTT could boost optimism. Researchers must also give a good account of the adaptive value of the trait. This thesis provides initial evidence that engagement with TTT may increase optimism, but further research is needed to establish whether TTT reliably increases optimism in the majority of individuals in a range of cultural settings. Questions of the phylogeny or evolutionary history of the trait also need to be tackled, although this is likely to be the most challenging question to answer. To address the question of phylogeny, researchers would need to consider what the evolutionary history of TTT is likely to be, consider how natural selection could have shaped this trait over generations, and how the process of natural selection could result in TTT taking the form we see today. Taking a comparative approach may also help answer the question of phylogeny,

by investigating whether our closest relatives, bonobos, chimps and gorillas show evidence of cognition similar to TTT. Research from the discipline of palaeoanthropology could also shed light on the question of phylogeny and by investigating whether ancestral humans displayed something akin to TTT and if so, how recently does evidence of TTT appear in our species' history.

As well as answering Tinbergen's four questions, researchers need to show the economy and efficiency of TTT as an optimism booster and show "demonstrable appropriateness as a means to an end" (Williams, 1969, p41). Furthermore, researchers need to be cautious not to make the mistake George Williams warns against in *Adaptation and Natural Selection*: "one should never imply that an effect is a function unless he can show that it is produced by design and not by happenstance".

In sum, there is a long way to go before it will be possible to say with any confidence whether religious cognition is a mechanism that functions to boost optimism. However, I believe that the notion that religious cognition could be a mechanism that functions to boost optimism is an exciting and novel proposal. I look forward with much optimism to learn what progress may be made, by building on some of the ideas and findings outlined in this thesis.

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Appendix

Appendix A: Full participant characteristics from Pew Religious Landscape Survey 2007 and 2014

Full participant characteristics from Pew Religious Landscape Survey 2007 and 2014		
Participant demographics	2007 Respondent %	2014 Respondent %
Gender		
Male	45.9	49.96
Female	54.1	50.1
Ethnicity		
White	71	66
Black or African American	11	12
Asian or Asian American	3	4
Latino	12	15
Mixed or Other Race	3	4
Religious Affiliation		
Protestant	53.9	50.2
Catholic	31.4	31.7
Mormon	1.8	1.7
Orthodox Christian	0.6	0.7
Jehovah's Witness	0.6	0.8
Other Christian	<0.3	0.4
Jewish	1.9	2.1
Muslim	0.3	0.9
Buddhist	0.4	0.6
Hindu	0.4	0.7
Other World Religion	<0.3	<0.3
Other Faiths	0.3	0.3
Unaffiliated	7.3	9.2
Don't know or Refused	0.7	0.5

Appendix B: Individual Income Measure

1	>$10,000
2	$10,000 – under $20,000
3	$20,000 – under $30,000
4	$30,000 – under $40,000
5	$40,000 – under $50,000
6	$50,000 – under $75,000
7	$75,000 – under $100,000
8	$100,000 – under $150,000
9	$150,000 or more
99	Don’t know/Refused

Appendix C: Pew Religiosity Measures

Aside form weddings and funerals, how often do you attend religious services? 1) More than once a week 2) Once a week 3) Once or twice a month 4) A few times a year 5) Seldom 6) Never 7) Don't know/Refused
How important is religion in your life? 1) Very important 2) Somewhat important 3) Not too important 4) Not at all important 5) Don't know/Refused
People practice their religion in different was. Outside of attending religious services, do you pray 1) Several times a day 2) Once a day 3) A few times a week 4) A few times a month 5) Seldom 6) Never 7) Don't know/Refused
How often do you participate in prayer groups, Scripture study groups or religious education programs? 1) At least once a week 2) Once or twice a month 3) Several times a year 4) Seldom 5) Never 6) Don't know/Refused
How often do you read scripture outside of religious services? 1) At least once a week 2) Once or twice a month 3) Several times a year 4) Seldom 5) Never 6) Don't know/Refused

Appendix D: Participant state of residence

State	Frequency	Percent
Alabama	7	1.8
Alaska	3	.8
Arizona	8	2.1
Arkansas	1	.3
California	47	12.1
Colorado	9	2.3
Connecticut	3	.8
Delaware	2	.5
District of Columbia	1	.3
Florida	37	9.5
Georgia	14	3.6
Idaho	3	.8
Illinois	15	3.9
Indiana	10	2.6
Iowa	3	.8
Kansas	2	.5
Kentucky	6	1.5
Louisiana	5	1.3
Maine	3	.8
Maryland	3	.8
Massachusetts	9	2.3
Michigan	12	3.1
Minnesota	9	2.3
Mississippi	3	.8
Missouri	7	1.8
Nebraska	3	.8
Nevada	2	.5
New Hampshire	4	1.0
New Jersey	8	2.1
New Mexico	1	.3
New York	26	6.7
North Carolina	17	4.4
Ohio	12	3.1
Oklahoma	1	.3
Oregon	7	1.8
Pennsylvania	22	5.7

Rhode Island	2	.5
South Carolina	2	.5
Tennessee	10	2.6
Texas	25	6.4
Utah	4	1.0
Virginia	11	2.8
Washington	6	1.5
Wisconsin	4	1.0
Total	389	100.0

Appendix E : Religious Identification Measure

Which of the following best describes your belief system?

1) Christian
2) Muslim
3) Hindu
4) Jewish
5) Buddhist
6) Spiritual
7) Believe in some kind of higher power (but unsure how to describe it)
8) Agnostic
9) Atheist
10) No Religion
11) Other

Appendix F: Full TTT Measure 1

Please indicate how much you agree or disagree with the following statements

9) I believe in destiny
10) Everything happens for a reason
11) Events in the world happen because they are fated to happen
12) I do NOT believe in fate
13) I do NOT believe things happen because they are predestined to happen
14) The universe exists to serve some higher purpose
15) The universe has NO ultimate purpose
16) There is NO ultimate purpose to existence

Responses given on a 5 point Likert scale. 1. Strongly Disagree 2. Somewhat Disagree 3. Neither agree nor disagree 4. Somewhat agree 5. Strongly agree

Appendix G: Pew Religion Measures

How strongly committed are you to your belief system? 1) Very strongly 2) Somewhat strongly 3) Not too strongly 4) Not at all strongly
Aside from weddings and funerals, how often do you attend religious services? 1)More than once a week 2) Once a week 3) Once or twice a month 4) A few times a year 5) Seldom 6) Never 7) Don't know/Refused
How important is religion in your life? 1) Very important 2) Somewhat important 3) Not too important 4) Not at all important 5) Don't know/Refused
People practice their religion in different was. Outside of attending religious services, do you pray 1) Several times a day 2) Once a day 3) A few times a week 4) A few times a month 5) Seldom 6) Never 7) Don't know/Refused
How often do you participate in prayer groups, Scripture study groups or religious education programs? 1) At least once a week 2) Once or twice a month 3) Several times a year 4) Seldom 5) Never 6) Don't know/Refused
How often do you read scripture outside of religious services? 1) At least once a week 2) Once or twice a month 3) Several times a year 4) Seldom 5) Never 6) Don't know/Refused

Appendix H: Belief System

Which BEST describes your belief system?

1) Agnostic
2) Atheist
3) Buddhist
4) Christian – Catholic
5) Christian – Protestant or Evangelical
6) Christian – No specific denomination
7) Christian – Other denomination (please state)
8) Hindu
9) Jewish
10) Muslim
11) Non-religious
12) Sikh
13) Spiritual
14) Believe in some kind of higher power (but unsure how to describe it)
15) Other belief system (please state)

Appendix I: Warwick Edinburgh Mental Wellbeing

Please indicate which option best describes your experience of each over the past 2 weeks

1) I've been feeling optimistic about the future
2) I've been feeling useful
3) I've been feeling relaxed
4) I've been dealing with my problems well
5) I've been thinking clearly
6) I've been feeling close to other people
7) I've been able to make up my own mind about things

Responses given on a 5 point Likert scale. 1. None of the time 2. Rarely 3. Some of the time 4. Often 5. All of the time

Appendix: J Financial Stress Batinic and Selenko (2011)

Please indicate how much you agree or disagree with the following statements

1) My current financial situation is a serious strain
2) I often think about my current financial situation
3) I am satisfied with my standard of living
4) Due to my financial situation I have to save considerably on food
5) Due to my current financial situation I have difficulty paying for my home and utilities
6) Due to my current financial situation I have to save considerably on clothes
7) Due to my financial situation I am restricted in my leisure activities
8) My financial situation is more of a strain than it was twelve months ago

Responses given on a 5 point Likert scale 1. Strongly disagree 2. Somewhat disagree 3. Neither agree nor disagree 4. Somewhat agree 5. Strongly agree

Appendix K: Relative Subjective Deprivation Callan, Shead and Olson (2011)

Please indicate how much you agree or disagree with the following statements

1) I feel deprived when I think about that I have compared to what other people like me have
2) I feel privileged compared to other people like me
3) When I compare what I have with what others like me have I realize I am quite well off
4) I feel dissatisfied with what I have compared to what other people like me have

Responses given on a 5 point Likert scale 1 Strongly disagree 2. Somewhat disagree 3. Neither agree nor disagree 4. Somewhat agree 5. Strongly agree

Appendix L: Personal Income

In which of these groups did your TOTAL PERSONAL INCOME, from all sources, fall last year -- 2017 -- before taxes, that is?	
1	Under $1,000
2	$1,000 to $2,999
3	$3,000 to $3,999
4	$4,000 to $4,999
5	$5,000 to $5,999
6	$6,000 to $6,999
7	$7,000 to $7,999
8	$8,000 to $8,999
9	$9,000 to $9,999
10	$10,000 to $12,499
11	$12,500 to $14,999
12	$15,000 to $17,499
13	$17,500 to $19,999
14	$20,000 to $22,499
15	$22,500 to $24,999
16	$25,000 to $29,999
17	$30,000 to $34,999
18	$35,000 to $39,999
19	$40,000 to $49,999
20	$50,000 to $59,999
21	$60,000 to $74,999
22	$75,000 to $89,999
23	$90,000 to $109,999
24	$110,000 to $129,999
25	$130,000 to $149,999
26	$150,000 or over

27	Don’t know or rather not say

Appendix M: Family Income

In which of these groups did your TOTAL FAMILY INCOME, from all sources, fall last year -- 2017 -- before taxes, that is?	
1	Under $1,000
2	$1,000 to $2,999
3	$3,000 to $3,999
4	$4,000 to $4,999
5	$5,000 to $5,999
6	$6,000 to $6,999
7	$7,000 to $7,999
8	$8,000 to $8,999
9	$9,000 to $9,999
10	$10,000 to $12,499
11	$12,500 to $14,999
12	$15,000 to $17,499
13	$17,500 to $19,999
14	$20,000 to $22,499
15	$22,500 to $24,999
16	$25,000 to $29,999
17	$30,000 to $34,999
18	$35,000 to $39,999
19	$40,000 to $49,999
20	$50,000 to $59,999
21	$60,000 to $74,999
22	$75,000 to $89,999
23	$90,000 to $109,999
24	$110,000 to $129,999
25	$130,000 to $149,999
26	$150,000 or over

27	Don’t know or rather not say

Appendix N: Social Support Kliem et al. (2015)

Please indicate how much you agree or disagree with each statement

1) I receive a lot of understanding and security from other
2) There is someone very close to mw whose help I can always count on
3) If I need to, I can borrow something from friends or neighbours without any problems
4) I know several people with whom I like to do things
5) When I am sick, I can ask friends/relative to handle important things for me without hesitation
6) If I'm very depressed, I know who I can turn to

Note: Responses given on a 5 point Likert scale 1 Disagree strongly 2. Disagree moderately 3. Neutral 4. Agree moderately 5. Agree strongly

AppendixO : LOT-R

Please indicate how much you agree or disagree with each statement

1) In uncertain times, I usually expect the best
2) It's easy for me to relax
3) If something can go wrong for me, it will
4) I'm always optimistic about my future
5) I enjoy my friends a lot
6) It's important for me to keep busy
7) I hardly ever expect things to go my way
8) I don't get upset too easily
9) I rarely count on good things happening to me
10) Overall, I expect more good things to happen to me than bad

Note: Responses given on a 5 point Likert scale 1. Disagree strongly 2. Disagree moderately 3. Neutral 4. Agree moderately 5. Agree strongly

Appendix P : Full TTT Measure 2

Please indicate how much you agree or disagree with each statement

1) I have felt like events in my life were influences by some kind of higher power
2) I have experienced a sense of higher meaning about events in my life
3) I can relate well to the idea that "everything happens for a reason"
4) I have felt like the purpose of my life was influenced by some higher power
5) I know how it feels to interpret a life event as a sign from some higher power
6) I have felt like there was a path in life that some higher power intended me to follow
7) I tend to regard coincidences in my life as having a special higher significance
8) I have felt as if events in my life were planned by some higher power
9) I have NOT felt like the purpose of my life was influenced by a higher power
10) I have NOT felt like the meaning of my life was influenced by a higher power

Note: Responses given on a 5 point Likert scale. 1. Disagree strongly 2.Disagree moderately 3.Neutral 4. Agree Moderately 5. Agree strongly

Appendix Q: Religious Identity

Please indicate how much you agree or disagree with each statement 1) I am religious 2) I am spiritual 3) I am atheist 4) I am agnostic
Note: Responses given on a 5 point Likert scale. 1. Disagree strongly 2.Disagree moderately 3.Neutral 4. Agree Moderately 5. Agree strongly

Appendix R: Attendance

Your in-person attendance at religious or spiritual gatherings: About how often do you attend gatherings (services, meetings, social events, etc.) related to a religious/spiritual affiliation?

1) Never
2) Less than once a YEAR
3) Once a YEAR
4) 2-6 times a YEAR
5) Once a MONTH
6) 2-3 times a MONTH
7) Once a WEEK
8) 2-4 times a WEEK
9) 5 or more times a WEEK

Appendix S : Systemising Quotient

Please indicate how much you agree or disagree with each statement:

1) If I were buying a car, I would want to obtain specific information about its engine capacity
2) If there was a problem with the electrical wiring in my home, I'd be able to fix it myself
3) I rarely read articles or web pages about new technology
4) I do not enjoy games that involve a high degree of strategy
5) I am fascinated by how machines work
6) In math, I am intrigued by the rules and patterns governing numbers
7) I find it difficult to understand instruction manuals for putting appliances together
8) If I were buying a computer, I would want to know exact details about its hard disc drive capacity and processor speed
9) I find it difficult to read and understand maps
10) When I look at a piece of furniture, I do not notice the details of how it was constructed

Note: Responses given on a 5 point Likert scale. 1. Disagree strongly 2. Disagree moderately 3.Neutral 4. Agree Moderately 5. Agree strongly

Appendix T: Future Satisfaction with Life Scale (F-SWLS)

Over the next 2-5 years, I expect that:

1. In most ways my life will be closer to my ideal than it is right now.
2. The conditions of my life will be better than they are right now.
3. I will be more satisfied with my life than I am right now.
4. I will have gotten more of the important things I want in life than I have right now.
5. I will feel that if I could live my life over, I would change almost nothing.

Note: Responses given on a 5 point Likert scale. 1. Disagree strongly 2. Disagree moderately 3.Neutral 4. Agree Moderately 5. Agree strongly