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The need to believe: belief in science & religious belief examined as more general components of positive psychological functioning

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The Need to Believe: Belief in Science & Religious Belief Examined as More General Components of Positive Psychological Functioning

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Abstract

Furthered by the spectacular innovations of technological advancement over the recent centuries, empirical science has yielded a depth of knowledge about the universe that early naturalistic philosophers could not imagine. Present-day scientists seem to have a much stronger motivation to espouse naturalistic worldviews than do early philosophers – the explanatory power of science appears to render null the need for explanations via numinous religious beliefs. Why do so many people maintain religious beliefs, then? A large body of literature suggests that religious belief is strongly associated with positive psychological functioning. However, other research suggests that religious belief is sometimes associated with negative psychological functioning. More recently though, and perhaps more accurately, findings indicate that religious belief is not unique in providing people with positive psychological functioning. In fact, a growing body of literature suggests that belief in science functions in similar ways to religious belief in providing individuals with positive psychological functioning. The following work compares and contrasts religious belief and belief in science, as related to mental health. Theoretical implications are discussed, and direction for future research is suggested.

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Introduction

While levels of religious belief and belief in science are a complex mixture of cultural values and perception, they both serve a more general component of positive psychological functioning – the need to believe. In western societies, science and religion are often viewed as in conflict with one another. This is not necessarily an accurate depiction. The perceived conflict between religion and science has been nominally referred to as the conflict thesis (Wilson, 2000; Russell, 2000). There is evidence that the perceived conflict is ideologically and culturally rooted (Watson, 2015; Aghababaei, 2013). For example, although Dawkins said that science is free from the "vices" of faith, it takes merely faith to believe in the superiority of the epistemology of empirical science (1997). Indeed, the consensus among the majority of modern-day historians of science is that the conflict thesis is antiquated (Wilson, 2000; Russell, 2000). The actual relationship between science and religion is much more complicated. The question to answer then, specifically in terms of positive psychological functioning, is how do belief in science and religious belief compare?

The distinction must be made at the outset between science and so-called belief in science. Belief in science refers to the psychometric scale developed by Farias, Newheiser, Kahane, and Toledo (2013). This scale measures the extent to which a person believes in the superiority of science as an epistemic worldview. Strong belief in science, therefore, is associated with scientism, the belief that science is superior to all other forms of knowledge. In western societies especially, the word science is often mistakenly used as an umbrella term for science and scientism – which are two distinct concepts (Haught, 2005; Farias et al., 2013).

Beliefs are important to people. A large body of research describes how people respond when their beliefs are threatened. Terror management theory (TMT) is one of the most

widespread theories in explaining how and why people defend their beliefs (Greenberg, Solomon, & Pyszczynski, 1997). TMT posits that in humans, the instinctive desire for self-preservation is manifested on a more cognitive level. One of the most studied aspects of TMT is mortality salience (Norenzayan & Hansen, 2006; Farias et al., 2013; Arndt, Greenberg, & Cook, 2002). When an individual is presented with the reality of their eventual death, this individual is under the effect called mortality salience. People consistently show higher levels of professed belief in individual worldview constructs (Norenzayan & Hansen, 2006; Farias et al., 2013; Arndt et al., 2002). The effects of mortality salience are more general components of fear, stress, and anxiety that can each individually elicit an increased level of belief (Farias et al., 2013; Inzlicht, Tullet, & Good, 2011).

The fact that people cling to their beliefs in the evoking of fear, stress, and anxiety is evidence for the legitimate purpose of beliefs. As pertains to mental health, beliefs help people deal with fear, stress, and anxiety. Whether these beliefs are conscious or unconscious to the individual, theories have amassed on why people believe. The meaning maintenance model (MMM), for example, posits that beliefs are innate, and that any experience that conflicts with an individual's mental model does essentially one of two things; either it causes the individual to reinterpret the experience, or it is accommodated by the individual's mental model (Heine, Proulx, & Vohs, 2006). Other authors argue that beliefs, both religious and scientific, can function as a sort of compensatory control that makes up for lack of personal control (Kay, Whitson, Gaucher, & Galinsky, 2009; Rutjens, Harreveld, & Pligt, 2010).

Research on the psychology of religion has presented growing evidence over recent decades that religion, and even spirituality, provide people with positive psychological functioning (Ano & Vasconcelles, 2005; Inzlicht et al., 2011; Nell, 2014; Aghababaei &

Błachnio, 2014; Wnuk & Marcinkowski, 2014). However, there is evidence that religiousness can often be associated with reduced life evaluation and depressive symptoms (Brown & Tierney, 2009; Pearce, Little, & Perez 2003). Understandably, the religious context and individual experience must be considered before making conclusions either positively or negatively regarding religion (Diener, Tay, Meyers, & Simpson, 2011; Lun & Bond, 2013). Religiosity concerning positive psychological functioning is complex, and one must err on the side of caution when making any generalizations on how religion affects to mental health.

More fascinatingly, a growing body of research suggests that belief in science, and a competent understanding of science, can also contribute to positive psychological functioning (Farias et al., 2013; Aghababaei, Sohrabi, Eskandari, Borjali, Farrokhi, & Chen, 2016; Aghababaei, 2016; Rutjens et al, 2010; Gottlieb, Keltner, & Lombrozo, 2018). Research is lacking in several areas, however. For one, few studies have analyzed how belief in science and a competent understanding of science directly predict positive psychological functioning. Secondly, no studies have been found that discuss how belief in science possibly contributes to negative psychological functioning.

The only handbook in the field of the psychology of science, edited by Feist and Gorman (2013), attests that research is severely lacking in the relation between the psychology of science and mental health. Specifically, Feist and Gorman (2013) highlight the need for interdisciplinary research in the psychology of science regarding mental health. This present work serves two primary purposes. The first purpose is to share and discuss the results of an exploratory study that examines mental health from the interdisciplinary fields of the psychology of science and the psychology of religion. The second is to present a quasi-theoretical framework in which the direction of future research is suggested.

Literature Review

Are Beliefs Really Important?

Belief can be called a sort of cognitive self-preservation. More generally, self-preservation is an instinct that is observable among all animals, including humans. According to Greenberg et al., the instinctive desire for self-preservation is manifested on a more cognitive level in humans (1997). TMT is a theory that attempts to explain this cognitive self-preservation. Self-esteem is strongly intertwined with a worldview (Greenberg et al., 1997). People do not generally enjoy feeling low self-esteem. Hence, any conflict to an individual's worldview is perceived as a personal attack. In response to the perceived offense, people react in two characteristic ways: defense and prejudice (Greenberg et al., 1997; Watson, 2015). People defend their worldviews from the perceived attack and exhibit prejudice towards groups of differing worldviews in an attempt to decrease their anxiety. Essentially, beliefs are a highly sensitive mechanism of cognitive self-preservation.

As mentioned earlier, one of the most studied aspects of TMT is mortality salience (Norenzayan & Hansen, 2006; Farias et al., 2013; Arndt et al., 2002). In 2002, Arndt et al. counted over 90 studies that had been conducted on the effects of mortality salience. Primarily, these studies showed that being reminded of one's death increases faith in his or her worldview. Arndt et al. desired to give more attention to how death-thoughts affect an individual's broader cognitive landscape. Arndt et al. were interested in answering questions like: what other thoughts are elicited by being reminded of one's mortality? How do these thoughts affect functions of belief, and therefore affect one's defense of his or her worldview?

Arndt et al. conducted seven experiments that built upon the foundation of TMT. The researchers found that not only does mortality salience increase an individual's faith in his or her

respective worldview, but it also increases the individual's accessibility of themes that are important to his or her worldview – a sort of defense mechanism to the perceived threat of dismantling beliefs. A critical insight made by Arndt et al. is that mortality salience does not act alone to invoke a defense of one's worldview, but rather it is a combination of "situational cues" that either highlight or suppress other relevant beliefs. These situational cues can either be sympathetic or antagonistic to one's worldview. In the case of antagonistic situational cues, the individual will have an increased ability to access main themes of his or her worldview construct (Arndt et al., 2002).

The implications of these seven studies conducted by Arndt et al. (2002) were foundational to the study completed by Farias et al. (2013) that determined belief in science increases in the face of stress and existential anxiety. Farias et al. published the results of this study which suggested that belief in science is like religious belief, at least in the ability to help cope with stress and anxiety. Although secular individuals would be unlikely to support beliefs with explicitly religious or transcendent qualities, the results of the study verify the proposed similarity between belief in science and religious beliefs (Farias, 2013). Clearly, despite their differences, the underlying functionality of belief in science and religious belief gives evidence of some innate desire to believe.

The effects of mortality salience have been shown to increase belief in one's world view, not only for those with secular worldviews, but also for those with religious worldviews (Farias et al., 2013; Arndt et al., 2002; Inzlicht et al., 2011). Four studies completed by Norenzayan and Hansen in 2006 not only verify previous findings on the effects of mortality salience, but they also provide further insight into the effects of mortality salience. The results of the studies suggest that people with prior inclination to religion were more likely to believe in supernatural

agents when primed with mortality salience (Norenzayan & Hansen, 2006). In addition, the evidence suggests that the effects of mortality salience produce a kind of inclusive religious worldview defense rather than a purely sectarian worldview defense. In other words, people who have religious beliefs do not derogate other worldviews when primed with mortality salience. For example, Christian participants indicated an increased belief in Buddha and Shamanic spirits when primed with mortality salience. Rather than taking other religious beliefs less seriously, mortality salience increased the inclination to believe in foreign supernatural agents.

These results are surprising considering that in all four studies; the majority of those who identified as religious were North American Christians. Furthermore, although the results of increased belief were only found among religious participants, the non-religious did not negatively criticize supernatural agents in an attempt to defend a secular worldview (Norenzayan & Hansen, 2006). TMT suggests that direct "attacks" on an individual's worldview may cause cognitive self-preservation manifested as defensiveness and prejudice. However, being reminded of the inevitability of death seems to cause cognitive self-preservation manifested as sympathy towards other worldviews – because after all, people realize that everyone will die someday. The implications of this "inclusive religious worldview," specifically among North American Christians, are discussed in depth in the general discussion section.

Why do People Believe?

Belief provides people with meaning. Meaning is a generic way to say making sense of the world, which directly affects social and personal motivations. According to Heine et al., the need for meaning is a natural desire (2006). MMM says that people need to conform reality into a mental model that organizes everyday events into organized perceptions of the world (Heine et

al., 2006). These models are often constructed and do not perfectly align with objective reality. When the model cannot accommodate perceived events, a person's sense of meaning is threatened.

MMM asserts three central claims. The first is that meaning is relational, i.e. meaning links people, things, and ideas to one another in predictable ways. The second is that people are meaning makers – people possess the innate ability to recognize and create meaningful and coherent relationships with people, things and ideas. While other research, such as that of Greenberg et al., has suggested that people either reinterpret events or revise their mental model to accommodate discrepant events, the third claim of MMM is that people can also reaffirm alternative mental models to accommodate discrepant events. Personally, people can feel disturbed when their mental models do not match reality. Therefore, the need to accommodate one's mental model is one way of dealing with the disturbance. Updating a mental model affects social and personal motivations. Therefore, people may feel social pressure upon changing their mental model. Socially, people can feel threatened by rejection from their social group by developing an alternate mental model. Making sense of the world, therefore, is a complex mixture of personal and social motivation, both of which are affected by how an individual makes sense of the world.

Heine et al. suggest that the innate ability of humans to create meaning is an evolutionarily adaptive trait that functions similarly to the instinct of cognitive self-preservation (2006; Greenberg et al., 1997). TMT says that when primed with mortality salience, people bolster their faith in and constructs of their worldview. MMM differs by saying that people only want to maintain predictable relationships between people, things, and ideas. To further the distinction, TMT gives a functional explanation of why beliefs matter: subconsciously, people

need cognitive self-preservation. MMM gives a practical interpretation of why people believe: consciously, people need to make sense of their world.

People want to believe that the world behaves in a predictable and organized way. People associate this predictability with a sense of control. The results of a study by Kay et al. found that when this personal sense of control is threatened, people will do the following: believe perceived suspicions and conspiracies, defend the legitimacy of the sociopolitical institutions that provide control, or believe in a supernaturally intervening God (2009). When a sense of personal control is low, this tendency to believe more in the authenticity of "higher" powers or random patterns is known as compensatory control. The researchers Kay et al. found evidence that compensatory control helps people who lack personal control cope with anxiety and comfort. The measure of personal control was not a sufficient reading of overall personal control (which is difficult to measure). It simply served the task of measuring lowered feelings of personal control. Participants described non-controllable events from their past, and were then more likely to support their respective government. However, there is strong evidence from Kay et al. that the level of threat is not the main predictor of compensatory control; rather, it is the measured level of personal control (2009). This seems to be congruent with the work of Arndt et al. that describes "situational cues" as a contributing to level of worldview defense (2002).

In 2010, Rutjens et al. published the results of four studies that indicate that belief in progress acts as a compensatory control for those who have a low sense of personal control. People who feel lack of personal control show an increased belief in scientific and moral progress. The researchers noted that while all the participants from the fourth study expressed belief in scientific progress, those who felt less personal control tend to show a higher level of belief in scientific progress than those who felt more personal control. Just as Kay et al. (2009)

showed that feeling lack of control increases belief in God, so it increases belief in human progress (Rutjens et al., 2010). More importantly, while belief in progress is often considered a substitution for religious belief, the evidence from the fourth study shows that belief in scientific progress is possibly a form of compensatory control. This implication was a vital component of the study conducted by Farias et al. (2013), which indeed gives evidence that belief in science can be considered a form of compensatory control.

Are Faith & Reason Incompatible?

In western societies, faith is often considered the hallmark of religion, while reason is often considered the hallmark of science. In support of the conflict thesis, religion is often considered incompatible with science because of the supposed epistemological incompatibility of faith and reason (Dawkins, 1997). Perhaps the incompatibility is more psychological than philosophical. In 2009, Preston and Epley published evidence that suggests one reason why science and religion are viewed as in conflict with one another is because they offer competing explanations of the same phenomena. Science and religion are often considered ultimate explanations, so increased explanation through one tends to "automatically oppose" the other. In other words, science and religion often seem to compete for explanatory space, for example, intelligent design versus natural selection. Preston and Epley (2009) conducted two studies in which they manipulated the perceived value of either science or God as an ultimate explanation. It was found that when a low credibility to the explanatory power of science was given, a higher belief in God was perceived. Conversely, when a low credibility to the explanatory power of a Creator was given, a higher belief in science was perceived.

This effect is what Preston and Epley (2009) call automatic opposition. It is important to note that this automatic opposition happened even though none of the participants were primed with any disagreement between science and religion. Similar to the ideas of MMM, people care about what they believe and seem to be programmed to automatically find meaning when their explanatory system is called into question (Heine et al., 2006). Just as MMM claims that people can accommodate their respective mental models, Preston and Epley suggest that if exposed to differing ultimate explanations, an individual can eventually accept those explanations (2009).

Ultimate explanations are similar to the ideas of incommensurable rationalities (MacIntyre, 1988). Incommensurables reveal the importance of ideology when comparing societies. Social rationalities, such as action and thought based on the belief in God, are incommensurable when societies bring their action and thought into conformity with different "ultimate standards." The stereotypical view in western societies is that those who believe in God do not rely on reason and analytical thinking. Rather, they rely more on faith-oriented refection instead of intellect-oriented reflection. Also, the stereotype assumes that those who believe in God are close-minded. However, Watson et al. (2015) found that, among western sub-groups of Christianity (not necessarily denominations), "foundationalism" is distinct from fundamentalism. Watson et al. found that contrary to the stereotypical view, Bible-based beliefs can support openness and intellectual thinking that are the hallmark of secularism. Indeed, although studies have shown that analytical thinking is one component of religious disbelief, it is not necessarily a predictor of religious disbelief (Shenhav, Rand, & Greene, 2012; Gervais & Norenzayan, 2012). This is especially true, considering that 65.4% of all Nobel Prize Laureates, who are exceptionally strong analytic thinkers, have identified as Christian (Shalev, 2003).

Religion & Mental Health

Religion is an important, and many times, central aspect of people's lives. The results of a study completed with over 450,000 individuals from 154 nations and over 350,000 individuals from all 50 states indicates that just over two-thirds of all people regard religion as important (Diener et al., 2011). A large body of research demonstrates that religion, and even spirituality, provide people with positive psychological functioning (Ano & Vasconcelles, 2005; Inzlicht et al., 2011; Nell, 2014; Aghababaei & Błachnio, 2014; Wnuk & Marcinkowski, 2014). Part of the reason that religion can have a positive psychological effect on people, perhaps, is because it helps people accommodate the discrepancies of their respective mental models (Inzlicht et al., 2011). Under the theoretical framework of MMM, religion allows people to attenuate the perceptual discrepancies that threaten an individual's respective mental model. When people are less concerned about these discrepancies, their sense of personal control increases, and their anxiety decreases. Therefore, according to Inzlicht et al. (2011), people with stronger religious faith report higher levels of SWB and fewer levels of negative psychological functioning compared to those "without faith."

While studies on religious fundamentalism have often shown aggressive, prejudicial, and hostile attitudes towards virtually all minority groups (Altemeyer & Hunsberger, 1992), this is not necessarily always the case. Research suggests that meaning in life can mediate the relationship between religious fundamentalism and satisfaction with life (Nell, 2014). Up to the point of Nell's study, no previous studies had investigated the relationship between religious fundamentalism, meaning in life, and satisfaction with life. In the same year (2014), Aghababaei and Błachnio found a similar result, although the study did not account for religious fundamentalism. Aghababaei and Błachnio found evidence that purpose in life mediates the

relationship between religiosity and happiness. Also in 2014, Wnuk and Marcinkowski found evidence that meaning in life mediates the relationship between spiritual experience and satisfaction with life. The evidence suggests that more general existential variables seem to mediate religion and spirituality to positive psychological functioning.

While religion is correlated with positive psychological functioning, it does not necessarily predict it. A meta-analysis of 49 relevant studies with over 13,000 participants revealed that positive and negative forms of religious coping are related to positive and negative forms of psychological adjustment to stress, respectively (Ano & Vasconcelles, 2005). Essentially, strong conviction to religion can go either way in terms of mental health. For religious people who consistently experience happiness and well-being, the source of happiness is perceived as rooted in their individual religious beliefs – "a good life means God is blessing me." For religious people who consistently experience sadness and depression, the source of sadness is perceived as rooted in their individual religious beliefs – "a bad life means God is punishing me." Things can get complicated, so it is of absolute importance to understand how individuals use religion (Ano & Vasconcelles, 2005) and the cultural context of an individual's religious beliefs (Lun & Bond, 2013; Diener et al., 2011).

There are cases of how religion contributes negatively to mental health. Among the oldest in China, for example, there is evidence that a negative relationship between religious participation and positive psychological functioning (Brown & Tierney, 2009). Religion in China has been subject to restriction since 1949, and religions must be registered with the state. Protestant Christianity is illegal, and as many as 70 million protestant Christians in China worship in underground congregations that are illegal and prosecutable (Kindopp, 2004). Religious participation does not necessarily entail positive psychological functioning. In a study

conducted by Pearce, Little, and Perez, evidence shows that positive and negative interpersonal religious experience had the strongest positive and negative associations, respectively, with depressive symptoms (2003). In other words, levels of religious attendance and participation are not necessarily predictors of positive psychological functioning.

Belief in Science, Scientific Belief, & Mental Health

Over the past several decades, the amount of literature concerning the effects religion has on mental health has grown. Only within the past decade, studies have been conducted that give evidence that belief in science, and scientific belief more generally, can also have an effect on mental health. The majority of the studies mainly highlight the effects of positive psychological functioning (Farias et al., 2013; Aghababaei, 2016; Gottlieb et al., 2018). In recent years, there have been questions of whether the alleviating effects of religious belief are due to supernatural phenomena or the general function of belief. Farias et al. (2013) posed an important question: What beliefs (if any) of secular individuals function similarly to those of religious individuals? It is not surprising to speculate that secular beliefs in progress may serve the stress and anxiety-relieving functions of religion. However, the research of Farias et al. contradicts this suggestion – under stressful and anxiety-inducing conditions, it was shown that individuals indicate a significantly higher belief in science. These results are congruent with the theoretical framework of TMT (Greeberg et al., 1997).

Just as researchers have found that existential variables seem to mediate religion and spirituality to positive psychological functioning (Nell, 2014; Aghababaei & Błachnio, 2014; Wnuk & Marcinkowski, 2014), Aghababaei et al. (2016) found evidence that existential variables, such as hope and purpose in life, also seem to mediate the relationship between belief

in science and positive psychological functioning (Aghababaei, 2016). Even more recently, Gottlieb et al. (2018) found evidence that emotions such as awe correlate with an accurate understanding of the nature of science. These feelings of awe can cause people to feel a lack of control. Thereby, people will find comfort in the notion of supernatural power via religion or predictability, explanation, and control via science. These results are congruent with the theoretical framework of MMM (Heine et al., 2006).

General Components of Positive Psychological Functioning

At least superficially, religion and spirituality do not appear to provide unique benefits in prosociality and mental health. The results of a study conducted by Aghababaei et al. (2016) showed that in a sample of Muslim students, while religious belief and attitudes toward science are similar in some general sense of belief, they are not the number one predictors of positive psychological functioning. A meta-analysis by Weber et al. (2012) shows evidence that belief, whether religious or nonreligious, can lead to positive psychological functioning.

In 2018, Galen published a paper that supports the work by Aghababaei et al. (2016), providing evidence that similar to religious belief, analogous secular mechanisms exist to provide positive psychological functioning. Increased focus on nonreligious belief has revealed that religious belief is often confounded with factors such as strong worldview conviction, social engagement, and a normative cultural fit; all of which can be found in religious and nonreligious worldviews. These three factors can be considered the general components of positive psychological functioning. The main component being analyzed in this study is that of belief, which is along the line of strong worldview conviction.

Present Study

This present work seeks to further understand the relationship between religious belief and belief in science, as related to mental health. To date, no studies have been conducted that explicitly examine the relationship between belief in science, conservative Christian beliefs, and satisfaction with life. The results of an exploratory study are presented below. This research was conducted for the partial requirements of an undergraduate honors thesis at the University of Tennessee at Chattanooga, in the department of psychology, directed under a more extensive study by Dr. Paul J. Watson. To the researcher's knowledge, this study is the first to hypothesize that Beliefs in Science (Farias et al., 2013) is compatible with Biblical Foundationalism (Watson, Sawyers, Morris, Carpenter, Jimenez, Jonas, & Robinson, 2003) after controlling for Religious Fundamentalism (Altemeyer, & Hunsberger, 1992) and incompatible with Religious Fundamentalism after controlling for Biblical Foundationalism.

Hypotheses

In general, this study will hypothesize that conservative Christian commitments can be both compatible and incompatible with beliefs in science, intellectual openness, and subjective well-being. First, Biblical Foundationalism controlling for Religious Fundamentalism should reveal the possibilities of compatibility. Second, Religious Fundamentalism controlling for Biblical Foundationalism should display the opposite results. Specifically, Religious Fundamentalism, controlling for Biblical Foundationalism, should correlate negatively with Beliefs in Science; Intellect Oriented Reflection (Watson, Chen, & Hood, 2011); and Satisfaction with Life (Diener, Emmons, Larsen, & Griffiths,1985). Biblical Foundationalism, controlling for Religious Fundamentalism, should display inverse relationships.

Method

Participants

Research participants were undergraduates enrolled in introductory psychology classes at the University of Tennessee at Chattanooga. The group was composed of 136 men and 262 women. The ages ranged from 17 to 26 years old, and the average age was 18.44 (*SD* = 1.01). The ethnic composition was 82.2% Caucasian, 9.5% African-American, and 8.3% various other ethnic identifications. Reported religious affiliations were 85.7% Christian, 8.8% atheist, and 5.3% who identified as other religious identifications. One participant failed to indicate a religious affiliation. About 60.6% identified as both religious and spiritual, 19.3% identified as religious but not spiritual, 12.6% identified as spiritual but not religious, and 7.3% identified as neither spiritual nor religious (one failed to identify). On a scale of 0 to 9, participants indicated a moderate (*M* = 6.46, *SD* = 2.37) level of religious interest.

Measures

The scales appeared in a single questionnaire. Eight scales were used to determine correlations between beliefs in science, religion, and subjective well-being. Responses to all items ranged across a 5-point Likert scale (0 = *strongly disagree, 4 = strongly agree*). The scales were given in the order below. All internal reliabilities were high except that of Xenosophia (α = .56).

Belief in Science

The first scale is the 10-item Belief in Science (SCI) scale (*M* response per item = 1.41, *SD* = 0.80, α = 0.88) developed by Farias et al. (2013). This scale determines whether a person believes that science is the best and only sure way to knowledge: “We can only rationally believe

what is scientifically provable" (Farias et al., 2013). This scale has an ideological bias towards science as superior to religion.

Religious Orientation

The second scale is the 14-item Religious Orientation scale (Gorsuch & McPherson, 1989). This scale measures the motivational applications of an individual's religious identity: Intrinsic (IR) (M = 2.44, SD = 0.88, α = 0.84), "My whole approach to life is based on my religion," Extrinsic Personal (Ep) (M = 2.45, SD = 0.97, α = 0.71), "What religion offers me most is comfort in times of trouble and sorrow," and Extrinsic Social (Es) (M = 1.22, SD = 0.89, α = 0.73), "I go to church mainly because I enjoy seeing people I know there."

Religious Fundamentalism

The third scale is the 12-item Religious Fundamentalism (FUND) scale (M = 2.23, SD = 0.95, α = 0.92) developed by Altemeyer and Hunsberger (2009). This scale uses the language of conservative religious commitment that conforms to the conflict thesis: "The fundamentals of God's religion should never be tampered with, or compromised with other's beliefs."

Biblical Foundationalism

The fourth scale is the 15- item Biblical Foundationalism (FOUND) scale (M = 2.63, SD =1.01, α = .96) developed by Watson et al. (2003). Biblical Foundationalism is a fifteen-item translation of the Religious Fundamentalism scale. Biblical Foundationalism attempts to express conservative religious commitments in a language that is less relevant to the perceived culture war of science and religion in the United States: "No single individual has the wisdom to recognized all truth; so, God gave us the Bible as a guide in our struggles to discover the complex truths that life presents us."

Religious Schema

The fifth scale is the 15-item Religious Schema scale developed Streib, Hood, & Klein, (2010). This scale identifies three religious perspectives. Truth of Texts and Teachings (TTT) (M = 2.51, SD = 1.01, α = 0.88) essentially records fundamentalism, "What the texts and stories of my religion tell me is absolutely true and must not be changed." Fairness, Tolerance, and Rationality (FTR) (M = 3.22, SD = 0.68, α = 0.80) and Xenosophia (XEN) (M = 2.37, SD = 0.67, α = 0.56) attempt to record greater religious openness: "Regardless of how people appear to each other, we are all human," and, "The truth I see in other world views leads me to re-examine my current views," respectively.

Christian Religious Reflection

The sixth scale is the 12-item Faith (FO) (M = 2.59, SD = 0.91, α = 0.86) and Intellect Oriented (IO) (M = 2.59, SD = 0.79, α = 0.76) Reflection scale developed by Watson et al. (2011). This measures the extent to which a person believes that knowledge should be obtained through faith ("My practice in Christianity is an inner reflection of my faith") or through the intellect ("Questioning life leads to answers, which ultimately leads to the truth"). Religious Fundamentalism accepts faith and rejects intellect while Biblical Foundationalism accepts both.

Defense Against Secularism

The seventh scale is the 17-item Defense Against Secularism (DEF) scale (M = 1.68, SD = 0.83, α = 0.94) developed by Watson et al. (2015). This scale measures tendencies of religious people to see "reason" as a secular weapon against religion: "Reason is a weapon that the culture uses to destroy faith."

Satisfaction with Life

The eighth scale is the 5-item Satisfaction with Life (SWL) scale (M = 2.61, SD = 0.87, α = 0.82) developed by Diener et al. (1985). This scale measures the personal satisfaction of one's own life ("I am satisfied with my life"), and will be useful in further evaluating the subjective well-being associated with Belief in Science within the context of conservative religious commitments.

Procedure

Informed, voluntary consent was obtained by all participants, and all procedures received approval from the Institutional Review Board. The questionnaires were given in a large classroom setting. Analyses began with an examination of initial zero-order correlations among the measures. Partial correlations were then conducted to re-examine the relationships among measures controlling for Biblical Foundationalism and Religious Fundamentalism. Furthermore, a moderation and multiple regression analyses were performed to explore relationships among crucial measures. IBM SPSS software was utilized for the data analysis.

		SCI	I	EP	ES	FUND	FOUND	TTT	FTR	XEN	IO	FO	DEF	SWL
SCI	Pearson Correlation	1	-.595**	-.273**	-.095	-.582**	-.566**	-.567**	-.022	.252**	.305**	-.567**	-.456**	-.131**
	Sig. (2-tailed)		.000	.000	.059	.000	.000	.000	.663	.000	.000	.000	.000	.009
	N	398	398	398	398	398	398	398	398	398	398	398	398	398
I	Pearson Correlation	-.595**	1	.392**	.189**	.756**	.704**	.742**	.080	-.279**	-.250**	.703**	.482**	.224**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.112	.000	.000	.000	.000	.000
	N	398	398	398	398	398	398	398	398	398	398	398	398	398
EP	Pearson Correlation	-.273**	.392**	1	.264**	.399**	.513**	.460**	-.006	-.006	-.123*	.493**	.384**	.095
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.898	.912	.014	.000	.000	.058
	N	398	398	398	398	398	398	398	398	398	398	398	398	398
ES	Pearson Correlation	-.095	.189**	.264**	1	.234**	.218**	.247**	-.216**	-.038	-.084	.205**	.202**	.056
	Sig. (2-tailed)	.059	.000	.000		.000	.000	.000	.000	.455	.093	.000	.000	.264
	N	398	398	398	398	398	398	398	398	398	398	398	398	398
FUND	Pearson Correlation	-.582**	.756**	.399**	.234**	1	.840**	.824**	-.011	-.380**	-.363**	.757**	.636**	.222**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.827	.000	.000	.000	.000	.000
	N	398	398	398	398	398	398	398	398	398	398	398	398	398
FOUND	Pearson Correlation	-.566**	.704**	.513**	.218**	.840**	1	.853**	.066	-.201**	-.188**	.855**	.632**	.226**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.186	.000	.000	.000	.000	.000
	N	398	398	398	398	398	398	398	398	398	398	398	398	398
TTT	Pearson Correlation	-.567**	.742**	.460**	.247**	.824**	.853**	1	.112*	-.191**	-.230**	.820**	.618**	.254**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.025	.000	.000	.000	.000	.000
	N	398	398	398	398	398	398	398	398	398	398	398	398	398
FTR	Pearson Correlation	-.022	.080	-.006	-.216**	-.011	.066	.112*	1	.387**	.415**	.136**	-.174**	.298**
	Sig. (2-tailed)	.663	.112	.898	.000	.827	.186	.025		.000	.000	.006	.000	.000
	N	398	398	398	398	398	398	398	398	398	398	398	398	398
XEN	Pearson Correlation	.252**	-.279**	-.006	-.038	-.380**	-.201**	-.191**	.387**	1	.558**	-.187**	-.328**	-.025
	Sig. (2-tailed)	.000	.000	.912	.455	.000	.000	.000	.000		.000	.000	.000	.614
	N	398	398	398	398	398	398	398	398	398	398	398	398	398
IO	Pearson Correlation	.305**	-.250**	-.123*	-.084	-.363**	-.188**	-.230**	.415**	.558**	1	-.133**	-.399**	.082
	Sig. (2-tailed)	.000	.000	.014	.093	.000	.000	.000	.000	.000		.008	.000	.101
	N	398	398	398	398	398	398	398	398	398	398	398	398	398
FO	Pearson Correlation	-.567**	.703**	.493**	.205**	.757**	.855**	.820**	.136**	-.187**	-.133**	1	.597**	.290**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.006	.000	.008		.000	.000
	N	398	398	398	398	398	398	398	398	398	398	398	398	398
DEF	Pearson Correlation	-.456**	.482**	.384**	.202**	.636**	.632**	.618**	-.174**	-.328**	-.399**	.597**	1	.186**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000
	N	398	398	398	398	398	398	398	398	398	398	398	398	398
SWL	Pearson Correlation	-.131**	.224**	.095	.056	.222**	.226**	.254**	.298**	-.025	.082	.290**	.186**	1
	Sig. (2-tailed)	.009	.000	.058	.264	.000	.000	.000	.000	.614	.101	.000	.000	
	N	398	398	398	398	398	398	398	398	398	398	398	398	398

Table 1: Zero-Order Correlations among All Measures

Correlations

Control Variables			FUND	SCI	I	EP	ES	TTT	FTR	XEN	IO	FO	DEF	SWL
FOUND	FUND	Correlation	1.000	-.240	.427	-.068	.095	.378	-.124	-.397	-.386	.138	.250	.061
		Significance (2-tailed)	.	.000	.000	.176	.057	.000	.014	.000	.000	.006	.000	.228
		df	0	395	395	395	395	395	395	395	395	395	395	395
	SCI	Correlation	-.240	1.000	-.336	.024	.036	-.196	.019	.171	.246	-.195	-.154	-.004
		Significance (2-tailed)	.000	.	.000	.640	.480	.000	.706	.001	.000	.000	.002	.943
		df	395	0	395	395	395	395	395	395	395	395	395	395
	I	Correlation	.427	-.336	1.000	.051	.052	.383	.047	-.197	-.169	.276	.068	.093
		Significance (2-tailed)	.000	.000	.	.311	.306	.000	.354	.000	.001	.000	.175	.063
		df	395	395	0	395	395	395	395	395	395	395	395	395
	EP	Correlation	-.068	.024	.051	1.000	.182	.050	-.047	.116	-.032	.123	.090	-.025
		Significance (2-tailed)	.176	.640	.311	.	.000	.318	.347	.021	.521	.014	.072	.615
		df	395	395	395	0	395	395	395	395	395	395	395	395
	ES	Correlation	.095	.036	.052	.182	1.000	.119	-.237	.007	-.045	.036	.084	.007
		Significance (2-tailed)	.057	.480	.306	.000	.	.018	.000	.895	.368	.469	.093	.889
		df	395	395	395	395	0	395	395	395	395	395	395	395
	TTT	Correlation	.378	-.196	.383	.050	.119	1.000	.107	-.038	-.137	.334	.195	.120
		Significance (2-tailed)	.000	.000	.000	.318	.018	.	.033	.447	.006	.000	.000	.016
		df	395	395	395	395	395	0	395	395	395	395	395	395
	FTR	Correlation	-.124	.019	.047	-.047	-.237	.107	1.000	.410	.436	.153	-.279	.291
		Significance (2-tailed)	.014	.706	.354	.347	.000	.033	.	.000	.000	.002	.000	.000
		df	395	395	395	395	395	395	0	395	395	395	395	395
	XEN	Correlation	-.397	.171	-.197	.116	.007	-.038	.410	1.000	.541	-.030	-.264	.021
		Significance (2-tailed)	.000	.001	.000	.021	.895	.447	.000	.	.000	.557	.000	.673
		df	395	395	395	395	395	395	395	0	395	395	395	395
	IO	Correlation	-.386	.246	-.169	-.032	-.045	-.137	.436	.541	1.000	.054	-.369	.130
		Significance (2-tailed)	.000	.000	.001	.521	.368	.006	.000	.000	.	.281	.000	.009
		df	395	395	395	395	395	395	395	395	0	395	395	395
	FO	Correlation	.138	-.195	.276	.123	.036	.334	.153	-.030	.054	1.000	.141	.190
		Significance (2-tailed)	.006	.000	.000	.014	.469	.000	.002	.557	.281	.	.005	.000
		df	395	395	395	395	395	395	395	395	395	0	395	395
	DEF	Correlation	.250	-.154	.068	.090	.084	.195	-.279	-.264	-.369	.141	1.000	.057
		Significance (2-tailed)	.000	.002	.175	.072	.093	.000	.000	.000	.000	.005	.	.258
		df	395	395	395	395	395	395	395	395	395	395	0	395
	SWL	Correlation	.061	-.004	.093	-.025	.007	.120	.291	.021	.130	.190	.057	1.000
		Significance (2-tailed)	.228	.943	.063	.615	.889	.016	.000	.673	.009	.000	.258	.
		df	395	395	395	395	395	395	395	395	395	395	395	0

Table 2: Part-in-Partial Correlations among Measures Controlling for FOUND

Correlations

Control Variables			FOUND	SCI	I	EP	ES	TTT	FTR	XEN	IO	FO	DEF	SWL
FUND	FOUND	Correlation	1.000	-.173	.194	.357	.041	.524	.140	.235	.232	.618	.233	.075
		Significance (2-tailed)	.	.001	.000	.000	.413	.000	.005	.000	.000	.000	.000	.135
		df	0	395	395	395	395	395	395	395	395	395	395	395
	SCI	Correlation	-.173	1.000	-.291	-.055	.052	-.189	-.035	.041	.124	-.238	-.137	-.002
		Significance (2-tailed)	.001	.	.000	.275	.298	.000	.488	.418	.013	.000	.006	.970
		df	395	0	395	395	395	395	395	395	395	395	395	395
	I	Correlation	.194	-.291	1.000	.150	.020	.323	.135	.013	.040	.307	.003	.088
		Significance (2-tailed)	.000	.000	.	.003	.696	.000	.007	.791	.425	.000	.951	.081
		df	395	395	0	395	395	395	395	395	395	395	395	395
	EP	Correlation	.357	-.055	.150	1.000	.191	.253	-.002	.172	.025	.319	.184	.007
		Significance (2-tailed)	.000	.275	.003	.	.000	.000	.965	.001	.618	.000	.000	.890
		df	395	395	395	0	395	395	395	395	395	395	395	395
	ES	Correlation	.041	.052	.020	.191	1.000	.098	-.220	.057	.001	.044	.071	.004
		Significance (2-tailed)	.413	.298	.696	.000	.	.051	.000	.257	.990	.382	.161	.931
		df	395	395	395	395	0	395	395	395	395	395	395	395
	TTT	Correlation	.524	-.189	.323	.253	.098	1.000	.214	.232	.130	.530	.215	.129
		Significance (2-tailed)	.000	.000	.000	.000	.051	.	.000	.000	.009	.000	.000	.010
		df	395	395	395	395	395	0	395	395	395	395	395	395
	FTR	Correlation	.140	-.035	.135	-.002	-.220	.214	1.000	.414	.441	.221	-.216	.308
		Significance (2-tailed)	.005	.488	.007	.965	.000	.000	.	.000	.000	.000	.000	.000
		df	395	395	395	395	395	395	0	395	395	395	395	395
	XEN	Correlation	.235	.041	.013	.172	.057	.232	.414	1.000	.487	.166	-.121	.066
		Significance (2-tailed)	.000	.418	.791	.001	.257	.000	.000	.	.000	.001	.016	.193
		df	395	395	395	395	395	395	395	0	395	395	395	395
	IO	Correlation	.232	.124	.040	.025	.001	.130	.441	.487	1.000	.233	-.234	.179
		Significance (2-tailed)	.000	.013	.425	.618	.990	.009	.000	.000	.	.000	.000	.000
		df	395	395	395	395	395	395	395	395	0	395	395	395
	FO	Correlation	.618	-.238	.307	.319	.044	.530	.221	.166	.233	1.000	.229	.191
		Significance (2-tailed)	.000	.000	.000	.000	.382	.000	.000	.001	.000	.	.000	.000
		df	395	395	395	395	395	395	395	395	395	0	395	395
	DEF	Correlation	.233	-.137	.003	.184	.071	.215	-.216	-.121	-.234	.229	1.000	.059
		Significance (2-tailed)	.000	.006	.951	.000	.161	.000	.000	.016	.000	.000	.	.238
		df	395	395	395	395	395	395	395	395	395	395	0	395
	SWL	Correlation	.075	-.002	.088	.007	.004	.129	.308	.066	.179	.191	.059	1.000
		Significance (2-tailed)	.135	.970	.081	.890	.931	.010	.000	.193	.000	.000	.238	.
		df	395	395	395	395	395	395	395	395	395	395	395	0

Table 3: Part-in-Partial Correlations among Measures Controlling for FUND

Results

Table 1 shows zero-order correlations among all measures. All following correlations have a significance at $p < .01$. There is a slight, negative correlation between SCI and SWL $r(394) = -.131$. Although there is no statistically significant correlation between IO and SWL, IO reflection does correlate positively with SCI, $r(394) = .305$. It is also fascinating to note that FUND correlates very strongly to FOUND, $r(394) = .840$. The strongest zero-order correlations to SWL are FO and FTR, $r(394) = .290$ and r(394) = .298, respectively. Strong negative correlations exist between SCI and FUND, $r(394) = -.582$, and FOUND, $r(394) = -.566$.

Tables 2 and 3 show the part-in-partial correlations for FOUND and FUND, respectively. In support of the religious openness hypothesis (Watson et al., 2015), when controlling for FOUND, a slightly negative correlation exists between FUND and IO, $r(394) = -.386$. Also, when controlling for FUND, a slightly positive correlation exists between FOUND and IO, $r(394) = .232$. However, the other components of the initial hypotheses failed. In both cases, no significant correlations exist between FUND and SWL when controlling for FOUND, nor do significant correlations exist between FOUND and SWL when controlling for FUND.

Also, contrary to the initial hypotheses, a slightly negative correlation exists between FOUND and SCI when controlling for FUND, $r(394) = -.173$, $p < .01$. A multiple regression analysis was conducted to find a model that most accurately predicts satisfaction with life. FO and FTR were found to best predict SWL. There is a weak, positive significant correlation between FO and FTR, as seen above in Table 1. There is no statistically significant correlation between SCI and FTR. The analysis yielded the standardized coefficients $\beta_{FO} = .254$, $t(393) = 5.43$, $p < .0005$, $\beta_{FTR} = .264$, $t(393) = 5.64$, $p < .0005$, and an intercept of zero, $p < .0005$. A significant amount of the variance was accounted for by this model, $R^2 = .15$, $F(2, 395) = 35.41$,

$p < .001$. Previous accounts of variance for the prediction of Satisfaction with Life were less than 5%. Moderation and mediation effects were tested via Andrew F. Hayes' method, but the effects tested across different measures did not yield any important changes in variance. The changes in variance were very small, and this is likely the result of random error.

General Discussion

Lessons from The Present Study

Although the hypotheses did not necessarily hold, valuable knowledge has been obtained, nonetheless. There are a few plausible explanations for why the hypotheses did not hold up. First of all, this was an exploratory study intended to obtain a surface-level idea of the dynamics between religious belief and belief in science as related to mental health. To date, no such study of its kind had been performed, and as should be expected in any new field of research, the first few hypotheses may not hold up – this is after all, science. Visible failure is much more informative than blind success. For example, the measures SCI and SWL have turned out to be rather trivial measures used in understanding levels of scientific belief and understanding, and positive psychological functioning.

Levels of scientific belief range from competent to ideological, and these levels do not necessarily overlap. Someone who understands the nature of science (Gottlieb et al., 2018), i.e. someone who participates or has participated in scientific research, has a competent understanding of science. The main emphasis here is that those who participate or have participated in scientific research understand the limitations of science. Someone who believes that science is the ultimate source of knowledge (Farias et al., 2013) has an ideological belief in science. The main emphasis here is that those who have an ideological belief in science are not

necessarily required to participate or have participated in scientific research. In other words, it is not implied that an ideological belief in science correlates with a competent understanding of science (Gottlieb et al., 2018).

In regards to mental health, more recent research shows that SWL is an ambiguous measure of positive psychological functioning. Future research should utilize more robust measures such as meaning and purpose in life (Harlow, Newcomb, & Bentler, 1987; Steger, Frazier, Oishi, & Kaler, 2006; Nasiri & Jowkar, 2008). Although Diener et al. (2011) suggest that meaning and purpose in life are not main predictors of positive psychological functioning in religious samples, the measure they used to determine "meaning in life" is not structurally sound compared to measures made by other researchers (Harlow et al., 1987; Steger et al., 2006; Nasiri & Jowkar, 2008, Aghababaei et al., 2016; Nell, 2014; etc.). The majority of research suggests that meaning and purpose in life are vital in determining the relationships between religious beliefs and positive psychological functioning.

Second, the results of this study could be more indicative of sample characteristics. UTC is a public university, but the convenience sample from any university in this part of the Southeast is most likely going to reflect the general Southeast population – namely that of conservative Christians. It was surprising that IR correlated so strongly to FUND, but it is not hard to imagine that the interpretation of IR in this part of the world is synonymous with FUND. "My whole approach to life is based on my religion," is not very far, conceptually, from "The fundamentals of God's religion should never be tampered with, or compromised with others' beliefs." At least not for people in the Southeast. This is consistent with the ideas of Lun and Bond (2013) and Diener et al. (2011).

Formulating New Hypotheses

Considering that FTR and FO were the strongest predictors of SWL, this study presents evidence that in some circumstances, levels of scientific understanding may be compatible with religious belief. Cultural context must be taken into consideration. New hypotheses need to center on an empathetic understanding of the sample's cultural context. Three suggestions are made here. First, future hypotheses should utilize the implications of psychological adjustment, such as the PANAS scale (Watson, Clark, & Tellegen, 1988). Second, the importance of meaning and purpose in life needs to be incorporated into the formulation of hypotheses based on cross-ideological studies such as this one. Third, and perhaps less obviously, personality aspects need to be incorporated into hypothesis development. These hypotheses should be formed on a deeper understanding of scientific and religious personalities.

For example, according to Big Five personality traits (McCrae & Costa, 1985), openness, conscientiousness, and agreeableness are important personality characteristics of the scientific and religious (Aghababaei, 2013; Feist, 2012). It is surprising that this study found no significant correlation between FTR and SCI. Perhaps this is evidence that SCI is not a measure correlated with openness; rather, it is a measure correlated with closed-mindedness. Religious individuals can have characteristically intrinsic or extrinsic motivations for believing, and personality and cognitive style are indeed aspects of these motivations. In his seminal work, Allport (1967) said, "To know that a person is in some sense 'religious' is not as important as to know the role religion plays in the economy of his life." Scientific thinkers also have intrinsic and extrinsic motivations (Helmreich, Spence, Beane, Lucker, & Matthews, 1980; Helmreich & Spence, 1989). Just as personality aspects influence the religious believer's competency and ideology, personality aspects can influence the scientific believer's competency and ideology.

Here are some rough hypotheses formulated on the basis of past research and the present study. It is expected that competent understanding of science should positively correlate with positive psychological functioning, and ideological belief in science should weakly or negatively correlate with positive psychological functioning. Also, it is expected that competent understanding of science should positively correlate with openness, and ideological belief in science should weakly or negatively correlate with openness. Finally, competent understanding of science should positively correlate with conservative Christian beliefs, and ideological belief in science should weakly or negatively correlate with conservative Christian beliefs.

Suggestions for Future Research

Much research has been done over the past decades on the cultural phenomena of mystical experiences. Hood (1973) has shown that the intrinsically religious (rather than extrinsically religious) are more likely to self-report experiences of transcendental quality. Mystical experiences have also been shown to correlate with those who report having personality characteristics that include a breadth of interest, creativity and innovation, tolerance, and social affluence (Hood, Hall, Watson, & Biderman, 1979). Many of these characteristics represent ideal characteristics that any scientist would wish to obtain.

Indeed, many of the questions from the Mysticism scale developed by Hood (1975) could be posed toward scientists. Statements, such as, “I have had an experience in which I realized the oneness of myself with all things,” would not be so foreign to scientists who believe and have a deep understanding of the universe. Weijers (2014) described a concept called optimistic naturalism. Essentially, even a secular, non-theistic individual can see scientific optimism tied into his or her infinite consequences – some secular individuals want to believe in optimistic

progress (Farias et al., 2013). According to Lifton, people strive to find a sort of symbolic immortality, and people can do that in a few distinct ways – biologically, creatively, religiously, naturalistically, and transcendentally (1976; 1979; Lifton & Olson, 1974).

Although secular, scientific believers may deny explicitly supernatural phenomena, future research should be conducted on if and how scientists can have "mystical experiences." Scientists often experience a sense of awe and wonder in their empirical endeavors (Gottlieb et al., 2018), so perhaps scientific believers can experience the same sort of cultural phenomena, especially considering that mystical experiences can be a healthy, normal part of everyday human life. Also, based on the previously stated hypotheses, future research needs to account for the distinction between the competent understanding of science and the ideological belief in science.

Closing Thoughts

In conclusion, this present work adds to the growing body of literature that belief, at least superficially, is a healthy and normal component of positive psychological functioning. Better hypotheses have been formed to test the validity of this claim, specifically in the comparison between the competent understanding of science and the ideological belief in science. Perhaps belief is less ideologically and philosophically important as it is psychologically vital. Each holds beliefs for different, personal, social, and cultural reasons. Some beliefs are explicit and public, while other beliefs are implicit and private. Although SCI was not shown to correlate positively with SWL, there is evidence that perhaps the beliefs of certain scientific and religious personalities work similarly to provide positive psychological functioning.

Works Cited

Aghababaei, N. (2013). Between you and God, where is the general factor of personality? Exploring personality-religion relationships in a Muslim context. *Personality and Individual Differences*, *55*(2), 196–198.

Aghababaei, N. (2016). Scientific faith and positive psychological functioning. *Mental Health, Religion & Culture, 19(7), 734-741.*

Aghababaei, N., & Błachnio, A. (2014). Purpose in life mediates the relationship between religiosity and happiness: evidence from Poland. *Mental Health, Religion & Culture*, *17*(8), 827-831.

Aghababaei, N., Sohrabi, F., Eskandari, H., Borjali, A., Farrokhi, N., & Chen, Z. J. (2016). Predicting subjective well-being by religious and scientific attitudes with hope, purpose in life, and death anxiety as mediators. *Personality and Individual Differences, 90*, 93-98.

Allport, G. W., & Ross, M. (1967). Personal religious orientation and prejudice. *Journal of Personality and Social Psychology*, *5*(4), 432–443.

Altemeyer, B., & Hunsberger, B. (1992). Authoritarianism, religious fundamentalism, quest, and prejudice. *International Journal for the Psychology of Religion*, *2*(2), 113–133.

Ano, G. G., & Vasconcelles, E.B. (2005). Religious coping and psychological adjustment to stress: a meta-analysis. (2005). *Journal of Clinical Psychology*, 61(4), 461-480.

Arndt, J., Greenberg, J., & Cook, A. (2002). Mortality salience and the spreading activation of worldview-relevant constructs: Exploring the cognitive architecture of terror management. *Journal of Experimental Psychology: General, 131*(3), 307-324.

Brown, P., & Tierney, B. (2009). Religion and subjective well-being among the elderly in China. *Journal of Socio-Economics*, *38*(2), 310–319.

Dawkins, R. (1997). Is science a religion? *The Humanist, 57*(1), 26-29.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*(1)*,* 71-75.

Diener, E., Tay, L., Myers, D., & Simpson, J. (2011). The Religion Paradox: If Religion Makes People Happy, Why Are So Many Dropping Out? *Journal of Personality and Social Psychology*, *101*(6), 1278–1290.

Farias, M., Newheiser, A., Kahane, G., & de Toledo, Z. (2013). Scientific faith: Belief in science increases in the face of stress and existential anxiety. *Journal of Experimental Social Psychology*, 49(6), 1210-1213.

Feist, G. (2012). Predicting interest in and attitudes toward science from personality and need for cognition. *Personality and Individual Differences,* 52(7)*,*771–775.

Feist, G., & Gorman, M. (2013). *Handbook of the psychology of science*. New York: Springer Publishing Company, LLC.

Galen, L. W. (2018). Focusing on the nonreligious reveals secular mechanisms underlying well-being and prosociality. *Psychology of Religion and Spirituality, 10*(3), 296-306.

Gervais, W., & Norenzayan, A. (2012). Analytic thinking promotes religious disbelief. *Science, 336*(6080), 493-496.

Gorsuch, R., & McPherson, S. (1989). Intrinsic/Extrinsic measurement: I/E-revised and single-item scales. *Journal for the Scientific Study of Religion*, *28*(3), 348-354.

Gottlieb, S., Keltner, D., & Lombrozo, T. (2018). Awe as a scientific emotion. *Cognitive Science*, *42*(6), 2081-2094.

Greenberg, J., Solomon, S., & Pyszczynski, T. (1997). Terror management theory of self-esteem and cultural worldviews: Empirical assessments and conceptual refinements. *Advances in Experimental Social Psychology,* 29, 61-139.

Harlow, L., Newcomb, M., & Bentler, P. M. (1987). Purpose in Life Test assessment using latent variable methods. *British Journal of Clinical Psychology*, *26*(3), 235-236.

Haught, J. F. (2005). Science and scientism: the importance of a distinction. *Zygon*, *40*(2), 363-368.

Heine, S. J., Proulx, T., & Vohs, K. D. (2006). The meaning maintenance model: On the coherence of social motivations. *Personality and Social Psychology Review*, *10*(2), 88-110.

Helmreich, R., Spence, J., Beane, W., Lucker, G., & Matthews, K. (1980). Making it in academic psychology: Demographic and personality correlates of attainment. *Journal of Personality and Social Psychology*, *39*(5), 896–908.

Helmreich, R., Spence, J., & Pred, R. (1988). Making it without losing it: Type A, achievement motivation, and scientific attainment revisited. *Personality and Social Psychology Bulletin*, *14*(3), 495–504.

Hood, R. W., Jr. (1973). Religious orientation and the experience of transcendence. *Journal for the Scientific Study of Religion*, *12*(4), 441–448.

Hood, R. W., Jr. (1977). Eliciting mystical states of consciousness with semi-structured nature experiences. *Journal for the Scientific Study of Religion*, 16(2), 155-163.

Hood, R. W., Jr. (1975). The construction and preliminary validation of a measure of reported mystical experience. *Journal for the Scientific Study of Religion, 14*(1), 29-41.

Hood, R. W., Jr., Hall, J., Watson, P. J., & Biderman, M. (1979). Personality correlates of the report of mystical experience. *Psychological Reports*, *44*(3), 804–806.

Inzlicht, M., Tullett, A., & Good, M. (2011). The need to believe: A neuroscience account of religion as a motivated process. *Religion, Brain & Behavior*, *1*(3), 192–212.

Kay, A. C., Whitson, J. A., Gaucher, D., & Galinsky, A. D. (2009). Compensatory Control: Achieving Order Through the Mind, Our Institutions, and the Heavens. *Current Directions in Psychological Science*, *18*(5), 264–268.

Kindopp, J. (2004). Policy dilemmas in church-state relations: an introduction. In: Kindopp, J., Lee Hamrin, C. (Eds.), *God and Caesar in China* (pp. 1–24). Washington, DC: Brookings Institute Press.

Lifton, R. J. (1976). *The life of the self: Toward a new psychology*. New York: Basic Books.

Lifton, R. J. (1979). *The broken connection*. New York: Simon and Schuster.

Lifton, R. J., & Olson, E. (1974). *Living and dying.* West Port, CT: Praeger.

Lun, V., & Bond, M. (2013). Examining the relation of religion and spirituality to subjective well-being across national cultures. *Psychology of Religion and Spirituality*, *5*(4), 304–315.

MacIntyre, A. (1988). *Whose justice? Which rationality?* Notre Dame, IN: University of Notre Dame Press.

McCrae, R. R., & Costa, P. T. (1985). Updating Norman's "adequacy taxonomy": Intelligence and personality dimensions in natural language and in questionnaires. *Journal of Personality and Social Psychology, 49*(3), 710-721.

Nasiri, H., & Jowkar, B. (2008). The relationship between life's meaningfulness, hope, happiness, life satisfaction and depression. *Women Studies*, *6*(2), 157-176.

Nell, W. (2014). Exploring the relationship between religious fundamentalism, life satisfaction, and meaning in life. *Journal of Psychology in Africa*, *24*(2), 159–166.

Norenzayan, A., & Hansen, I. G. (2006). Belief in Supernatural Agents in the Face of Death. *Personality and Social Psychology Bulletin*, *32*(2), 174–187.

Pearce, M., Little, T., & Perez, J. (2003). Religiousness and depressive symptoms among adolescents. *Journal of Clinical Child & Adolescent Psychology*, *32*(2), 267–276.

Preston, J., Epley N. (2009). Science and God: An automatic opposition between ultimate explanations. (2009). *Journal of Experimental Social Psychology*, *45*(1), 238-241.

Russell, C. A. (2000). The conflict of science and religion. In G. B. Ferngren (Ed.), *The history of science and religion in the western tradition: An encyclopedia* (pp. 12-17). New York: Garland Publishing, Inc.

Rutjens, B. T., Harreveld, F. van, & der Pligt, J. van. (2010). Yes we can: Belief in progress as compensatory control. *Social Psychological and Personality Science*, *1*(3), 246-252.

Shalev, B. A. (2003). *100 Years of Nobel Prizes*. Atlantic Publishers & Distributors.

Shenhav, A., Rand, D., & Greene, J. (2012). Divine intuition: Cognitive style influences belief in God. *Journal of Experimental Psychology: General*, *141*(3), 423–428.

Steger, M., Frazier, P., Oishi, S., & Kaler, M. (2006). The meaning in life questionnaire: Assessing the presence of and search for meaning in life. *Journal of Counseling Psychology*, *53*(1), 80–93.

Streib, H., Hood, R. W., J.R., & Klein, C. (2010) The religious schema scale: Construction and initial validation of a quantitative measure for religious styles. *The International Journal for the Psychology of Religion*, *20*(3), 151-172.

Watson, D., Clark, L., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070.

Watson, P. J., Chen, Z., Ghorbani, N., & Vartanian, M. (2015). Religious openness hypothesis: I. religious reflection, schemas, and orientations within religious fundamentalist and biblical foundationalist ideological surrounds. *Journal of Psychology and Christianity, 34*(2), 99-113.

Watson, P. J., Sawyers, P., Morris, R. J., Carpenter, M., Jimenez, R. S., Jonas, K. A., & Robinson, D. L. (2003). Reanalysis within a Christian ideological surround: Relationships of intrinsic religious orientation with fundamentalism and right-wing authoritarianism. *Journal of Psychology and Theology*, *31*(4), 315–328.

Weber, S., Pargament, K., Kunik, M., Lomax, J., & Stanley, M. (2012). Psychological distress among religious nonbelievers: A systematic review. *Journal of Religion and Health*, *51*(1), 72-86.

Weijers, D. (2014). Optimistic naturalism: scientific advancement and the meaning of life. *Sophia*, *53*(1), 1–18.

Wilson, D. B. (2000). The historiography of science and religion. In G. B. Ferngren (Ed.), *The history of science and religion in the western tradition: An encyclopedia* (pp. 3-11). New York: Garland Publishing, Inc.

Wnuk, M., & Marcinkowski, J. (2014). Do existential variables mediate between religious-spiritual facets of functionality and psychological wellbeing. *Journal of Religion and Health*, *53*(1), 56–67.

Appendix I

Questionnaire

In the following questionnaire, there are seven sections that record a number of your characteristics, beliefs, and attitudes. We would like you to read carefully the instructions for each section and then respond to all items within that section. When you have decided what your response will be to any particular item, you should note the letter that corresponds to your answer and blacken the proper space on your answer sheet using a No.2 pencil. Work fairly rapidly, not brooding over any one statement too long. Except for questions about your personal characteristics (e.g. your age and sex), there are no right or wrong answers. Some people will agree, and others will disagree with each of the statements. All your answers will be kept strictly confidential. Before beginning, we would like for you to supply the following information:

A. Write **SP18SCI** on your answer sheet where it says instructor.

B. In the first column for your student number, we would like for you to indicate your gender as follows:

0. Male 1. Female

C. In the next two columns, enter your age.

D. In the next column, column 4, indicate which one of the following best describes you:

1. I am both religious and spiritual 2. I am religious but not spiritual
3. I am spiritual but not religious 4. I am neither religious nor spiritual

E. In column 5, please indicate your interest in religion on a scale from 0 (No interest at all) to 9 (Extremely interested).

F. In column 6, we would like for you to indicate your religious preference as follows:

0. Christian (Protestant, Catholic, or Orthodox) 1. Jewish 2. Buddhist
3. Hindu 4. Muslim 5. Atheist or Agnostic 6. Other

G. In column 7, indicate your race as follows:

0. African-American 1. Caucasian/White 2. Hispanic
3. Middle Eastern 4. Oriental/Asian 5. Other

H. In the last two columns, enter in the number 18 because this study is conducted in 2018.

Now begin the sections of this questionnaire. Please take care in understanding the instructions in each section. Throughout please respond to all items, and enter your responses clearly on the answer sheet.

SECTION 1

Items 1-10: For each of the statements below, please indicate to what extent the statement is characteristic of you. Please use the following scale scheme to respond.

A = I strongly disagree B = I tend to disagree C = I am not sure

D = I tend to agree E = I strongly agree

---

1. Science provides us with a better understanding of the universe than does religion.
2. "In a demon-haunted world, science is a candle in the dark." (Carl Sagan)
3. We can only rationally believe in what is scientifically provable.
4. Science tells us everything there is to know about what reality consists of.
5. All the tasks human beings face are soluble by science.
6. The scientific method is the only reliable path to knowledge.
7. The only real kind of knowledge we can have is scientific knowledge.
8. Science is the most valuable part of human culture.
9. Science is the most efficient means of attaining truth.
10. Scientists and science should be given more respect in modern society.

Go on to the next section

SECTION 2

Items 11-24: For each of the statements below, please indicate to what extent the statement is characteristic of you. Please use the following scale scheme to respond.

A = I strongly disagree B = I tend to disagree C = I am not sure

D = I tend to agree E = I strongly agree

---

11. I enjoy reading about my religion.
12. I go to church because it helps me to make friends.
13. It doesn't much matter what I believe so long as I am good.
14. It is important to me to spend some time in private thought and prayer.
15. I have often had a strong sense of God's presence.
16. I pray mainly to gain relief and protection.
17. I try hard to live all my life according to my religious beliefs.
18. What religion offers me most is comfort in times of trouble and sorrow.
19. Prayer is for peace and happiness.
20. Although I am religious, I don't let it affect my daily life.
21. I go to church mostly to spend time with my friends.
22. My whole approach to life is based on my religion.
23. I go to church mainly because I enjoy seeing people I know there.
24. Although I believe in my religion, many other things are more important in life.

Go on to the next section

SECTION 3

Items 25-51: In the next two pages, please indicate how you agree or disagree with the following claims about one's Christian belief.

A = I strongly disagree B = I tend to disagree C = I am not sure

D = I tend to agree E = I strongly agree

---

25. God has given humanity a complete, unfailing guide to happiness and salvation, which must be totally followed.

26. No single book of religious teachings contains all the intrinsic, fundamental truths about life.

27. The basic cause of evil in this world is Satan, who is still constantly and ferociously fighting against God.

28. It is more important to be a good person than to believe in God and the right religion.

29. There is a particular set of religious teachings in this world that are so true, you can't go any "deeper" because they are the basic, bedrock message that God has given humanity.

30. When you get right down to it, there are basically only two kinds of people in the world: the Righteous, who will be rewarded by God; and the rest, who will not.

31. Scriptures may contain general truths, but they should NOT be considered completely, literally true from beginning to end.

32. To lead the best, most meaningful life, one must belong to the one, fundamentally true religion.

33. "Satan" is just the name people give to their own bad impulses. There really is no such thing as a diabolical "Prince of Darkness" who tempts us.

34. Whenever science and sacred scripture conflict, science is probably right.

35. The fundamentals of God's religion should never be tampered with, or compromised with others' beliefs.

36. All of the religions in the world have flaws and wrong teachings. There is no perfectly true, right religion.

37. We should accept the Bible as God's gift to us to follow completely so that we can achieve the peace and salvation that he desires for us.

38. The Bible tells me the God offers all people an opportunity to have a special relationship with him by believing in his revealed truths and by following his laws.

Section 3 Response Options:

A = I strongly disagree	B = I tend to disagree	C = I am not sure
D = I tend to agree	E = I strongly agree	

---

39. When you get right down to it, there are two kinds of people in the world: the Righteous, sinners who have accepted the forgiveness of God, and the rest, sinners who God hopes will accept his forgiveness in the future.

40. Like Jesus, I must learn to see the signs in my life that will help me understand how Satan is fighting against God to cause evil in the world and in me.

41. God has created a universe in which punishment is the unavoidable consequence of failing to follow the love and sacrifice modeled by Christ

42. No single individual has the wisdom to recognize all truth; so, God gave us the Bible as a guide in our struggles to discover the complex truths that life presents us.

43. By taking seriously the biblical stories of Satan, God's true followers will admit the potential reality of evil in themselves and in the world, and this will encourage them to constantly fight against Satan and Satan's allies on this earth.

44. The bloodshed of human history makes it clear that evil cannot be dismissed as the effect merely of "bad human impulses." The reality of evil is captured instead in the biblical depiction of Satan as the "Prince of Darkness" who tempts us.

45. Whenever science and sacred scripture are in conflict, my faith remains firm because I am confident that both science and our understanding of the Bible will eventually confirm God's word.

46. Christ's perfect faith in God shows us the best, most meaningful life that we can aspire to in this world.

47. A loving and forgiving God has presented us with an unfailing guide to peace and salvation, and our goal should be to follow it totally.

48. To take responsibility for myself, I must remember that Satan was able to enter into Judas and that he is fighting ferociously against God to cause all evil in the world and in me.

Section 3 Response Options:

A = I strongly disagree B = I tend to disagree C = I am not sure

D = I tend to agree E = I strongly agree

---

49. The atrocities of 20th Century history should convince us that the Bible is right about the reality of Evil and about our responsibility to constantly fight against Satan and Satan's allies on this earth.

50. God's hand is in all creation and in all truth; so, conflicts between faith and science should not frighten us, but rather should inspire us to seek God's truth.

51. Only by accepting the love and forgiveness that God has given us through Christ can we achieve the best and most meaningful life that is available in this world.

Go on to the next section

SECTION 4

Items 52-66: Please indicate how you agree with the following statements about your beliefs.

A = I strongly disagree B = I tend to disagree C = I am not sure

D = I tend to agree E = I strongly agree

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52. What the texts and stories of my religion tell me is absolutely true and must not be changed.
53. When I make a decision, I look at all sides of the issue and come up with the best decision possible.
54. We can learn from each other what ultimate truth each religion contains.
55. When people want to know how the world came to be, they need to hear a creation story.
56. Although every person deserves respect and fairness, arguments need to be voiced rationally.
57. We need to look beyond the denominational and religious differences to find the ultimate reality.
58. When I have to make a decision, I take care that my plans are acceptable by my religious teachings.
59. We should resolve differences in how people appear to each other through fair and just discussion.
60. When I make a decision, I am open to contradicting proposals from diverse sources and philosophical standpoints.
61. The stories and teachings of my religion give meaning to the experiences of my life and reveal the unchangeable truth about God or the Divine.
62. Regardless of how people appear to each other, we are all human.
63. Religious stories and representations from any religion unite me with the ultimate universe.
64. The teachings of my religion offer answers to any question in my life, if I am ready to listen.
65. It is important to understand others through a sympathetic understanding of their culture and religion.
66. The truth I see in other world views leads me to re-examine my current views

Go on to the next section

SECTION 5

Items 67-78: The following statements ask about your opinion towards the religious belief.

A = I strongly disagree B = I tend to disagree C = I am not sure

D = I tend to agree E = I strongly agree

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67. Faith in Christ is what nourishes the intellect and makes the intellectual life prosperous and productive.

68. My practice in Christianity is an inner reflection of my faith.

69. Questioning life leads to answers, which ultimately lead to the truth.

70. The Bible does not reveal all the essential truth or facts about life and God and that is why God has blessed us with our intellect.

71. I believe as humans we should use our minds to explore all fields of thought from science to metaphysics.

72. In search of knowledge, one should resort to all methods, be they experimental or rational.

73. Studying nature and the universe would reveal treasures of knowledge and truth.

74. Understanding science and the Bible helps one to realize that God exists.

75. I believe that through science and religion one can really understand the meaning of life.

76. I have always held religious beliefs similar to the ones I hold now -- I have never had times of doubt or questioning.

77. Based on what I've heard or read, I have come to the conclusion that Christianity is the right religion for me.

78. I have seriously thought about my religious beliefs and I am very committed to the faith I now have.

Go on to the next section

SECTION 6

Items 79-95: Please indicate how you agree or disagree with the following claims about one's Christian or religious belief.

A = I strongly disagree B = I tend to disagree C = I am not sure

D = I tend to agree E = I strongly agree

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79. Reason is a weapon that the culture uses to destroy faith.

80. Secular commitments to reason and open-mindedness are a ploy to purge our laws of the essential foundations that they must have in God.

81. Pressure to be reasonable is a wedge that the culture tries to drive between us and our faith.

82. Science, philosophy, and so-called "rationality" rest upon a sinful human pride that seeks to weaken Christian faith.

83. Cultural demands that we be reasonable are just a way to destroy biblical definitions of marriage.

84. Reason cannot be trusted, only faith can.

85. In their confused commitment to reason, intellectuals are unable to avoid the deeply mistaken notion that the creation of humanity is based upon so-called scientific facts.

86. Secularist beliefs urge the use of reason and open-mindedness in political life because the real motive is to destroy our religious beliefs.

87. The secular demand that we be reasonable is a strategy to get us to reject our faith when it conflicts with science.

88. The government should determine what a marriage entails based upon the Bible and not upon reasoning about sexuality and nature.

89. The true Christian can put no trust at all in reason, science, and philosophy.

90. Secular evaluations of whether a pregnancy makes sense are just one example of how beliefs based upon reason destroy the life-affirming beliefs of our faith.

91. Our culture uses reason to attack prayer in public settings and to disparage our Christian faith more generally.

Section 6 Response Options:

A = I strongly disagree B = I tend to disagree C = I am not sure

D = I tend to agree E = I strongly agree

---

92. Reason is an enemy of faith and must be rejected.

93. Intellectuals use reason to undermine our Christian sense of right and wrong.

94. The demands of culture and reason to base beliefs on science must be rejected as incompatible with religion.

95. The theory of evolution is an example how science and reason are dedicated to eliminating faith.

Go on to the next section

SECTION 7

Items 96-100: Please indicate how you agree with the following statements about your life.

A = I strongly disagree B = I tend to disagree C = I am not sure

D = I tend to agree E = I strongly agree

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96. In most ways my life is close to my ideal.
97. The conditions of my life are excellent.
98. I am satisfied with my life.
99. So far I have gotten the important things I want in life.
100. If I could live my life over, I would change almost nothing.

Stop! Thanks for your help!!!!

Appendix II

Informed Consent Letter

Dear Participant,

You are being asked to participate in a research project involving an examination of relationships between certain commitments and beliefs you may have. Your participation in this project is completely voluntary. You may discontinue your participation in the project at any time without penalty if you decide for any reason that you do not want to continue, and if you do so, any data you have entered in on the research materials will be thrown away. Involvement in this study will be a useful learning experience that will help you better understand the research process in psychology. It should take no more than 40 minutes to finish the survey questionnaire.

If you do choose to participate, your participation will be completely confidential. You will enter your responses to the questionnaire on a scantron sheet on which you will not indicate who you are; so, your responses will never be linked to you personally. In fact, these scantron sheets will be read by electronic scanning equipment into a computer data file and later destroyed. This data file will not include any information identifying you as an individual. In other words, to emphasize the main point once again, your responding will be completely confidential.

The questionnaire will present you with psychological scales, many of which have been widely used with undergraduate participants by social and personality psychology researchers in this country and elsewhere. There really are no risks associated with filling out this questionnaire, but some of the items may refer to characteristics and beliefs about which you may feel strongly. If you have any concerns or experience any discomfort about the issues raised by these questions, please contact the UTC Counseling Center at 425-4438. If you have any questions about the nature of this project, you may also call Dr. Paul J. Watson at 423-425-4291. This project has been approved by the University of Tennessee at Chattanooga's Review Board for Protection of Human Subjects. If you have any questions about your rights as a subject/participant in this research, or if you feel that you have been placed at risk, you can contact the IRB Committee Chair Dr. Amy Doolittle, at 423-425-5563. Additional contact information is available at www.utc.edu/irb.

A copy of the results of this survey, reported in aggregate form, will be available upon the completion of this project, if you would like to see it. You may obtain a copy of these results from Dr. Paul J. Watson after May 2019.

By signing this form, you are expressing agreement with the following statement: "I have read this consent form, and by my signature, I voluntarily agree to participate and confirm that I am at least 18 years old." Thanks for your help!!!

Sincerely,

Jordan Madrigal, UTC Honors Student
Dr. Paul J. Watson, UTC Professor of Psychology

Name (Print):_____ Signature:_____

Student ID: _____ Date: _____

Appendix III

IRB Approval: Exemption Letter

THE UNIVERSITY OF TENNESSEE CHATTANOOGA

Institutional Review Board
Dept 4915
615 McCallie Avenue
Chattanooga, TN 37403
Phone: (423) 425-5867
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instrb@utc.edu
http://www.utc.edu/irb

TO: Jordan Madrigal
Dr. Paul Watson

IRB # 18-099

FROM: Lindsay Pardue, Director of Research Integrity
Dr. Amy Doolittle, IRB Committee Chair

DATE: 9/5/2018

SUBJECT: IRB #18-099: Compatibility of Conservative Christian Beliefs with Beliefs in Science

Thank you for submitting your application for exemption to The University of Tennessee at Chattanooga Institutional Review Board. Your proposal was evaluated in light of the federal regulations that govern the protection of human subjects.

Specifically, 45 CFR 46.101(b) identifies studies that are exempt from IRB oversight. The UTC IRB Chairperson or his/her designee has determined that your proposed project falls within the category described in the following subsection of this policy:

46.101(b)(2): Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Even though your project is exempt from further IRB review, the research must be conducted according to the proposal submitted to the UTC IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit an Application for Changes, Annual Review, or Project Termination/Completion form to the UTC IRB. Please be aware that changes to the research protocol may prevent the research from qualifying for exempt review and require submission of a new IRB application or other materials to the UTC IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite our best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the UTC IRB as soon as possible. Once notified, we will ask for a complete explanation of the event and your response. Other actions also may be required depending on the nature of the event.

Please refer to the protocol number denoted above in all communication or correspondence related to your application and this approval.

For additional information, please consult our web page http://www.utc.edu/irb or email instrb@utc.edu.

Best wishes for a successful research project.