Spirituality, Naturalism, and Agnosticism:
Investigating the Principles and Benefits of Worldviews in Psychology

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Declaration

I declare that this report does not incorporate without acknowledgment any material previously submitted for a degree in any University, College of Advanced Education, or other educational institution, and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text. I further declare that the ethical principles and procedures specified by the Swinburne University Human Research Ethics Committee have been adhered to in the preparation of this report.

Oliver Holmes
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Worldviews are systems of beliefs about the essential nature of reality. Despite longstanding recognition from philosophers and psychologists, the worldview concept has been largely overlooked as a central focus in contemporary psychological research (Koltko-Rivera, 2004). This is partly due to the conceptual scope of the worldview concept, which, though challenging, could act as a force of integration between the many sub-disciplines of psychology, adding explanatory and predictive power to its models (Koltko-Rivera, 2004, 2006b; Nilsson, 2013, 2014). The current thesis aimed to further clarify the principles of worldviews in psychology, particularly their integration with trait models of personality, and their relevance to clinical psychology. In line with these overarching goals, the current thesis examined how worldviews could theoretically and psychometrically fit in personality psychology, how they were associated with cognitive tendencies, and how they were associated with well-being outcomes. To do this, three constructs were used to represent distinct worldviews – spirituality, naturalism, and agnosticism.

In order to investigate the relationship between worldviews and personality traits, two online studies, one using exploratory factor analyses ($N = 412$) and another using confirmatory factor analyses ($N = 1056$), were conducted to develop a psychometrically robust inventory to measure spirituality, naturalism, and agnosticism as amalgamations of both worldview beliefs and personality traits. The statistically elucidated structure of these constructs provided psychometric information about how worldviews and traits associate in personality. Second, these constructs were administered alongside a measure of the Big 5 personality trait domains so that observations could be made about the relationship of worldviews to personality as it is widely represented.

A third online study ($N = 816$) used path analyses to test the relationship between worldviews and cognition, and between worldviews and well-being. First, this study tested
how much variance in spirituality, naturalism, and agnosticism could be explained by the
tendency to use certain cognitive processes. For example, how much variance in spirituality
was due to differences in anthropomorphising (e.g., Shermer, 2011). Second, the study tested
the influence of spirituality, naturalism, and agnosticism on well-being. Variables were
selected to cover an extremely comprehensive model of well-being that included both
personal and collective domains.

The outcomes of this project contributed to worldview psychology as it relates to both
theoretical and clinical domains of psychology. First, by adding support to the theoretical and
empirical fit of worldviews in personality alongside traits. Second, by adding empirical
support to the associations between worldviews, cognition, and well-being. Not only did this
help to clarify theoretical principles of worldview psychology in general, it also had
implications for how clinical psychology might engage with the cognitive tendencies of
clients to modify worldviews towards specific well-being goals.

As well as the contributions made to worldview psychology, the current thesis also
contributes to the psychology of religion and spirituality. Elucidation of the spirituality
construct, and empirical investigation of its relationship with cognition and personality
addressed a longstanding need for integration between the disparate lines of research within
the psychology of religion and spirituality, as well as between this discipline and other areas
of psychology (Hill & Gibson, 2008; Mahoney & Shafranske, 2013). Results also introduced
relatively new findings regarding naturalism and agnosticism in these areas. The inventory
developed and validated in the current project measures worldview beliefs and behavioural
traits representing spirituality, naturalism, and agnosticism, and is a largely unique
psychometric tool that will be useful for further research in the psychology of religion and
spirituality.
The current thesis is organised into two parts. Part One begins with Chapter One, a description of the psychology of worldviews. Chapter Two explains how worldviews can be integrated with trait theory in order to represent personality constructs comprehensively. Chapter Three offers a theoretical description of three particular constructs – spirituality, naturalism, and agnosticism – each inclusive of both worldviews and traits. Chapter Four then reports the findings from Studies 1 and 2, which together developed a psychometric inventory for these three constructs, and tested them alongside the Big 5 personality domains.

Part Two begins with Chapter Five, which discusses the associations between worldviews and cognition, both generally and also in relation to spirituality, naturalism, and agnosticism. Chapter Six discusses worldviews and well-being, again in general and in relation to those three constructs. Chapter Seven reports findings from Study 3, which investigated how spirituality, naturalism, and agnosticism were associated with specific cognitive variables and well-being outcomes. Finally, Chapter Eight discusses the implications of the current findings, in terms of contributions to worldview psychology as an emerging sub-discipline, and also in relation to the repercussions that comparative benefits of different worldviews might have for clinical psychology.
PART ONE: WORLDVIEWS IN PERSONALITY
Chapter One: Worldview Psychology

“A central model of the universe hovers continuously in our minds, if not consciously then unconsciously, whether magical, theological, or scientific. It influences the form the central model of man takes.”

~ Moreno, 1955

1.1 Introduction

It is difficult to overstate the breadth of the worldview concept. Worldviews are structures of beliefs that relate to the fundamental nature of reality, and so the term can encapsulate both individual and collective relationships with reality – defining conceptual borders around psychological and cultural belief systems, as well as the core axioms of those systems – from the foundational to the most superordinate philosophical postulates held by persons and groups. Therefore, to speak of worldviews is to evoke a concept that can be studied from nearly any framework of social science or humanities.

Even specifically from a psychological perspective, the concept of worldviews spans many facets of the individual, such as intellect, personality, motivation, and neurology, and covers multiple levels of social psychology, such as collective, societal, and cultural domains (Koltko-Rivera, 2006). This broad conceptual scope makes the worldview concept challenging to define comprehensively using any current frameworks within psychology, which might explain why it has been largely overlooked as a central construct in contemporary psychological research (Koltko-Rivera, 2004). However, the conceptual breadth hints that worldviews have good potential for explaining and predicting a great deal of variance in human experience across multiple contexts if they can be systematically studied (Koltko-Rivera, 2004; Nilsson, 2013).
To move forward with a formal psychology of worldviews, clear and shared understandings are needed about the nature of the concept, and its relationship to already substantiated sub-disciplines in psychology. Koltko-Rivera (2004, 2006a, 2006b) and Nilsson (2013, 2014) both offered clear defining features of the concept of worldviews. Furthermore, Nilsson showed that worldview constructs fit logically and usefully into personality psychology alongside trait theory, adding explanatory power and improving the standing of theoretical and philosophical problems inherent to trait theory.

This first part of the current thesis begins with a chapter that defines worldviews in psychology, and provides a brief history of the concept as it developed in philosophy and eventuated in recent empirical research agendas. Chapter Two then explains how the concept of worldviews can be incorporated into personality models alongside traits, in order to represent personality more logically and comprehensively, and resolve dissonance at the philosophical and methodological foundations of the trait approach to personality. Chapter Three then defines three constructs – spirituality, naturalism, and agnosticism – and explains how they can be most accurately represented as an amalgamation of both worldview beliefs and traits. Chapter Four then uses empirical research to develop and validate a psychometric inventory for these three constructs, using quantitative data to support claims about the relationship between worldviews and traits, and between these constructs and the Big 5 model of personality.

1.2 Definition of Worldviews

Like many constructs in psychology, the term “worldview” is often used without the strict defining characteristics needed for a systematic investigation. Whether colloquially or within psychological science, the term worldview is usually used to denote a generalised personal meaning, or a unique existential perspective held by an individual. As Karl Jaspers
(cited by Webb, 2009) explained, this general use of worldview can be separated into objective and subjective poles. That is, the concept of an individual worldview can include the objective beliefs that people hold about the world, and also the subjective ways that the worldview actually informs their perception and interpretation of the world.

Koltko-Rivera's (2004) theoretical work offered a slightly collapsed version of the objective and subjective poles of worldview concept. In his model, Koltko-Rivera defined worldviews from the objective pole, as structures of specific beliefs about the nature of reality. However, he suggested that stimuli from the environment are mediated by these structures of belief before they are activated as moments of subjective experience. So while we can proceed with Koltko-Rivera’s definition of worldviews as mental content rather than perceptual process, this is not without acknowledging their role in shaping individual perceptions of the world. In fact, it is only in defining worldviews strictly according to their objective content that uncompounded testing can be done regarding their relationships with specific cognitive processes. So defining worldviews as structures of belief may actually lead to a greater appreciation of the impact of worldviews on experiential processes.

Worldview can be best understood as a structure of categorically specified beliefs. Not only have worldviews been largely ignored in psychological research, but also the concept of belief itself has been at the background of theory, often referred or inferred to, but rarely defined or explained. Hume (1748) initially demonstrated the difficulty in differentiating ideas and beliefs. A seemingly automatic process associates some phenomena with a felt quality of importance, vividness, rigidity and endurance, and a strong force of influence over behaviour. These vivid, enduring, influencing ideas are beliefs, and “by the time we have reached adulthood we have tens possibly hundreds of thousands of beliefs concerning what is or is not true and beautiful and good about the physical and social world in which we live” (Rokeach, 1973, p. 1). The systematic study of beliefs suggests that they
exist as inferable structures within each person, organised into an integrated system that can
be measured, described in terms of generalisable principles, and related to overt behaviour.
Thus, “a belief system represents the total universe of a person’s beliefs about the physical
world, the social world, and the self… analysed in terms of subsystems of varying breadth or
narrowness” (Rokeach, 1973, p. 123). Worldviews are one such subsystem, comprised of
beliefs that relate to the fundamental nature of reality.

Like all beliefs, worldview beliefs can be either existential, evaluative, or prescriptive,
that is, concerning what exists, what is good, and how we should act (Koltko-Rivera, 2004;
Rokeach, 1973). All beliefs essentially can fall into these three categories, but worldview
beliefs are differentiated by making presuppositional claims about reality, in other words,
claims that cannot be reduced to more fundamental components. *Existential* worldview
beliefs describe entities thought to exist in the world, or the nature of what can be known or
done in the world, for example, “there really is such a thing as free will” (Koltko-Rivera,
2004, p. 5). In other words, existential worldview beliefs are ontological, concerning what
exists and where it came from (Vidal, 2012). *Evaluative* worldview beliefs are axiological,
concerning abstract value judgments such as “human nature is basically good” (Koltko-
Rivera, 2004, p. 5; Vidal, 2012). *Prescriptive* worldview beliefs concern how people should
exist and act in the world, for example, “the thing to do in life is live in the moment” (Koltko-
Rivera, 2004, p. 5). Prescriptive worldview beliefs are predictive, in that they involve a
model of the future, and also praxeological, in that they involve a personal theory of action
(Vidal, 2012).

As previously explained, although worldview beliefs are either existential, evaluative,
or prescriptive, they are further defined by their presuppositional content. Various
philosophers and psychologists have worked to identify the distinct dimensions that
worldviews might inform, that is, different categories of irreducible claims about the nature
of reality. Recently, Koltko-Rivera (2004) reviewed the major 20th century interpretations of the worldview construct, and used the work of earlier thinkers such as Freud to develop a collated list that arranges different dimensions of worldview beliefs into seven groups based on their subject matter. The human nature group comprises beliefs about human morality, mutability, and complexity. The will group comprises beliefs regarding the existence of free will, personal agency, determinism, and intrapsychic foundations of human behaviour. The cognition group comprises beliefs about valid sources of knowledge, as well as about the most desirable relationship between consciousness and ego. The behaviour group comprises beliefs concerning appropriate behaviour, the source and scope of moral codes, and the factors that may or may not influence life outcomes. The interpersonal group comprises beliefs regarding proper and natural characteristics of interpersonal relationships and collectives. The truth group comprises beliefs about the existence and accessibility of absolute, objective truth. Finally, the world and life group comprises beliefs about ontology, cosmology, the existence of deities and nature-consciousness, the relationship between humans and nature, the existence of intrinsic universal justice, the proper attainment of well-being, how reality can best be explained, and the value and purpose of life in general.

Although upcoming research might indicate changes to the dimensions of this collated model, we can understand worldviews to be amalgamate structure of beliefs within these sort of categories.

The important quality about these categories is that they focus on what Sire (2004) called prime reality. Worldview beliefs amount to an ontological and epistemological position that provides a framework of what reality consists of, the types of knowledge we can have, and the behaviours that are possible and desirable (Koltko-Rivera, 2004; Sire, 2004). In other words, worldview beliefs make claims about reality as an irreducible phenomenon, and so when we speak of worldviews, we speak of those beliefs that make claims about the
qualities of reality in the ultimate sense, claims that set the foundation for all experiences. This also means that worldview beliefs are essentially unprovable. Worldviews are fundamental positions about irreducible aspects of reality, and therefore there is no room for them to be directly supported by other claims. Worldview beliefs are the statements that appear at the end of a philosophical regress, as Sire (2004) noted, when we are forced to say about the ultimate conditions of reality, “that’s just the way it is” (p. 18). It is important to note that, despite their unprovable nature, most people feel that their worldview is objectively accurate. That is, even though worldview beliefs emerge somewhat arbitrarily from unconscious cognitions, cultural and environmental circumstances, and volition, “it is in the nature of a given worldview that it appears to be The Truth” (Koltko-Rivera, 2006, p. 6).

Having said that, worldviews beliefs are formed from experiences and general principles of cognition, they do not appear out of a vacuum. This presents an interesting paradox about worldview beliefs that will be explored in further detail later on. However, it is important to appreciate even while defining worldviews that they are made possible from tangible experiences that give rise to abstract cognitions, and yet then become superordinate by providing a bounded framework around what can exist, what can be known, and how we should live. For example, the concept of mortality can be seen as a prerequisite for the worldview belief in reincarnation, and yet the belief in reincarnation then sets conceptual boundaries around the idea of mortality. Worldviews occupy a top-down and bottom-up position in psychology, in that they are informed by and influential over the interpretation of experiences of the world.

1.2.1 Worldviews and Schemas

So far, worldviews have been described as structures of belief that are informed from bottom-up experiences in the world, and then act as mediators that have a top-down influence
over perception. This places worldviews close to schemas, a concept representing mental structures of thoughts, feelings, and behaviours that are shaped by and then help to organise experience (Beck, Rush, Shaw, & Emery, 1979; Koltko-Rivera, 2004; Nevid, 2007; Norman, 1981; Piaget, 1955, 1972; Plant & Stanton, 2013). Koltko-Rivera (2004) conceded that scholars may still choose at this point to assimilate the concept of worldviews into schema theory, as hierarchically superordinate schemas. However, he also explained how worldview beliefs can be conceptually differentiated from schemas in several ways. The next several paragraphs will contest Koltko-Rivera's distinctions, to aid in arriving at clearer definition of worldviews in psychology. Ultimately it will be argued that worldview beliefs are specific types of information that can be assimilated into schema theory, so long as they retain their defining characteristics in doing so.

Koltko-Rivera's (2004) first distinction between worldviews and schemas was that schemas incorporate concrete, everyday objects and actions, whereas worldview beliefs concern abstract and hypothetical concepts. This distinction is not particularly supported by contemporary models of schemas, which describe them as structures of mental representations of physical objects, events, and actions, as well as ideological and highly abstract information (Norman, 1981; Plant & Stanton, 2013). Some scholars have criticised this development, claiming that the concept of schemas has been broadened “too far beyond its original scope” (Koltko-Rivera, 2004, p. 25). Though the current author is of the opinion that the usefulness of schema theory comes in part from its breadth, the argument is essentially irrelevant to the problem of defining worldviews. Worldviews are beliefs about reality at the highest level of abstraction, concerning presuppositional information about the nature of reality. For those that choose to treat the concept of schemas as organisational structures of both embodied and abstract information, worldview beliefs would represent the most superordinate pieces of abstract information in those hierarchical structures.
Koltko-Rivera's (2004) second and third distinctions between worldviews and schemas were that (a) schemas are formed by generalisations from direct experiences, whereas worldview beliefs are formed by cultural transmission and culturally mediated abstraction from personal experience; and (b) schemas involve a monopolar structure, whereas worldview beliefs involve a multipolar structure. Although these two observations are useful descriptive qualities of worldview beliefs, they do not clearly distinguish worldview beliefs from schemas. The further a mental representation is removed from direct sensory experiences, the more it is interpreted through cultural relevancies (Bloom, 2007; Neuman, Turney, & Cohen, 2012). Additionally, increasingly abstracted concepts have a larger potential for multipolarity, as they are based on self-referential boundaries rather than tangible observations of physical stimuli. For example, it would be much more difficult to define the degree to which a phenomenon fits the abstract concept of “democracy” than it would be to define the degree to which a phenomenon fits the concept of “chair,” and yet a person’s concept of democracy does not constitute a worldview belief. The probability that schemas are culturally influenced and multipolar increases as they relate to increasingly abstract concepts. Cultural influence and multipolarity are valid features of worldview beliefs, but these observations do not offer a fixed line between worldview beliefs and other schemas. Koltko-Rivera's (2004) fourth distinction between worldview beliefs and schemas was that worldview beliefs are much more difficult to disconfirm. To illustrate this, he compared the schema “trains have wheels” to a worldview belief regarding the character of God (p. 27). The increased difficulty in disconfirming the second example lies in the somewhat intangible concept of God. People with different attitudes towards religion frequently attempt to disconfirm beliefs regarding the character of God; however, unlike exposing a person to a
bullet train with no wheels, their linguistic attempts at disconfirmation are simply not considered proof enough by the holder of the worldview belief.

However, there are abstract concepts that contain this ambiguity without reaching the presuppositional level of worldview categories. Consider Koltko-Rivera's (2004) example of a schema structure in which “writing a psychology journal article” includes the subordinate schema “reviewing the literature” (p. 25). We might restate this schema as “writing a psychology journal article involves reviewing the literature” (linguistically similar to “trains have wheels”). To disconfirm this schema would be extremely difficult, because the holder of the belief could simply argue that a psychology journal article written without a review of the literature is not actually a true psychology journal article. The more abstract a schema becomes (i.e., the less it relates to physical observations), the more it depends on subordinate semantic definitions for existence (Neuman et al., 2012). To disconfirm worldview beliefs would require a restructuring or abandonment of supporting semantic definitions – but the same can be said of particularly abstract schemas. The ease of disconfirmation depends on the degree of abstraction in the specific schema under question. There are schemas that are not definable as worldview beliefs, but that are abstract enough that disconfirmation would require a thorough restructuring of specific mental representations of the world.

Finally, Koltko-Rivera's (2004) fifth distinction was that, when compared to schemas, worldview beliefs are much more likely to trigger catastrophic and potentially transformative experiences if they are disconfirmed. Though empirical studies will probably support the truth of this statement, the potential consequences of disconfirming schemas and worldviews are not defining characteristics of their concepts – in fact, to define worldviews according to their potential impacts would confound studies that might seek to test these systematically. To take this notion even further, though it seems acceptable to understand worldview beliefs as superordinate pieces of information in schematic hierarchies of information about the
world, it is probably important that worldview beliefs are thought to stand alongside but not include behavioural and affective components. In the same way that worldview beliefs are defined according to their semantic (i.e., conceptual) content rather than their role in cognitive/perceptual processes, it seems helpful that they are differentiated from embodied and affective information, in order that the relationships between these domains might be investigated without confusion.

Insomuch as scholars are already inclined to accept the concept of schemas as a broad organisational structure of both embodied and ideological information, there do not seem to be valid protests for excluding worldview beliefs from assimilation into these structures as superordinate pieces of semantic information. What firmly distinguishes worldview beliefs from other types of schematic information is that they comprise only existential, evaluative, and prescriptive beliefs, which must be presuppositional, that is, they must concern fundamental and irreducible statements about the nature of reality (Kluback & Weinbaum, 1957; Koltko-Rivera, 2004; Naugle, 2002; Rokeach, 1968, 1973; Sire, 2004). Although worldview beliefs are superordinate, and therefore have an impact on other cognitions, they themselves seem subject to the organisation and activation principles that have been described as schematic. Arguments against the broad use of the schema concept do not concern worldview psychology much more than any other domain so far assimilated into schema theory. In defining worldview beliefs, it seems most helpful to show that they do have a particular place in schematic structures – as semantic presuppositions about reality at probably the highest level of hierarchical abstraction.

1.2.2 Worldview Psychology and Existential Psychology

There are obvious similarities between worldview and existential psychology, as both disciplines place under scrutiny the most fundamental beliefs that people posit about reality.
Although its perspectives are rooted in the work of postmodern philosophers, existential psychology arose more as a therapeutic method than a body of scientific knowledge, when various practitioners observed and worked with neuroses stemming from their clients’ confrontation with the largest problems of existence – such as death, freedom, existential isolation, and meaninglessness (Yalom, 1980). While existential psychology and worldview psychology are somewhat similar in their subject matter, there are some major differences in the way that they approach fundamental beliefs in psychology.

Existential psychology, which arose out of the phenomenological and existential philosophical movements, is largely experiential in that it primarily focuses on the confrontation that people can have with reality experientially. From the perspective of existential psychology, worldview beliefs would be considered as defences that prevent reality from being experienced in phenomenological starkness. Belief in the existence of an all-powerful deity or a personal afterlife, for example, would be seen as strategies for people to avoid distress caused by the awareness that one is essentially an isolated consciousness that will inevitably die (Yalom, 1980). Existential psychology is primarily concerned with the therapeutic process of confronting the nature of reality without these defences. It is clear that worldview beliefs form a part of existential psychology, insomuch as existential psychology deals with the fundamental beliefs that people generate in response to existential concerns.

However, worldview psychology extends further than being simply a catalogue of possible existential defences. First, worldview psychology is primarily an investigative discipline of psychology, which aims to test the structure and impact of worldview beliefs empirically. Second, while existential psychology might see worldview beliefs as psychological buffers against distress caused by existential dilemmas, worldview psychology would see the perceived reality of those dilemmas as worldview beliefs. For example, existential psychology posits that underneath individual defences reality is ultimately
groundless – this belief in groundlessness is a worldview belief. So worldview beliefs can be seen as a buffer against existential distress, and yet the axioms of existential psychology can also be seen as a selection of worldview beliefs that are not elevated above others in terms of their claim to being “really” real.

1.2.3 Worldview Psychology and Ontological Neutrality

The above section argues that, in contrast to existential psychology, worldview psychology cannot take a philosophical stance against the ontological reality of some beliefs. Ideally, it would offer no stance at all (not even agnosticism) with regards to the truth of worldview domains, so that their structure and impact can be studied without bias. In practice, however, axioms must be set in place for worldviews to be studied methodologically. These assumptions range from the theoretical (e.g., that worldview beliefs exist and are inferable) to the epistemological and prescriptive (e.g., that empirical science can provide accurate information about worldviews). Taking these sets of assumptions, the current thesis uses an empirical psychometric approach. It is important to recognise two boundaries around this type of investigation. First, the project aims to use empirical data to find the most plausible answers to questions regarding the principles and benefits of worldviews as they are reported by individuals. It cannot use any data to comment on the ontological truth of any worldview claims. Second, no part of the project excludes non-empirical or non-psychometric forms of investigating worldview beliefs. In recognising these boundaries, the current study is able to use an approach founded on some scientific worldview assumptions in order to provide insight into worldviews more generally. Worldview psychology as a whole would contain information gathered from approaches with various methodologies and foundational assumptions.
1.3 A Brief History of Worldview Theory

The study of worldviews has an extensive and diverse history. Theories about fundamental beliefs and their impacts have pervaded human thought since early history. Worldview theories have been carried through ancient societies, romantic philosophy, through classical and now modern psychological science. Even as far as 2500 years ago, oriental philosophers observed that thoughts create representations of the world that have a profound impact on experience (Koltko-Rivera, 2004). In the West, the Ancient Greek philosopher Plato and his student Aristotle both included in their philosophical systems the notion that experience was divided into the products of senses, or material objects, and Forms, which represent immaterial concepts and ideas (Frame, 2007). Plato, like the oriental philosophers, argued that material experience was subordinate to immaterial, mental representations of objects.

It was not until German philosophical romanticism that the term *weltanschauung* (worldview) was introduced. Immanuel Kant, a widely influential Prussian thinker, is generally credited with coinage of the term (Naugle, 2002). Kant’s use of the word *weltanschauung*, as well as similar terms that generally refer to the contemplation of the sensory world, was somewhat offhand. However, it was coined within the delivery of a philosophy that emphasised the metaphysical contents of consciousness that made comprehension of material objects possible. Thus, his use of the term *weltanschauung*, though conceptually tied to the mental consideration of purely sensory information, was linked to a framework that made further exploration of worldviews possible, by highlighting the fundamental mental structures that underlie all experience (Naugle, 2002).

After Kant, the idea of worldview was carried into many areas of European academia in general, eventually becoming in 19th century Europe a concept that was difficult to detangle from the idea of philosophy itself (Naugle, 2002). Various prominent thinkers
helped to shape the term worldview, until it began to signify a conceptualisation of the world that was increasingly distinct from purely sensory perception. The spreading of the term *weltanschauung* into different European languages illustrated this more generalised meaning, in that translations explicitly began to account for the fact that worldview referred to metaphysical, intuitive, and attitudinal relationships with the world and life in general, often inferring personal ideas about the overall conception and meaning of existence (Naugle, 2002). No longer was the concept of worldview limited to the interpretation of sensory experience, but instead became explicitly used to denote a psychological structure that orientated individuals to reality as a whole.

European idealist and romantic philosophers eventually acknowledged the concept of worldview as a fundamental structure of existential and moral beliefs that shape the way people understand and behave within the world generally – influencing every thought and behaviour. One exemplar of this shift is Wilhelm Dilthey, whose work in the second half of the 19th century presented the worldview concept as a foundational framework for comprehensively examining the relationship between mind and reality (Kluback & Weinbaum, 1957; Naugle, 2002; Sire, 2004). Similar to the existentialists, Dilthey suggested that the course of life confronts every person with a set of unchanging challenges, such as the inevitability of death and the suffering inherent in the natural world, and each person creates subjective beliefs in response to these objective problems. The concept of worldviews then focused on fundamental orientations towards reality as a whole.

Although brought about by universal life experiences, Dilthey suggested that worldviews develop differently depending on individual and cultural variations (Kluback & Weinbaum, 1957; Naugle, 2002; Sire, 2004). This relativism of worldviews was a topic that Dilthey explored broadly in his writings. The idea was communicated somewhat more directly by philosopher Friedrich Nietzsche, who argued that different people can hold
mutually exclusive worldviews with the same claim to validity (Koltko-Rivera, 2004; Naugle, 2002; Sire, 2004). The very existence of contrasting worldviews reflected their somewhat arbitrary nature. Other famous philosophers, such as Ludwig Wittgenstein and Michel Foucault, also embraced the postmodern relativism that worldview theory insinuated (Sire, 2004). Still today, the topic of worldviews has been largely ignored in English speaking countries, and it has been argued that this is at least partly due to the personal and professional ramifications of acknowledging the arbitrariness of any specific worldview (Koltko-Rivera, 2004). There are difficulties in scientists and theologians approaching a concept that undermines the validity of presuppositions that their professions are based on.

In the modern West, the concept of worldviews was more readily accepted by theologians rather than scientists (Naugle, 2002). In response to criticisms of Christianity as being too ideologically contradictory, theologians such as James Orr, Gordon Clark, Herman Dooyeweerd, and Francis Schaeffer worked to shift Christian apologetics into a language of worldviews. This helped to defend the internal consistency of Christianity as a structure of belief, and encourage new generations of missionaries to deliver Christianity as a self-consistent, complete worldview (Naugle, 2002).

The work of psychiatrist Karl Jaspers in the 20th century, particularly his untranslated *Psychology of Worldviews*, was largely responsible for moving the concept of worldviews into the discipline of psychology (Naugle, 2002). Jaspers described the structure of worldviews as interplay between patterns of relating to the world, often formed from early childhood experiences, and the totality of mental concepts formed to represent the contents of the world. This synthesis of subjective attitudes and objective sensory impressions, Jaspers argued, were essential for human survival. Like Dilthey, Jaspers claimed that worldviews offered psychological protection from “the horrors of ultimate situations” (Naugle, 2002, p.
For psychology, which partly aims to promote and maintain mental well-being, it is therefore difficult to ignore the clinical impact that the concept of worldviews might provide.

Thinkers such as Frankl (1973), who had firsthand experience with horrors particular to the 20th century, recognised the clinical utility of belief systems that could provide meaning in life. Frankl’s logotherapy was a call to shift the focus of clinical psychology towards meaning-making processes, and he argued that the presence of meaning was the most important factor for human resilience, well-being, and virtue. Frankl’s work, alongside the treatises of phenomenological and existential philosophers, was one of the foundations for the emergence of existential psychology. Described previously, existential psychology deals with similar areas as worldview psychology. However, rather than being a systematic study of worldviews from an empirical method, existential psychology put forward ideas about the nature of reality (e.g., groundlessness), and facilitated individual confrontations with these axioms.

The idea that worldviews provided psychological comfort against existential problems was generally scorned by Freud, which might also partly explain the prolonged dismissal of the worldview concept among modern psychological theorists (Koltko-Rivera, 2004; Naugle, 2002). Freud thought of worldviews as conscious, personal philosophies with which people attempted to explain every aspect of life, and he was often derogatory about this need for psychological comfort, arguing that worldviews themselves were delusional and unnecessary barriers towards real insight (Koltko-Rivera, 2004; Naugle, 2002). This was part of a general trend in 20th century Western psychology, which attempted to distance itself from metaphysical content in the hopes of establishing scientific credibility (Emmons & Paloutzian, 2003; Gridley, 2009; E. L. Johnson & Watson, 2012).

Freud’s mistake, as Koltko-Rivera (2004) has noted, was the notion that people might have no worldview at all. This was similar to the existentialists, who tended to take their
fundamental assumptions about existence (e.g., as groundless, isolated, and meaningless) for

granted, and conceptualised worldview beliefs that altered these axioms as buffers against the

Truth. While Freud logically claimed that no cognitive or empirical tool could produce

objectively accurate worldviews, this in itself could be seen as an ontologically agnostic

worldview. Furthermore, in practice Freud approached psychoanalysis from a naturalist

worldview, positing that empirical science was the most reliable path towards knowledge.
Not only did Freud entertain both these agnostic and naturalist worldviews, they have

generally unscored the practice of modern psychology.

Only recently has psychology begun to acknowledge the concept of worldview as a

topic of central investigation in its own right, and acknowledge that worldview claims made

by all parties, whether religious, scientific, or existential, together span the breadth of

possible worldviews. In fact, the very idea that a person holds just one worldview is

challenged by contemporary worldview psychology. In saying a worldview, we imply a

grouping of fundamental beliefs into a cohesive whole, often signifying the total

amalgamation of every belief held by an individual. However, in worldview theory it

becomes necessary to investigate distinct constructs, that is, groupings of worldview beliefs

that are organised together by their similarity of content. For example, Nilsson (2013)

identified the worldview constructs of Humanism and Normativism, each of which

represented clusters of worldview beliefs that were conceptually cohesive.

Similar to trait constructs, the amount of worldview constructs open to investigation is

limited only to the language that psychological scientists can use to define them. So also

similar to trait theory, worldview constructs can theoretically be organised hierarchically,
collapsed statistically, and ranked in relation to outcomes they can predict. The first real work
in worldview psychology is to investigate the psychometric structure of worldview

constructs, turning theoretical frameworks of worldview categories (e.g., Koltko-Rivera,
2004) into statistically robust worldview constructs that add explanatory power to psychological models.

1.4 An Investigation of Worldviews

There is some evidence for the benefit of personality constructs being represented as cohesive concepts encapsulating traits and worldview beliefs (Nilsson, 2014). The worldview concept can then benefit from the methods of personality measurement, and in turn add to the power that personality constructs have to explain and predict thoughts, feelings, and behaviour. Once statistically sound instruments have been developed to measure worldview beliefs, they can be used to investigate the factors that influence the emergence of distinct worldviews (e.g., processes of cognition), and the impact that distinct worldviews have on well-being. The following chapter will examine how worldviews theoretically fit into contemporary models of personality in psychology, and the remaining chapters of this section relate the development of an inventory to measure three specific worldviews – spirituality, naturalism, and agnosticism.

Part Two of the thesis reports on the use of this inventory to test the worldview constructs alongside cognitive and well-being variables. Not only is this interesting in terms of having an empirically informed understanding of how worldviews are formed and maintained, but also because it extends into the realm of worldview malleability. If specific worldview constructs such as spirituality, naturalism, and agnosticism are shown to associate with specific cognitive tendencies that can be targeted with cognitive intervention, then we begin to explore the possibility of purposeful worldview change – not with a missionary aim, but from the perspective of a clinical psychology empirically informed with data regarding specific worldviews and their relationships with cognitive processes and well-being outcomes.
Chapter Two: Worldviews in Personality

As part of his formalisation of the worldview concept, Koltko-Rivera (2004) encouraged investigations into the relationship between worldview beliefs and personality traits, wondering how they structurally relate to each other, and how they interact to produce behaviour. This effort would be mutually beneficial for both worldview and personality psychology. First, personality psychology can offer a stable framework for investigations regarding the association between worldview psychology and other sub-disciplines of psychology. Second, personality psychology needs worldviews in order to offer a description of personhood in its entirety (Nilsson, 2013, 2014), and to benefit from the explanatory power that worldviews can bring to theory and research (Koltko-Rivera, 2004). In other words, the psychology of worldviews and of personality both stand to benefit from the joining of their fields of study.

The underlying goal of personality psychology is to provide a comprehensive psychological model of the person as a complete entity (Nilsson, 2013). Paradoxically, this task has been approached from a variety of perspectives that favour some aspects and interpretations of personhood over others. Costa and McCrae (2003) suggest that these perspectives can be simplified into three major schools of psychology. The psychoanalytic school describes human nature in terms of largely unconscious motivational forces, the behaviourist school describes human nature as a deterministic consequence of prior events, and the humanistic school describes human nature in terms of personal subjectivity and an inherent capacity to develop towards positive potentials. These different assumptions regarding human nature are themselves presuppositional, and probably unprovable, worldview beliefs.

Within personality psychology, models that are founded on trait theory seem to offer the best framework for the assimilation of worldviews. Trait theory, like worldview theory,
takes a pluralistic approach to human nature. As opposed to the three schools previously mentioned, trait theory presents differentiation as the primary feature of human nature; in other words, the fundamental assumption behind trait theory is that personalities are varied (Costa & McCrae, 2003). Of course, other approaches are still able to account for differences between people, but trait theory makes this variability its philosophical foundation.

Worldview theory and trait theory share the same philosophical underpinning, which is that both worldviews and traits are tools for understanding individual variability across a catalogue of universal dimensions (Costa & McCrae, 2003; Koltko-Rivera, 2004). Furthermore, as will be explained, it seems very likely that worldviews and behavioural traits depend on each other for their emergence and maintenance (Koltko-Rivera, 2004). This makes it logical for worldviews and traits to be represented as complementary aspects of the same personality constructs. Not only do personality constructs make a neat conceptual fit for the understanding of worldviews, but the presence of worldviews within personality models can also address some longstanding conceptual problems inherent to trait models of personality.

The following section of this chapter will introduce the trait theory of personality, and then outline some examples of complete models of personality from the trait perspective. Then, some philosophical and methodological limitations of trait theory will be explained: the problems of agency, bias, and explanation. Finally, the chapter will explain how worldviews can be introduced into models of personality alongside traits, making some progress towards resolving these limitations of trait theory. Finally, this chapter will point towards some objectives in studying the integration of worldviews and traits psychometrically.
2.1 The Trait Theory of Personality

Trait theory aims to provide both a conceptual boundary around personality as an abstract concept, and also function as a tool for describing the differences in personality across individuals and over time (Costa & McCrae, 2003). Within the context of trait theory, the method for moving towards a comprehensive model of personhood is to generate a complete list of traits that can account for the many dimensions across which individuals can differ. Every multivariate combination across a hypothetically complete taxonomy of personality traits would theoretically represent the boundaries around what we understand as personality.

Thus, traits are defined and analysed at the populace level, with the goal of arriving at a universal set of characteristics that define personhood in its abstract sense, and also within individuals, who each display their own configuration of each trait to varying degrees. Costa and McCrae (2003) defined traits on the collective level as “dimensions of individual differences in tendencies to show consistent patterns of thoughts, feelings, and actions,” (p. 18), and on the individual level as “endogenous basic tendencies that give rise to consistent patterns of thoughts, feelings, and actions” (p. 160). In other words, trait theory describes personality as a set of general psychological constructs that together outline the boundaries of personhood, and also as each person’s unique formation of those constructs, his or her individual, observable personality.

As opposed to physical and ability traits, personality traits “describe emotional, interpersonal, experiential, attitudinal, and motivational styles” (Costa & McCrae, 2003, p. 21). Being unbounded by physical stimuli, psychological theorists could posit the existence of an almost infinite variety of trait constructs. Thus, conception and measurement of traits has often been conducted according to each researcher’s pre-existing notions about what aspects of personality exist and are important.
However, trait theory is bounded by the lexical tools used to describe different aspects of a person. Therefore, isomorphic to the language supporting them, trait constructs are organised into a structural hierarchy with some traits conceptually superordinate to others, assimilating lower order traits both in concept and in the explanation of overt behaviour (Costa & McCrae, 2003; Mccrae, Costa, & Piedmont, 1993; Wallace, 1970). Therefore, the trait approach is theoretically able to generate a unifying taxonomy of psychological traits covering personality components at the highest level of semantic abstraction. These components would represent the most fundamental framework for understanding conceptual boundaries around personhood, and for mapping the variation in individual personalities. Empirically, factor analysis can uncover the component hierarchy, by demonstrating that variance in some traits can be explained by the shared influence from higher-order latent constructs.

Theoretically, a complete catalogue of personality descriptors exists in natural language, and this could act as a source of data in developing a comprehensive trait taxonomy (Cattell & Mead, 2008; Costa & McCrae, 2003; Norman, 1963). Allport and Odbert (1936) used a dictionary to generate a list of 18,000 English trait-descriptors, which they refined to 4,000. Subsequently, the terms were categorised into groups and factor analysed in order to arrive at a set of dimensions that would comprehensively capture normal personality, measured with the Sixteen Personality Factor Questionnaire (16PF; Cattell, Eber, & Tatsuoka, 1970, as cited in Cattell & Mead, 2008). Costa and McCrae (1976) analysed the 16PF, and found three superordinate personality components: Neuroticism, extraversion, and openness to experience. Openness to experience conceptually assimilated similar factors suggested by other personality theorists, and neuroticism and extraversion mirrored Eysenck’s two factors of the same name (Costa & McCrae, 2003). Other analyses of the 16PF yielded a personality structure of five factors – this result was obtained by multiple
theorists (e.g., Norman, 1963). In fact, Goldberg (1981, 1992) conducted a completely separate study of trait-descriptors, resulting in the same five factor solution. This has since been referred to as the Five Factor Model (FFM) of personality (Costa & McCrae, 2003; McCrae & Costa, 2008; McCrae & John, 1998). Thus, validity of the five overarching trait domains is supported by their being discovered by multiple theorists across relatively distinct lines of research.

The five factors are: (a) openness to experience, which represents a spectrum between low and high levels of activity and sensitivity towards art, beauty, imagination, and novelty; (b) conscientiousness, which represents a spectrum between low and high levels of diligence, organisation, personal discipline, and ability to filter impulses; (c) extraversion, which represents a spectrum between low and high energy and low and high social dominance; (d) agreeableness, which represents a spectrum between low and high levels of compassion and care in interpersonal interactions; and (e) neuroticism, which represents a spectrum between low and high levels of negative experiences such as anxiety, nervousness, and depression. The five factors have been demonstrated across many different cultures and languages, and have shown a powerful capacity to explain universal variation in personality (Costa & McCrae, 2003; McCrae & Costa, 2008; McCrae & John, 1998).

Recent research has shown that the FFM domains can be collapsed into four-factor (conscientiousness, extraversion, agreeableness, and neuroticism), three-factor (negative emotionality, positive emotionality, and disinhibition), and two-factor (plasticity and stability) models that reflect even broader personality constructs (Higgins & Scholer, 2008). Similarly, some traits have been added to the FFM, and argued to be equally universal, such as spirituality (Piedmont, 1999) and honesty-humility (Ashton & Lee, 2005). Essentially, while there may be disagreements about which domain constructs represent the highest order trait components, widespread consensus is that reducing traits into overarching factors
Trait theory does not posit that traits are the only causes of behaviour, but instead defines traits as tendencies that exist within a dynamic model of personality that is open to influence of other aspects of personhood and other fields of psychology (Costa & McCrae, 2003; McCrae & Costa, 2008). For example, McAdams and Pals (2006) integrated traits with evolutionary psychology, personal narratives, culture, and specific social contexts to generate a holistic model of personhood. Similarly, McCrae and Costa (2008) developed the Five Factor Theory, a system for describing personality that integrates basic tendencies, characteristic adaptations, and self-concept. Both of these models situate traits within an interrelated system of components that can theoretically account for personality as a whole.

On the one side, traits reflect biological principles of evolution – universal structures built into the developing human organism (McAdams & Pals, 2006; McCrae & Costa, 2008). On the other side, traits are expressed differently in accordance with characteristic adaptations – personality structures that are relative to the environmental experiences of each individual. Some of these structures last a lifetime once acquired, such as a learned language, but others are more fleeting, such as personal concerns and context-sensitive motivations and goals. External influences such as culture, societal norms, and individualised life events also influence the expression of traits, and the acquisition and expression of characteristic adaptations.

Empirical tests that have investigated variance in the FFM as a function of genetics and environmental factors have typically found that genes account for roughly half of the differences in personality traits across individuals, and non-shared environmental effects account for the other half (Higgins & Scholer, 2008). In other words, a hypothetically complete taxonomy of traits exists due to human genetic templates, and variance in their
expression across individuals is based on individual genetic variations interacting with the specific circumstances of personal development.

2.2 Integrating Worldviews with Trait Theory

Neither of the abovementioned holistic personality models explicitly incorporate worldviews. McCrae and Costa (2008) include the self-concept as an especially important characteristic adaptation, described as a central cognitive-affective schema. Similarly, McAdams and Pals (2006) emphasise the process whereby personal narratives organise experiential memory into a personal identity with an individualised sense of meaning, purpose, and coherence to life. While both of these interpretations suggest that personality generates subjective systems of meaning and purpose, they do not explicitly or precisely accommodate the concept of worldview beliefs (Nilsson, 2014). The content of these characteristic adaptations, self-concepts, and life narratives are almost entirely dependent on individual formative experiences (McAdams & Pals, 2006; McCrae & Costa, 2008). Worldview beliefs are not dependant to the same extent on individual construction from episodic content – they are bounded by universal worldview dimensions that everyone must address as their cognition interfaces with reality. In other words, worldview beliefs naturally develop in order to provide conceptual closure to specific, universal fragmentations in experiences of reality (Gabora & Aerts, 2009; Gabora, 1999, 2000; Sire, 2004)

Like traits, individual variances in worldview beliefs are observable across a universal catalogue of beliefs founded on “specieswide biological bases,” and “the shared human experiences of living in groups, using abstract thought, or being conscious of our own mortality” (McCrae & Costa, 1997, p. 509). Of course culture and social encounters do influence worldview development and expression, but the dimensions of worldview beliefs are attached to the broad process of human evolution, as endogenous, stable features of
personality in their own right. As stated by Nilsson (2013), “the most general worldview constructs, which deal with such fundamental issues in life, may therefore be as universally applicable, and in that sense basic, as the Big Five” (p. 42).

In some sense, beliefs can even be considered traits, insofar as they are considered persistent thoughts about the world. However, beliefs are very specific in that they relate to existential, evaluative, and prescriptive categories, and worldview beliefs are even more specific in that they relate to the most fundamental assumptions about reality. Thus, “the division between trait and worldview constructs is basic in the sense that it corresponds to whether information is sought about objective regularities of thought, feeling, and behaviour (traits) or about the subjective meanings (worldview) that imbue experiences and behaviours with intentionality and rationality, yet even trait and worldview constructs often overlap in terms of what they refer to” (Nilsson, 2013, p. 33).

Just as the biological storage of mental representations are content-addressable (Canli, 2008; Gabora, 1999, 2000; Godfrey-Smith, 2002; Higgins & Scholer, 2008), so too are the linguistic categories that hierarchically comprise personality concepts. As is evident in the factor structure of trait models (e.g., the FFM), thoughts, feelings, and behaviours are organised into semantic categories (e.g., conscientiousness), rather than being organised in terms of being a thought, feeling, or behaviour (McCrae & Costa, 2008). Similarly, within personality constructs worldview beliefs are most likely organised alongside traits depending on their semantic content, rather than their being either a worldview belief or a trait. The new psychometrics of personality psychology aims to develop constructs that integrate conceptually similar worldview beliefs and behavioural traits (Nilsson, 2014).

An important aspect to note about worldviews is that, like traits, they are dimensional rather than categorical (Koltko-Rivera, 2004). Dimensional constructs are valuable as they lend themselves more easily to conceptual collaboration between theories, and also to more
advanced statistical analyses (Clark & Watson, 1995). However, “dimensional approaches may not be reduced, even in principle, to categorical approaches” (Koltko-Rivera, 2004, p. 6, italics his). This means that worldviews in personality are tendencies towards certain beliefs, rather than unchanging aspects of personhood. For example, belief in God in personality would be represented as a tendency to believe in God across different times and social contexts, rather than a static belief that manifests in every moment of daily life. This dimensional nature of belief has important implications for each specific worldview construct in personality, as a dimensional approach might appear counterintuitive compared to lay perspectives of belief. The current project will discuss this idea further as it becomes pertinent to the current investigation of specific worldviews in personality.

2.3 The Benefits of Worldviews in Trait Theory

Worldview theory provides an opportunity to develop taxonomies of worldview beliefs that can be assimilated into personality constructs. This would enable personality models to account for observable patterns of consistency in thoughts, feelings, and behaviour, as well as subjective dimensions of meaning that shape people’s unique perspective of the world (Nilsson, 2013, 2014). This is a necessary step in order that models of personality become more comprehensive, accurate representations of personhood (Koltko-Rivera, 2004, 2006b; Nilsson, 2013, 2014). Psychometric measures for personality constructs that integrate worldview beliefs can then be empirically investigated to assess their potential for increased predictive power. This in itself, insofar as personality psychology aims to provide comprehensive and useful models of personality, is an obviously worthwhile goal. But even beyond this, integrating worldviews into trait-based personality models provides some resolution of longstanding theoretical contradictions and problems that are inherent in the trait-based depiction of personality.
Personality psychology aims to understand individuals as holistic entities. It would dissolve as a discipline should disparate theoretical approaches become fragmented beyond the scope of a unifying framework for defining and investigating personhood (Nilsson, 2013, 2014). However, theory development has been explicitly and implicitly influenced by the worldviews of scientists whose presupposed assumptions have directed research and interpretation (Slife, Reber, & Lefevor, 2012). For example, trait theory has emerged within “a reformation in theory and research,” whereby personality models have had to demonstrate substantial empirical evidence to support their claims (Costa & McCrae, 2003, p. 15). The benefits of this are that trait models statistically account for a great deal of human behaviour, and they have been a unifying focus of effort in personality research. However, this underlying empiricism reflects presuppositions about the primacy of mechanistic psychological principles in personality, resulting in inconsistencies and limitations within the theories that currently represent “the basis for most research on personality” (Costa & McCrae, 2003, p.15). These problems are summarised here as the problems of explanation, agency, and bias.

2.3.1 The Problem of Explanation

Trait-based models typically define the person as a structure of processes determined by natural laws of biology on the one hand, and physics on the other (e.g., McAdams & Pals, 2006; McCrae & Costa, 2008). Theoretically and methodologically, these models run into explanatory problems in trying to describe traits as tendencies to produce patterns of thoughts, feelings, and actions, as well as the psychological structures that are claimed to cause them (Nilsson, 2013). This explanatory loop seems inevitable when personality is reduced to an interface between the forces of biology and physics, and yet it is expected to be an explanatory factor in its own right (e.g., to explain behaviour).
This problem of explanation is somewhat improved by including worldview beliefs in personality models alongside traits. First, the explanatory problem of traits, whereby they are suggested to cause themselves, can be somewhat alleviated by acknowledging the place of worldviews as a causative factor in personality. For example, values are prescriptive worldview beliefs about the desirability of certain actions or outcomes, and values therefore act as “an intervening variable that leads to action when activated” (Rokeach, 1968, p. 7). Just as traits are observed as thoughts, feelings, and behaviours, beliefs have a cognitive, affective, and behavioural component (Rokeach, 1973). Thus, traits and worldview beliefs are interdependent in their development and expression – the fallacious notion that traits influence traits can be somewhat improved with the logical framework whereby worldviews influence traits, and vice versa.

2.3.2 The Problem of Agency

Within the study of personality, “scientific psychology is caught in a fundamental dilemma, between studying human beings as mechanical systems, which are subject to the same chains of cause and effect as all other objects in nature, and studying them as conscious and rational persons, whose actions are imbued with meaning and intentionality” (Nilsson, 2013, p. 17, italics his). Most disciplines in psychology have either ignored or failed to resolve these two perspectives. Essentially, the problem is that contemporary models of personality do not explicitly include a force of agency, which contradicts the lived experience of the people the models are aiming to describe (Paranjpe, 2013; Smythe, 2013).

Contemporary models of personality situate traits within an integrated system brought about by biological principles on one end, and a myriad of external influences on the other (McAdams & Pals, 2006; McCrae & Costa, 2008). This perspective essentially reduces personality to a psychological vocabulary for describing humans as the expression of genetic
laws as they encounter the natural world. In this context, individual tendencies to produce certain thoughts, feelings, and behaviours, and even to develop subjective life narratives, become nothing more than a mechanistic process determined by the laws of biology and physics. Accepting agency as a force within personality would be a direct affront to hard determinism, and thus it is no wonder that claims regarding free will are highly controversial amongst psychological theorists (Koltko-Rivera, 2004; Paranjpe, 2013). To acknowledge human agency as an influential factor outside the laws of physics and biology undermines the positivism and empiricism at the very core of modern psychology,

And yet, a force of agency must be clearly included in personality models in order to actually represent the state of personhood as experienced by people (Nilsson, 2013). Furthermore, the folk language used to generate and support trait models implies that some force of agency exists within personality itself (Nilsson, 2013, 2014; Smythe, 2013). Most people naturally talk as if they have free will, and measurements for trait constructs ask participants about personal choices and preferences, not about the biological and natural laws determining their behaviour. Folk psychology and trait methodology both attribute a force of personal agency that the personality models do not explicitly support (Nilsson, 2013, 2014; Paranjpe, 2013; Smythe, 2013).

Furthermore, individual differences can only be considered an aspect of personality if they reflect at least some degree of personal choice. This does not mean that all aspects of personality must reflect conscious decision-making processes – there are influences on personality below the threshold of subjective awareness (Higgins & Scholer, 2008; Nilsson, 2013). However, they must reflect at least some coherence between the subject’s inner processes and their overt behaviour, as well as at least some degree of arbitrariness. So it is not just that excluding agency from personality models limits their cohesion with lived experience and self-report methods, but more importantly, unless some force of agency is
included in personality models they cannot be strictly said to describe personality at all. “The term person, by definition, designates those aspects of a human being whereby he or she is not a thing or an animal. The domain of personhood begins where that of physics and biology ends” (Paranjpe, 2013, p. 67). To put it clearly, dismissing agency runs counter to the concept of personality itself, because what we understand as personality can only exist when people are able to freely choose between a range of alternate behaviours somewhat arbitrarily (Higgins & Scholer, 2008; James, 2011). In other words, “motivation and biases (and thus personality) can be inferred only when we know that an individual could have responded in a different way” (Higgins & Scholer, 2008, p. 183, italics theirs).

To summarise the problem, personality must conform to deterministic principles in order to be studied scientifically, and yet there must be some degree of arbitrariness for any thought, feeling, or behaviour to represent what is commonly understood as personality (Higgins & Scholer, 2008; Paranjpe, 2013; Smythe, 2013). This dilemma is impossible to directly resolve, because if a locus of agency exists then it cannot, by definition, be located within the physical and biological structures that can be investigated with positivist science. Claims regarding human agency are existential worldview beliefs that posit the existence or non-existence of an aspect of reality that lies beyond the scope of provability. In the face of this dilemma, theorists have traditionally supported positivist laws and denied the existence of agency in personality, or they have asserted that personality can only be understood in term of personal agency, and thus posited its existence as a matter of principle (Paranjpe, 2013).

Worldview theory presents a third option in this dilemma of agency. The essential improvability of worldview beliefs makes them, more than any other component of personality, theoretically able to account for the generation of arbitrariness of action. Worldview beliefs are, by definition, groundless selections (whether by mechanism or
agency) between equally unsubstantiated options. Part Two of this thesis will explain this selection process in more detail. Essentially, worldview beliefs, whether spiritual or naturalist, arise from imaginative meta-cognitive processes that amalgamate memory stores with varying degrees of novelty. The unfounded nature of worldview beliefs, as well as their formation from novel imaginative processes, together demonstrate that worldviews represent an element of arbitrariness within personality. Furthermore, because worldviews influence behaviour and vice versa, their presence imbues all interrelated aspects of personality with the possibility of novelty and arbitrariness, the sense that the subject “could have responded in a different way” (Higgins & Scholer, 2008, p. 537).

This does not assert that agency definitely plays a part in the generation of worldviews – it has already been shown that this can at least partly be due to genetic and learning mechanisms. The process of imagination, which creates worldview beliefs with content “taken from the world, [but] not entirely ‘of’ the world” (Pelaprat & Cole, 2011, p. 413), simply leaves room for the possibility that some locus of agency could play a role in the novel amalgamation of thought into original belief systems, and the subsequent expression of unique patterns of behaviour. Even McCrae and Costa's (2008) personality models allowed room for as yet unspecified dynamic processes, stating that, “the ongoing functioning of the individual in creating adaptations and expressing them in thoughts, feelings, and behaviours is regulated in part by universal cognitive, affective, and volitional mechanisms” (p. 150). Integrating worldviews into personality provides a greater sophistication of balancing mechanistic explanations with the potential for personal agency.

### 2.3.3 The Problem of Bias

The above section claimed that worldviews might present a degree of arbitrariness in personality, which can offer a way to account for personal agency, and yet it is equally
possible that worldviews could emerge from cognitive processes that are entirely determined rigidly by biological and physical laws. Positions in the debate between agency and determinism in personality psychology are themselves worldview beliefs. This provides an example whereby worldviews in personality provide a higher-order position that can present theory without falling into limiting ontological biases.

Making statements about the objective validity of any worldview belief is not possible for psychology, which can only concern itself with the processes and variations in individual thoughts, feelings, and behaviours. As the abovementioned example of agency shows, by explicitly incorporating worldviews into personality models, even contradictory beliefs about personhood can both be equally represented in models of personality. This stance seems to demonstrate the most integrity, since fully supporting the existence or non-existence of agency presents inconsistencies and limitations between positivist ideals and authentic personhood, and proof for either position would need to be sought in metaphysics, beyond the empirical reach of psychology.

This higher-order solution extends to other controversial areas of personality theory, for example, the argument between theistic and non-theistic psychological approaches. Johnson and Watson (2012) explained how the rules of modern psychological discourse have been tacitly limited to a naturalist worldview. In order to unify psychological research and clinical treatment across multicultural divides, it is necessary for practitioners and scientists to account for worldview differences. It seems unlikely that people can ever completely dissociate from their worldview positions (Slife et al., 2012), but by explicitly incorporating worldviews in personality models, perhaps researchers will be confronted with the different foundational beliefs that can direct the development of theory, and be encouraged to account more for these variations in their work. Counter-intuitively, this may help to avoid scientific fragmentation, as theorists with different worldview beliefs do not need to conduct their
research in isolated streams. Some researchers (e.g., Johnson, 2013) have already begun to develop frameworks for representing personality theory across varied forms of epistemology and philosophical foundation.

This solution becomes even more attractive upon realising that worldview beliefs are not categorical, but dimensional constructs measured in degrees of variation (Koltko-Rivera, 2004). Worldview beliefs, like traits, are tendencies rather than actualities. For example, belief in human agency and non-agency should not be represented as mutually exclusive categorical statements. Instead, they represent degrees of belief in human agency and psychological determinism that manifest in different levels across people and over different contexts. It is not necessary for the model of personality itself to make sense from either a perspective of absolute determinism or a perspective of absolute volition – what is necessary is for the personality model to logically explain how both types of belief can exist in models of personality, and how they might affect other components in the system (e.g., behaviour).

To represent worldview pluralism explicitly also has implications for psychological treatment. To again use agency as an example, psychologists often use a discourse whereby clients are not only claimed to have personal agency, but that the goal of the therapeutic process is often to increase personal agency (Caston, 2011; Williams & Levitt, 2007). Many therapists posit that “human reactions are the result of choice or potential choice” (Hackney & Cormier, 2013, p.6). Therefore, it makes sense that there is often friction between the psychologists engaged in the publication of research and those engaged in practice (Stewart, Stirman, & Chambless, 2012). This divide might be bridged by research that explicitly includes and accounts for worldview variability. As Gridley (2009) explained, “the world is changing rapidly, and in times of global crisis and uncertainty, the human yearning for meaning beyond the mundane intensifies and demands recognition of multiple world views
and systems of knowledge” (p. 10). Clients would benefit from therapeutic frameworks that are based on research that addresses worldview diversity.

### 2.4 Summary

Trait theory emerged from a philosophical framework that aimed to investigate individual differences across a universal taxonomy of hierarchical personality traits. This theoretical taxonomy encapsulates the breadth of dimensions that personality could vary across, emerging as biology interacts with universal features of the physical and social environment. Similarly, worldviews are systems of presuppositional beliefs that emerge as biology encountering the fundamental, existential boundaries around experiences of reality. Like traits, worldviews can be understood as a theoretical taxonomy of possible worldview dimensions across which individual differences occur between individuals and over time.

The storage of memory is content-addressable, which means that modules of information are organised schematically in terms of their semantic association rather than their quality (i.e., being a thought, affect, behaviour, worldview belief). All types of mental representation are stored in networks of association depending on their semantic content. Thus, it is logical to measure personality constructs that integrate worldview beliefs and traits according to their shared conceptual focus.

The integration of worldviews into trait constructs progresses the theory and methodology of personality psychology (Nilsson, 2014). Previously, traits have been described as both behaviour and the cause of that behaviour. Worldview beliefs, when situated alongside traits, allow for a circular but less contradictory model, whereby worldview beliefs act as the source of traits and vice versa. Furthermore, by integrating worldviews, personality theorists are able to account for the lived experience of people as subjective creators of their own systems of meaning. The presuppositional and imaginative
features of worldviews allows them to represent a degree of arbitrariness in personality models, which more accurately captures the definition of personality as a set of thoughts, feelings, and behaviours influenced by creative and novel factors. Finally, worldviews in personality models would help to reduce the tendency for researchers to assert their own worldviews as truths that underlie the nature of personhood, and instead encourage the development of personality models that can account for variations in worldview beliefs.

Perhaps more important than these theoretical contributions to personality psychology, worldviews are simply a good candidate for the increased capacity for personality constructs to usefully explain and predict other variables (Koltko-Rivera, 2004). Once psychometric measures are developed that explicitly account for both traits and worldview beliefs, they can be subject to empirical analysis in order to determine their utility. The following chapter introduces three constructs in personality: Spirituality, naturalism, and agnosticism. These constructs will be explained in terms of their worldview beliefs and behavioural traits, such that the final chapter of this section can report on the development of a psychometric inventory that captures both of these elements in integrated personality constructs.
Chapter Three: Spirituality, Naturalism, and Agnosticism

The previous chapter outlined the benefits of integrating worldview beliefs with traits in personality constructs, to be grouped together in psychometric inventories according to their similar semantic content. Worldviews can then be tested for their utility in predicting desired outcomes such as well-being variables.

No unidimensional construct could include beliefs across the entire breadth of worldview dimensions, and a multitude of theoretical worldview constructs could potentially be measured for the sake of this research agenda. The primary goal of the current project was to investigate principles relating to worldviews in general, and so the selection of specific worldview constructs to measure was somewhat arbitrary. However, to make the investigation as valuable as possible, certain criteria for the constructs was desirable. Chosen worldview constructs needed to be established in the literature and theoretically present across many individuals to allow for large sample testing. Most importantly, the multiple worldview constructs needed to be conceptually distinct from one another to assess worldview principles not limited to one specific worldview, and to test whether there are different predictors and outcomes for distinct worldviews.

Fortunately, established worldviews could be found by using Koltko-Rivera's (2004) collated model, which presented theoretical categories to which worldview beliefs could pertain. Within these categories, different worldviews offered alternative beliefs to the same existential problems, for example, worldview beliefs about the existence and non-existence of deities are contradictive. The most distinct worldviews would be those that offer different beliefs across the largest amount of categories. To select multiple worldview constructs that are distinct from each other, Koltko-Rivera's (2004) list of worldview dimensions was reviewed for mutually exclusive responses to the same categories.
It was evident from investigating the dimensions of Koltko-Rivera's (2004) model, that spirituality, naturalism, and agnosticism could stand apart as three distinct worldviews together encapsulating a huge portion of worldview dimensions, and being directly contradictory across multiple domains. Spirituality (understood to include the domain of religiosity; Hill et al., 2000; Lambert, Stillman, & Fincham, 2013; Rose, 2001; Saucier & Skrzypińska, 2006; Zinnbauer et al., 1997; Zinnbauer, Pargament, & Scott, 1999; Zwingmann, Klein, & Büssing, 2011), and naturalism (understood to include the domain of science acceptance; Rosenkranz & Charlton, 2013), presented contradictory beliefs across 11 of the 29 mutually exclusive dimensions – they appeared to be the most broadly oppositional worldviews in Koltko-Rivera's model. Furthermore, empirical evidence has suggested that they are psychometrically distinct (e.g., Rosenkranz & Charlton, 2013). While not necessarily mutually exclusive, these two worldviews are conceptually oppositional, allowing for tests that can explore the impacts of worldviews with distinctly different claims about reality.

While spirituality and naturalism alone could have been used for the current project, agnosticism stood out as a third worldview construct that seemed to comprise beliefs oppositional to both spirituality and naturalism across many dimensions in Koltko-Rivera's (2004) model. The benefit of testing three rather than two worldview constructs was that results would have more chance of relating to worldview theory in general, rather than the minimal constructs chosen. Together, spirituality, naturalism, and agnosticism covered 22 of the 42 total worldview dimensions in Koltko-Rivera's collated model.

The inclusion of agnosticism also presented a unique way of investigating worldview theory, because agnosticism comprises beliefs supporting uncertainty and unknowability, whereas most worldviews are felt by the subject to be the provider of truth (Koltko-Rivera, 2006b). Thus, for each of the hypotheses, contrasting agnosticism with spirituality and naturalism could theoretically clarify whether all worldview beliefs are associated with
similar principles (e.g., their influence on positive outcomes), or whether only specific worldview beliefs can be associated with certain findings. In other words, the inclusion of agnosticism allows investigation of whether it is the mere presence of worldview beliefs or their actual content that contribute to well-being outcomes.

Not only are spirituality, naturalism, and agnosticism represented across many of the dimensions in Koltko-Rivera's (2004) contemporary model, they are perhaps the most widely represented worldviews in the history of the concept. In particular, spirituality and naturalism, under various labels, have been used as the exemplars of contrasting worldviews since the introduction of weltanschauung into philosophical discourse. For example, Wilhelm Dilthey, one of the first philosophers to elucidate the concept of worldview, spoke of three worldview typologies in his elaboration of the concept: Naturalism, the idealism of freedom, and objective idealism (Kluback & Weinbaum, 1957; Naugle, 2002). A closer look at these three worldviews uncovers huge similarity between them and the three worldviews under current investigation.

There is great similarity between the modern spirituality worldview, and Dilthey’s conceptualisation of the idealism of freedom. Dilthey described the idealism of freedom worldview as a system of belief that emphasises the freedom of the mind from any physical laws of causation (Kluback & Weinbaum, 1957; Naugle, 2002). From the perspective of this worldview, the mind, soul, consciousness, or spirit, represent an aspect of each person that has free agency in the world. In the modern psychological understanding of spirituality, the spiritual worldview extends this agency to other objects. The essential characteristic of Dilthey’s idealism of freedom worldview, which holds true for the current definition of spirituality, and is in direct contrast to the naturalist worldview, is that there exists some aspect of reality that is entirely separate and free from the causative laws of the natural world.
Dilthey described the naturalist worldview as a perspective that seeks to understand reality on the same terms as it understands the physical characteristics of the human body (Kluback & Weinbaum, 1957; Naugle, 2002). Seeing this worldview as opposed to idealism of freedom, naturalism posits that all of reality can be understood as part of nature, and everything from physical objects to human consciousness can be understood in terms of physical laws of causation. This worldview is characterised by its sensationalist epistemology, which considers information about reality valid if it has been obtained from physical observation. Naturalism is further characterised, according to Dilthey, its perspective of the cosmos as a mechanistic arrangement of parts, which can be completely understood as a non-conscious law-abiding machine (Kluback & Weinbaum, 1957; Naugle, 2002).

Finally, the agnostic worldview echoes Dilthey’s objective idealism (Kluback & Weinbaum, 1957; Naugle, 2002). This worldview, according to Dilthey, attempts to integrate empirical naturalism and free idealism into a cohesive and holistic system of belief. Proponents of this worldview saw the intrinsic unity of mind and nature, and therefore rejected both naturalism and idealism of freedom entirely. In this system, all of reality is understood as an inseparable whole, which contrasts with the lived experience of each individual who can only perceive a microcosmic section of the macrocosmic whole.

Importantly, this infers that “objective idealism binds mind and matter together into a whole which is never fully comprehended” (Naugle, 2002, p. 97). So weak agnosticism, which represents personal uncertainty of beliefs, and strong agnosticism, which represents a firm belief in the unknowability of ultimate reality (Le Poidevin, 2010), are both encapsulated by Dilthey’s objective idealism, a worldview that is based on sensual contemplation of a unified reality that can never be directly comprehended.

Not only are spirituality, naturalism, and agnosticism evident in the early expositions of worldview theory in philosophical history, they are evident in the early writings of Freud,
whose discussion of contrasting worldviews also focused on what he labelled scientific and religious worldviews. Clearly relatable to current conceptualisations of naturalism and spirituality, Freud described these worldviews as distinct in their ontology, “that is, a distinction between a view of reality in which the spiritual is real and a view of reality that embraces a thoroughgoing ontological materialism” (Koltko-Rivera, 2004, p. 7).

However, in Freud’s (perhaps mistaken) rejection of worldviews in general, he indirectly advocated for a third worldview construct, which could be understood as agnosticism. That is, although Freud championed the naturalist worldview, or at least thought that psychoanalysis should operate under this paradigm, he also proclaimed that “there is no cognitive system available to humanity, science included, that is capable of producing the kind of comprehensive worldview as a chief desideratum of the human race” (Naugle, 2002, p. 214). Freud’s response to this belief is to turn towards naturalism as the best alternative; however, there are those who instead fully embrace the agnostic worldview that his statement implies.

It is clear that spirituality, naturalism, and agnosticism are present in the historical literature on worldview theory. They have been used by some of the most influential theorists, in some of the earliest discussions about the worldview concept, to illustrate worldviews and their contrasting types. In contemporary worldview theory (i.e., Koltko-Rivera, 2004), these three worldviews are still present, together including beliefs that span a huge proportion of the possible worldview dimensions, and in many cases are directly oppositional responses to those categories. Therefore, they seem like worldview constructs that would be especially useful in the testing of general worldview principles, both because of the content that can be used in their definition and subsequent measurement, and also because the focus given to these constructs suggests that they are probably the most important and contradistinctive worldviews inherent to the human condition. The current chapter defines
these three distinct worldviews. It will offer a brief anthropological context for the emergence of each worldview culturally, and then describe how each worldview can be understood as a personality construct comprising both worldview beliefs and traits.

3.1 Spirituality

“The ancient Poets animated all sensible objects with Gods or Geniuses, calling them by names and adorning them with the properties of woods, rivers, mountains, lakes, cities, nations, and whatever their enlarged and numerous senses could perceive. And particularly they studied the genius of each city and country, placing it under its mental deity; Till a system was formed, which some took advantage of, and enslaved the vulgar by attempting to realize or abstract the mental deities from their objects: thus began Priesthood; Choosing the forms of worship from poetical tales. And at length they pronounced that the Gods had ordered such things. Thus men forgot that All deities reside in the Human breast.”

~ Blake, 1790

The roots of human civilisation grew from primitive or pre-modern mentalities that were founded on the existence of transcendent agencies and non-physical entities in the world (Gridley, 2009; Jung, 1933). The cognitive capacity to experience theory of mind enabled people to attribute agency to human companions and animal threats, to objects, places, and abstract concepts, until anything, whether everyday occurrences, changing of seasons, movements of celestial bodies, or the metaphysical structures of the universe, could be seen as the expression of some form of intelligence or will (Gorelik, 2016; Pyysiäinen, 2012; Rosenkranz & Charlton, 2013; Shermer, 2011). Worldviews positing the existence of gods, deities, supernatural forces, and immaterial agencies and dimensions are at least as old as the
earliest anthropological artefacts, as ancient as abstract thought (Culotta, 2009; Guirand, Aldington, Ames, & Graves, 1987).

In its emergence, this spiritual attitude was not illogical, in that it did not run counter to any kind of formal discipline of thought. Rather than being a systematic attempt to describe reality objectively, the spiritual worldview arose from an experiential aspect of being in the world (Jung, 1933; Levy-Bruhl, 1923). From this broad perspective, spirituality is not a cultural category to which some subscribe and others do not, but rather an inherent feature of human psychology. The Darwinian benefit of spirituality seemed not only related to the group cohesion encouraged by shared religious traditions and behavioural mandates, but also that the spiritual perspective in itself has had “psychotherapeutic and psychohygienic importance” (Frankl, 1973, p. 49; Gorelik, 2016; La Barre, 1972).

Not surprisingly then, religiosity was a favourite topic of the earliest pioneers in psychology, such as William James and G. Stanley Hall (Vande Kemp, 1992). In the 1960’s, personal spirituality was differentiated from collective religiosity, and since then many different measures and models for the spirituality concept have been developed (Emmons & Paloutzian, 2003; Piedmont, 2013). For example, spirituality has been defined as a domain of personality traits (Piedmont, 1999; Rican & Janosova, 2010), as an underlying motivating factor towards experiences with the sacred (Hill et al., 2000; Pargament, 2013b). The diverse attention that spirituality has received has helped to highlight many nuanced aspects of the concept. However, conceptual and scientific fragmentation has meant that the psychology of religion and spirituality has demonstrated an increasing need to “develop sustaining substantive theories or concepts that integrate multiple disparate lines of research” (Hill & Gibson, 2008, p. 20; see also Koltko-Rivera, 2006a, 2006b).

Within contemporary psychological science, separate strains of research are converging into a clarified understanding of spirituality, one that can account for its
foundation in neuro-cognitive structures and its presence at the folk level of individual personality. The neuro-cognitive perspective attempts to understand spirituality by focusing on the universal cognitive and evolutionary functions that make typically spiritual experiences and beliefs possible (Barrett & Zahl, 2013; Pyysiäinen, 2012; Shermer, 2011).

This will be explored further in Part Two of the current thesis, which reports on an investigation into the cognitive processes underlying the spirituality worldview. The current section aims to develop an integrative definition of spirituality as a construct in individual personality. First, it will explore the way that spirituality has been approached and defined as a personality construct in trait models, and then explain how specific worldview beliefs can be added to this domain.

### 3.1.1 Spirituality as Traits

Although they thought it to be quite improbable, McCrae and John (1998) conceded that major trait domains of personality could go unmeasured by the Big 5 model. A large body of historical literature suggests that religiosity and spirituality could be one of those aspects ignored by the FFM (Piedmont & Wilkins, 2013). Furthermore, recent studies have shown that spirituality constructs are not statistically redundant alongside FFM measures, and actually add to the predictive power of personality models in explaining behavioural outcomes (e.g., Piedmont, 1999). There is growing opinion that “for any model of human functioning to be comprehensive, it will have to include spiritual and religious constructs” (Piedmont & Wilkins, 2013, p. 173).

If trait theory aims to provide a comprehensive taxonomy of personality constructs, and if it is agreed that spirituality should be included in this taxonomy, then the question still remains about what traits should represent spirituality. There are many different measures of spirituality as a trait-based construct, and they define the concept according to varied
dimensions. In their critical review of 24 measures of spirituality in psychology, Kapuscinski and Masters (2010) explained that the general definition of spirituality, as well as its relationship to religiosity, was used “with little consensus on meaning” (p. 193). The fragmented nature of theory within the psychology of religion and spirituality has allowed for the development of many disparate concepts under the same name.

Kapuscinski and Masters' (2010) review offered guidance for clarifying the essential aspects of the spirituality concept in personality. Most importantly, trait-based models of spirituality need to include some element of transcendence. Kapuscinski and Masters rightly argued that an understanding of spirituality that ignores the transcendental element does not provide anything to existing theory. In other words, if spirituality is defined according to pre-existing concepts, such as quality of life, then its usefulness in adding to explanatory or predictive power is made redundant. What must be included in representations of spirituality in personality are references to the transcendent element that sets it apart from any other construct. Measurement of this transcendent element must also cut across particular religious institutions (de Meezenbroek et al., 2012)

Piedmont's (1999, 2001, 2005) conceptualisation of spirituality in personality was that it represented a fundamental drive towards transcencence, an experience in which one takes on a larger perspective than that of their own individual and embodied existence in space and time. Transcendent experiences are often described as mystical experiences, in which typical perceptions of agency, space, and time are interrupted, altered, or altogether suspended (Hood, Morris, & Watson, 1993). Typically, mystical experiences are not able to be put into words, though they often involve the sensation or feeling that no part of reality can be divided – that everything in existence is unified, including the experiencing subject (Diebels & Leary, 2018; Hood, 1975; Hood & Francis, 2013; Hood et al., 1993). This transcendent drive is similar to spirituality defined as a “search for the sacred” (Hill et al., 2000; Pargament,
2013a), where sacredness can be understood as a quality of phenomena that denotes it as
divine (i.e., Godlike) or indicative of an ultimate truth about the nature of reality. Note that
this definition of spirituality points towards a representation in both traits (behaviours related
to the search or drive towards transcendence), and worldview beliefs (notions about what
constitutes divinity and ultimate truth about reality).

Gorelik (2016) argued that transcendent experiences are cross-cultural and pan-
historical. He identified several different ways that they might manifest, from group-directed
activities that encourage egoic unification with social collectives, to epistemic experiences of
profound and universal truths. Many other researchers have contributed their own lists of
qualities that describe transcendant experiences. What seems to be at the core of transcendent
experiences is that they tend to orient the individual towards encounters with agency and non-
physicality.

At the core of cognitive explanations for spiritual experiences is agenticity, an
amalgamation of cognitive processes such as mind perception and theory of mind that enable
the perception of agents in reality (Barrett, 2000; Barrett & Keil, 1996; Barrett & Zahl, 2013;
Boyer, 1996; Gervais, 2013; Guthrie et al., 1980; Petrican & Burris, 2012; Shermer, 2011).
An agent is that “which seems to have some kind of internal source of energy or force
explaining its self-propelledness, which acts teleologically in pursuit of goals, and which has
cognitive properties; i.e. it can perceive, think, know, and remember” (Pyysiäinen, 1999, p.
109). Part Two of the current thesis will explore these cognitive foundations more fully, but
when describing spirituality in personality it is important to recognise that its defining
experiences and beliefs seem to relate to the attribution of agency, what Dennett (2009) calls
the intentional stance. Descriptions of the primitive or pre-logical mentality show that all of
its interpretations and explanations of the world revolve around the attribution of agency to
reality (Jung, 1933; Levy-Bruhl, 1923). For example, where a cause of death cannot be
attributed to an observable agent (i.e., a murderer), the primitive mind would explain the
death as being the work of a non-observable agent (e.g., a spirit or sorcerer). The spiritual
worldview is founded on cognitive capacities to perceive and attribute agency to aspects of
reality, and transhuman agents are featured in nearly every religious belief system (Atran &
Norenzayan, 2004; Bloom, 2007; Petrican & Burris, 2012). Empirical studies have linked this
tendency to anthropomorphise with supernatural beliefs (Barrett & Keil, 1996; Willard &
Norenzayan, 2013).

Alongside agenticity, another aspect that unifies different manifestations of
transcendence appears to be the quality of non-physicality. That is, transcendent experiences
typically involve the dissolving of phenomenological boundaries of embodied time and
space, or the direct confrontation with aspects of reality that seem to be unbounded by
physicality. Ghosts, spirits, Gods, deities, dimensions, personal abilities, or spiritual
principles can be experienced or believed to exist beyond the physical laws of space and time
(Atran & Norenzayan, 2004; Hood et al., 1993; Pargament, 2013b; Pennycook, Cheyne, Seli,

So far, we have explained that spirituality in personality can be characterised by its
reference to transcendence, a tendency to experience or believe in non-physical aspects of
reality, especially sources of agency. As well as noting that the spiritual tendencies are
defined by their relation to the transcendent, it is also important to note that the expression of
spiritual tendencies must be acknowledged across thoughts, feelings, and behaviours.
Kapuscinski and Masters (2010) found that most models of spirituality tended to favour inner
experiences, beliefs, and values, failing to account for overt behaviours. These behaviours
might take the form of prayer, meditation, ritual, paranormal or occult practices, or activities
designed to activate mystical or transcendent states.
Perhaps most commonly, spiritual behaviours can also take the form of religious interpersonal behaviours. Religious institutions are intertwined with spiritual expression all the way back to its earliest anthropological records, in the form of shamanism. Shamanism, in its most basic definition, can be understood as a set of principles surrounding the use of altered states of consciousness to interact with spiritual entities (Walsh, 1989). The shaman typically offers the benefits of his encounters with spiritual agents to followers in the form of insights or divine healing. Similarly, many modern world religions such as Christianity, Judaism, Islam, and Hinduism, attribute agency to the concept of reality as a whole, personifying it, for example, as “God” or “Brahma,” as well as a cohort of other spiritual entities such as angels or lesser gods. These religions also offer insight or divine healing to members of their social groups. In other words, modern spiritual leaders have inherited the “socially beneficial religious and magical roles of the shaman” (Walsh, 1989, p. 9). Thus, a consistent theme across the literature suggests that spirituality refers to a personal, individualised experience, while religiosity refers to tradition-orientated systems of behaviours and group conducts (Lambert et al., 2013; Saucier & Skrzypińska, 2006).

Saucier and Skrzypińska (2006) warned against religiosity and spirituality being treated as a unified construct. However, their explanatory model showed both religiosity and spirituality originating from general spiritual tendencies – another way of signifying a latent construct superordinate to subjective spirituality and interpersonal religiosity. It makes sense, then, to understand religiosity as an interpersonal expression of spirituality in personality – one of many ways spirituality can be experienced and observed. This is supported by Zwingmann et al.’s (2011) suggestion that religiosity can be understood as a subordinate aspect of spirituality, unless there is a specific justification within the sample for strictly differentiating the two concepts. Thus, we can understand religiosity as an interpersonal, behavioural component of spirituality, present in various degrees across individuals (e.g., Hill
et al., 2000; Lambert et al., 2013; Pargament, 2013; Rose, 2001; Saucier & Skrzypińska, 2006; Zinnbauer et al., 1997, 1999; Zwingmann et al., 2011)

A person with high levels of spirituality, according to the current definition, would tend to experience aspects of reality as having a quality of agency, and show patterns of thoughts, feelings, behaviours, and worldview beliefs that relate to these experiences. Some of those trait behaviours might take the form of group rituals, reading spiritual literature, or simply talking about spirituality with another person. Similarly, worldview beliefs might prescribe proper ways of behaving that explicitly advocate participation in religious groups and engagement with community. The tendency to display those interpersonal traits and beliefs is defined as religiosity, a subordinate aspect of the general spirituality construct. By defining religiosity this way, the current definition of spirituality can account for individual membership in any religious group, without being limited by any culturally specific institutions.

3.1.2 Spirituality as Worldview Beliefs

As previously explained, the spiritual worldview emerged as an active way of relating to reality, rather than a set of explicit formalised beliefs (Jung, 1933; Peterson, 1999). Across the globe and across history, the function of transcendence arose as an inherent feature of human psychology, and with it came universal thoughts, feelings, and behaviours related to the personal and social orientation around these experiences (Gorelik, 2016; Pargament, 2013b). Despite these processes seeming to emerge experientially, rather than from a process of formal logic or systemic thought, the earliest anthropological artefacts do show records of Gods and deities (Culotta, 2009). This suggests that the experiences and practices surrounding transcendence did eventuate into conscious worldview beliefs about what forces and beings existed. Spanning from the early shamanic principles and models of reality, to the
current tenets of the great world religions, we have evidence that spiritual worldview beliefs are a part of individual personality.

It is possible to use the collated list of worldview dimensions generated by Koltko-Rivera (2004) to generate potential worldview beliefs that might comprise a spiritual worldview. For example, existential worldview beliefs for spirituality might be, “humans have a non-physical soul or spirit,” or “the universe as a whole is alive and aware.” Evaluative worldview beliefs for spirituality might be, “the highest state of human consciousness is ego transcendent,” or “intuition, divination, and revelation are valuable sources of knowledge.” Prescriptive worldview beliefs for spirituality might be “humans should try to live their lives according to the will of God,” or “in life, humans should care for their soul, spirit, or consciousness.” In the same way that spiritual traits are thoughts, feelings, and behaviours that orient the individual towards transcendent agency and non-physicality, spiritual worldview beliefs posit that these transcendent aspects of reality exist, have value, and should be related to with the proper behaviours.

The psychology of religion and spirituality is moving into a new, multidisciplinary paradigm (Hill & Gibson, 2008). As such, the investigation of spirituality in psychology does not need to remain bifurcated between the stream of evolutionary cognition and the stream of personal subjectivity – it can account for both. In line with this goal, the current paper suggests a psychological definition of spirituality as the thoughts, feelings, behaviours, and worldview beliefs that relates to aspects of the world with agenticity and non-physicality. This definition encapsulates the broad possibility for transcendent experiences, offering a substantive conceptualisation founded on neuro-cognitive and anthropological evidence, and underlying its capacity to function as a source of meaning and purpose.
3.2 Naturalism

“We must trust to nothing but facts: These are presented to us by Nature, and cannot deceive. We ought, in every instance, to submit our reasoning to the test of experiment, and never to search for truth but by the natural road of experiment and observation.”

~ Lavoisier, 1743

Naturalism as a psychological construct has been largely overlooked, due to its frequent conceptualisation as an absence of spirituality (Streib & Klein, 2013). On the one hand this is reasonable, because scientific naturalism arose as a movement of direct criticism of supernatural agency as an explanation for events (Caldwell-Harris, 2012; Irzik & Nola, 2007), and there is evidence that religious and naturalist cognitions are oppositional (Preston & Epley, 2009). However, there is also evidence that people can consider and explain events using both natural and supernatural perspectives simultaneously (Legare, Evans, Rosengren, & Harris, 2012). Furthermore, the treatment of worldview beliefs in personality as dimensional rather than categorical allows belief systems to be observable in varying degrees across individuals and over time. For these reasons, it is not comprehensive to measure only the lack of spirituality, there also needs to be the measurement of naturalism as a psychological construct in its own right. This has been argued, particularly so that the psychological well-being implications of naturalistic worldview as an aspect of identity can be investigated properly (Jesse M. Smith, 2011; Whitley, 2010).

Another likely reason that naturalism has been left out of empirical investigations could be that it would place under scientific scrutiny the worldview that many scientists hold. Psychological scientists operate under the assumption that the scientific method is
theoretically able to provide an objective truth of reality that is not based on individual
worldview beliefs. Slife et al. (2012) called this the myth of neutrality, arguing that the
worldview beliefs of scientists actually do influence their research, explicitly or implicitly
directing their methods and interpretations in conformity with presupposed assumptions.

The current section will highlight how naturalism can be understood as a construct in
personality comprising both traits and worldview beliefs. In the same way that cognitive
evidence can be used to delineate the unique characteristic of spirituality, cognitive and
anthropological evidence can be used to inform the key component of naturalism as a
psychological construct, the quality that gives it a unique influence over people’s interaction
with the world. Similar to the previous section, this section will define naturalism as a set of
traits, and then explain how worldview beliefs can be integrated into this definition.

3.2.1 Naturalism as Traits

In the same way that religions are the cultural artefacts of a spiritual worldview,
science is the cultural artefact of a naturalist worldview. The pre-logical spiritual worldviews
related to the world in terms of agencies and non-physical principles. However, over time, a
logical mentality emerged, which explained reality in terms of non-conscious physical forces
and natural laws (Jung, 1933; Levy-Bruhl, 1923). Scientific behaviours arose as a direct
opposition to spiritual and religious worldviews that used agencies to explain objects and
events, and rejection of supernatural entities is a stable feature of the naturalist worldview
and the scientific methods it includes (Gridley, 2009; Irzik & Nola, 2007).

During this modern paradigm, empirical sciences had a tendency to challenge
worldviews that appeared too philosophical or theological, and even psychological science
attempted to create a system of knowledge that was based on strict materialism and natural
law (Emmons & Paloutzian, 2003; Gridley, 2009; E. L. Johnson & Watson, 2012). A
thorough rejection of agency as an explanatory force in the world meant that 19th century psychologists rejected the mind as too ethereal, so it was no wonder that spiritual and religious experiences were generally regarded as scientifically taboo. Even through most of the 20th century, “spirituality and religion were considered generally incompatible with science, and more specifically with psychology in its quest for scientific respectability” (Gridley, 2009, p. 10).

Naturalist traits are exemplified by the actions involved in the scientific method, which at the very least demand methodological naturalism, if not ontological naturalism (Naugle, 2002). Historically, natural science emerged as a set of investigatory behaviours that attempted to observe phenomena and comprehend the patterns in their arrangements. These patterns were then treated as the causal factor for their arrangements, instead of any added factor such as agency. Naturalism therefore represents a domain of thoughts, feelings, and behaviours that relate to the world from a perspective in which events are observed, criticised, and refined in order to generate explanations of increasing epistemological validity (Gridley, 2009; Irzik & Nola, 2007). What is necessary for this type of behaviour is that observations can actually be made of phenomena in the world (importantly, as the behaviourists understood, agency cannot be directly observed). Thus, naturalist traits are those thoughts, feelings, and behaviours that relate to aspects of the world as physical and non-conscious.

The sort of traits that interact with the world as physical and non-conscious are exemplified in the enactment of the scientific method. This might include actual behaviours included in scientific projects, but it can be generalised far beyond this as a set of basic trait tendencies rather than vocational tasks. These tendencies have been referred to as autistic-like traits, that is, those thoughts, feelings, and behaviours by which individuals relate to phenomena (people, objects, environments, etc.) as non-conscious mechanical systems
understood in terms of automatous parts rather than conscious agency (Baron-Cohen, Richler, Bisarya, Gurunathan, & Wheelwright, 2003; Del Giudice, Angeleri, Brizio, & Elena, 2010).

Various measures have attempted to capture these kind of traits, and these will be discussed further as the current thesis turns towards psychometric investigations. What is important here is just to note that we can understand that naturalism has a trait-domain. This domain has been observed and investigated by various theorists in contemporary psychological science. In its extreme negative manifestation it represents those sets of behaviours labelled as autistic (Baron-Cohen et al., 2003). In its extreme positive manifestation it represents those sets of behaviours included in the scientific method. Both of these domains of personality traits reflect the tendency to use thoughts, feelings, and behaviours that relate to phenomena as a non-thinking mechanical systems.

3.2.2 Naturalism as Worldview Beliefs

The traits and worldview beliefs of naturalism seem to be founded on an interpretation of reality as non-conscious systems of physical parts, using what Dennett (2009) calls the physics and design stances to attribute causes of events to the operation of physical laws and non-conscious functions. These interpretations of reality give rise to specific autism-like traits, which are thoughts, feelings, and behaviours that relate to phenomena as non-conscious mechanisms.

These kind of interpretations comprise the scientific method, which theorists have argued is devoid of worldview content. However, at the core of the scientific discipline is a naturalism worldview (Irzik & Nola, 2007). Irzik and Nola (2007) showed that even the most basic conceptualisation of science involves numerous worldview beliefs. Naturalism as a worldview includes beliefs about objects and events being explicable without appealing to agency. Furthermore, the belief in realism posits that external physical reality exists
independently of the human mind. While perhaps taken as a given, this worldview belief is not necessary, as some spiritual worldviews posit that physical reality is an illusory product of mind (Capra, 2010). Irzik and Nola showed that the scientific method includes the worldview belief that reality is orderly and comprehensible to humans, and a subsequent worldview belief that the way towards this comprehension includes logic and the application of empirical evidence.

We can define naturalism then as the thoughts, feelings, behaviours, and worldview beliefs that relates to aspects of the world as non-conscious and physical. In this way, far from being simply an absence of spirituality, naturalism can be understood as a worldview in its own right with positive claims about what exists in reality, what can be valued, and how people should behave. Koltko-Rivera's (2004) list of worldview dimensions can also help to outline beliefs that could underlie a Naturalism worldview construct. For example, belief in biological and environmental determinism, the non-consciousness of nature, the absence of any form of deity, the lack of an ultimate meaning and purpose for the cosmos, and the individualised purpose of human life. Empirical testing is necessary to collapse the many worldview beliefs that could potentially comprise naturalism into a validated worldview construct.

Naturalism is a collection of worldview beliefs that include, for example, the belief that reality is physical, that it is comprehensible to humans, and that the path towards this comprehension is to use logic and empirical evidence (Irzik & Nola, 2007). These existential and epistemological worldview beliefs are consistent with behaviours that put them into practice – for example, being actively involved in scientific projects, reading and integrating scientific findings, and using rational logic and empirical evidence to develop or validate personally held beliefs and ideas. Rosenkranz and Charlton's (2013) measure of Science Acceptance showed that two items measuring Naturalism worldview beliefs (e.g., “the nature
of existence can be explained through scientific principles”, p. 129), could be integrated with two items measuring Naturalism traits (e.g., “I make important decisions in my life based on rational analysis”, p. 129) into a single psychometric construct. Like spirituality, naturalism can be assessed as a construct in personality comprising both traits and worldview beliefs.

Similar to the spirituality construct, when naturalism is represented in personality it is considered dimensional rather than categorical. This suggests that the beliefs and actions involved in naturalism, for example the belief that everything in reality is physical, are not completely static but rather manifest to varying degrees across time and context. This on the surface might seem to contradict people’s sense that their beliefs are static and stable. However, naturalism in personality does not represent a category of person, but rather a tendency to hold worldview beliefs and demonstrate thoughts, feelings, and behaviours related to an idea about reality being physical and non-conscious.

3.3 Agnosticism

“No knowledge can ever be certain that continues to expand with us as we live inside the growing flesh of our experience.”

~ Bronowski, 1971

Similar to naturalism being incorrectly considered as a lack of spirituality, agnosticism as a belief system has often been incorrectly considered as a mid-point somewhere between spirituality and naturalism (Benn, 1999; Le Poidevin, 2010; Streib & Klein, 2013). That is, on a spectrum with spirituality on the one end positing the existence of non-physical realities and forces of agency, and naturalism on the opposite end positing the existence of material realities and non-conscious natural laws, agnosticism is often thought to be somewhere in the middle – representing the absence of a strong belief one way or the
other. However, this is only one position of agnosticism; agnosticism in its most comprehensive definition encapsulates more than uncertainty, and can stand alongside spirituality and naturalism as an entirely distinct worldview.

Long before the term agnosticism was coined, people have questioned their own beliefs and denied the possibility of epistemological certainty. It could be argued that agnosticism is as old as philosophy itself, insofar as philosophy has attempted to deconstruct the foundations of knowledge and establish limitations around what can be truly known about reality. Even in the West, methodological scepticism has been attempted from as early as 1st century BC, with the followers of Pyrrho establishing an organised rejection of belief in general (Le Poidevin, 2010). Even in ancient times, there were those who posited the impossibility of comprehensive and objective knowledge about reality.

In the turn of the twentieth century, the term agnosticism was attributed to T. H. Huxley, who reflected on many of the great worldviews (atheism, theism, pantheism, materialism, idealism, etc.) and decided that they all shared a certainty that his did not (Clausen, 1976; Dockrill, n.d., 1971). He used the term agnosticism to signify a worldview in which one does not have gnosis (knowledge) about the ultimate truth of reality, and included in this idea the notion that this sort of knowledge is most likely impossible to obtain. In this sense, the term agnosticism implied both a reactive position that cast doubt onto other worldviews, and also as a set of worldview claims in its own right, comprising statements about the epistemological limits of all belief systems in general.

The agnostic position maintained through the pre-modern and modern eras, and seems to have gained a more central focus in current postmodern movements that treat worldviews as relative. Just as the modern era had rejected the pre-modern claims of agency and non-physicality, the twentieth century sparked a postmodern era that involved a rejection of natural positivist paradigm of non-consciousness and physicality. Around this time,
humanistic psychology emerged to favour notions of subjective experience and autonomy that were unacknowledged by the empirical materialist framework (Maslow, 1962; Rogers, 2011). Furthermore, the philosophical ramifications of quantum physics were becoming widely known, which seemed to suggest that the natural laws championed by modern positivism were caught in a somewhat uncertain state of subjective pluralism (Capra, 2010). Taken together, these shifts represented a scientific rejection of fundamentalism, a letting go of “attachment to a set of irreducible beliefs” (Nagata, 2001, p. 481).

Agnosticism can be understood as two distinct types, weak and strong. Weak agnosticism is characterised by personal doubt and uncertainty about what to believe, an uncertain lack of conviction about other beliefs. Strong agnosticism on the other hand, posits epistemological claims about the limits of what can be known in the world (Le Poidevin, 2010). Rather than being a position on a spectrum between spirituality and naturalism, strong agnosticism can represent an explicit rejection of that spectrum entirely, and claims about the validity of the sources of information used to generate its positions. In its broadest definition, strong agnosticism claims that there are limitations on what can possibility be known about reality, for example, that we can never know whether a God or Higher Power, agency and free will, or universal justice exists or not.

3.3.1 Agnosticism as Traits

Agnosticism can be understood as a tendency to cast doubt on ideas and beliefs, and set epistemological limits over what is possible to know for certain. Early psychological scientist Piaget (1955) used empirical investigations to support a model in which cognitive development includes a continual reappraisal of old ideas and thought processes. He described how new information can either be assimilated into current belief systems, or else the belief system itself would need to change in order to accommodate what would not have
made sense within the old system. These models highlight the ongoing meta-cognitive processes that assess information, and begins and explain how individual differences in agnosticism might emerge in personality. In personality agnosticism would represent thoughts, feelings, and behaviours that emerge as consistent patterns of disengagement and deconstruction of beliefs.

Part Two of the current thesis will explore further the meta-cognitive processes that underlie on overt critique of beliefs and ideas. What is important to know at this stage of the current thesis is that agnostic tendencies are observable in different degrees across people and over time. For example, Van Pachterbeke, Keller, and Saroglou's (2012) development of a new construct, called Existential Quest, showed that people’s tendency to question and change existential beliefs could be psychometrically assessed. This construct went beyond mere rejection of spiritual beliefs, instead capturing a domain of traits that favoured personal doubt and the re-appraisal of personal beliefs.

Van Pachterbeke et al.'s (2012) Existential Quest scale sets a good benchmark for exploring the tendency to doubt certain types of beliefs relating to existential domains; but a trait construct of agnosticism could theoretically capture a much broader tendency to be doubtful and flexible with one’s own beliefs, and also experience thoughts, feelings, and behaviours that associate with a universal uncertainty. Trait models for agnosticism in this broad sense have no precedent in the psychological literature. The following chapter reports on the development and validation of an inventory that includes agnostic traits, however the robust measurement of these tendencies in psychometric inventories will most likely involve prolonged attention and study.

3.3.2 Agnosticism as Worldview Beliefs
Agnosticism can be understood in its “weak” form, denoting personal uncertainty and flexibility of belief, and in its “strong” form, which puts forward claims about the nature of reality as ultimately unknowable (Le Poidevin, 2010). Thus, agnosticism is not a mere lack of personal belief, but a psychological construct that represents the presence of beliefs that promote epistemological uncertainty. This is evident in the existence of agnosticism as a culturally recognised worldview in its own right.

Koltko-Rivera's (2004) collated model of worldview dimensions helps to suggest some possible beliefs that could be included in an agnostic worldview. Within the knowledge dimension of Koltko-Rivera's (2004) model, we see the option of nullity, which asserts that there are no reliable sources for knowledge available in the world. This can be understood as a simple qualifier for other beliefs. If X represented any category of worldview belief, then agnosticism would intuitively be represented with the formula “it is not possible to know the true nature of X” across any category. When taken as a rejection of the other options within this dimension, nullity essentially rejects the information from interpersonal, intrapersonal, divine, and sensory sources as unreliable. This dimension of Koltko-Rivera's model can act as a source for agnostic worldview beliefs that could be tested psychometrically.

Perhaps most obviously related to the agnostic worldview is Koltko-Rivera's (2004) group of worldview dimensions concerning Truth. In this group, the scope dimension offers the option of relativity, as opposed to universal objective truth. The belief in relativity is not a claim about another belief system, but rather a claim about the non-existence of an ultimate Truth in general. The possession and availability dimensions include beliefs about the amount of objective truth held by oneself and one’s own culture. Rather than belief about whether or not ultimate Truth exists or not, these attitudes concern whether ultimate truth is known or knowable by people. Together, these epistemological beliefs characterise agnosticism in terms of its worldview content.
3.4 Summary

The first chapter of this thesis introduced and defined the concept of worldviews as sets of beliefs about the fundamental nature of reality. The second chapter argued that these types of beliefs can be explicitly incorporated into models of personality alongside traits, which would add comprehensibility, logical consistency, and predictive power to personality constructs. In order to test these assertions, it was argued that certain constructs would need to be developed in order to measure personality constructs as integrations of traits and worldviews.

As with traits, the potential breadth of worldview beliefs can be understood to be as vast as the language used to describe them at the folk level of personality, and Koltko-Rivera's (2004) initial collated model of worldview beliefs does show a large range of options for a conceptual partition of possible worldview constructs. In order for the current thesis to develop an inventory to test the integration of traits and worldviews, as well as the explanatory and predictive power that these amalgamated constructs might have, it was necessary to select specific worldviews to focus on. Spirituality, naturalism, and agnosticism were chosen as three distinct worldviews for the current thesis. Together they represent an extremely large portion of Koltko-Rivera's (2004) worldview dimensions, and they are present across common parlance and psychological theory, which means they can be potentially assessed in the general population and validated in line with previous empirical findings.

The current chapter offered theoretical explanations of spirituality, naturalism, and agnosticism. Spirituality was described as a psychological capacity of transcendence, in which aspects of reality are related to in terms of non-physicality and agency. In contrast, naturalism was explained as a psychological capacity to relate to aspects of reality as physical
and non-conscious. In contrast to both of these constructs, agnosticism was explained as a psychological capacity to relate to aspects of reality as personally or ultimately unknowable. Each of these three capacities can be understood as comprising both traits (i.e., thoughts, feelings, and behaviours) and worldview beliefs, which are not understood as categorical but dimensional tendencies that might be observed in varying degrees across individuals, time, and context.

The contention of the current thesis is that these three constructs – spirituality, naturalism, and agnosticism – can be measured at the level of individual differences in personality. The following chapter reports two studies that used exploratory and confirmatory factor analyses to develop and validate an inventory for these three constructs. The psychometric data of this inventory, as well as its statistical association with the FFM of personality, were used to comment on the way that worldview beliefs and traits might be integrated into personality constructs. Furthermore, this inventory was then used in Part Two of the current thesis to test the associations that spirituality, naturalism, and agnosticism had with cognitive processes and well-being variables. Not only did this provide data that could comment on the explanatory and predictive power of these three worldviews in particular, but it could also be used to comment tentatively on the explanatory and predictive power of worldview constructs in general.
Chapter Four: Measuring Spirituality, Naturalism, and Agnosticism

The overarching aims of the current project were to investigate how worldviews could be integrated with traits in personality constructs, how they related to cognition, and how they related to well-being outcomes. In order to do this, three worldviews were chosen as a focus for empirical studies – spirituality, naturalism, and agnosticism. The purpose of the current chapter was to report the development and validation of a psychometric inventory that measured these three constructs as integrations of worldview beliefs and traits.

This chapter is separated into two studies. Study One used exploratory factor analysis to reduce a large pool of items measuring spirituality, naturalism, and agnosticism into an inventory that presented simple structure and captured all three domains. Study Two used confirmatory factor analysis to reduce the scale into an even more psychometrically sound instrument, and demonstrate construct validity alongside other measures for similar constructs. Study Two also had secondary aims, which were to test the spirituality, naturalism, and agnosticism constructs alongside the FFM domains, and to begin development of a small outcome measure for self-reported worldview functionality.

4.1 Study One

The aim of this study was to develop a large pool of items, and then subject them to exploratory factor analysis in order to represent spirituality, naturalism, and agnosticism as empirically robust constructs comprising both worldview beliefs and traits in personality. The previous chapter defined spirituality as a psychological capacity associated with transcendence, specifically in terms of the tendency to relate to aspects of reality as non-physical and conscious. In contrast, naturalism was defined as a tendency to relate to aspects of reality as physical and non-conscious. Finally, agnosticism was defined as a tendency to relate to aspects of reality as either personally or ultimately unknowable. These three
definitions were used to generate a list of potential items for each of the constructs. Furthermore, pre-existing constructs with some relation to the constructs were used as inspiration for the development of additional items. The proceeding sections outline further details about how items specific to each of the hypothesised domains were developed and tested.

4.1.1 Method

4.1.1.1 Participants

Most participants were recruited from a community sample of convenience, via email and word-of-mouth. Some participants were recruited as part of their assessment for an undergraduate psychology degree. After the screening process, the sample comprised 412 participants with ages ranging from 18 to 78 years. There were 130 men (\(M = 37.59, SD = 15.06\) years), 275 women (\(M = 36.02, SD = 12.90\) years), three participants who identified as “Other” gender, and four participants who did not report their gender. When asked to report their highest level of education completed, less than one percent of participants had not completed secondary school, 17% had completed secondary school or equivalent, 35% had a certificate or diploma, 30% had a bachelor or undergraduate degree, and 17% had a postgraduate, master, or doctorate degree. Forty-five percent of participants had completed the survey as part of their university course.

Eighty percent of participants resided in Australia, 11% in the USA, 5% in Europe (including United Kingdom, Estonia, Finland, France, Germany, Norway, Poland, Romania, and the Netherlands), 2% in Canada, 2% in Asia (including China, Japan, India, Indonesia, Iran, and Taiwan). There was one participant who resided in South Africa, one participant who resided in Zambia, one participant who resided in New Zealand and two participants who did not report their country of residence.
Thirty-six percent of participants reported their ethnicity as white, Caucasian, or Anglo-Saxon, 35% Australian, 12% European (including British, English, Celtic, Dutch, German, Irish, Romanian, Hispanic, Nordic, Polish, Scottish, Swedish, Croatian, Italian, Maltese, Norwegian, Estonian, French, Turkish, Lebanese, and Iranian), 6% Asian (including Indian, Malaysian, Bengali, Chinese, Shiraz, Filipino, and Sri Lankan), 3% mixed Australian (including Australian-Asian and Australian-European), 1% New Zealander, 1% African (including South African and Ethiopian), 0.5% Multiracial, 0.5% Canadian (including Quebecois). One participant reported their ethnicity as USA, one participant as Russian, one as Black, one as Middle-Eastern, and one as Mexican. Three percent of participants did not report their ethnicity. English was a first language for 90% of participants.

Forty-four percent of participants associated their culture of upbringing with a religious institution (including Judeo-Christian religions, Buddhism, Wicca, Hinduism, and Islam), while 56% did not (one participant did not report this). Eighteen percent of participants associated personally with a religious institution (including Judeo-Christian religions, Buddhism, Zen, and Vipassana Dhura), while 82% did not. Forty-four percent of participants never attend an organised place of worship, 27% attend once a year or less, 14% several times a year, 3% once a month, 2% several times a month, 7% once a week, 2% several times a week – one participant reported attending once a day, and another participant reported attending several times a day. Forty percent of participants never worship privately, 7% once a year or less, 13% several times a year, 4% once a month, 7% several times a month, 4% once a week, 11% several times a week, 8% once a day, and 6% several times a day.
4.1.1.2 Materials

Participants were asked to report their age, gender (Male; Female; Other), education level (not completed secondary school; secondary school or equivalent; certificate/diploma; bachelor degree/undergraduate degree; postgraduate/master/doctorate), ethnicity, country of residence, whether English was their first language (Yes; No), frequency of organised worship, prayer, or meditation (never; once a year or less; several times a year; once a month; several times a month; once a week; several times a week, once a day; several times a day), and frequency of private worship, prayer, or meditation (never; once a year or less; several times a year; once a month; several times a month; once a week; several times a week, once a day; several times a day). Participants were also asked to report whether they associate personally with a religious institution (Yes; No), and whether they associate their culture-of-upbringing with a religious institution (Yes; No). If they responded “yes” to either of these questions, they were given the opportunity to write which religion. Participants were asked whether they were completing the survey as part of university involvement (Yes; No). Participants also completed the following measures.

**Balanced Inventory of Desirable Responding 6 Short Form (BIDR).** Paulhus’ (1991) inventory was refined by Bobbio and Manganelli (2011) in order to provide a short measure of socially desirable responding across two factors. Impression Management assesses the degree that participants consciously distort self-reports in order to present a positive image to others (e.g., “I have never dropped litter on the street”; $a = .76$). Self-Deception Enhancement measures the degree that participants unconsciously bias self-reports in order to maintain a positive self-esteem (e.g., “I never regret my decisions”; $a = .74$). Responses were measured on a 6-point Likert scale ranging from 1 (Strongly Disagree) to 6 (Strongly Agree).
**Spirituality.** It was intended that the Spirituality items would measure spirituality in its broadest sense, and that quantitative analysis would reveal thoughts, feelings, behaviours, and worldview beliefs that define the manifestation of spirituality across cultures. Religiosity was defined as a subordinate aspect of the Spirituality construct, measuring traits and beliefs in the construct that are inherently interpersonal – this definition is supported consistently throughout the literature (e.g., Hill et al., 2000; Lambert et al., 2013; Rose, 2001; Saucier & Skrzypińska, 2006; Zinnbauer et al., 1997, 1999; Zwingmann et al., 2011). By defining religiosity this way, the current Spirituality construct could account for individual membership in any religious group, without being limited by any culturally specific institutions.

In generating the item pool for Spirituality, items were developed to reflect the theoretical construct definition outlined above – thoughts, feelings, behaviours, and worldview beliefs that relate to perceptions or interpretations of agency in different aspects of reality. Items were also developed to reflect dimensions of spirituality present across various measures in the literature, such as spiritual philosophising, spiritual beliefs, spiritual practices, spiritual connection, and relationship with a God or Higher Power (Holmes & Findlay, 2016), paranormal beliefs (Pennycook et al., 2012; Tobacyk, 2004); eco-awareness (Delaney, 2005; Hedlund-de Witt, de Boer, & Boersema, 2014); transcendence (Piedmont, 1999), devotion (King, Clardy, & Ramos, 2013); anti-materialism (Lambert et al., 2013); spiritual attitudes towards coincidence (Bressan, 2002); mystical experiences (Hood, 1975; Hood & Francis, 2013; Hood et al., 1993; MacLean, Johnson, & Griffiths, 2011), and spiritual worldview beliefs (Koltko-Rivera, 2004).

This effort of collation was expected to result in common factors for the Spirituality scale, measuring thoughts, feelings, attitudes, behaviours, and worldview beliefs about: spiritual philosophy, meaning and purpose, God and Higher Powers, supernatural beings, the
afterlife, personified reality, non-physical spirit, spiritual morality, spiritual rituals, spiritual experiences, spiritual connection, personal practices, interpersonal practices, and nature awareness. With such an inclusive approach it was difficult to predict the common factors that will be present in exploratory factor analysis. Even still, “a researcher should attempt to delineate as comprehensively as possible the population of measured variables for the domain of interest. He or she should then include in the study a sample of these measured variables that is as large as feasible” (Fabrigar, Wegener, MacCallum, & Strahan, 1999, p. 273). The current item pool satisfies recommendations from Fabrigar et al. (1999), in that the total number of measured variables in the item pool is at least five times more than the expected number of common factors, evenly spread so that each expected common factor is represented by at least five items.

**Naturalism.** A review of the literature helped to develop items relating to science acceptance (Rosenkranz & Charlton, 2013); belief in science (Farias, Newheiser, Kahane, & de Toledo, 2013); science perception (C. S. Wallace, Prather, & Mendelsohn, 2013); naturalist attitudes towards coincidence (Bressan, 2002); and naturalist worldview beliefs (Irzik & Nola, 2007; Koltko-Rivera, 2004). Further items were developed by taking general definitional characteristics of naturalism and atheism (e.g., Caldwell-Harris, 2012), and applying them across domains of thought, feeling, behaviour, and worldview beliefs, in line with the construct definition.

This effort of collation was expected to result in common factors for the Naturalism scale, measuring thoughts, feelings, attitudes, behaviours, and worldview beliefs about: the universe being purely material, physical forces and natural laws, determinism, natural science, chance, logic and rationality, materialism, and personal scientific practices. As with the Spirituality item pool, the expected common factors for the Naturalism scale were each represented by at least five items (Fabrigar et al., 1999).
**Agnosticism.** A review of the literature helped to develop items relating to epistemological agnosticism (DeBacker, Crowson, Beesley, Thoma, & Hestevold, 2008) existential agnosticism and belief flexibility (Van Pachterbeke et al., 2012), agnostic interpretations of coincidence (Bressan, 2002), dogmatism (reversed for the agnosticism construct, Altemeyer, 2002), and worldview dimensions relating to existential truth (Koltko-Rivera, 2004). Some items were inspired by theoretical work detailing the agnostic worldview (e.g., Cook, 2009; Kuhn, Cheney, & Weinstock, 2000; Sire, 2009). Further items were developed by taking general definitional characteristics of agnosticism and applying them across domains of thought, feeling, behaviour, and worldview beliefs, in line with the construct definition.

This effort of collation resulted in expected common factors for the Agnosticism scale, measuring thoughts, feelings, attitudes, behaviours, and worldview beliefs about: mystical experiences, universal oneness, belief flexibility, doubt and scepticism, epistemological agnosticism, existential agnosticism, and paranormal beliefs and experiences. As with the Spirituality and Naturalism item pool, the expected common factors for the Agnosticism scale were each represented by at least five items (Fabrigar et al., 1999).

**Psychometric considerations.** The use of both positively and negatively worded items within the same psychological measure is a technique often used in order to avoid response biases such as acquiescence, careless responding, and confirmation bias (Horan, DiStefano, & Motl, 2009; Netemeyer, Bearden, & Sharma, 2003; Weijters & Baumgartner, 2012; Weijters, Baumgartner, & Schillewaert, 2013). However, scales including negatively worded items are often shown to be less reliable, due to the lower item-total correlations found with negatively worded items (Netemeyer et al., 2003; Weijters & Baumgartner, 2012). Furthermore, negatively worded items can be detrimental to scale development, whereby the method effect produced by negatively worded items can act as an influential latent variable,
generalisable across psychological scales (DiStefano & Motl, 2006; Horan et al., 2009). Negatively worded items, therefore, can lead to complex or simply poor factor models. The influence on factor structure by negatively worded items could be extremely confounding for the current study, especially because a negative factor for Spirituality could be considered a positive factor for Naturalism – this exact effect was shown during Holmes and Findlay's (2015) factor analysis of a spirituality measure.

Including negatively worded items in the current worldview measures in order to control for response bias would not necessarily justify the increased error variance and distorted perspective on construct dimensionalities (Schriesheim & Eisenbach, 1995). However, there is a different way of controlling for response bias. Instead of negatively worded items, the current study used a technique prescribed by Barnette (2000), whereby the response scale changes directions across the items, so that “Strongly Disagree” sometimes appears on the left side, and sometimes on the right. In order to make sure participants are not confused by this, they will be forewarned about the random changes in direction of the response scale. Weijters and Baumgartner (2012) explained that instructing participants about the inclusion of negatively worded items effectively reduced the careless responding related to negative items. Similarly, it was decided that the random changes in response scale direction would not pose any more of a problem than negatively worded items, as long as participants received clear instructions about this function being present throughout the survey.

To further reduce confusion and misresponse, the “Strongly Disagree” and “Slightly Disagree” options were presented in red and “Slightly Agree” and “Strongly Agree” options were presented in green – participants were clearly advised about this format. Research has suggested that these colours would not influence participant responses, as long as the scale
response options are numbered and semantically labelled (Toepoel & Dillman, 2011; Tourangeau, Couper, & Conrad, 2007).

Weijters, Cabooter, and Schillewaert (2010) showed that having an odd number of response options, meaning that a mid-point in the scale was present, would result in increased acquiescence but decreased extreme responses. Because measures were already taken to reduce acquiescence, it was decided that a mid-point should be present in the scale to offset the effects of extreme responding. In fact, Weijters et al. recommended always including a mid-point unless there is a specific reason not to. Furthermore, it was decided that a 5-point scale would be used, rather than a 7-point scale, because the intended sample would be members of the general population, and Weijters et al. recommended having fewer response options for a sample that may or may not have high cognitive ability (i.e., non-students or non-academics). The 5-point, fully labelled scale is in line with Weijters et al.'s framework for deciding a scale response format – and the current study used the same semantic labels as they did during the investigations that supported this framework (1 = strongly disagree; 2 = slightly disagree; 3 = neutral; 4 = slightly agree; 5 = strongly agree). It was decided that a “no-opinion” response would not be included in the possible responses, due to evidence showing that omitting this option does not impact on data quality, but including one does impact on the attainment of meaningful information (Krosnick et al., 2012).

Finally, it was decided that the online survey would contain only ten items per screen, and that there would only be one header for each segment of questions. This was in line with suggestions from Toepoel, Das, and Van Soest (2009), whereby having four to ten items per screen, with a single header per screen, optimised the trade-off between survey completion time and item nonresponse. Because the interpretation of items often changes as a result of their placement with other items (Toepoel et al., 2009), the items within each set of ten would be presented in a random order for each participant, and the sets of ten items would also be
presented in a random order for each participant. Because any set of ten items will share the same direction of the response scale, the changes in response scale direction will also appear randomly across participants.

As well as advising participants of the response scale and its change of direction throughout the survey, the instructions also define key terms used in the survey. These key terms were “God,” “Higher Power,” “supernatural being,” and “natural science.” Defining these terms was deemed important, as their interpretation could impact many responses in the survey. Participants were told that they could interpret God or Higher Power as “any God, group of gods, Supreme Being, or Higher Intelligence that is transhuman, alive, and conscious,” and supernatural being as “any type of supernatural entity (e.g., spirits, ghosts, angels, demons)”. These instructions are in line with the previously mentioned aim of the Spirituality measure being universal, and also with the evidence found in the cognitive science of religion (e.g., Pyysiäinen, 1999). Natural science was defined as “any form of investigation that focuses only on physical matter, and excludes any form of spiritual or non-physical explanations for events.” Defining natural science in terms of scientific methodology or theories of non-agency would have produced too much of a cognitive load for participants, however it was deemed important to make sure that participants defined this term as excluding spiritual or non-physical phenomena.

4.1.1.3 Procedure

After receiving ethics approval, a questionnaire was made available online using Qualtrics software. Most participants were recruited from a community sample of convenience, via email and word-of-mouth. Some participants were recruited as part of their assessment for an undergraduate psychology degree. All participants completed the online survey voluntarily in their own time. The survey was accessible for three months and during
that time it received 849 attempts, and 414 complete responses, indicating a return rate of 49%.

4.1.2 Results

4.1.2.1 Data Screening

All analyses were conducted using SPSS version 22. Before analysis, demographic variables were examined for inaccurate responses. Two cases were removed due to out-of-range age values, which left a sample of 412 participants. Items measuring Spirituality, Naturalism, Agnosticism, and BIDR were examined for missing values. None of the variables had 5% of data missing, and no case had 3% of data missing.

Little's (1988) MCAR test showed that missing values were missing completely at random within the Spirituality items ($\chi^2 (5098) = 5217.553, p = .119$), Agnosticism items ($\chi^2 (2185) = 2383.521, p = .002$), and BIDR items ($\chi^2 (104) = 105.003, p = .454$). Little's MCAR test showed that missing values were not missing completely at random for the naturalism items ($\chi^2 (2254) = 2530.016, p < .001$). Examination of the missing naturalism values showed no discernible pattern, and so it was concluded that these values were missing at random.

Based on these findings, it was deemed appropriate to impute missing values using the expectation maximisation method (Schafer & Graham, 2002; Tabachnick & Fidell, 2014), this was done separately within the Spirituality, Naturalism, Agnosticism, and BIDR item groups.

Items measuring Spirituality, Naturalism, and Agnosticism were examined for outlier cases. No univariate outliers were detected, but 28 cases were multivariate outliers at the $p < .001$ significance level. Although these multivariate outlier cases typically displayed extreme responses across many items, discriminant function analysis did not show any discernible pattern of items that accounted for multiple cases. All subsequent analyses for study one were
conducted with and without multivariate outliers in the dataset, and there were no substantial differences in results. The following results are reported with multivariate outliers present. Because of the large number of variables, and because many squared multiple correlations were above .90, it was desirable to screen for multicollinearity quite severely. Correlations within the combined Spirituality, Naturalism, and Agnosticism item pool were examined; those scoring above .65 were examined for semantic redundancy. A total of 60 variables were removed so that all squared multiple correlations were below .90, and all correlations between items were below .80. Items measuring Spirituality, Naturalism, and Agnosticism were also examined for outlier variables. A further eighteen outlier variables were removed because they did not correlate with at least three other items above .30.

The remaining 195 Spirituality, Naturalism, and Agnosticism items showed mostly non-linear relationships, non-normal distributions, significant skewness and kurtosis, and heteroscedasticity. However, transformation of variables was not desirable because that would make interpreting EFA results difficult. Moreover, departures from multivariate assumptions were to be expected with Likert-scale data, and nearly 80 years of investigation suggest that parametric tests can provide robust results despite their violation (Norman, 2010).

**4.1.2.2 Exploratory Factor Analysis**

Many items presented non-normal distributions, and it was estimated that the emerging factors of would correlate, therefore principal axis estimations with oblique rotations were used to analyse the data. Bartlett's (1950) test of sphericity was significant ($\chi^2 (18915) = 64069.84, p < .001$), and the Kaiser-Meyer-Olkin (Kaiser, 1970) measure of sampling adequacy was high (.94), both indicating that the 195 items were adequately intercorrelated for EFA.
Estimating the amount of retainable factors using eigenvalues larger than one was not feasible, because this criterion overestimated the number of discernible factors in the data – this was to be expected with so many variables (Tabachnick & Fidell, 2014). Similarly, Horn's (1965) parallel analysis suggested even more factors, most of which were inadequately represented. Cattell's (1966) scree plot was somewhat ambiguous, though results suggested that the possible number of factors was between six and 15. Therefore, 10 principal axis estimations were conducted with direct oblimin rotation, 10 with promax (kappa = 2) rotation, and 10 with promax (kappa = 4) rotation, each forcing 6 through 15 factors. Pattern matrices across all 30 analyses suggested that the most interpretable solution occurred with promax rotation (kappa = 4), with seven forced factors. That is, this analysis provided the largest amount of conceptually discernible factors that showed the best outcome for high factor loadings and minimal cross-loadings.

A series of principal axis factoring with promax rotation (kappa = 4) were conducted, forcing seven factors. Items were removed if they showed communalities below .30, factor-loadings below .40, cross-loading between factors, correlations above .60 combined with similar semantic content, and poor conceptual match with other items loaded into the same factor. The final model contained 44 items loaded across the seven factors, and explained 56% of the variance in the sample data. One factor had an eigenvalue below one, but it was apparent on Cattell’s scree plot, and the items it comprised were logical. This factor also comprised the fewest number of items, so it was expected that subsequent extension of the scale would result in a higher eigenvalue. Table 1 displays eigenvalues, Cronbach’s alpha values, factor loadings, and communalities across the seven factors. Table 2 shows the means, standard deviations, range, and correlations between the seven factors.
<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>$\alpha$</th>
<th>Item</th>
<th>Loading</th>
<th>Communality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mysticism</td>
<td>14.18</td>
<td>.89</td>
<td>I have had an experience in which I seemed to transcend time and space, or time and space ceased to exist.</td>
<td>.89</td>
<td>.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I purposefully alter my state of consciousness in order to have mystical experiences.</td>
<td>.86</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I have had an experience in which I merged completely with everything that exists.</td>
<td>.83</td>
<td>.58</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I have had an out-of-body experience, in which I was separate from my physical body.</td>
<td>.76</td>
<td>.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sometimes it seems as though my spirit, soul, or consciousness has merged or connected with someone else.</td>
<td>.66</td>
<td>.62</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I have had an experience that defied the natural laws of physics.</td>
<td>.56</td>
<td>.55</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I have had an experience in which all things seemed sacred.</td>
<td>.55</td>
<td>.55</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I have had an experience in which ultimate reality was revealed to me.</td>
<td>.54</td>
<td>.44</td>
</tr>
<tr>
<td>Scientism</td>
<td>3.33</td>
<td>.89</td>
<td>I actively seek scientific knowledge and evidence.</td>
<td>.81</td>
<td>.56</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I trust in the knowledge and wisdom of scientific experts.</td>
<td>.82</td>
<td>.57</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>We should believe in what is scientifically proven with physical evidence.</td>
<td>.72</td>
<td>.69</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Natural science provides true knowledge about the universe.</td>
<td>.71</td>
<td>.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>We can be certain that scientific knowledge is true and reliable.</td>
<td>.69</td>
<td>.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I make sure my beliefs are supported by scientific evidence.</td>
<td>.60</td>
<td>.63</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Beliefs are valid if they are supported by physical evidence.</td>
<td>.60</td>
<td>.50</td>
</tr>
</tbody>
</table>

(Table 1 continues)
(Table 1 continued)

<table>
<thead>
<tr>
<th></th>
<th>Sp. Practice</th>
<th>Physicism</th>
<th>Sp. Belief</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sp. Practice</td>
<td>2.66</td>
<td>1.64</td>
<td>1.00</td>
</tr>
<tr>
<td>Physicism</td>
<td>.92</td>
<td>.86</td>
<td>.91</td>
</tr>
<tr>
<td>Sp. Belief</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sp. Practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sp. Belief</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In order to discover true information, people should use physical senses and logic. .56 .52
I look to a spiritual community for support in tough times. .81 .66
I participate in spiritual ceremonies with other people. .80 .69
I follow guidance from spiritual leaders. .77 .67
Humans should live according to the will of God or a Higher Power. .74 .69
I have a personal relationship with God or a Higher Power. .70 .70
My life involves spiritual rituals or behaviours (e.g., prayer, meditation). .58 .67
There is no free will; all behaviour is predetermined by non-conscious physical forces and natural laws. .79 .34
Everything is caused by non-conscious forces and natural laws. .74 .44
People are really just organised physical matter. .66 .64
When trying to understand reality, people should assume that there is only physical matter. .68 .53
Reality is purely physical. .59 .56
Human consciousness is a by-product of the brain and body; it is controlled by physical forces and natural laws. .54 .50
My choices are caused by purely physical events in my brain and body. .55 .51
The universe unfolds according to a plan, or a conscious will. .84 .67
There is an ultimate meaning and purpose for life. .70 .62
(Table 1 continued)

<table>
<thead>
<tr>
<th>Belief</th>
<th>Weak Ag.</th>
<th>Strong Ag.</th>
</tr>
</thead>
<tbody>
<tr>
<td>There exists an essential justice in the universe (e.g., karma, divine judgment).</td>
<td>.70</td>
<td>.70</td>
</tr>
<tr>
<td>The universe is governed by spirit, soul, or consciousness.</td>
<td>.55</td>
<td>.70</td>
</tr>
<tr>
<td>Spirits of the dead can intervene in the physical world.</td>
<td>.54</td>
<td>.56</td>
</tr>
<tr>
<td>There is some form of life after death.</td>
<td>.53</td>
<td>.72</td>
</tr>
<tr>
<td>I am never really sure about what I believe.</td>
<td>.83</td>
<td>.67</td>
</tr>
<tr>
<td>My beliefs change from moment to moment.</td>
<td>.81</td>
<td>.63</td>
</tr>
<tr>
<td>I find it difficult to choose between different systems of belief and knowledge.</td>
<td>.61</td>
<td>.43</td>
</tr>
<tr>
<td>Sometimes I believe in God or a Higher Power, sometimes I don’t.</td>
<td>.57</td>
<td>.46</td>
</tr>
<tr>
<td>My beliefs about reality change when it suits me.</td>
<td>.55</td>
<td>.35</td>
</tr>
<tr>
<td>It is not possible to know the absolute truth about anything.</td>
<td>.81</td>
<td>.64</td>
</tr>
<tr>
<td>There is no set of beliefs that can ever be completely true.</td>
<td>.70</td>
<td>.52</td>
</tr>
<tr>
<td>No form of knowledge can be completely certain.</td>
<td>.69</td>
<td>.46</td>
</tr>
<tr>
<td>In the grand scheme of things, there are no absolute truths.</td>
<td>.67</td>
<td>.53</td>
</tr>
</tbody>
</table>

N = 412
Table 2
*Means, Standard Deviations, Ranges, and Correlations for 7-Factor Model of Worldviews*

<table>
<thead>
<tr>
<th></th>
<th>Spirituality</th>
<th>Naturalism</th>
<th>Agnosticism</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1. Mysticism</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Sp. Practice</td>
<td>.56***</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Sp. Belief</td>
<td>.58***</td>
<td>.72***</td>
<td>-</td>
</tr>
<tr>
<td>4. Scientism</td>
<td>-.41***</td>
<td>-.51***</td>
<td>-.64***</td>
</tr>
<tr>
<td>5. Physicism</td>
<td>-.45***</td>
<td>-.60***</td>
<td>-.71***</td>
</tr>
<tr>
<td>6. Weak Ag.</td>
<td>.23***</td>
<td>.09</td>
<td>.24***</td>
</tr>
<tr>
<td>7. Strong Ag.</td>
<td>.05</td>
<td>-.17**</td>
<td>-.03</td>
</tr>
</tbody>
</table>

N = 412

*Note.* *p* < .05, **p** < .01, ***p*** < .001

For all further analyses with the current sample, relationships were considered significant at the *p* < .001 level. As can be seen in Table 2, three second-order factors seem evident through sets of significant positive correlations. The Mysticism, Spiritual Practice, and Spiritual Belief factors show moderate and strong significant intercorrelations, representing a potential second-order factor which can be called Spirituality – a worldview that focuses on transcendental aspects of reality, including supernatural agencies. Conversely, a significant moderate positive correlation between the Scientism and Physicism factors suggests a possible second-order factor which could be called Naturalism – a worldview based around beliefs that assert the physical nature of reality, and practices based on empiricism. Finally, the weak positive correlation between Weak Agnosticism and Strong Agnosticism could indicate a second-order Agnosticism factor, representing an essentially relativistic worldview. Scores from the factors were summed in order to create these three overarching worldviews. Correlations between these three worldviews are presented in Table
which shows that the Spirituality and Naturalism worldview constructs had a significant and strong negative relationship.

Table 3
Correlations, Means, Standard Deviations, Range, and Cronbach’s Alphas for Worldviews and Social Desirability

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Naturalism</td>
<td>-.70***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>49.43</td>
<td>12.25</td>
<td>18-70</td>
<td>.91</td>
</tr>
<tr>
<td>3. Agnosticism</td>
<td>.12*</td>
<td>-.13*</td>
<td>-</td>
<td></td>
<td></td>
<td>26.11</td>
<td>7.16</td>
<td>9-45</td>
<td>.80</td>
</tr>
<tr>
<td>4. Impression Management</td>
<td>.06</td>
<td>-.04</td>
<td>-.22***</td>
<td>-</td>
<td></td>
<td>25.06</td>
<td>7.57</td>
<td>8-48</td>
<td>.74</td>
</tr>
<tr>
<td>5. Self-Deception Enhancement</td>
<td>-.03</td>
<td>.07</td>
<td>-.23***</td>
<td>.20***</td>
<td>-</td>
<td>29.09</td>
<td>6.18</td>
<td>8-48</td>
<td>.71</td>
</tr>
</tbody>
</table>

*N = 412

Note. *p < .05, **p < .01, ***p < .001

4.1.2.3 Social Desirability

Correlations between the BIDR and the seven factors of the EFA showed that only the Weak Agnosticism factor had significant relationships with Impression Management (*r* = -.19, *p* < .001) and Self-Deception Enhancement (*r* = -.26, *p* < .001). Impression Management also had relationships that approached significance with Spiritual Practice (*r* = .13, *p* < .05) and Strong Agnosticism (*r* = -.16, *p* < .01). As can be seen in Table 3, Agnosticism was the only worldview construct that had significant correlations with socially desirable responding, showing weak but significant negative relationships with both of its dimensions.

4.1.2.4 Demographics

Age, Gender, and Education Level. Table 4 shows correlations between scores across the seven factors, as well as the three worldview constructs, with participants’ age.
There was a weak positive correlation between age and Spiritual Practice, and a weak negative correlation between age and Weak Agnosticism, both significant at the $p < .001$ level. There were also several correlations that were significant at the $p < .01$ and $p < .05$ levels.

An independent-samples t-test was conducted to investigate differences in mean scores between men and women across the seven worldview factors and the three worldview constructs and their sub-factors (see Table 4). Levene's (1960) test for equality of variances was used to account for differences in group variance. Compared to women, men scored significantly higher for Naturalism ($t(233.78) = 5.53, p < .001$) and its Scientism ($t(403) = 5.86, p < .001$) and Physicism ($t(205) = 4.20, p < .001$) factors, and significantly lower for Spirituality ($t(403) = -1.39, p < .001$) and its Spiritual Belief factor ($t(403) = -6.42, p < .001$), and men’s lower scores for Spiritual Practice approached significance ($t(403) = -2.48, p < .05$). Compared to women, men’s lower scores for Agnosticism ($t(403) = -3.04, p < .01$) and its Weak Agnosticism factor ($t(403) = -3.38, p < .01$) also approached significance.

A series of one-way between subjects ANOVAs were conducted to compare the effect of education level on the seven worldview factors and the three second-order worldview constructs. Means and standard deviations across the five education levels are shown in Table 4. Spiritual Belief was the only factor in which the effect of education approached significance ($F(4, 407) = 3.07, p < .05$).

**Country of Residence, Ethnicity, and Language.** Independent-samples t-tests were conducted to investigate differences in mean scores for country of residence, ethnicity, and English as first language variables, across the seven worldview factors and the three second-
Table 4

Age Correlations, and Differences in Mean Worldview Scores as a Function of Gender and Education Level

<table>
<thead>
<tr>
<th>Age (r)</th>
<th>Mysticism</th>
<th>Sp. Practice</th>
<th>Sp. Belief</th>
<th>Scientism</th>
<th>Physicism</th>
<th>Weak Ag.</th>
<th>Strong Ag.</th>
<th>Spirituality</th>
<th>Agnosticism</th>
<th>Naturalism</th>
</tr>
</thead>
<tbody>
<tr>
<td>.16**</td>
<td>.18***</td>
<td>.04</td>
<td>-.10*</td>
<td>-.17**</td>
<td>-.18***</td>
<td>.11*</td>
<td>.15**</td>
<td>-.05</td>
<td>-.15**</td>
<td></td>
</tr>
</tbody>
</table>

N = 411

<table>
<thead>
<tr>
<th>n</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>17.40 (8.66)</td>
<td>12.24 (7.14)</td>
<td>31.74 (6.12)</td>
<td>10.69 (4.50)</td>
<td>22.49 (7.61)</td>
<td>13.84 (4.65)</td>
<td>42.85 (18.96)</td>
<td>24.54 (7.43)</td>
</tr>
<tr>
<td>275</td>
<td>18.80 (8.62)</td>
<td>14.14 (7.23)</td>
<td>27.72 (6.89)</td>
<td>19.32 (5.90)</td>
<td>12.38 (4.79)</td>
<td>14.46 (3.93)</td>
<td>50.82 (20.04)</td>
<td>26.84 (6.98)</td>
</tr>
</tbody>
</table>

N = 405

<table>
<thead>
<tr>
<th>n</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSC</td>
<td>4</td>
<td>17.75 (6.44)</td>
<td>12.50 (4.93)</td>
<td>26.00 (9.66)</td>
<td>21.00 (10.20)</td>
<td>12.00 (2.94)</td>
<td>16.75 (3.30)</td>
<td>46.75 (16.84)</td>
<td>28.75 (1.71)</td>
</tr>
<tr>
<td>SC</td>
<td>68</td>
<td>17.63 (9.18)</td>
<td>14.07 (7.12)</td>
<td>29.62 (6.36)</td>
<td>20.84 (6.17)</td>
<td>12.60 (5.29)</td>
<td>13.96 (4.37)</td>
<td>48.15 (20.32)</td>
<td>26.56 (8.26)</td>
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<tr>
<td>C/D</td>
<td>146</td>
<td>18.87 (8.12)</td>
<td>14.04 (7.43)</td>
<td>27.81 (6.75)</td>
<td>19.87 (6.02)</td>
<td>11.98 (4.61)</td>
<td>14.06 (3.93)</td>
<td>50.74 (19.74)</td>
<td>26.04 (6.73)</td>
</tr>
<tr>
<td>B/U</td>
<td>125</td>
<td>18.40 (8.51)</td>
<td>13.22 (7.35)</td>
<td>29.86 (7.21)</td>
<td>20.71 (7.27)</td>
<td>11.52 (4.65)</td>
<td>14.14 (4.33)</td>
<td>47.41 (19.52)</td>
<td>25.66 (7.03)</td>
</tr>
<tr>
<td>P/M/D</td>
<td>69</td>
<td>17.91 (9.57)</td>
<td>12.45 (6.77)</td>
<td>29.86 (6.68)</td>
<td>20.28 (7.04)</td>
<td>11.46 (4.86)</td>
<td>15.01 (4.18)</td>
<td>44.76 (20.75)</td>
<td>26.48 (7.44)</td>
</tr>
</tbody>
</table>

N = 412

Note. *p < .05, **p < .01, ***p < .001; NSC = not completed secondary school, SC = secondary school or equivalent, C/D = certificate/diploma, B/U = bachelor/undergraduate degree, P/M/D = postgraduate, masters, doctorate
order worldview constructs (see Table 5). Levene's (1960) test for equality of variances was used to account for differences in group variance. For country of residence, in contrast to the comparison group, the reference control group (Australia) showed significantly higher scores for Spiritual Belief ($t(408) = 4.54, p < .001$), while higher scores for total Spirituality ($t(408) = 2.80, p < .05$) approached significant difference. The reference control group also significantly lower scores for Naturalism ($t(408) = -5.64, p < .001$) and its Scientism ($t(148.88) = -6.31, p < .001$) and Physicism ($t(116.03) = -4.02, p < .001$) factors.

For ethnicity, no differences between the reference control (Australian) and comparison group were significant at the $p < .05$ level (see Table 5). There were also no differences significant at the $p < .05$ level between participants who did and did not have English as a first language.

**Religious Association and Frequency of Worship.** Independent-samples t-tests were conducted to investigate differences in mean scores across the seven factors and three worldviews between religious and non-religious participants. One analysis investigated personal association with religious institutions, while the other investigated culture of upbringing association with a religious institution (for relevant t-test statistics, see Table 6). Levene's (1960) test for equality of variances was used to account for differences in group variance. Results showed that personal association with a religious institution was associated with significantly higher levels of Mysticism, Spiritual Practice, and Spiritual Belief, and significantly lower levels of Scientism and Physicism. Similarly, personal association with a religious institution was significantly correlated with higher scores in the Spirituality worldview, and lower scores in the Naturalism worldview. Culture-of-upbringing association with a religious institution was associated with significantly higher levels of Spiritual Practice, and the association with Physicism and the Spirituality worldview approached significance.
Table 5

Differences in Mean Worldview Scores as a Function of Country of Residence, Ethnicity, and English as First Language

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Reference Control</strong></td>
<td>326</td>
<td>18.55 (8.71)</td>
<td>13.90 (7.29)</td>
<td>17.19 (6.97)</td>
<td>28.11 (6.83)</td>
<td>19.66 (6.22)</td>
<td>11.88 (4.75)</td>
<td>14.39 (3.96)</td>
<td>49.65 (20.02)</td>
<td>26.27 (7.03)</td>
</tr>
<tr>
<td><strong>Comparison</strong></td>
<td>84</td>
<td>17.53 (8.35)</td>
<td>12.06 (6.85)</td>
<td>13.31 (7.08)</td>
<td>32.74 (5.77)</td>
<td>23.14 (7.29)</td>
<td>11.83 (4.87)</td>
<td>13.68 (4.87)</td>
<td>42.90 (18.52)</td>
<td>25.51 (7.74)</td>
</tr>
<tr>
<td>N = 410</td>
<td></td>
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</tr>
</tbody>
</table>

Ethnicity

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Mysticism</th>
<th>Sp. Practice</th>
<th>Sp. Belief</th>
<th>Scientism</th>
<th>Physicism</th>
<th>Weak Ag.</th>
<th>Strong Ag.</th>
<th>Spirituality</th>
<th>Agnosticism</th>
<th>Naturalism</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reference Control</strong></td>
<td>297</td>
<td>18.13 (8.46)</td>
<td>13.14 (7.08)</td>
<td>16.24 (7.03)</td>
<td>28.93 (6.88)</td>
<td>20.31 (6.46)</td>
<td>11.95 (4.83)</td>
<td>14.35 (4.15)</td>
<td>47.51 (19.20)</td>
<td>26.31 (7.26)</td>
</tr>
<tr>
<td><strong>Comparison</strong></td>
<td>102</td>
<td>19.32 (9.08)</td>
<td>14.66 (7.58)</td>
<td>16.74 (7.63)</td>
<td>29.61 (6.91)</td>
<td>20.69 (7.11)</td>
<td>11.49 (4.63)</td>
<td>13.90 (4.35)</td>
<td>50.71 (21.65)</td>
<td>25.39 (7.12)</td>
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<tr>
<td>N = 399</td>
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</tbody>
</table>

Language

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-English</td>
<td>41</td>
<td>18.93 (8.79)</td>
<td>13.89 (7.08)</td>
<td>16.07 (7.48)</td>
<td>30.88 (5.85)</td>
<td>20.47 (6.95)</td>
<td>11.17 (4.64)</td>
<td>13.22 (4.26)</td>
<td>48.88 (20.65)</td>
<td>24.39 (6.66)</td>
</tr>
<tr>
<td>N = 412</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Country of residence: “Reference Control” is Australia; “Comparison” is all other nationalities. Ethnicity: “Reference Control” is Australian/White/Caucasian/Anglo-Saxon; “Comparison” is all other ethnicities.
## Table 6

**Differences in Mean Worldview Scores across Religious and Non-Religious Groups**

<table>
<thead>
<tr>
<th></th>
<th>Personal Association</th>
<th>Culture of Upbringing Association</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Religious (n=76)</td>
<td>Non-Religious (n=336)</td>
</tr>
<tr>
<td>Mysticism</td>
<td>21.84 (7.81)</td>
<td>17.56 (8.65)</td>
</tr>
<tr>
<td></td>
<td>df=180</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t=396.20</td>
<td></td>
</tr>
<tr>
<td>Spiritual Practice</td>
<td>21.63 (6.36)</td>
<td>11.68 (6.05)</td>
</tr>
<tr>
<td></td>
<td>df=409</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t=396.20</td>
<td></td>
</tr>
<tr>
<td>Spiritual Belief</td>
<td>21.14 (5.75)</td>
<td>15.32 (7.03)</td>
</tr>
<tr>
<td></td>
<td>df=409</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t=409</td>
<td></td>
</tr>
<tr>
<td>Scientism</td>
<td>26.30 (6.74)</td>
<td>29.68 (6.77)</td>
</tr>
<tr>
<td></td>
<td>df=409</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t=409</td>
<td></td>
</tr>
<tr>
<td>Physicism</td>
<td>15.91 (5.72)</td>
<td>21.38 (6.42)</td>
</tr>
<tr>
<td></td>
<td>df=409</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t=409</td>
<td></td>
</tr>
<tr>
<td>Weak Ag.</td>
<td>11.83 (4.77)</td>
<td>11.86 (4.77)</td>
</tr>
<tr>
<td></td>
<td>df=409</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t=409</td>
<td></td>
</tr>
<tr>
<td>Strong Ag.</td>
<td>12.82 (4.82)</td>
<td>14.58 (3.94)</td>
</tr>
<tr>
<td></td>
<td>t=409</td>
<td></td>
</tr>
<tr>
<td>Spirituality</td>
<td>64.62 (15.05)</td>
<td>44.56 (19.04)</td>
</tr>
<tr>
<td></td>
<td>df=409</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t=409</td>
<td></td>
</tr>
<tr>
<td>Naturalism</td>
<td>42.21 (10.57)</td>
<td>51.06 (12.02)</td>
</tr>
<tr>
<td></td>
<td>df=409</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t=409</td>
<td></td>
</tr>
<tr>
<td>Agnosticism</td>
<td>24.64 (8.33)</td>
<td>26.44 (6.85)</td>
</tr>
<tr>
<td></td>
<td>df=409</td>
<td></td>
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<tr>
<td></td>
<td>t=409</td>
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</tbody>
</table>

\[N = 412\] \[N = 411\]

*Note.* Figures in parentheses are standard deviations, *p < .05, **p < .01, ***p < .001
Independent-samples t-tests were conducted to investigate differences in mean scores across the seven factors and three worldviews between Judeo-Christian participants and participants with other religious orientations. One analysis investigated personal association with religious institutions, while the other investigated culture of upbringing association with a religious institution (see Table 7). Levene's (1960) test for equality of variances was used to account for differences in group variance. Results show that there were no significant differences between the groups at the $p < .001$ level.

Independent-samples t-tests were conducted to investigate differences in mean scores across the seven factors and three worldviews between worshiping and non-worshiping participants. One analysis investigated private prayer, ritual, or worship, while the other investigated organised prayer, ritual, or worship (for relevant t-test statistics, see Table 8). Levene's (1960) test for equality of variances was used to account for differences in group variance. At the $p < .001$ level, results showed that both private and organised prayer, ritual, or worship were associated with significantly higher levels of Mysticism, Spiritual Practice, and Spiritual Belief, and significantly lower levels of Scientism and Physicism. Results showed that private prayer, ritual, or worship was associated with higher levels of Weak Agnosticism. Both private and organised prayer, ritual, and worship were associated with significantly higher levels of the Spirituality worldview, and significantly lower levels of the Naturalism worldview.
Table 7

*Differences in Mean Worldview Scores across Judeo-Christian and Other Religious Groups*

<table>
<thead>
<tr>
<th></th>
<th>Personal Association</th>
<th></th>
<th>Culture of Upbringing Association</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Judeo-Christian (n =</td>
<td>Other (n = 8)</td>
<td>df</td>
<td>t</td>
</tr>
<tr>
<td></td>
<td>64)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mysticism</td>
<td>21.44 (7.35)</td>
<td>27.13 (10.20)</td>
<td>7.93</td>
<td>-1.53*</td>
</tr>
<tr>
<td>Spiritual Practice</td>
<td>22.50 (6.06)</td>
<td>17.63 (5.55)</td>
<td>70</td>
<td>2.16*</td>
</tr>
<tr>
<td>Spiritual Belief</td>
<td>21.48 (5.58)</td>
<td>20.00 (6.41)</td>
<td>70</td>
<td>0.70</td>
</tr>
<tr>
<td>Scientism</td>
<td>26.05 (7.07)</td>
<td>26.50 (4.63)</td>
<td>70</td>
<td>-0.18</td>
</tr>
<tr>
<td>Physicism</td>
<td>15.50 (5.63)</td>
<td>16.63 (5.97)</td>
<td>70</td>
<td>-0.53</td>
</tr>
<tr>
<td>Weak Ag.</td>
<td>11.41 (4.71)</td>
<td>13.50 (4.93)</td>
<td>70</td>
<td>-1.18</td>
</tr>
<tr>
<td>Strong Ag.</td>
<td>12.64 (4.84)</td>
<td>13.38 (5.76)</td>
<td>70</td>
<td>-0.40</td>
</tr>
<tr>
<td>Spirituality</td>
<td>65.42 (14.46)</td>
<td>64.75 (15.51)</td>
<td>70</td>
<td>0.12</td>
</tr>
<tr>
<td>Naturalism</td>
<td>41.55 (10.69)</td>
<td>43.13 (9.72)</td>
<td>70</td>
<td>-0.40</td>
</tr>
<tr>
<td>Agnosticism</td>
<td>24.05 (8.25)</td>
<td>26.88 (10.19)</td>
<td>70</td>
<td>-0.89</td>
</tr>
</tbody>
</table>

N = 72                                   N = 177

*Note. Figures in parentheses are standard deviations, *p < .05, **p < .01, ***p < .001*
Table 8

**Differences in Mean Worldview Scores across Worship and Non-Worship Groups**

<table>
<thead>
<tr>
<th>Private Prayer, Ritual, or Worship</th>
<th>Organised Prayer, Ritual, or Worship</th>
</tr>
</thead>
<tbody>
<tr>
<td>No ( (n = 164) )</td>
<td>Yes ( (n = 248) )</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Mysticism</td>
<td>12.77 (5.95)</td>
</tr>
<tr>
<td>Spiritual Practice</td>
<td>7.78 (2.94)</td>
</tr>
<tr>
<td>Spiritual Belief</td>
<td>11.59 (5.62)</td>
</tr>
<tr>
<td>Scientism</td>
<td>32.50 (5.30)</td>
</tr>
<tr>
<td>Physicism</td>
<td>24.35 (5.64)</td>
</tr>
<tr>
<td>Weak Ag.</td>
<td>10.23 (4.38)</td>
</tr>
<tr>
<td>Strong Ag.</td>
<td>14.26 (4.17)</td>
</tr>
<tr>
<td>Spirituality</td>
<td>32.14 (11.69)</td>
</tr>
<tr>
<td>Naturalism</td>
<td>56.85 (9.68)</td>
</tr>
<tr>
<td>Agnosticism</td>
<td>24.49 (6.96)</td>
</tr>
</tbody>
</table>

\( N = 412 \)

*Note.* Figures in parentheses are standard deviations, *\( p < .05 \), **\( p < .01 \), ***\( p < .001 \)
4.1.3 Discussion

4.1.3.1 Spirituality, Naturalism, and Agnosticism Scales

The aim of Study One was to reduce a large pool of items measuring spirituality, naturalism, and agnosticism into an inventory that presented simple structure and captured all three domains. The 7-factor model that emerged from the EFA explained an acceptable portion of the variance in the data, and each factor showed excellent internal consistency. Theoretically and statistically, the seven first-order factors included in the model seemed to be explainable by three larger worldviews that could be called spirituality, naturalism, and agnosticism. The new inventory was labelled the Spirituality, Naturalism, and Agnosticism Scales (SNAS).

*Mysticism* was measured by eight items relating to personal experiences with extrovertive and introvertive mysticism, religious interpretation, as well as purposeful behaviour of engaging in mystical experiences. *Spiritual Practice* measured spiritual behaviours and beliefs across six items. These items included participation in organised spiritual community, and so could conceptually contain religiosity, as well as traditional beliefs and experiences relating to God or a Higher Power. *Spiritual Belief* measured worldview beliefs about a transcendental aspect of the universe, an ultimate meaning and purpose, and life after death. Together, these three factors seem to offer a comprehensive definition of spirituality as a collection of worldview beliefs and traits.

Within this definition of spirituality, religiosity was a subordinate aspect representing one of many ways that spirituality could be expressed. As previously explained, this representation of religiosity as a subordinate domain of spirituality was supported by previous findings, and it makes sense for it to be represented this way in psychometric measures unless there is a good reason for not doing so (Saucier & Skrzypińska, 2006; Zwingmann et al.,
Religiosity is one tendency within the spirituality construct, in which spiritual experiences and behaviours are conducted interpersonally and culturally.

**Scientism** comprised eight items that together measured worldview beliefs that promote the use of empirical and logical inquiry in order to obtain valid knowledge, and personal behaviours relating to the seeking of scientific information. **Physicism** measured worldview beliefs about the physical nature of the universe, as well as beliefs about a lack of personal and universal will. Together, these two factors seem to represent a comprehensive naturalism worldview, in which reality is perceived as an orderly set of non-conscious principles that can be elucidated through the scientific process.

**Weak Agnosticism** comprised five items that measured personal uncertainty and flexibility of beliefs. **Strong Agnosticism** comprised four items that measured epistemological nihilism – various beliefs about the unattainability or non-existence of absolute knowledge. While this last factor presented an Eigenvalue less than one, it is very probable that further development of this scale could increase this result, by adding items based on the data available in the current model. Essentially, weak and strong agnosticism are the two stances of the worldview that can be taken from its basic definition (Le Poidevin, 2010). It is ideal that any instrument that claims to measure agnosticism in its entirety captures both of these dimensions.

### 4.1.3.2 Social Desirability

Total Agnosticism scores, and in particular scores for Weak Agnosticism, were correlated significantly and negatively with Impression Management and Self-Deception Enhancement. This suggested that participants had a tendency to distort the level of agnosticism in order to appear more acceptable to researchers, and also as a way of unconsciously protecting their own self-esteem. However, these relationships were not even
moderate in strength, and so conclusions cannot be drawn without subsequent supporting evidence.

4.1.3.3 Population Validity

The new measures were designed to be administered in the general population, and to measure spirituality in a universal sense, not related to any specific religion (de Meezenbroek et al., 2012). It was therefore important to assess population validity by testing whether scores for the SNAS significantly varied across different demographic variables.

**Age, Gender, and Education Level.** There were no differences in scores for the measures across age or education levels. There were differences in scores for the measure across gender. Men tended to score lower for Spirituality factors and higher for Naturalism factors. This finding is consistent with past research, which has for a long time asserted that women tend to be more spiritual or religious than men (Rosenkranz & Charlton, 2013). Rosenkranz and Charlton (2013) recently demonstrated that this difference could be attributed largely to cognitive habits, whereby men tend to use mechanistic cognitive styles and women a more likely to use forms of social cognition. These distinct cognitive biases give rise to differences in religious and spiritual tendencies. Study three of the current project will test whether differences in cognition can predict levels of distinct worldview beliefs. In terms of the current measures, gender differences lend support to the consistency of the current measure with previous instruments.

**Country of Residence, Ethnicity, and Language.** There were no differences in scores for the measures across ethnicity or English as a second language. There was a significant difference in Spiritual Belief scores between participants who lived in Australia and participants who lived in other countries. Participants from Australia tended to score higher for Spirituality and its sub-factors, and lower for Naturalism and its sub-factors, when
compared to participants currently living in other countries. This finding can be taken tentatively in light of the differences in-group sizes. Taken as a robust finding, this presents contradictions with many surveys that have gathered data about the importance of religion to citizens of countries around the world (e.g., Crabtree, 2010). What seems to be interest, however, is that new global data could be required now that spirituality has been conceptually separated from religiosity, and cross-cultural trends are changing when examining levels of spirituality as opposed to religious behaviours (Houtman & Aupers, 2007). Further data is needed to establish expected differences between Australia and other countries in terms of spirituality rather than religious involvement.

**Religious Association and Frequency of Worship.** Personal association with a religious institution was associated with higher levels of Spirituality and lower levels of Naturalism, and culture-of-upbringing was associated with higher levels of spiritual practice. Both private and organised prayer, ritual, and worship were associated with significantly higher levels of the Spirituality worldview, including its Mysticism, Spiritual Practice, and Spiritual Belief factors, and significantly lower levels of the Naturalism worldview, including both its Scientism and Physicism factors. Together, these findings predictably link spirituality to religious institutions, which makes sense when religiosity is understood in this context as an aspect of spirituality.

Interestingly, results showed that private prayer, ritual, or worship was associated with higher levels of Weak Agnosticism. In other words, people who engaged in private prayer, ritual, or worship tended to have greater personal flexibility and uncertainty of beliefs. This finding mirrors that of Crowson (2009), who found that people who engaged in a flexible approach towards religious questions that could tolerate uncertainty tended to hold report less religious dogmatism.
There were no differences in the measures between Judeo-Christin and other religious associations. Ultimately, this suggests that the domains measured by the new scales are not associated with any particular institutionalised religious belief-system, and instead capture universal aspects of spiritual and religious belief and behaviour.

4.2 Study Two

There were several aims for Study Two. First, confirmatory factor analysis was used to refine the SNAS. Analyses were conducted to determine the construct and population validity of the new measure, and to examine the relationship between worldviews and the FFM. The best fitting models for the SNAS provided data regarding the structural relationships between worldview beliefs and traits in personality constructs. Furthermore, these constructs were tested alongside the Big 5 domains of personality in order to investigate how they would relate to widely accepted representation of personality variance.

4.2.1 Measuring Worldview Functionality

Another aim of Study Two was to use exploratory factor analysis to develop a new short measure for worldview functionality, based on Vidal's (2012) criteria. This tool was intended to provide clear data about the self-reported benefit that different worldviews have for individuals. In his suggestion for criteria that can be used to assess worldview functionality, Vidal integrated these different types of impact that worldviews can have on well-being. Vidal explained that worldviews are created to harmonise experiences with nature (objective), ourselves (subjective) and others (intersubjective). He suggested metaphysical criteria across which worldviews can be assessed, organised across first-order, second-order, third-order, and collective tests.
Of Vidal's (2012) first-order criteria, *Is-Ought* represents efforts to generate consistency between perspectives of the world and personal values. *Ought-Act* represents efforts to generate consistency between values and actions. *Is-Act* determines whether beliefs generate actions that are effective in the world. These three criteria can be understood in relation to Piaget's (1955) model of adaptive drive towards a schematic representation of the world that is accurate, consistent, and effective.

Of Vidal's (2012) second-order criteria, *Critical* represents efforts towards critical assessment of worldview beliefs using objective, subjective, and intersubjective criteria. *Dialectical* represents efforts to consider and harmonise all major perspectives and opinions about worldview belief categories. *Synthetical* represents how compatible and consistent worldviews are with other knowledge disciplines. Finally, *First-second-order* represents how effectively second-order philosophies tie back to “real-world”, grounded issues. These second-order criteria can be understood in relation to Piaget's (1955) description of the conceptual intelligence that must conform its representations of reality not only with embodied information, but also with verification from other people.

Of Vidal's (2012) collective criteria, *We-I* represents how compatible a worldview is with the larger interests of society. *I-it* represents how compatible a worldview is with most contemporary scientific findings. Finally, *We-it* asks whether society at large is compatible with the objective world. These criteria relate to the challenges that emerge in formal-operational stages of intelligence that question and evaluate the credibility of knowledge sources and entertain the possibility of suspended judgment (Piaget, 1972), and also in post-formal cognitive operations that generate and test sets of cross-paradigmatic thought against their observed limitations (Commons, 2008).

These metaphysical criteria for assessing worldview functionality can provide a guide towards the empirical, comparative testing of worldview benefits. One way of beginning to
assess these criteria is to conduct direct self-report measures of worldview functionality, based on Vidal's (2012) domains outlined above. This was attempted as part of the current study. The newly developed measure could then be tested alongside specific worldview constructs in order to assess whether distinct worldviews influence the self-reported functionality of beliefs. Chapter Seven reports findings from such a test, which measured the association that spirituality, naturalism, and agnosticism each have with scores from the worldview functionality scale.

4.2.2 Method

4.2.2.1 Participants

Most participants were recruited as part of their assessment for an undergraduate psychology degree. Other participants were recruited from a community sample of convenience, via email and word-of-mouth. After the screening process, the sample comprised 1056 participants with ages ranging from 18 to 90 years. There were 282 men ($M = 32.84, SD = 13.33$ years), 765 women ($M = 32.60, SD = 11.36$ years), five participants who identified as “Other” gender, and four participants who did not report their gender. When asked to report their highest level of education completed, approximately one percent of participants had not completed secondary school, 27% had completed secondary school or equivalent, 39% had a certificate or diploma, 20% had a bachelor or undergraduate degree, and 13% had a postgraduate, master, or doctorate degree. Seventy-three percent of participants had completed the survey as part of their university course.

Eighty-five percent of participants resided in Australia, 7% in the USA, 4% in Europe (including Great Britain, United Kingdom, England, Germany, Czech Republic, Denmark, Scotland, Austria, Finland, France, Greece, Italy, Latvia, Lithuania, Poland, Slovakia, Sweden, Turkey, and The Netherlands), 1% in Canada, 2% in Asia (including China,
Indonesia, Singapore, South Korea, India, Japan, Lebanon, Pakistan, Taiwan, and Thailand). There were three participants who resided in New Zealand, two participants who resided in Russia, one participant who resided in Chile, one participant who resided in Saudi Arabia, and one participant who resided in South Africa. Four participants did not report their country of residence.

Thirty-six percent of participants reported their ethnicity as white, Caucasian, or Anglo-Saxon, 35% Australian, 9% European (including English, British, Greek, Italian, Irish, Scottish, Dutch, German, Swedish, Turkish, Albanian, Bosnian, Czech, Hungarian, Latvian, Macedonian, Persian, Polish, Romanian, Scandinavian, and Welsh), 6% Asian (including Chinese, Indian, Filipino, Sri Lankan, Vietnamese, Lebanese, Pakistani, Indonesian, Iraqi, Korean, Taiwanese, and Afghani), 3% mixed Australian (including Australian-Asian and Australian-European), 3% Multiracial, and 1% Indigenous Australian. Six participants reported their ethnicity as Middle Eastern (including Israeli and Saudi Arabian), six African (including South African, Algerian, and Eritrean), four Jewish, four New Zealanders (including Pakeha), three Polynesian (including Samoan and Tongan), three Russian, two Maltese, two South American, and two Canadian. One participant reported their ethnicity as American, one Celtic, one Mexican, one Native American, Papua New Guinean, one Spanish, one Western, one Mauritian, and one Mapuche. Four percent of participants did not report their ethnicity. English was a first language for 89% of participants – with 1% of participants not reporting their first language.

Forty percent of participants associated their culture of upbringing with a religious institution (including Judeo-Christian religions, Buddhism, Hinduism, Islam, Sikhism, and Aboriginal), while 59% did not (one percent did not report this). Eighteen percent of participants associated personally with a religious institution (including Judeo-Christian religions, Buddhism, Wicca, Islam, Sikhism, and various spiritualist groups), while 82% did
not (five participants did not report this). Forty-nine percent of participants never attend an organised place of worship, 26% attend once a year or less, 12% several times a year, 3% once a month, 2% several times a month, 5% once a week, 2% several times a week – five participants reported attending once a day, and three participants reported attending several times a day (four participants did not report this). Forty-one percent of participants never worship privately, 12% once a year or less, 11% several times a year, 5% once a month, 6% several times a month, 3% once a week, 9% several times a week, 7% once a day, and 7% several times a day (one percent did not report this).

4.2.2.2 Materials

Participants were asked to report their age, gender (Male; Female; Other), education level (not completed secondary school; secondary school or equivalent; certificate/diploma; bachelor degree/undergraduate degree; postgraduate/master/doctorate), ethnicity, country of residence, whether English was their first language (Yes; No), frequency of organised worship, prayer, or meditation (never; once a year or less; several times a year; once a month; several times a month; once a week; several times a week; once a day; several times a day), and frequency of private worship, prayer, or meditation (never; once a year or less; several times a year; once a month; several times a month; once a week; several times a week; once a day; several times a day). Participants were also asked to report whether they associate personally with a religious institution (Yes; No), and whether they associate their culture-of-upbringing with a religious institution (Yes; No). If they responded “yes” to either of these questions, they were given the opportunity to write which religion. Participants were asked whether they were completing the survey as part of university involvement (Yes; No). Participants also completed the following measures.
Based on the results of the previous study, a revised list of items measured worldview beliefs across seven factors: Mysticism (mystical experiences and beliefs), Spiritual Practices (including organised spirituality and relationship with God or Higher Power), Spiritual Belief, Scientism (belief in validity of science and involvement in science), Physicism (beliefs about natural laws), Strong Agnosticism (beliefs about there being no certain truths), and Weak Agnosticism (a lack of rigidity in personal beliefs and values). Each factor was measured with ten items, each on a 5-point, fully labelled Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Participants were told to interpret the term “God” to mean any specific God, group of gods, Supreme Being, Greater Power, or Higher Intelligence, or to provide their own preferred term.

In the previous study, the direction of the response scale options were randomly reversed in order to control for acquiescence (Barnette, 2000). This was a necessary alternative to using negatively worded items, which would have unfavourably impacted factor structure during scale development (Horan et al., 2009; Weijters & Baumgartner, 2012; Weijters et al., 2013). However, acquiescence was not a major concern in the current study, because the length of the survey was greatly reduced – instead of 27 pages of 10 items each, the current scales to measure worldviews were seven pages of 10 items each. It was therefore decided to present the response options as simply as possible, so their ordering was consistent throughout this questionnaire. This meant that the colouring of the response options, which was applied to reduce misresponse to the reversed response scale (Toepoel & Dillman, 2011; Tourangeau et al., 2007), was also not necessary and was subsequently not used.

**Worldview Functionality.** Fifty items were administered to measure Worldview Functionality, based on Vidal's (2012) theoretical framework. For example, *Is-Ought* was measured with the item “I am comfortable with my beliefs about reality,” *Ought-Act* with the item “When I have to make an important decision, I use my own value system,” *Is-Act* with
the item “No matter the situation, my understanding of the world helps me to act appropriately,” Critical with the item “I reflect on my beliefs in order to change them for the better,” Dialectical with the item “It is important to combine our beliefs in order to reach the best possible perspective,” Synthetic with the item “There is no area of knowledge that greatly contradicts my beliefs about reality,” First-second-order with the item “My beliefs have value; they can make life better for people,” We-I with the item “I agree with most other people’s beliefs about reality,” It-I with the item “My beliefs and values are compatible with the latest scientific findings,” and We-It with the item “Human civilisation is in harmony with the world.” Responses were measured on a 5-point, fully labelled Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

**Balanced Inventory of Desirable Responding 6 Short Form (BIDR).** Bobbio and Manganelli's (2011) short version of Paulhus' (1991) inventory was used to assess socially desirable responding. As described in section 3.2.1.2, the BIDR includes two subscales: Impression Management ($\alpha = .76$), and Self-Deception Enhancement ($\alpha = .74$). Responses were measured on a 6-point Likert scale ranging from 1 (Strongly Disagree) to 6 (Strongly Agree).

**Existential Orientation Scale (EOS).** Rosenkranz and Charlton's (2013) Existential Orientation Scale was used to measure religious orientation and science acceptance using 20 items on a 7-point Likert-scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Religious Orientation was measured with items that either directly endorse or directly reject theistic, religious beliefs ($\alpha = .96$), while Science Acceptance was measured with items that promote a science and naturalism ($\alpha = .82$; Rosenkranz & Charlton, 2013). Participants were told to interpret the term “God” to mean any specific God, group of gods, Supreme Being, Greater Power, or Higher Intelligence, or to provide their own preferred term.
Expressions of Spirituality Inventory - Revised (ESI-R). MacDonald's (2000)

Expressions of Spirituality Inventory - Revised measures experiences, attitudes, beliefs, and lifestyle practices related to spirituality, using 32 items on a 5-point Likert scale from 0 (Strongly Disagree) to 4 (Strongly Agree). The factors were Cognitive Orientation towards Spirituality ($\alpha = .87$), Experiential/phenomenological Dimension ($\alpha = .81$), Existential Well-Being ($\alpha = .80$), Paranormal Beliefs ($\alpha = .82$), and Religiousness ($\alpha = .89$; Macdonald, 2000).

Dogmatism Scale. Altemeyer's (2002) Dogmatism Scale measures rigidity and confidence in beliefs, values about open-mindedness, and epistemological uncertainty using 22 items on a 7-point Likert type scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). The items are highly internally consistent ($\alpha = .90$; Altemeyer, 2002).

Mini International Personality Item Pool (Mini-IPIP). Donnellan, Oswald, Baird, and Lucas' (2006) Mini International Personality Item Pool measures five trait domains of personality (Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Intellect/Imagination), using 20 items on a 5-point scale indicating how much each statement is true of the respondent, from 1 (Very Inaccurate) to 5 (Very Accurate). Cronbach’s alpha scores ranged from .70 to .82 for the five factors (Donnellan et al., 2006).

4.2.2.3 Procedure

In order to increase the response rate, participants were offered a chance to win one of three $250 gift vouchers. These sort of incentives have been shown to increase responses but not impact data quality (Deutskens, Ruyter, Wetzels, & Oosterveld, 2014; Göritz, 2004). Participants who were not completing the study as part of their university course were given the option to provide their contact details in order to participate in the lottery, which was
completely voluntary. Respondents were told that their contact information would not be linked to their questionnaire responses but stored in a separate file so as to protect their anonymity. Upon completion of data collection, all participants who provided contact details were put into a data base and three winners were selected using SPSS random number generator.

After receiving ethics approval, a questionnaire was made available online using Qualtrics software. Most participants were recruited from a community sample of convenience, via email and word-of-mouth. Some participants were recruited as part of their assessment for an undergraduate psychology degree. All participants completed the online survey voluntarily in their own time. The survey was accessible for four months and during that time it received 1360 attempts, and 1056 complete responses, indicating a return rate of 78%.

4.2.3 Results

4.2.3.1 Data Screening

All analyses were conducted using SPSS version 22 and AMOS Graphics version 22. Before analysis, demographic variables were examined for inaccurate responses. Two cases were removed due to out-of-range age values, which left a sample of 1056 participants. The dataset was examined for missing values within each separate construct, using Little's (1988) MCAR test at the \( p < .001 \) level. None of the constructs had 5% of data missing, and no case had 3% of data missing.

Little's MCAR test showed that missing values were missing completely at random within the worldview factors (Mysticism, \( \chi^2 (71) = 76.32, p = .503 \); Spiritual Practice, \( \chi^2 (72) = 62.83, p = .771 \); Spiritual Belief, \( \chi^2 (89) = 93.49, p = .352 \); Physicism, \( \chi^2 (72) = 68.98, p = .579 \); Scientism, \( \chi^2 (72) = 55.40, p = .926 \); Weak Agnosticism, \( \chi^2 (71) = 76.32, p = .312 \); and
Strong Agnosticism, $\chi^2(88) = 96.16, p = .259$). Little's MCAR test also showed that missing values were missing completely at random for the Worldview Functionality items ($\chi^2(1285) = 1278.21, p = .548$). Little's MCAR test also showed that missing values were missing completely at random for the BIDR items (Impression Management, $\chi^2(42) = 59.63, p = .038$; Self-Deception Enhancement, $\chi^2(42) = 37.58, p = .665$), the EOS items (Religious Orientation, $\chi^2(196) = 244.39, p = .011$; Science Acceptance, $\chi^2(16) = 10.32, p = .849$), the ESI items (Cognitive Orientation Towards Spirituality, $\chi^2(20) = 16.91, p = .659$; Existential Well-Being, $\chi^2(20) = 15.09, p = .771$; Experiential/Phenomenological Dimension, $\chi^2(20) = 38.41, p = .008$; Paranormal Beliefs, $\chi^2(20) = 18.60, p = .816$; Religiousness, $\chi^2(30) = 33.29, p = .310$), and the IPIP items (Agreeableness, $\chi^2(12) = 2.27, p = .999$; Conscientiousness, $\chi^2(9) = 7.38, p = .597$; Extraversion, $\chi^2(9) = 11.24, p = .260$; Emotional Stability, $\chi^2(14) = 18.71, p = .176$; Intellect/Imagination, $\chi^2(6) = 7.98, p = .240$).

Little's MCAR test showed that missing values were not missing completely at random for the DOG items ($\chi^2(320) = 450.43, p < .001$). Examination of the missing DOG values showed no discernible pattern, and so it was concluded that these values were missing at random. Based on these findings, it was deemed appropriate to impute missing values using the expectation maximisation method (Schafer & Graham, 2002; Tabachnick & Fidell, 2014). This was done separately within each of the construct item groups.

It was important to screen the worldview items for multicollinearity and outlier variables before conducting confirmatory factor analysis, and to screen the worldview functionality items for multicollinearity and outlier variables before the exploratory factor analysis. As seen in the squared multiple correlations and the bivariate correlation tables, neither the worldview items nor the worldview functionality items had any issues with multicollinearity. However, five outlier variables were found in the SNAS set (“People's beliefs about reality are not important,” “I do not want definite answers to the big questions
in life,” “I am quite willing to change my core beliefs about reality,” “There is no free will; all behaviour is pre-determined by non-conscious physical forces and natural laws,” and “The universe is controlled by impersonal forces”), which did not correlate above .3 with more than two other items in the set. Similarly, two outlier variables were found in the Worldview Functionality set (“I only do what I believe to be the right thing,” and “It is important to combine our beliefs in order to reach the best possible perspective”), which did not correlate above .3 with more than two other items in the set. All seven of these variables were removed from the dataset.

The remaining items showed mostly non-linear relationships, non-normal distributions, significant skewness and kurtosis, and heteroscedasticity. However, transformation of variables was not desirable because that would make interpreting CFA and EFA results difficult. Moreover, departures from multivariate assumptions were to be expected with Likert-scale data, and, as previously mentioned, evidence suggests that parametric tests do provide robust results despite the violation of these assumptions (Norman, 2010).

4.2.3.2 Confirmatory Factor Analysis: SNAS

The worldview items were examined for outlier cases. Some cases were detected that might have represented univariate outliers, however it was decided to not remove these extreme scores, as some extreme z-scores are to be expected in large samples (Tabachnick & Fidell, 2014). The data was scanned for multivariate outliers. Cases with Mahabalanobis distances at the $p < .001$ significance level were removed from the dataset and then the dataset was scanned again. Twelve iterations uncovered 287 multivariate outliers. Although
these cases typically displayed extreme responses across many items, discriminant function analyses for initial iterations did not show any discernible pattern of items that accounted for many cases. The subsequent confirmatory factor analysis was conducted with and without multivariate outliers in the dataset, and there were no substantial differences in results. Therefore, the following results are reported with multivariate outliers present.

Confirmatory factor analyses with maximum likelihood estimation was used to analyse the data. However, maximum likelihood estimation assumes multivariate normality and the data was mostly non-normal. Therefore, 1000 bootstrap samples with replacement were used to generate an adjusted chi-square distribution, resulting in the Bollen-Stine bootstrap alpha. Bootstrapping was also used to generate 95% bias-corrected confidence intervals for relevant parameters.

Before testing a comprehensive model, each worldview domain (Spirituality, Naturalism, and Agnosticism) was tested individually, in order to assess their factor structure. First, a model was tested in which a higher-order Spirituality construct was used to explain the variance in the latent Mysticism, Spiritual Practice, and Spiritual Belief variables, each reflective of their respective items (see Figure 1; Initial Model). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .87, TLI = .86, RMSEA = .09, SRMR = .08). The participant/parameter ratio was acceptable (10.56).
However, an alternate model was investigated in the hopes of finding a factor structure that was a better fit to the data. First, it was observed that the higher-order Spirituality factor was explaining more than 80% of the variance in both Practice and Belief sub-factors, and only 56% of the variance in the Mysticism sub-factor. Second, modification indices suggested that the error variance in items related to God/Higher Power be correlated. For these reasons, the model was adjusted so that the variance in Mysticism was correlated with, rather than explained by, the variance in the higher-order Spirituality variable. A fourth factor was also generated, called God/Higher Power, and this was used to explain the variance in some items previously explained by the Spiritual Practice sub-factor (see Figure 1).
1; Alternative Model). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant \( (p < .001) \), indicating a less-than-ideal model fit. However, other fit indices were adequate \( (CFI = .88, TLI = .86, RMSEA = .08, SRMR = .08) \). The participant/parameter ratio was acceptable \( (10.35) \). It was decided that this factor structure would be used in subsequent analyses – this was due to two reasons. First, the alternative factor structure seemed to be a slightly better fit to the data. Second, the more detailed factor structure would help to reduce the amount of items needed to represent the Spirituality construct, while retaining items that pertained to the various dimensions of spirituality.

Second, a model was tested in which a latent second-order Naturalism construct was used to explain the variance in the latent Physicism and Scientism variables, both reflective of their respective items (see Figure 2). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant \( (p < .001) \), indicating a less-than-ideal model fit. However, other fit indices were adequate \( (CFI = .94, TLI = .93, RMSEA = .06, SRMR = .04) \). The participant/parameter ratio was acceptable \( (17.31) \). The latent second-order Naturalism construct explained variance in both Physicism (69%) and Scientism (82%).

![Figure 2. Measurement model for Naturalism.](image)

Third, a model was tested in which a latent second-order Agnosticism variable was used to explain the variance in the latent Weak Agnosticism and Strong Agnosticism variables, which were both reflective of their respective items (see Figure 3). The ML-with-
bootstrapping Bollen-Stine goodness-of-fit test was significant \( p < .001 \), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .89, TLI = .88, RMSEA = .07, SRMR = .06). The participant/parameter ratio was acceptable (18.21). Contrary to expectations, the higher-order Agnosticism variable explained very little variance in Weak Agnosticism (25%) and Strong Agnosticism (23%). It was decided that subsequent analyses would treat Strong and Weak Agnosticism as correlated factors with no higher-order latent factor.

![Figure 3. Measurement model for Agnosticism.](image)

After establishing the factor structure for each of the three-worldview domains, they were all included in a single model in order to reduce the amount of items. Rather than reduce items separately for each domain, it was hoped that the final item listing would best fit the data while all three domains were represented simultaneously. Problematic items were removed from the model if they had low regression weights from their respective latent factors (regression weights < .3 were removed), or if modification indices suggested that error variance for an item should be accounted for across factors. Thirty-five items were removed from the model.
Figure 4 displays the diagram for the final model. The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .94, TLI = .94, RMSEA = .05, SRMR = .05). The participant/parameter ratio was acceptable (7.82). Table 9 shows the regression weights and correlations between the latent factors. Table 10 shows the means, standard deviations, Cronbach’s alpha, and range for each of the summed factors and sub-factors.

![Figure 4. Measurement model for SNAS.](image)

4.2.3.3 Exploratory Factor Analysis: Worldview Functionality Scale

Worldview Functionality items were examined for outlier cases. Some cases were detected that might have represented univariate outliers, however it was decided to not remove these extreme scores, as some extreme $z$-scores are to be expected in large samples (Tabachnick & Fidell, 2014). The data was scanned for multivariate outliers. Cases with
Table 9

<table>
<thead>
<tr>
<th>Factors</th>
<th>Items</th>
<th>Regressions</th>
<th>Mys</th>
<th>Nat</th>
<th>W.A.</th>
<th>S.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spirituality</strong></td>
<td>I look to a spiritual community for support in tough times.</td>
<td>.91*** (.89, .93)**</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>I participate in spiritual ceremonies with other people.</td>
<td>.82*** (.79, .84)**</td>
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<td></td>
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<tr>
<td></td>
<td>My life involves spiritual rituals or behaviours (e.g., prayer, meditation).</td>
<td>.79*** (.76, .82)**</td>
<td></td>
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<tr>
<td></td>
<td>I follow guidance from spiritual leaders.</td>
<td>.83*** (.81, .86)**</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>In order to lead a full life, there must be some attention given to God, a Higher Power, or spirit.</td>
<td>.81*** (.79, .84)**</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Humans should live according to the will of God or a Higher Power.</td>
<td>.85*** (.83, .87)**</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>I have a personal relationship with God or a Higher Power.</td>
<td>.90*** (.88, .91)**</td>
<td></td>
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</tr>
<tr>
<td><strong>God/HP</strong></td>
<td>The universe unfolds according to a plan, or a conscious will.</td>
<td>.82*** (.79, .85)**</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>There is an ultimate meaning and purpose for life.</td>
<td>.79*** (.76, .81)**</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>There exists an essential justice in the universe (e.g., karma, divine judgment).</td>
<td>.82*** (.79, .84)**</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>There is a divine purpose for each person's life.</td>
<td>.77*** (.74, .80)**</td>
<td></td>
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<tr>
<td></td>
<td>There is some form of life after death.</td>
<td>.89*** (.88, .91)**</td>
<td></td>
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</tr>
<tr>
<td><strong>Sp. Belief</strong></td>
<td>Sometimes it seems as if my spirit, soul, or consciousness has merged or connected with someone else.</td>
<td></td>
<td></td>
<td></td>
<td>-50*** (-.56, -.44)**</td>
<td>.27*** (.20, .33)**</td>
</tr>
<tr>
<td></td>
<td>I have had an experience in which all things seemed sacred.</td>
<td>.72*** (.68, .75)**</td>
<td></td>
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<tr>
<td></td>
<td>I have had an experience in which I seemed to transcend time and space, or time and space ceased to exist.</td>
<td>.76*** (.73, .79)**</td>
<td></td>
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<tr>
<td></td>
<td>I have had an experience in which ultimate reality was revealed to me.</td>
<td>.76*** (.73, .79)**</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>I have had an experience in which I merged completely with everything that exists.</td>
<td>.69*** (.65, .73)**</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Naturalism</strong></td>
<td>When trying to understand reality, people should assume that there is only physical matter.</td>
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<tr>
<td></td>
<td>Reality is purely physical.</td>
<td>.72*** (.68, .75)**</td>
<td></td>
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<tr>
<td></td>
<td>My choices are caused by purely physical events in my brain and body.</td>
<td>.74*** (.71, .78)**</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>People are really just organised physical matter.</td>
<td>.75*** (.72, .79)**</td>
<td></td>
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<tr>
<td></td>
<td>Human consciousness is a by-product of the brain and body; it is controlled by physical forces and natural laws.</td>
<td>.70*** (.66, .73)**</td>
<td></td>
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<td></td>
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<tr>
<td><strong>Psychism</strong></td>
<td>I trust in the knowledge and wisdom of scientific experts.</td>
<td>.81*** (.77, .85)**</td>
<td></td>
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<tr>
<td></td>
<td>We should believe in what is scientifically proven with physical evidence.</td>
<td>.73*** (.70, .76)**</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Natural science provides true knowledge about the universe.</td>
<td>.84*** (.81, .86)**</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>To know anything with certainty, we have to test it with the scientific method.</td>
<td>.71*** (.67, .74)**</td>
<td></td>
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<tr>
<td></td>
<td>In order to discover true information, people should use physical senses and logic.</td>
<td>.75*** (.72, .78)**</td>
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</tr>
<tr>
<td><strong>Scientism</strong></td>
<td>My beliefs change from moment to moment.</td>
<td>.79*** (.76, .82)**</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>My beliefs about reality change when it suits me.</td>
<td>.82*** (.80, .85)**</td>
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<tr>
<td></td>
<td>I change my beliefs to suit each situation I am in.</td>
<td>.76*** (.72, .80)**</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>My values change depending on my circumstances.</td>
<td>.70*** (.66, .74)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weak Ag.</strong></td>
<td>There is no set of beliefs that can ever be completely true.</td>
<td>.72*** (.67, .76)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>It is not possible to know the absolute truth about anything.</td>
<td>.70*** (.66, .74)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No form of knowledge can be completely certain.</td>
<td>.61*** (.55, .65)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In the grand scheme of things, there are no absolute truths.</td>
<td>.71*** (.66, .75)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Strong Ag.</strong></td>
<td>There is no set of beliefs that can ever be completely true.</td>
<td>.72*** (.67, .76)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>It is not possible to know the absolute truth about anything.</td>
<td>.62*** (.57, .67)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No form of knowledge can be completely certain.</td>
<td>.61*** (.55, .65)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In the grand scheme of things, there are no absolute truths.</td>
<td>.71*** (.66, .75)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 1056

Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001
Table 10

**Means, Standard Deviations, Ranges, and Cronbach’s Alphas for SNAS Factors**

<table>
<thead>
<tr>
<th>Factor</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spirituality</td>
<td>30.21</td>
<td>13.09</td>
<td>12-60</td>
<td>.94</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>God/Higher Power</td>
<td>6.69</td>
<td>3.92</td>
<td>3-15</td>
<td>.91</td>
</tr>
<tr>
<td>Practice</td>
<td>8.68</td>
<td>4.71</td>
<td>4-20</td>
<td>.89</td>
</tr>
<tr>
<td>Beliefs</td>
<td>14.84</td>
<td>5.94</td>
<td>5-25</td>
<td>.91</td>
</tr>
<tr>
<td>Mysticism</td>
<td>10.48</td>
<td>5.22</td>
<td>5-25</td>
<td>.85</td>
</tr>
<tr>
<td>Naturalism</td>
<td>32.86</td>
<td>8.29</td>
<td>10-50</td>
<td>.89</td>
</tr>
<tr>
<td>Scientism</td>
<td>18.11</td>
<td>4.34</td>
<td>5-25</td>
<td>.86</td>
</tr>
<tr>
<td>Physicism</td>
<td>14.75</td>
<td>4.80</td>
<td>5-25</td>
<td>.84</td>
</tr>
<tr>
<td>Strong Agnosticism</td>
<td>14.26</td>
<td>3.63</td>
<td>4-20</td>
<td>.76</td>
</tr>
<tr>
<td>Weak Agnosticism</td>
<td>8.05</td>
<td>3.54</td>
<td>4-20</td>
<td>.85</td>
</tr>
</tbody>
</table>

*N = 1056

*Note. *p < .05, **p < .01, ***p < .001*

Mahabalanobis distances at the p < .001 significance level were removed from the dataset and then the dataset was scanned again. Nine iterations uncovered 212 multivariate outliers. Although these cases typically displayed extreme responses across many items, discriminant function analyses during initial iterations did not show any discernible pattern of variables that accounted for many cases. The subsequent confirmatory factor analysis was conducted with and without multivariate outliers in the dataset, and there were no substantial differences in results. Therefore, the following results are reported with multivariate outliers present.

Many Worldview Functionality items presented non-normal distributions, and it was estimated that any emerging factors would correlate, therefore a series of principal axis estimations with direct oblimin rotation were used to analyse the data. Bartlett's test of sphericity was significant ($\chi^2$ (703) = 15503.78, $p < .001$), and the Kaiser-Meyer-Olkin
measure of sampling adequacy was high (.92), both indicating that the 38 worldview functionality items were adequately intercorrelated for EFA.

During EFA, items were removed if they showed communalities below .30, factor-loadings below .40, or cross-loading between factors. Initially, Cattell's (1966) scree plot and eigenvalues suggested that there could be up to five factors, however as problematic items were removed these factors failed to emerge, or they had extremely low eigenvalues (i.e., < .5). The model achieved simple structure when it was reduced to an 8-item, 2-factor solution. This model was shown to explain 48% of variance in the data.

Composite scores were calculated for each of the factors, as well as the total Worldview Functionality construct. The two factors had a significant, positive, weak relationship ($r = .16, p < .001$). Table 11 displays eigenvalues, Cronbach’s alpha values, mean scores, standard deviations, range, item factor loadings, and item communalities across the two factors. In the current sample, Worldview Functionality had a mean score of 28.43 ($SD = .436$), with possible scores ranging from 8 to 40.

### 4.2.3.4 Construct Validity

Construct validity for the new scales was investigated using bivariate correlations in order to assess convergent and discriminant validity. Table 12 shows the correlations between the SNAS constructs, Worldview Functionality factors, and various measures with previously established scales.

As can be seen in Table 12, Spirituality showed moderate and strong positive correlations with Mysticism, Religious Orientation, Spiritual Cognition, Experiential Spirituality, Paranormal Beliefs, and Religiousness, as well as a strong negative correlation with Science Acceptance. Mysticism showed significant moderate negative correlations with Naturalism and Science Acceptance, as well as significant moderate and strong positive
Table 11

Eigenvalues, Cronbach’s Alphas, Means, Standard Deviations, Range, Factor-Loadings, and Communalities for the Model of Worldview Functionality

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>α</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>Item</th>
<th>Loading</th>
<th>Communalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefit</td>
<td>2.33</td>
<td>.81</td>
<td>15.28</td>
<td>2.85</td>
<td>4-20</td>
<td>My beliefs are useful for people's lives.</td>
<td>.773</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>My beliefs about reality can lead to a real, positive difference in the world.</td>
<td>.772</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>My beliefs have value; they can make life better for people.</td>
<td>.760</td>
<td>.57</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>My belief system helps me to get things done effectively.</td>
<td>.567</td>
<td>.35</td>
</tr>
<tr>
<td>Integration</td>
<td>1.56</td>
<td>.75</td>
<td>13.15</td>
<td>2.87</td>
<td>4-20</td>
<td>My beliefs about reality are shared by most other people.</td>
<td>.763</td>
<td>.57</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td>My beliefs about reality would make sense to most people.</td>
<td>.664</td>
<td>.47</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>I agree with most other people's beliefs about reality.</td>
<td>.650</td>
<td>.41</td>
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<tr>
<td></td>
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<td></td>
<td>If other people knew what my real beliefs were, they would be accepting of them.</td>
<td>.552</td>
<td>.34</td>
</tr>
</tbody>
</table>

N = 1056

correlations with Religious Orientation, Spiritual Cognition, Experiential Spirituality, Paranormal Beliefs, and Religiousness. Naturalism showed a strong positive correlation with Science Acceptance, as well as moderate and strong significant negative correlations with Religious Orientation, Spiritual Cognition, and Experiential Spirituality, Paranormal Beliefs, and Religiousness. Weak Agnosticism did not demonstrate any significant correlations that reached moderate strength. However, Strong Agnosticism showed a significant moderate negative correlation with Dogmatism. Worldview Functionality did not show any significant correlations that reached moderate strength.

Correlations were examined between the SNAS domains and the five personality domains of the IPIP (see Table 12). There were many significant relationships of weak
Table 12

Correlations to Test Convergent and Discriminant Validity of SNAS and WFS

<table>
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</thead>
<tbody>
<tr>
<td>SNAS</td>
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<tr>
<td>Sp. Bel.</td>
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<tr>
<td>Spirituality</td>
<td>90***</td>
<td>-</td>
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</tr>
<tr>
<td>Sp. Practice</td>
<td>89***</td>
<td>63***</td>
<td>-</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>God/HP</td>
<td>92***</td>
<td>72***</td>
<td>92***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mysticism</td>
<td>59***</td>
<td>50***</td>
<td>56***</td>
<td>51***</td>
<td>-</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Naturalism</td>
<td>-66***</td>
<td>-65***</td>
<td>-53***</td>
<td>-60***</td>
<td>-41***</td>
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<tr>
<td>Physiology</td>
<td>-64***</td>
<td>-63***</td>
<td>-51***</td>
<td>-57***</td>
<td>-38***</td>
<td>92***</td>
<td>-</td>
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</tr>
<tr>
<td>Scientism</td>
<td>-56***</td>
<td>-55***</td>
<td>-44***</td>
<td>-52***</td>
<td>-37***</td>
<td>90***</td>
<td>65***</td>
<td>-</td>
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</tr>
<tr>
<td>Weak Ag.</td>
<td>.05</td>
<td>.09**</td>
<td>.05</td>
<td>-.01</td>
<td>.22***</td>
<td>-.02</td>
<td>.02</td>
<td>-.06*</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strong Ag.</td>
<td>-.17***</td>
<td>-.07*</td>
<td>-.18***</td>
<td>-.24***</td>
<td>.00</td>
<td>.10**</td>
<td>.08*</td>
<td>.10**</td>
<td>.14***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WF</td>
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</tr>
<tr>
<td>Total</td>
<td>.16***</td>
<td>.15***</td>
<td>.12***</td>
<td>.16***</td>
<td>.15***</td>
<td>.02</td>
<td>-.02</td>
<td>.06</td>
<td>-.09***</td>
<td>-.11***</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benefit</td>
<td>.26***</td>
<td>.19***</td>
<td>.26***</td>
<td>.27***</td>
<td>.21***</td>
<td>-.07*</td>
<td>-.10**</td>
<td>-.02</td>
<td>-.16***</td>
<td>-.13***</td>
<td>.76***</td>
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N = 1056

Note. *p < .05, **p < .01, ***p < .001
strength, though due to large sample size these tests were probably overly sensitive and so only relationships of moderate strength or higher are reported here (i.e., $r > .02$). Spirituality and its Spiritual Belief sub-factor showed a significant positive correlation with Agreeableness. The Physicism sub-factor of the Naturalism worldview showed a significant negative correlation with Agreeableness. Weak Agnosticism showed a significant positive correlation with Neuroticism. Both Worldview Functionality and its Benefit sub-factor showed a significant positive correlation with Agreeableness, and the Benefit sub-factor alone showed a significant positive correlation with Openness.

4.2.3.5 Social Desirability

As can be seen in Table 12, correlation scores between the BIDR and SNAS show that neither Impression Management nor Self-Deception Enhancement had relationships with the worldview constructs that were both moderate and significant at the $p < .001$ level. The same can be said for the Worldview Functionality constructs, although Self-Deception Enhancement had a significant relationship with Worldview Benefit that approached moderate strength.

4.2.3.6 Demographics

Age, Gender, and Education Level. Table 13 shows correlations across the SNAS and Worldview Functionality factors with participants’ age. Across the SNAS constructs, age had a significant but weak positive correlation with Spiritual Practice, God/Higher Power, Mysticism, and overall Spirituality, and a weak but significant negative correlation with Scientism, Physicism, and Weak Agnosticism. Across the Worldview Functionality constructs, age had a weak but significant positive relationship with Worldview Benefit, and a weak but significant negative relationship with Worldview Integration.
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Note. *p < .05, **p < .01, ***p < .001; NSC = not completed secondary school, SC = secondary school or equivalent, C/D = certificate/diploma, B/U = bachelor/undergraduate degree, P/M/D = postgraduate, masters, doctorate
An independent-samples t-test was conducted to investigate differences in mean scores between men and women across the seven worldview factors and the three second-order worldview constructs (see Table 13). Levene's (1960) test for equality of variances was used to account for differences in group variance. Amongst the SNAS sub-factors, men scored significantly lower for total Spirituality ($t(467.81) = -6.32$, $p < .001$) and its Spiritual Belief ($t(469.81) = -9.96$, $p < .001$) and God/Higher Power ($t(1045) = -3.80$, $p < .001$) factors, and men’s lower scores for Spiritual Practice ($t(1045) = -2.35$, $p < .05$) approached significance. Men also scored significantly lower for total Spirituality ($t(467.81) = -6.32$, $p < .001$) and its Spiritual Belief ($t(469.81) = -9.96$, $p < .001$) and God/Higher Power ($t(1045) = -3.80$, $p < .001$) factors, and men’s lower scores for Spiritual Practice ($t(1045) = -2.35$, $p < .05$) approached significance. Men also scored significantly higher for Naturalism ($t(452.25) = 6.41$, $p < .001$) and its Physicism ($t(438.36) = -6.57$, $p < .001$), and Scientism ($t(1045) = -5.11$, $p < .001$) factors. Men also scored significantly higher for Strong Agnosticism ($t(1045) = -3.82$, $p < .001$). Across the Worldview Functionality constructs, both the Integration factor ($t(442.87) = -6.60$, $p < .001$), and total Worldview Functionality ($t(484.54) = -4.06$, $p < .001$) men showed significantly lower scores compared to women.

A series of one-way between subjects ANOVAs were conducted to compare the effect of education level on the seven worldview factors and the three second-order worldview constructs. Means and standard deviations across the five education levels are shown in Table 13. Across education levels there were differences in scores for total Spirituality ($F(4, 1053) = 6.83$, $p < .001$) and its Spiritual Belief ($F(4, 1053) = 13.52$, $p < .001$), God/Higher Power ($F(4, 1053) = 5.10$, $p < .001$) factors, while the effects on Spiritual Practice ($F(4, 1053) = 2.62$, $p < .05$) and Mysticism ($F(4, 1053) = 2.86$, $p < .05$) approached significance. The effect of education was also significant for total Naturalism ($F(4, 1053) = 6.35$, $p < .001$) and its Scientism ($F(4, 1053) = 7.03$, $p < .001$) factor, while the effect on Physicism ($F(4, 1053) = 4.47$, $p < .01$) approached significance. There was also a significant effect of education on Weak Agnosticism ($F(4, 1053) = 5.51$, $p < .001$). Across the Worldview Functionality constructs, the effect of education was significant for Worldview Benefit ($F(4, 1053) = 9.42$, $p < .001$).
p < .001), while the effect on Worldview Integration (F(4, 1053) = 3.26, p < .05) only approached significance. However, even the significant relationships between education level and the SNAS constructs were not linear, in that scores did not trend either higher or lower as education level increased.

**Country of Residence, Ethnicity, and Language.** Independent-samples t-tests were conducted to investigate differences in mean scores for country of residence, ethnicity, and English as first language variables, across the SNAS and Worldview Functionality constructs (see Table 14). Levene's (1960) test for equality of variances was used to account for differences in group variance. For country of residence, when compared to the comparison group, the reference control group (Australia) had significantly higher levels of total Spirituality ($t(187.22) = 4.24, p < .001$) and its Spiritual Belief factor ($t(187.24) = 6.58, p < .001$), and higher scores for God/Higher Power ($t(1050) = 2.39, p < .05$) and Spiritual Practice ($t(1050) = 2.02, p < .05$) approached significant difference. The reference control group had significantly lower levels of Naturalism ($t(186.88) = -4.61, p < .001$), and its Scientism factor ($t(1050) = -5.59, p < .001$), and lower scores for Physicism ($t(181.88) = -3.27, p < .01$) approached significant difference. The impact of country of residence approached significant difference for Strong Agnosticism ($t(1050) = 3.36, p < .01$), and Worldview Integration ($t(188.09) = 2.26, p < .05$), with the reference control group scoring higher for both constructs.

For ethnicity, when compared to the comparison group, the reference control group (Australia/white/Caucasian/Anglo-Saxon) scored significantly lower for total Spirituality ($t(433.44) = -4.38, p < .001$), and its God/Higher Power ($t(416.05) = -4.53, p < .001$) and Spiritual Practice ($t(428.98) = -4.62, p < .001$) factors. The reference control group had lower scores for Mysticism ($t(1013) = -2.00, p < .05$) and Spiritual Belief ($t(1013) = -3.01, p < .01$),
Table 14

Differences in Mean SNAS and Worldview Functionality Scores as a Function of Country of Residence, Ethnicity, and English as First Language

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<th>Sp. Belief</th>
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<th>Scientism</th>
<th>Physicism</th>
<th>Weak Ag.</th>
<th>Strong Ag.</th>
<th>Spirituality</th>
<th>Naturalism</th>
<th>Benefit</th>
<th>Integration</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Control</td>
<td>748</td>
<td>10.30 (5.09)</td>
<td>8.25 (4.52)</td>
<td>14.50 (5.94)</td>
<td>6.33 (6.72)</td>
<td>18.19 (4.30)</td>
<td>14.93 (4.71)</td>
<td>8.00 (3.48)</td>
<td>14.50 (3.56)</td>
<td>29.08 (12.62)</td>
<td>33.12 (8.15)</td>
<td>15.24 (2.83)</td>
<td>13.23 (2.70)</td>
</tr>
<tr>
<td>Comparison</td>
<td>267</td>
<td>11.04 (5.42)</td>
<td>9.86 (5.02)</td>
<td>15.77 (5.85)</td>
<td>7.67 (4.31)</td>
<td>17.98 (4.46)</td>
<td>14.19 (5.00)</td>
<td>8.14 (3.67)</td>
<td>13.73 (3.81)</td>
<td>33.30 (13.85)</td>
<td>32.17 (8.67)</td>
<td>15.46 (2.92)</td>
<td>13.16 (3.13)</td>
</tr>
<tr>
<td>N = 1015</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Language</th>
<th>Mysticism</th>
<th>Sp. Practice</th>
<th>Sp. Belief</th>
<th>God/HP</th>
<th>Scientism</th>
<th>Physicism</th>
<th>Weak Ag.</th>
<th>Strong Ag.</th>
<th>Spirituality</th>
<th>Naturalism</th>
<th>Benefit</th>
<th>Integration</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>936</td>
<td>10.53 (5.23)</td>
<td>8.59 (4.65)</td>
<td>14.84 (5.88)</td>
<td>6.58 (3.82)</td>
<td>18.06 (4.32)</td>
<td>14.71 (4.80)</td>
<td>8.01 (3.52)</td>
<td>14.41 (3.58)</td>
<td>30.01 (12.82)</td>
<td>32.77 (8.26)</td>
<td>15.24 (2.86)</td>
<td>13.12 (2.82)</td>
</tr>
<tr>
<td>Non-English</td>
<td>105</td>
<td>10.36 (5.25)</td>
<td>9.62 (5.21)</td>
<td>15.12 (6.36)</td>
<td>7.88 (4.55)</td>
<td>18.42 (4.55)</td>
<td>14.95 (4.84)</td>
<td>8.57 (3.72)</td>
<td>13.20 (3.92)</td>
<td>32.62 (15.09)</td>
<td>33.37 (8.65)</td>
<td>15.61 (2.90)</td>
<td>13.63 (3.20)</td>
</tr>
<tr>
<td>N = 1041</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Country of residence: “Reference Control” is Australia; “Comparison” is all other nationalities. Ethnicity: “Reference Control” is Australian/White/Caucasian/Anglo-Saxon; “Comparison” is all other ethnicities.
as well as higher scores for Physicism \((t(1013) = 2.16, p < .05)\) and Strong Agnosticism \((t(1013) = 2.95, p < .01)\) that approached significant difference.

There were no differences significant at the \(p < .001\) level between participants who did and did not have English as a first language. However, differences approached significance for God/Higher Power \((t(121.07) = -2.82, p < .01)\) and Worldview Functionality \((t(1039) = -1.98, p < .05)\) – with people who had English as a first language scoring lower – and for Strong Agnosticism \((t(1039) = 3.24, p < .01)\) – with people who had English as a first language scoring higher.

Religious Association and Frequency of Worship. Independent-samples t-tests were conducted to investigate differences in mean scores across the SNAS and Worldview Functionality constructs between religious and non-religious participants. One analysis investigated personal association with religious institutions, while the other investigated culture of upbringing association with a religious institution (for relevant \(t\)-test statistics, see Table 15). Levene's (1960) test for equality of variances was used to account for differences in-group variance. Results showed that personal association with a religious institution was associated with significantly higher levels of Spirituality and its Spiritual Practice, Spiritual Belief, and God/Higher Power factors, Mysticism, as well as Worldview Functionality and its Worldview Benefit factor. Personal association with a religious institution was also associated with significantly lower levels of Naturalism and its Physicism and Scientism factors, as well as lower levels of Strong Agnosticism. Culture-of-upbringing association with a religious institution was associated with significantly higher levels of Spirituality and its Spiritual Practice, and God/Higher Power factors, as well as Worldview Benefit.

Independent-samples t-tests were conducted to investigate differences in mean scores across the seven factors and three worldviews between Judeo-Christian participants and participants with other religious orientations. One analysis investigated personal association
Table 15

*Differences in Mean SNAS and Worldview Functionality Scores across Religious and Non-Religious Groups*

<table>
<thead>
<tr>
<th></th>
<th>Personal Association</th>
<th>Culture of Upbringing Association</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Religious (n = 190)</td>
<td>Non-Religious (n = 861)</td>
</tr>
<tr>
<td><strong>Spirituality</strong></td>
<td>43.45 (12.43)</td>
<td>27.33 (11.33)</td>
</tr>
<tr>
<td><strong>Spiritual Belief</strong></td>
<td>19.22 (4.74)</td>
<td>13.90 (5.74)</td>
</tr>
<tr>
<td><strong>Spiritual Practice</strong></td>
<td>13.59 (4.85)</td>
<td>7.60 (3.94)</td>
</tr>
<tr>
<td><strong>God/HP</strong></td>
<td>10.64 (4.06)</td>
<td>5.83 (3.31)</td>
</tr>
<tr>
<td><strong>Mysticism</strong></td>
<td>11.93 (5.19)</td>
<td>10.16 (5.17)</td>
</tr>
<tr>
<td><strong>Naturalism</strong></td>
<td>28.22 (7.93)</td>
<td>33.86 (8.02)</td>
</tr>
<tr>
<td><strong>Physicism</strong></td>
<td>12.04 (4.46)</td>
<td>15.34 (4.66)</td>
</tr>
<tr>
<td><strong>Scientism</strong></td>
<td>16.18 (4.54)</td>
<td>18.52 (4.18)</td>
</tr>
<tr>
<td><strong>Weak Agnosticism</strong></td>
<td>7.58 (3.63)</td>
<td>8.15 (3.52)</td>
</tr>
<tr>
<td><strong>Strong Agnosticism</strong></td>
<td>12.73 (4.18)</td>
<td>14.61 (3.42)</td>
</tr>
<tr>
<td><strong>Worldview Functionality</strong></td>
<td>29.76 (3.96)</td>
<td>28.15 (4.39)</td>
</tr>
<tr>
<td><strong>Benefit</strong></td>
<td>16.40 (2.68)</td>
<td>15.02 (2.83)</td>
</tr>
<tr>
<td><strong>Integration</strong></td>
<td>13.36 (2.88)</td>
<td>13.13 (2.85)</td>
</tr>
</tbody>
</table>

\( n = 1051 \) \( n = 1050 \)

*Note.* Figures in parentheses are standard deviations, *p < .05, **p < .01, ***p < .001
with religious institutions, while the other investigated culture of upbringing association with
a religious institution (for relevant $t$-test statistics, see Table 16). Levene's (1960) test for
equality of variances was used to account for differences in group variance. Results show that
there were no significant differences between the groups at the $p < .001$ level.

Independent-samples $t$-tests were conducted to investigate differences in mean scores
across the SNAS and Worldview Functionality factors between worshiping and non-
worshiping participants. One analysis investigated private prayer, ritual, or worship, while the
other investigated organised prayer, ritual, or worship (for relevant $t$-test statistics, see Table
17). Levene's (1960) test for equality of variances was used to account for differences in
group variance. At the $p < .001$ level, results showed that both private and organised prayer,
ritual, or worship were associated with significantly higher levels of Spirituality and its
Spiritual Belief, Spiritual Practice, and God/Higher Power factors, Mysticism, as well as
Worldview Benefit. Private and organised prayer, ritual, or worship were also both associated
with significantly lower levels of Naturalism and its Physicism and Scientism factors. Unlike
private prayer, ritual, or worship, organised prayer, ritual, and worship was associated with
significantly higher levels of Worldview Functionality, and significantly lower levels of
Strong Agnosticism.
Table 16

*Differences in Mean SNAS and Worldview Functionality Scores across Judeo-Christian and Other Religious Groups*

<table>
<thead>
<tr>
<th></th>
<th>Personal Association</th>
<th></th>
<th>Culture of Upbringing Association</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Judeo-Christian (n = 131)</td>
<td>Other (n = 25)</td>
<td>df</td>
<td>t</td>
</tr>
<tr>
<td><strong>Spirituality</strong></td>
<td>46.34 (10.01)</td>
<td>41.76 (13.13)</td>
<td>154</td>
<td>1.99*</td>
</tr>
<tr>
<td><strong>Spiritual Belief</strong></td>
<td>20.10 (3.63)</td>
<td>18.44 (5.28)</td>
<td>28.48</td>
<td>1.51</td>
</tr>
<tr>
<td><strong>Spiritual Practice</strong></td>
<td>14.64 (4.21)</td>
<td>13.56 (4.80)</td>
<td>154</td>
<td>1.15</td>
</tr>
<tr>
<td><strong>God/HP</strong></td>
<td>11.60 (3.47)</td>
<td>9.76 (4.21)</td>
<td>154</td>
<td>2.34*</td>
</tr>
<tr>
<td><strong>Mysticism</strong></td>
<td>11.76 (4.81)</td>
<td>14.68 (6.26)</td>
<td>29.64</td>
<td>-2.21*</td>
</tr>
<tr>
<td><strong>Naturalism</strong></td>
<td>26.84 (7.09)</td>
<td>30.72 (8.99)</td>
<td>154</td>
<td>-2.40*</td>
</tr>
<tr>
<td><strong>Physicism</strong></td>
<td>11.18 (4.03)</td>
<td>13.52 (4.94)</td>
<td>154</td>
<td>-2.56*</td>
</tr>
<tr>
<td><strong>Scientism</strong></td>
<td>15.65 (4.33)</td>
<td>17.20 (5.18)</td>
<td>154</td>
<td>-1.58</td>
</tr>
<tr>
<td><strong>Weak Agnosticism</strong></td>
<td>7.25 (3.37)</td>
<td>8.48 (4.79)</td>
<td>28.71</td>
<td>-1.23</td>
</tr>
<tr>
<td><strong>Strong Agnosticism</strong></td>
<td>12.05 (4.21)</td>
<td>13.71 (3.95)</td>
<td>154</td>
<td>-1.90</td>
</tr>
<tr>
<td><strong>Worldview Functionality</strong></td>
<td>29.76 (3.66)</td>
<td>29.15 (4.98)</td>
<td>154</td>
<td>.73</td>
</tr>
<tr>
<td><strong>Benefit</strong></td>
<td>16.51 (2.65)</td>
<td>16.43 (2.64)</td>
<td>154</td>
<td>.14</td>
</tr>
<tr>
<td><strong>Integration</strong></td>
<td>13.25 (2.66)</td>
<td>12.71 (3.82)</td>
<td>28.62</td>
<td>.68</td>
</tr>
</tbody>
</table>

*n = 156  n = 404

*Note. Figures in parentheses are standard deviations, *p < .05, **p < .01, ***p < .001*
Table 17

*Differences in Mean SNAS and Worldview Functionality Scores across Worship and Non-Worship Groups*

<table>
<thead>
<tr>
<th></th>
<th>Private Prayer, Ritual, or Worship</th>
<th>Organised Prayer, Ritual, or Worship</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No ((n = 433))</td>
<td>Yes ((n = 611))</td>
</tr>
<tr>
<td></td>
<td>(\text{df})</td>
<td>(t)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spirituality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20.65 (8.03)</td>
<td>36.98 (11.78)</td>
</tr>
<tr>
<td></td>
<td>23.73 (9.96)</td>
<td>36.59 (12.68)</td>
</tr>
<tr>
<td>Spiritual Belief</td>
<td>11.29 (5.18)</td>
<td>17.35 (5.14)</td>
</tr>
<tr>
<td></td>
<td>12.71 (5.78)</td>
<td>16.96 (5.31)</td>
</tr>
<tr>
<td>Spiritual Practice</td>
<td>5.35 (2.46)</td>
<td>11.04 (4.52)</td>
</tr>
<tr>
<td></td>
<td>6.18 (3.05)</td>
<td>11.13 (4.77)</td>
</tr>
<tr>
<td>God/HP</td>
<td>4.01 (1.81)</td>
<td>8.59 (3.92)</td>
</tr>
<tr>
<td></td>
<td>4.85 (2.74)</td>
<td>8.50 (4.07)</td>
</tr>
<tr>
<td>Mysticism</td>
<td>7.70 (3.62)</td>
<td>12.39 (5.29)</td>
</tr>
<tr>
<td></td>
<td>9.21 (4.87)</td>
<td>11.71 (5.26)</td>
</tr>
<tr>
<td>Naturalism</td>
<td>36.87 (7.26)</td>
<td>30.07 (7.82)</td>
</tr>
<tr>
<td></td>
<td>35.04 (8.06)</td>
<td>30.71 (7.95)</td>
</tr>
<tr>
<td>Physicism</td>
<td>17.01 (4.30)</td>
<td>13.17 (4.48)</td>
</tr>
<tr>
<td></td>
<td>15.99 (4.78)</td>
<td>13.53 (4.47)</td>
</tr>
<tr>
<td>Scientism</td>
<td>19.86 (3.74)</td>
<td>16.90 (4.33)</td>
</tr>
<tr>
<td></td>
<td>19.05 (4.13)</td>
<td>17.18 (4.36)</td>
</tr>
<tr>
<td>Weak Agnosticism</td>
<td>7.67 (3.43)</td>
<td>8.27 (3.56)</td>
</tr>
<tr>
<td></td>
<td>7.71 (3.47)</td>
<td>8.38 (3.59)</td>
</tr>
<tr>
<td>Strong Agnosticism</td>
<td>14.40 (3.39)</td>
<td>14.18 (3.80)</td>
</tr>
<tr>
<td></td>
<td>14.68 (3.43)</td>
<td>13.88 (3.79)</td>
</tr>
<tr>
<td>Worldview Functionality</td>
<td>27.95 (4.45)</td>
<td>28.77 (4.28)</td>
</tr>
<tr>
<td></td>
<td>27.95 (4.55)</td>
<td>28.92 (4.11)</td>
</tr>
<tr>
<td>Benefit</td>
<td>14.71 (2.94)</td>
<td>15.67 (2.74)</td>
</tr>
<tr>
<td></td>
<td>14.90 (3.01)</td>
<td>15.64 (2.64)</td>
</tr>
<tr>
<td>Integration</td>
<td>13.24 (2.88)</td>
<td>13.10 (2.86)</td>
</tr>
<tr>
<td></td>
<td>13.05 (2.94)</td>
<td>13.27 (2.79)</td>
</tr>
</tbody>
</table>

*Note.* Figures in parentheses are standard deviations, \(*p < .05, \**p < .01, \***p < .001*
4.2.4 Discussion

Study Two aimed to use confirmatory factor analysis was used to refine the SNAS. Second, exploratory factor analysis was used to develop a new short measure for worldview functionality, based on Vidal's (2012) criteria. Third, analyses were conducted to determine the construct and population validity of both measures. Finally, one of the most important aims of study two was to examine the relationship between worldviews and personality. The best fitting models for spirituality, naturalism, and agnosticism provided data regarding the structural relationships between worldview beliefs and traits in personality constructs. Furthermore, these constructs were tested alongside the Big 5 domains of personality in order to investigate how they would relate to widely accepted representation of personality variance.

4.2.4.1 Refining the SNAS

The first aim of the current study was to reduce the SNAS into a short, psychometrically sound instrument. The CFA conducted with the SNAS showed encouraging results for the model by demonstrating promising values across numerous fit indices. Furthermore, the CFA provided valuable data regarding the factor structure of the inventory, such that initial factor structure could be refined.

The best-fitting CFA model showed eight first-order factors: Spiritual Practice, Spiritual Belief, God and Higher Power, Mysticism, Scientism, Physicism, Weak Agnosticism, and Strong Agnosticism. Of these factors, only two second-order factors improved the model fit: Spiritual Practice, Spiritual Belief, and God and Higher Power factors were organised under a second-order factor Spirituality, and the Scientism and Physicism factors were organised under the second-order factor Naturalism. This structure can be seen in Figure 4 (p. 128).
Essentially, these findings conform to expectations about the discrete Spirituality, Naturalism, and Agnosticism constructs save for three expectations. First, Mysticism, while being associated with Spirituality, was not associated enough to be considered a subdomain of Spirituality. Instead, it seemed more accurate to assert that mystical experiences are often but not always associated with spiritual practices and beliefs. Second, experiences with and belief in God or Higher Power are better understood as a separate sphere of Spirituality, separate to other practices and beliefs – though they are still highly associated enough to be considered an aspect of Spirituality alongside Spiritual Practice and Spiritual Belief. Finally, Weak and Strong Agnosticism were not organised under a single second-order construct, and were not even moderately associated with one another. This makes it especially important that both constructs are taken into account, especially when measuring outcomes of worldviews. It seems that, while Weak Agnosticism can be understood as a personal uncertainty and flexibility, Strong Agnosticism can be understood as a certainty of belief in the uncertain nature of existence, in other words, “I know for sure that I do not know.”

Although Mysticism should not in this instance be understood as a subordinate aspect of the Spirituality construct, it is nevertheless strongly related to it (MacDonald, 2000a). Similarly, although Weak and Strong Agnosticism were not associated with one another statistically, they are often understood as two alternate stances within the same belief system (i.e., agnosticism; Le Poidevin, 2010). Therefore, it seems simplest to still speak of the three overarching worldviews, spirituality, naturalism, and agnosticism, while acknowledging that they are multidimensional constructs in detailed analyses. In line with the aims of the current study, the SNAS was refined into a 35-item measure that seems psychometrically robust enough to be used in further analyses.
4.2.4.2 Worldview Functionality Scale

The second aim of the current study was to develop a small measure for worldview functionality that could be used as an outcome measure to test the effectiveness of various worldviews. It was intended that exploratory factor analysis would provide a small model with simple structure that could measure worldview functionality. Unfortunately, EFA results did not provide a solution that comprehensively represented Vidal's (2012) theorised metaphysical criteria. The scale itself only measures a small subset of the criteria, which focuses mainly on intrapsychic and interpersonal functionality rather than larger societal integration. However, this self-reported assessment of worldview functionality can be refined in further research. In its current form, it is still able to fill a psychometric gap in measuring self-reported functionality of worldview beliefs.

The 2-factor model that emerged from the EFA explained an acceptable level of variance in the sample data, and both factors had good internal reliability. The first factor, *Worldview Benefit*, comprised items that together measured participants’ opinions about the efficacy and usefulness of their own beliefs. A person who scored high in this factor would tend to think that their beliefs are worth having, because they are beneficial for oneself and others. The second factor, *Worldview Integration*, comprised items that together measured participants’ agreement of other people’s beliefs, as well as how much their own beliefs would be accepted or understood by others. Overall, the combination of these two scales will be referred to as the Worldview Functionality Scales (WFS).

Interestingly, neither total WFS scores, nor either of its two factors, had associations with any of the other variables in the study that were at least moderate strength. This seems to suggest that WFS scores were not related to the three specific worldviews measured in the current study. However, it could also raise doubts about the construct validity of the WFS, in that it has not been able to demonstrate convergent validity in the current study. Having said
that, there is no previous literature that would provide legitimate expectations about the relationships that the WFS would have with these other variables, so at this point the validity of the new measure will need to remain somewhat ambiguous until further testing offers more data.

4.2.4.3 Construct Validity

The third aim of the second study was to examine intercorrelations between the SNAS, the WFS, and other similar inventories, in order to investigate construct validity. Each of the eight factors of the SNAS showed good evidence of construct validity.

4.2.4.3.1 Construct Validity: SNAS

**Spirituality.** Convergent validity was demonstrated for the Spirituality factor through its logical associations with Rosenkranz and Charlton's (2013) EOS, in which Spirituality showed a strong positive relationship with Religious Orientation, and a strong negative association with Science Acceptance. Similarly, Spirituality showed logical strong positive associations with the facets of Macdonald's (2000) ESI, all except Existential Well-Being, which arguably measures psychological well-being rather than a dimension of spirituality. Discriminant validity was demonstrated for the Spirituality factor through its overall weak relationships with the Big 5 personality domains, which echoes previous findings (Holmes & Findlay, 2016; MacDonald, 2000b; Piedmont, 1999; Rican & Janosova, 2010).

However, both Spirituality and its Spiritual Belief sub-factor were positively associated with Agreeableness. This relationship seems to support the theoretical framework outlined in the current work, because agreeableness measures the level of positive regard and interaction a person has with others, and spirituality and particularly its beliefs in supernatural agencies were theoretically linked to underlying features of social cognition. It has been
found that the social-cognitive functions inherent to theory of mind are associated with Agreeableness (Nettle, 2007; Nettle & Liddle, 2008), and so it seems likely that the relationship between Spirituality and Agreeableness is due to their shared foundation in individual tendencies and abilities with social-cognition. Another possibility is that highly agreeable people are generally less socially defensive, and are more likely to accept spiritual ideas from other people. This would mean that high levels of Agreeableness could mediate the influence that religiosity has on levels of spirituality, a speculation that may be worth future investigation. Overall, the Spirituality factor was related to other measures of spirituality, and differentiated from the Big 5 domains of personality.

Mysticism showed good convergent validity in its logical positive association with the various domains of spirituality in the ESI, particularly Experiential Spirituality, which is essentially another measure of mystical experiences (MacDonald, 2000b). Mysticism showed good discriminant validity in its weak relationships with the Big 5 personality domains, which have also consistently shown weak relationship to mystical experiences ((MacDonald, 2000b; Piedmont, 1999; Rican & Janosova, 2010). The only exception to this is that Mysticism is often related to Openness (MacDonald, 2000b; MacLean et al., 2011; Rican & Janosova, 2010), although this was not found in the current study. Overall, the Mysticism factor seems related to other measures of mystical experience and spirituality, and differentiated from the Big 5 domains of personality.

Naturalism. Convergent validity was demonstrated for the Naturalism factor through its logical associations with Rosenkranz and Charlton's (2013) EOS, in which Naturalism showed a strong negative relationship with Religious Orientation, and a strong positive association with Science Acceptance. Similarly, Naturalism showed logical strong negative associations with the facets of Macdonald's (2000) ESI. Overall, Naturalism showed good convergent validity in its logical positive association with Science Acceptance, and its
negative associations with Religious Orientation and the various factors of the ESI. The exception to this was the lack of relationship between Naturalism and Existential Well-Being, which mirrors similar results from Rosenkranz and Charlton (2013) and shows discriminant validity for the measure. Naturalism was also showed discriminant validity in its weak relationships with the Big 5 domains of personality.

**Agnosticism.** Weak Agnosticism did not show any relationships with other variables that were of moderate strength, and so it remains to be seen whether it can demonstrate consistent associations with other variables. The fact that Weak Agnosticism did not show any strong relationships lends support for its discriminant validity. The only relationship between Weak Agnosticism and the Big 5 was a positive association with Neuroticism, which suggests that personal uncertainty of belief leads to the experience of negative emotions, or vice versa.

Strong Agnosticism demonstrated convergent validity in its moderate negative association with Altemeyer's (2002) measure of Dogmatism, as well as its negative associations with Religious Orientation and Religiousness, which approached moderate strength. Other than these associations, Strong Agnosticism displayed only weak relationships with other variables, demonstrating discriminant validity for Strong Agnosticism in its differentiation from spiritual experiences and the Big 5 personality domains.

**4.2.4.3.2 Construct Validity: WFS**

The two WFS factors did not show any relationships with other variables that reached moderate strength, and therefore it is difficult to comment on construct validity with the data currently available. This difficulty is further compounded by the fact that other measures have not tapped into self-reported assessment of the usefulness of one’s own beliefs, and so
relationships with other variables are somewhat preliminary. However, the two factors of the WFS were not related to Macdonald's (2000) measure of Existential Well-Being, which arguably measure psychological well-being more generally. This, as well as the lack of association with Neuroticism, lends support to the notion that the WFS measured a relatively distinct construct. Both total WFS scores and its Benefit sub-factors were positively associated with Agreeableness, which suggests that people are able to trust and relate more positively to others if they perceive their own beliefs as valuable, or that positive relationships with others tend to increase the sense that one’s beliefs are valuable. Also, Benefit had a positive association with Openness, which suggests that appreciation of new ideas and aesthetics can lead to an appreciation of the value of one’s own beliefs, or vice versa. It remains to be seen whether it can be differentiated from other well-being outcome variables in study three, and used to compare the different impacts of distinct worldviews.

4.2.4.4 Social Desirability

Weak and Strong Agnosticism were significantly, negatively correlated with Impression Management. This seems to suggest that personal uncertainty and philosophical nihilism are perceived as somewhat shameful to disclose. There is therefore the possibility that these agnosticism scores could be higher than what some participants chose to self-report. Similarly, Weak Agnosticism was correlated significantly and negatively with Self-Deception Enhancement, which suggests that an element of self-deception prevented people from being aware of their own personal uncertainty and flexibility of beliefs. However, none of these relationships approached even moderate strength, and so conclusions cannot be drawn without subsequent supporting evidence.

Total WFS scores, as well as scores for both of its sub-factors, were correlated significantly and positively with Impression Management and Self-Deception Enhancement.
This suggests that participants had a tendency to exaggerate the level of benefit and social integration they experience with their own beliefs, both in order to appear more acceptable to researchers, and as a way of unconsciously protecting their own self-esteem. However, none of these relationships approached even moderate strength, and so conclusions cannot be drawn without subsequent supporting evidence.

4.2.4.5 Population Validity

The fourth aim of the current study was to continue investigation of the population validity of the newly developed measures. That is, because the scales were designed to measure worldviews in the general population, it was important to test whether results significantly varied across different demographic variables.

4.2.4.5.1 Population Validity: SNAS

**Age, Gender, and Education Level.** In contrast to study one, age had a significant relationship with some of the SNAS factors. Older participants tended to report higher levels of Spiritual Practice, relationships with God/Higher Power, Mysticism, and overall Spirituality, when compared to younger participants. Older participants also tended to report lower levels of Scientism, Physicism, and Weak Agnosticism. Together these findings suggest that there are either generational differences in SNAS scores, in that previous generations tend to have worldviews that are more spiritual, less naturalist, and they are more certain of their beliefs. Alternatively, these findings might suggest a movement towards spiritual worldviews, away from naturalist worldviews, and an increase of belief certainty as people mature.

Similar to study one, there were differences in scores for the measure across gender. Men tended to score lower for Spirituality factors and higher for Naturalism factors. This can
again be tentatively explained through men’s tendency to use mechanistic cognition, and women’s tendency to use social cognition (Rosenkranz & Charlton, 2013). Results from study three can further investigate these differences. Regardless of the accuracy of the cognitive explanation, these findings with worldviews and gender are expected and do not compromise the validity of the new measure.

In contrast, to Study One, study two results found significant differences between worldview scores across education levels. These significant differences occurred for most worldview factors. However, there did not appear to be any consistent directional trend for the worldview scores and education. That is, scores did not consistently increase or decrease as education level increased for any of the variables. Instead, the relationship between education and scores for the worldview factors tended to be nonlinear. It remains to be seen whether this pattern of results between education level and worldview is repeated in study three.

**Country of Residence, Ethnicity, and Language.** Similar to Study One, there were no significant difference for scores depending on English as a first language. Also similar to Study One, results showed a significant difference in Spirituality and Naturalism scores between participants who lived in Australia and participants who lived in other countries. Residents of Australia tended to have higher scores for Spirituality factors, and lower scores for Naturalism factors when compared to residents of other countries. However, when comparing ethnicity, Australians tended to have lower scores for Spirituality factors and higher scores for Naturalism factors. Again, these scores are difficult to compare against other countries, because long-term data tends not to differentiate between religiosity and spirituality, and Australia has not been included in many studies that do compare cross-cultural levels of spirituality (e.g., Houtman & Aupers, 2007). These findings may point to a multicultural make-up of Australian population in which those living in Australia who are
from migrant backgrounds tend to report higher spirituality than those who live in Australia without migrant backgrounds, although the demographic methodology in the current study makes detailed analysis difficult.

**Religious Association and Frequency of Worship.** Personal association with a religious institution was associated with higher levels of Spirituality and lower levels of Naturalism, and culture-of-upbringing association with a religious institution was linked to higher levels of spiritual practice. Both private and organised prayer, ritual, or worship were associated with significantly higher levels of the Spirituality worldview, including its Mysticism, Spiritual Practice, and Spiritual Belief factors, and significantly lower levels of the Naturalism worldview, including both its Scientism and Physicism factors. Together, these findings predictably link spirituality to religious institutions, which make sense with religiosity as an aspect of spirituality.

Similar to Study One, there were no differences in the measures between Judeo-Christian and other religious associations. Again, this suggests that the domains measured by the new scales are not associated with any particular institutionalised religious belief-system, and instead capture universal aspects of spiritual and religious belief and behaviour.

### 4.2.4.5.2 Population Validity: WFS

**Age, Gender, and Education Level.** Across the WFS factors, age had a weak but significant positive relationship with Benefit, and a weak but significant negative relationship with Integration. Together these results show that older participants tended to report that their beliefs are more beneficial but less socially integrated when compared to younger participants. Education level had a significant relationship with worldview benefit. As education level increased, so too did the self-reported benefit of participant’s beliefs, which could indicate
either a change in worldview towards more beneficial beliefs over time, or an increased ability to extract benefit from whatever worldview is held.

There were differences for WFS scores across genders. Men tended to score lower in Integration, and overall WFS scores. It will be interesting to see whether this is a trend that continues in future studies. Similar to tendencies towards mechanistic versus social cognition, perhaps there is another variable that can explain these differences, especially seeing as worldview functionality was largely represented by the quality of interpersonal relationship one has with others based on the beliefs held by both parties.

**Country of Residence, Ethnicity, and Language.** There were no significant differences in WFS scores as a function of either country of residence, ethnicity, or English as a first language.

**Religious Association and Frequency of Worship.** Personal association with a religious institution was associated with significantly higher levels of Worldview Functionality and its Benefit factor. Culture-of-upbringing association with a religious institution was associated with significantly higher levels of Benefit. There were no significant differences in WFS scores between Judeo-Christian and other forms of religion. Both private and organised prayer, ritual, or worship were associated with significantly higher levels of Benefit. Only organised prayer, ritual, and worship was associated with significantly higher levels of Worldview Functionality.

### 4.2.4.6 Worldviews and Personality

One of the most important aims of study two was to examine the relationship between worldviews and personality. This data was primarily from the models of best fit that would represent spirituality, naturalism, and agnosticism, and the way that items measuring worldview beliefs would be integrated with items that measure trait-level behaviours. It was
also of interest how these worldview constructs would relate to the Big 5 domains of personality.

In Study One, 23 of the 44 items included in the seven factor model seemed to capture worldview beliefs that relate clearly to dimensions outlined by Koltko-Rivera's (2004) collated model, and the other 21 items represent personality traits and experiences. In Study Two, 20 of the 35 items included in the final model seemed to capture worldview beliefs.

It is difficult with any factor analysis to determine the nature of the shared variance between items, as these could include a large spread of different semantic and methodological effects. Preliminary results suggest that, for the most part, the best fitting model is organised into constructs based on conceptual content, rather than their items addressing either worldview beliefs of behavioural trait.

There were two factors in which traits and worldview beliefs appear together: God/Higher Power and Scientism. These two factors comprise a set of worldview beliefs, and the single behavioural trait they each include is directly validated by the beliefs in the factor. In other words, the only behavioural item in the Scientism factor represents personal trust in scientific experts – this is alongside worldview beliefs that posit the usefulness of scientific practice. The God/Higher Power factor contains a single behavioural item relating to a personal relationship with God or a Higher Power, as well as two prescriptive worldview beliefs that posits this relationship as necessary or important.

Furthermore, the factors themselves were organised under second-order constructs based on their content. For example, the best fitting models showed that the three Spirituality factors had more than 80% of their variance explained by a shared second-order construct, despite the individual factors comprising either traits or worldview beliefs. These second-order constructs represent patterns of organisation in personality that integrates both traits and worldview beliefs.
As hypothesised, spirituality, naturalism, and agnosticism stood apart from the Big 5 personality factors, as correlations between the new constructs and the Big 5 factors were weak at best. This is in line with studies that have shown that belief systems such as spirituality are not reducible to the Big 5 domains, that they represent distinct domains with unique variance in personality (e.g., Piedmont, 1999; Rican & Janosova, 2010).

4.3 Summary

The purpose of the current chapter was to report the development and validation of a psychometric inventory that measured spirituality, naturalism, and agnosticism as worldview beliefs and traits. Study One used exploratory factor analysis to reduce a large pool of items measuring these three constructs into an inventory that presented simple structure and captured all three domains. Study Two used confirmatory factor analysis to reduce the scale into an even more psychometrically sound instrument, and demonstrate construct validity alongside other measures for similar constructs. Study Two also had secondary aims, which were to test the spirituality, naturalism, and agnosticism constructs alongside the FFM domains of personality, and to begin development of a small outcome measure for self-reported worldview functionality.

4.3.1 The SNAS

Exploratory and confirmatory factor analyses were used to successfully develop scales that could measure spirituality, naturalism, and agnosticism in personality. The spirituality construct encapsulated spiritual beliefs, relationships with God or a Higher Power, and spiritual practices. Although mystical experiences were not included as a subordinate
factor of the spirituality construct, they were represented in the best-fitting model by a distinct domain that demonstrated an overall positive relationship with it. The naturalism construct was represented by attitudes towards science, and belief in ontological materialism and determinism. The agnosticism construct was differentiated into Strong Agnosticism, which represents belief in ontological uncertainty, and Weak Agnosticism, which represents personal belief flexibility and uncertainty.

Some construct validity was demonstrated for these worldview measures. Spirituality, Mysticism, Naturalism, and Strong Agnosticism each showed logical associations with their similar measures, and were differentiated from the Big 5 measures of personality. Weak Agnosticism was not able to demonstrate convergent validity, but showed only weak associations with all other variables, therefore capturing a construct differentiated from the mere lack of the other types of belief.

4.3.2 The WFS

Exploratory factor analysis was also able to develop a short measure for Worldview Functionality. Items representing Vidal's (2012) metaphilosophical criteria for worldview comparison were subject to an exploratory factor analysis. Initially, this was intended to capture many of the domains outlined by Vidal, which covered many grounded and abstract relationships between the self and the world that could be mediated by worldviews. However, factor analysis showed that the more abstract domains did not explain enough variance to warrant inclusion in the measure. The WFS emerged as a 2-factor inventory that measured worldview benefit and worldview integration, that is, the perceived benefit and social integration that one’s beliefs have. While this was more limited in scope that originally planned, these two factors appeared to be measuring a unique construct that could help to test the positive impact that different worldviews might have.
4.3.3 Limitations

Generally, results relating the new scales to demographic variables were positive, in that they together suggest a universal applicability of the scales. In particular, it is beneficial that the new scales measuring spirituality and naturalism did not significantly differ as a function of religious association, which supports the idea that they captured universal rather than specific cultural variations in worldviews. However, these tests for population validity were somewhat limited by the differences between group sizes for the reference and comparison groups. Furthermore, the second sample found seemingly contradictory results regarding country of residence and ethnicity, and this may relate to the wording of those items, and/or group sizes. Particularly regarding the universality of the measures cross-culturally, further tests that can include a more culturally diverse and demographically clarified sample would be beneficial, as well as much more specific items that can clarify participants’ current and background exposure and participation in culturally specific aspects of religion.

Furthermore, it has been previously suggested that measures of spirituality need to take into account differences in scores between laypersons and those with expertise in theology (Kapuscinski & Masters, 2010). The same could be said for those who have specific training in science and philosophy generally, and so the current study was limited by the exclusion of these demographic variables. Subsequent tests for validity could investigate the new measures using a sample that explicitly accounts for differences in relevant knowledge.

Importantly, there is room for further testing around the test-retest reliability of the current measures. It would be good for future studies to gather evidence regarding the claim that these scales tap into structures within personality that are relatively stable over time.
4.3.4 Conclusion

This chapter has reported on the empirical development of new psychometric inventories. First, the 35-item SNAS includes seven factors that measure beliefs and behaviours that can be described within the context of three superordinate worldview constructs – spirituality, naturalism, and agnosticism. Second, the 8-item WFS included two factors that measure the benefit and social integration of personally held beliefs.

Spirituality, naturalism, and agnosticism were previously argued to be the most prominent and distinct worldviews present throughout worldview theory in philosophy and psychology. It was intended that investigations into these constructs shed light on principles of worldviews in general, specifically their relationship to personality, cognition, and well-being.

In terms of the relationship between worldviews and personality, Study One and Two demonstrated that it is statistically and logically plausible to represent both worldview beliefs and traits in the same personality constructs. On the level of personality, it seems that constructs are organised according to their semantic content, rather than their being either a worldview belief or a behavioural trait. That is, shared variation was more prominent within groups of items that related to a core semantic similarity (e.g., relating to spirituality), rather than within groups based on the “depth” that items probed in terms of surface behaviours or deeply ontological beliefs. Part Two of the current thesis takes these ideas further by more thoroughly exploring the consistency between cognition, beliefs, and traits, arguing that that they are essentially co-constitutional.

Part Two of the current thesis explores the relationship between worldviews, cognition, and well-being. While further validity and reliability tests might be demanded of the SNAS, preliminary results from the current studies give no reason to exclude its use in subsequent testing. The SNAS was administered alongside measures for various cognitive
tendencies theoretically linked to each of the three worldviews, as well as numerous well-being outcomes that are theoretically associated with worldviews in general. It was intended that these tests would clarify the cognitive underpinnings and well-being outcomes of spirituality, naturalism, and agnosticism in particular, and that these findings might be tentatively extended to comment on worldviews in general.
PART TWO: WORLDVIEWS, COGNITION, AND WELL-BEING
Chapter Five: Worldviews and Cognition

Karl Jaspers (cited by Webb, 2009), who first prompted a psychology of worldviews, separated the worldview concept into objective and subjective poles. From this perspective, worldviews were understood as both the objective beliefs held about reality, and the subjective processes by which each person perceives and interprets reality – essentially incorporating cognitive processes into the worldview concept. Koltko-Rivera's (2004) reinstatement of the psychology of worldviews defined the concept from the objective pole, that is, the clear presence of beliefs held about reality, separating cognitive processes from the concept of worldviews.

The benefit of conceptually separating cognition from worldviews is that it is then possible to study the relationship between those two domains systematically. In line with this, Koltko-Rivera (2004) asked, “where do worldviews ‘fit in’ among the various cognitive and personality structures and functions? Do worldviews affect basic processes of concept formation? Perception? Sensation? Or are worldviews farther ‘downstream’ in the process of cognition?” (p. 22). Obviously, these questions were intended to incite empirical investigations that are beyond the scope of any single project. Evidence seems to suggest that worldviews direct attention and therefore cause variation in cognitive processes, and, on the other hand, differences in worldview beliefs appear to depend on differences in cognitive styles. By separating cognitive styles from worldview constructs, hypotheses about the relationship between these two domains can be studied empirically.

The simultaneous top-down and bottom-up feedback between cognition and worldviews seems to occur because worldview beliefs are informed by experiences, and then subsequently set ontological and epistemological boundaries around further experiences. To reiterate a previously used example, the concept of mortality can be seen as a prerequisite for a worldview belief in reincarnation, and yet the belief in reincarnation then sets boundaries
around the concept of mortality. The worldview subsystem is superordinate in the total belief system, and so it is important to acknowledge that the presence of certain worldviews can have an influence on cognition. However, the very existence of worldview beliefs depends on a prolonged process of mental abstraction from embodied experience, and so differences in cognitive styles therefore do seem to underlie the development of diverse worldviews.

The current chapter emphasises the bottom-up approach, by explaining how personality constructs, including worldview beliefs, emerge as observable amalgamations of cognitive processes. This mirrors Jaspers’ (cited by Webb, 2009) original assertion that different worldviews are associated with specific cognitive processes, however it treats cognition and worldviews as separate psychological domains. As will be demonstrated, this separation can be useful for clarifying how cognitive processes shape worldview content. The current chapter will explain how differences in cognition gives rise to different worldview beliefs. This will help to arrive at hypotheses for the specific hypotheses regarding the cognitive variables that are expected to associate with spirituality, naturalism, and agnosticism. Furthermore, the current chapter argues that, because worldview diversity emerges from universal cognitive functions, the presence of these worldviews in personality is inevitable, in the same way that the presence of Big 5 personality domains in each person is inevitable, albeit to varying degrees.

5.1 The Cognitive Foundation of Worldviews

It is difficult to mark the point at which biology ends and cognition begins. Cognition has been described as “a biological ‘toolkit’ used to control behaviour; a collection of capacities which, in combination, allow organisms to achieve various kinds of adaptive coordination between their actions and the world” (Godfrey-Smith, 2002, p. 135). Proto-cognitive functions represent the simplest forms of established responses to environmental
cues (Godfrey-Smith, 2002). As the biological processes used to interact with the environment build upon each other into higher levels of complexity, they appear more abstract and can be more clearly defined as “cognitive,” and advanced cognition allows organisms to track changes in the environment and adjust behavioural responses accordingly. However, all of these cognitive processes are amalgamations of basic abilities to perceive and respond to stimuli, and the domain of cognition thus “shades off into other kinds of biological processes” (Godfrey-Smith, 2002, p. 136).

For similar reasons, it is very difficult to state where the distinction lies between cognition and personality. Biological principles underlie each person’s cognitive relationship with the environment, as the cognitive styles continue to build upon each other and become more complex, they form relatively stable structures of environmental interaction that can be observed and labelled at the folk level, and therefore understood as components of personality (Canli, 2008; Higgins & Scholer, 2008).

The five factor model of personality, as well as even broader taxonomies of basic personality traits, such as two-factor, three-factor, and four-factor models, have been correlated with genetic influences that are not directly aimed at one level of the personality hierarchy (Krueger & Johnson, 2008). In other words, the same set of genes may relate to the development of brain structures, certain cognitive styles, and personality trait domains, and it seems that this reflects the lack of any sharp delineation between biological, cognitive, and personality processes in the human organism. As Canli (2008) put it, personality traits can be understood as “individual differences in cognitive processes from valanced stimuli. Viewed from the bottom-up, these individual differences are believed to arise from gene-environment interactions between specific gene polymorphisms and unique life experiences” (p. 927). All of this evidence illustrates the human organism as a pattern of feedback with the environment (see Figure 5 below).
Figure 5. Worldviews within a model of the human organism.

As biological processes combine to interact with the environment with increasing complexity, they amalgamate into larger processes that become more abstract, more understandable as cognition (Godfrey-Smith, 2002). Similarly, as cognitive processes amalgamate into larger schematic processes for relating to the world, they become observable and understandable at the level of individual personality (Canli, 2008). Just as cognition is bounded by the limits of genetic adaptation to the environment, personality is bounded by the limits of cognitive capacities. Both traits and worldviews are therefore represented as individual differences across a limited set of dimensions, bounded by the genetic and worldly universals that characterise human experience. Each person’s combination of traits and worldview beliefs are then expressed as characteristic adaptations that reflect even more individualised refinements of “universal cognitive, affective, and volitional mechanisms” (Costa & McCrae, 2003, p. 190). Individual behaviours generate culture, which shapes the
The artefactual environment that each person is confronted with and, in turn, the new adaptations of biology, cognition, and personality (Koltko-Rivera, 2006a; Lehman, Chiu, & Schaller, 2004).

The following section will show how worldviews emerge through the development of cognition, specifically the experience of concepts that are increasingly abstracted from embodied experience. This has two important consequences. First, the emergence of worldview beliefs are inevitable, in that they reflect a natural process of cognitive abstraction. Second, the specific content of individual worldview beliefs is dependent on culture, as infants are obliged to at least initially internalise the linguistic frameworks from their social environment (La Barre, 1972), and cognitive abstractions depend on linguistic frameworks for interpretation.

### 5.1.1 Abstraction

Embodied experiences eventually give rise to concepts that are separate from representations of worldly objects. We can see evidence for this process of abstraction in the development of language and neurological structures – both of which show a process whereby self-referential systems give rise to mental representations that are increasingly abstract. As will be shown, the emergence of worldview beliefs seems to rely on this process of abstraction.

In the initial stages of language development, words are associated with mental representations of the objects and events those words signify. However, words can also be associated with perceived qualities of objects or events, creating adjectives that signify phenomenological properties of the original object. This process has been termed hypostatic abstraction (Pierce, 1974, as cited in Neuman et al., 2012). For example, the word ‘sweet’ might originally be associated with an experienced quality of honey. Once a word can signify
that phenomenological quality, the mental representation of sweet, or sweetness, can be encountered within thought and language as an object in itself, and associated with a variety of other phenomena that have nothing to do with the taste of honey, such as a sweet person or deed.

Furthermore, words are combined to create phrases, both words and phrases are combined to create sentences, and phrases and sentences are combined to create passages of prose. In general, when people remember sentences, phrases, or passages of prose, they typically do not have access to a verbatim record – instead, they remember a general meaning associated with the entire content (Potter & Lombardi, 1990). Single words can then be used to signify those generalised meanings. For example, an entire passage of linguistic information that describes specific types of human interaction might be signified by a single word such as “democracy”. This allows hypostatic abstraction to create separate mental representations for different phenomenological qualities of democracy, and so on. Both the development and the experience of thought are extremely interwoven with language, to the point where certain abstract concepts completely rely on language for their existence (Neuman et al., 2012).

Simultaneously, as linguistic communications become increasingly abstract, neural adaptations are required to process the information they convey. The prefrontal cortex, for example, deals mainly with information from other parts of the brain, rather than the external world (Frith & Dolan, 1996). Pyysiäinen (1999) differentiates between “first-order modules” of the brain, which relate mind to the external environment, and “second-order conceptual modules,” which relate mind to its own processing of information (p. 108). In other words, first-order modules are triggered by specific types of objects from the environment, whereas second-order conceptual modules are triggered by mental representations being activated in other parts of the brain. And because the storage of mental representations is distributed
cross many locations in the brain, organised by semantic associations, there is the potential for phenomenological aspects of some concepts to be triggered in isolation from the complete phenomenon that was originally encoded (Gabora, 2000). These developments amount to a network of mental representations organised hierarchically into increasing levels of abstraction, with the higher levels dealing with “entities and processes and events that are not evident in the senses” (Bloom, 2007, p. 147, italics his). For example, the concept of flower is subordinate to the concept of plant, which is subordinate to the concept of nature, and so on.

As cognition continues to generate mental representations of the self and the world that reach into higher and higher levels of abstraction, eventually people encounter what Pyysiäinen (1999) termed the *conceptual postulate*. The conceptual postulate is a mental representation that acts as a buffer against the potentially infinite progress of abstraction. It can be a pantheistic God, an Ultimate Reality, or materialistic universe or multiverse – any mental representation that conveys an “ontological-cosmological” unit that can conceptually contain all other mental representations. Different forms of the conceptual-postulate have been used by theologians, philosophers, and scientists as a way of representing the causal or synchronistic configuration of everything (Pyysiäinen, 1999). Convolutedly, the term “everything” can be interpreted as another signifier for the conceptual postulate – an example of how any attempt to reach beyond the ultimate abstraction will fall short and often result in semantic paradox. The conceptual postulate, by definition, is all-inclusive; it acts as a mental representation of reality as a whole.

This series of abstractions, culminating in ideas about the universe as a whole, enables conscious thoughts about the nature of reality. From this perspective, worldview beliefs can be understood as an inevitable result of a cognitive and linguistic processes abstracting towards conceptualisations of reality as a whole – towards worldview beliefs. What is of major interest in the current thesis is how different worldview beliefs emerge. This seems to
occur to a large extent because the process of abstraction uses imagination, that is, the creative application of previously established mental representations (unique to each individual set of experiences), as part of the generation of abstract concepts.

### 5.1.2 Imagination

Mental representations of aspects of reality – objects, events, and concepts – are stored in long-term memory, in hierarchies of increasing abstraction. These hierarchical network of mental representations are associated with structures of specified neurological modules in the brain (Gabora, 1999, 2000; Grossi, 2014; Pyysiäinen, 1999). People are able to experience mental representations of external objects (e.g., a chair) due to the sensory apparatus that transforms energy into electromagnetic information in our brain. They are also able to experience internal objects (e.g., a thought) due to the self-referential evolution of language, and the way that brains processes information from their own neurological modules (Gabora, 1999, 2000; Grossi, 2014; Neuman et al., 2012; Pyysiäinen, 1999).

Not only are the structures of mental representations organised hierarchically, they are also content-addressable. That is, informational networks and neurological structures are organised according to categorical associations (Gabora, 1999, 2000). The activation of any one neurological module, and corresponding mental representation, triggers the activation of closely associated neurological modules and mental representations, and so the likelihood of one mental representation activating another depends upon the similarity of their information content. Immediate experiences therefore activate relevant memories, which in turn activate other stored mental representations with which they are conceptually similar. Each activated module along this network can evoke mental representations into awareness, influencing the content of immediate experience. Thus, cognitive processes continually refine behaviour by
allowing immediate experience to interact with an overarching storage of previous experiences and abstract thoughts (Gabora, 1999, 2000).

Experience involves a circular process whereby immediate perceptions of the world activate relevant memories, which in turn inform immediate experience. However, this process is inherently fragmented. Although consciousness seems like an unbroken stream, sensorimotor impressions are presented to consciousness disjointedly, and mental representations appear in a myriad of combinations and timespans (James, 2011; Pelaprat & Cole, 2011). Humans have an ability to perceive associations between any of these isolated objects and events (Shermer, 2011). Associations are often perceived as temporally causal, for example, preceding object X affects proceeding object Y. However, individuals can perceive teleological associations, whereby proceeding object Y causes preceding object X, such as experiential interpretations of intuition or precognition. And individuals can also perceive synchronic associations, whereby connections between objects X and Y are influenced mutually across time and space – these types of association have been discussed frequently in the context of quantum physics and psychological theories of synchronicity (e.g., Jung, 1933). In all of these examples, mental representations from immediate experience and memory are presented to awareness in a disjointed manner, and then cognition fills in the gaps between and within experiences. This “filling-in” of experiential gaps is the function of imagination (Pelaprat & Cole, 2011).

Rather than being a compartmentalised cognitive activity dealing exclusively in unreal illusions, imagination is a crucial cognitive process that, in normal adults, continually mediates the fundamental gaps within and between the aspects of reality that are presented to consciousness (Pelaprat & Cole, 2011). As already highlighted, these gaps in experience occur across various scopes. Fragmented sensorimotor sensations are presented in microsecond snippets obscured by other elements of the environment, yet they are filled-in to
form Gestalt mental representations of whole and enduring objects. Separate day-to-day experiences are filled-in to maintain mental representations of objects over time, despite their presenting transformed characteristics. Ontological gaps related to the groundless existential dilemmas are filled-in to develop beliefs and attitudes that blanket all of life in structures of meaning and purpose.

Perceptions and beliefs are permeable in that they can be supplemented with past experiences and cognitive processes in different ways (Pelaprat & Cole, 2011). The sources used by imagination are both cultural and biological, and so gaps are filled with memories and the content of simultaneously occurring cognitive processes (Pelaprat & Cole, 2011). Therefore, imagination varies in its functioning across individuals, depending on the content available in stored memories, and also on “mechanisms such as classical conditioning, reinforcement, and imitation” (Godfrey-Smith, 2002, p. 136).

The products of imagination can be more or less novel depending on whether imagination incorporates materials in a relatively original combination and formation (Pelaprat & Cole, 2011). This might be a consequence of reduced neuron activation thresholds, which would lead to the triggering of more modules and provide the possibility for mental representations being associated in unusual mixtures (Gabora, 2000). People differ in the creativity of their imaginative processes, some people fill-in experience using the content of their memory and cognition in combinations that are more novel. The individualised content of long-term memory, as well as the individually conditioned tendencies to use certain cognitive processes over others, both shape the way that imagination transforms fragmented signals into seemingly coherent experiences.

All belief systems are capable of generating propositions that are counter-intuitive, because abstract mental representations generated by second-order modules, though evolved from direct encounters with the sensory world, can contradict first-order embodied
experiences (Pyysiäinen, 1999). Counter-intuitive concepts involve propositions that
contradict sensory categorical associations, and these types of theories are present in both
science, such as the suggestion that time and space are finite but without boundaries
(Hawking, 1988), and religions, such as the existence of invisible entities such as spirits
(Bloom, 2007). Despite being counter-intuitive, in that they involve propositions that
contradict first-order categorical associations; these concepts are especially compelling to
different people because they emerge as a consequence of rational information processing,
and are attention-grabbing due to their counterintuitive nature (Barrett & Nyhof, 2001; Boyer
& Ramble, 2001; Pyysiäinen, 1999; Pyysiäinen, Lindeman, & Honkela, 2003). Similarly,
embodied experience can contradict the abstract belief systems that emerge from them. The
example of agency is again useful, because most people feel that they have a sense of volition
despite it possibly contradicting their abstract ideas about determinism.

The process of imagination transforms disjointed perceptions and cognitions into
seemingly coherent objects and patterns. As Shermer (2011) stated, “our brains are belief
engines, evolved pattern-recognition machines that connect the dots and create meaning out
of the patterns that we think we see in nature” (p. 59). This connecting of dots, or filling-in of
gaps, occurs in the most micro levels of perception, and the macro levels of ontological
belief. As Nilsson (2013) put it, “we all, insofar as we are existentially aware beings, are
caught in the same existential predicament, confronting us with the same kind of
impermanence and corruptibility of our world, injustice and evil, mind-boggling possibilities
of choice, epistemic finitude, and the problem of finding meaning and value in life” (p. 42).
The big questions in life are gaps filled by imagination to deliver answers in the form of
worldview beliefs. These beliefs are shaped by the resources available to imagination – the
individualised content of memory, and the individualised tendency to use certain types of
cognitive functions.
5.2 Different Cognition, Different Worldviews

Personality is not ontologically separate from the underlying cognitive processes it comprises. As shown in Figure 5, both worldviews and traits can be understood as amalgamations of cognitive processes that are observable at a large enough scale, and with enough stability and relative uniqueness to be considered personality. Therefore, the content of each worldviews would depend on the types of cognitive processes forming it. This has been supported theoretically by early developmental theorists such as Piaget (1955, 1972), who highlighted the cognitive foundations of higher-order functions of the person, and also by contemporary cognitive theorists such as Barrett and Zahl (2013), who have explored the cognitive foundations for religious beliefs. Although people tend to assimilate the beliefs that are predominant in their community, people differ in their expression of a universal catalogue of worldview beliefs and this variation to a large part is influenced by cognitive constraints.

Worldview beliefs, like all beliefs and theories, are produced when experiential gaps are filled using content from memory stores and simultaneously occurring cognitive processes – in other words, worldviews are generated by imagination (Boyer, 2000). We would therefore expect to see differences in worldviews emerge alongside differences in the cognitive content used by imagination to generate worldview beliefs. The construction of scientific beliefs has been described as a process of disciplined imagination, whereby theorists fill experiential gaps according to selective criteria attained from scientific training, bounded rationality, and accepted metaphor (Cornelissen, 2006; Weick, 1989). Similarly, De Cruz (2013), after conducting an experiment on the limitations in generating novel religious entities, described religious concepts as a consequence of structured imagination. In fact, it could be argued that all beliefs exist only in the gaps between sensorimotor experiences – thus they are all at least partly the product of imagination, whereby experiential gaps are
filled using content from past experiences (e.g., scientific training, cultural mythology) and simultaneously occurring cognitive processes (e.g., logical reasoning, theory of mind).

As Evans (2001) argues, children are “selective constructivists, rapidly assimilating ideas to the extent that they are congruent with existing knowledge structures, and rejecting others that do not fit in” (p. 252). A tendency to use cognitive processes based on theory of mind or empathising might make it more likely that experiences with the world would be filled with perceptions of agencies. These would make spiritual worldviews, perhaps transmitted by religions, more acceptable to the individual who already tends to experience the world as organised by expressions of will. Once spiritual worldview beliefs positing the existence of agencies in the world are consciously accepted, this would in turn reinforce the likelihood of turning to agencies as a way of understanding experience. The same description has been given for science as a set of semantic and social norms that establish a shared way of perceiving and understanding the world (Astley, 1985). Koltko-Rivera's (2004) cyclical model of self (including worldviews) influencing behaviour, in turn influencing experience, in turn influencing self, illustrates this sort of self-perpetuating dynamic between worldviews and experience.

For example, Evans et al. (2001) examined the cognitive factors that determined children’s beliefs in either creationism or evolution, while taking into account their cultural context (e.g., whether their family and community endorsed one worldview over the other). Their results suggested that a key factor in the preference for creationist beliefs was that they were congruent with cognitive essentialism, whereas the idea of evolution ran counter to their cognitive style of internalising objects as permanent features of reality. Similarly, Rosenkranz and Charlton (2013) found that differences in religious orientation were explainable in terms of cognitive biases towards either social or systemising styles of cognition. In other words, if people tend to interpret reality using social cognitions, then they are more likely to have
spiritual or religious beliefs, whereas if people tend to interpret reality using mechanical cognitions, then they are more likely to believe in the prevalence on non-conscious natural laws.

The cyclical and self-perpetuating nature of cognition and worldview belief can also become a conscious preference, rather than a conditioned set of habitual responses to the world. For example, Freud’s early speculations about worldviews in psychology suggested that beliefs about valid sources of knowledge could be seen as both a content of a worldview and also a factor that generates and maintains distinct worldviews (Koltko-Rivera, 2004). A naturalist worldview might be partly characterised by the belief that information is only valid when gained through empirical observation, and this belief acts to reinforce the worldview by narrowing the kind of information that is accepted into the already established belief system. Similarly, a spiritual worldview might be partly characterised by the belief in divine revelation, and this too would influence behaviour that in turn shapes the sort of information to which someone with that worldview would be exposed.

The cyclical and self-perpetuating nature of cognition and worldview belief can also become a cultural feature. Rather than being a consequence of genes or physical environments, the development of religiosity in children relates to the culture they are raised in (Bloom, 2007). Similarly, scientific theories are subject to an artificial selection process within their societal context, with successful theories being passed onto subsequent generations (Astley, 1985; Cornelissen, 2006; Weick, 1989). It is clear that cultural institutions play a large role in shaping worldviews, by influencing the artefactual world that each person is confronted with, the environment to which biological, cognitive, and personality processes adapt (Koltko-Rivera, 2006a). Worldviews, as one aspect of personality, emerge as macro expressions of those underlying biological and cognitive processes. Even more profoundly, cultural propagation of certain styles of cognition informs the function of
imagination, so that the way that people are conditioned to think impacts the way in which they form concepts from their micro and macro pieces of experience.

Continuing from Part One, the current thesis used spirituality, naturalism, and agnosticism as examples to investigate how variation in cognition might be associated with differences in worldviews. The following sections will explain how each of these worldviews are associated with specific underlying cognitive tendencies. Spirituality for example, seems to be evidently associated with cognitive tendencies that focus on agency detection, that is, cognitive processes that look for agency in phenomena and tend to solve problems effectively when able to employ social cognition and theory of mind. Naturalism, on the other hand, seems to be associated with mechanistic cognitive processes that specifically do not include agency, instead thinking in terms of adherence to the non-conscious rules within logical systems. Agnosticism seems to be associated with meta-cognitive processes in which previously learned concepts are doubted in terms of their epistemological certainty. All three worldviews have specific content that, more or less, differentiates them as personality variables, and each of these variables seems evidently associated with specific cognitive processes.

The purpose of making these arguments about the cognitive foundation of worldview constructs is twofold. First, to argue that specific worldviews can be explained in terms of the underlying cognitive tendencies that inform them. As will be shown, this can lead to hypotheses about specific cognitive tendencies that can then be used to test the model in relation to specific worldviews. Second, to demonstrate that the emergence of specific worldviews is an inevitable consequence of cognitive development across the lifespan. This also underscores the dimensional, rather than categorical nature of worldviews, because the cognitive capacities that underlie the worldviews under current investigation are universal.
This means that the potential to experience and express these worldviews exists in each person to some degree.

### 5.2.1 Spirituality: Agenticity and Non-Physicality

Charles Darwin proposed that religious existentialism was a natural development from the combination of human imagination, wonder, curiosity, and reasoning. The past few decades of psychological research have involved a revisiting of Darwin’s early speculations – investigating and expounding the cognitive foundations of religion and spirituality (Barrett, 2000; Culotta, 2009). The consistent and significant findings of these investigations were largely summarised in Part One of the current thesis. Essentially, spirituality as an aspect of personality can be understood as a way of relating to the world that includes experiences of transcendence, that is, experiences and ideas that are interpreted as representative of agency and non-physicality.

Anthropological and psychological theses illustrate spiritual beliefs and practices as involving the perception and communication with agencies, and experiences and concepts that relate the individual to dimensions or ideals that are seen as divine, separate and distinct from the material world. The first interpersonal system for this process were shamanistic practices whereby one person related to these agencies and non-physical dimensions on behalf of their tribe (Walsh, 1989; Webb, 2013). These practices were inherited by major religions, which provide a cultural framework for people to relate to an assortment of gods, deities, and ideas that have a transcendent quality. From pre-history to the contemporary world, spirituality represents a worldview that comprises cognitions related to agency and non-physicality.

Agenticity refers to the proclivity to experience aspects of reality as representing some force of will, intention, understanding, or goal-setting (Gorelik, 2016; Pyysiäinen,
Cognitive processes emerged, such as theory of mind, such that individuals were able to perceive agency in aspects of reality. Consensus among researchers is that agenticity evolved as an adaptive benefit for survival, because the tendency to interpret environmental stimuli as an indicator of predators would be protective (Boyer, 2003; Gorelik, 2016; Shermer, 2011).

Once it was established as a cognitive resource, agenticity was then available to the imaginative function, such that any gaps in sensorimotor impression, daily experiences, or larger conceptual frameworks, could be filled-in with the qualities of will, intention, understanding, or goal-setting. Any aspect of reality can then be perceived as an agent. Other people and animals can be regarded as subjective entities capable of understanding and intention, and objects can also be “spiritualised”, for example, in personified forces of nature, or the association of certain natural objects with specific gods or goddesses (Guirand et al., 1987; Price, 1900). Agency can be perceived within associative patterns between phenomena, such that the causative connections between objects and events can be interpreted as expressions of invisible or telekinetic entities, or intelligent transhuman forces. Agency can be experienced as a quality of internal thoughts or emotions, such that they are perceived as manifesting from a Higher Self or indwelling spirit (York, 2012), autonomous Jungian archetype (Stevens, 2006), or deceased ancestor (Bering, 2006). Agency can be experienced as a quality of the conceptual postulate, such that the totality of reality can be regarded as a conscious entity, rather than a non-conscious “clockwork” universe (Pyysiäinen, 1999).

Perhaps most importantly, agency can be perceived as a quality of the self-concept, with the notion that one has an immaterial mind, soul, or spirit that free and “separate from whatever it is our brains are doing” (Roazzi, Nyhof, & Johnson, 2013; Shermer, 2011, p. 128).

A focus on agenticity does not dismiss the role of spirituality as a system for generating meaning and purpose. On the contrary, “meaning” refers to a subjective sense of
comprehension and significance, and “purpose” to a subjective sense of goals and direction (George & Park, 2013), and so meaning and purpose can only be attributed to aspects of reality insofar as those aspects are perceived or interpreted as having agency (i.e., some form of subjectivity; Pyysiäinen, 1999). It is agency that gives capacity for meaning and purpose to exist, whether as a personal ability to understand and direct one’s life, or as ultimate meaning and purpose made possible by attributing agency to the conceptual postulate, a Godlike subjective consciousness associated with reality as a whole (Pyysiäinen, 1999). The concept of sacredness, central to spirituality, is characterised by any type of experience being imbued with divinity, in other words, seen as relating to God – an ultimate agency that provides vital meaning and purpose. When individuals attribute their self-concept as having agency they can consciously manage their beliefs, behaviours, and cognitive processes, encouraging deeper understanding and purposeful control over cognition and behaviour – this is why increasing personal agency is often the focus of psychotherapy (Caston, 2011; Williams & Levitt, 2007).

It seems likely that it was the proclivity to focus on agency in the world that lead to a consideration of the ultimate meaning and purpose of life. The concepts that underlie all spiritual and religious traditions, such as transcendence and divinity, relate to the reach towards an agent that can represents a source of meaning and purpose. All religions stem from pre-historic shamanic practices that imbued reality with agents and treated these agents as the source of existential knowledge and power (Walsh, 1989). The nature of non-physical entities evolved over time to reflect the needs of communities, such that greater abstractions were perceived as representations of greater agencies, eventually resulting in monotheistic systems that attributed agency to reality as a whole and based morality around the conformity to its will, intention, understanding, and goals (Gervais & Norenzayan, 2012b; Gorelik, 2016; Norenzayan et al., 2016). Meaning and purpose reflect understanding and goal-setting, which
can only be undertaken by agents, and ultimate meaning and ultimate purpose can only be perceived if there is an agent that can be responsible for understanding and directing reality as a whole (Pyysiäinen, 1999).

Alongside agenticity, spirituality is also set apart from other worldviews in its treatment of non-physical aspects of reality, those distinct from the mundane physical world, as most significant and true (Hill et al., 2000; Pargament, 2013b). This is not to say that objects in the physical world cannot be imbued with spiritual quality, but in such cases, the objects are seen as having a divine nature, that is, something representative or resembling qualities of a god or divine being. So importantly, there is strong relationship between the agency and non-physicality. The very notion of personal agency goes against materialist explanations for reality – if a locus of agency exists then it lies outside the natural realms of biology and physics (Paranjpe, 2013; Smythe, 2013). To include a force of agency within the person is to imply that some component of the person is able to act as a volitional force outside the causal chain of physical determinism. The very definition of agency implies that the world might be influenced by a force stemming from subjectivity. True agency, insofar as it represents an entity capable of generating and pursuing goals, by definition cannot be reduced to non-conscious physical principles. So even these tendencies to exalt aspects of reality as non-physical relate back to notions of agency. Experiences that take the individual away from normal embodied life, such as mystical or shamanic experiences, are valued in spiritual worldviews because they moved a person closer to spiritual agents, or imparted truths or powers to the individual on a spiritual level, that is to their soul or spirit that was perceived as separate to their physical body.

Empirical research has shown that cognitive processes related to agenticity are associated with spiritual experiences and worldviews. For example, Petrican and Burris (2012) showed how the tendency to attribute agency to objects in the environment could
positive predict a drive towards transcendent spiritual experiences, which were in turn associated positively with religious involvement and a sensed connection to a spiritual dimension of reality. Furthermore, Rosenkranz and Charlton (2013) showed that empathising, a set of social cognitions, was significantly associated with spiritual worldview beliefs, such as the existence of God and an afterlife. That is, participants who were more likely to use social cues to understand and resolve problems in their lives, were also more likely to hold worldviews about the existence of ultimate agents and a transcendent dimension. Modern experiments like this lend support to anthropological and cross-cultural studies that link the emergence of spirituality and its religious expressions to the extension of agenticity into many aspects of reality (Atran & Norenzayan, 2004).

An interesting addition to the theories connecting agenticity with spirituality is that these associations are suggested to occur below the threshold of awareness and therefore facilitated by a style of thinking that is intuitive rather than rational. In other words, because the agenticity processes that underlie spiritual experiences and beliefs are automatic rather than voluntary, so too are the spiritual experiences and beliefs. This suggests that spirituality as a worldview could be predicted by the level to which people engage in intuitive rather than rational thinking styles (Barrett & Zahl, 2013; Boyer, 1994). However, recent research has shown that intuitive thinking styles do not modulate supernatural beliefs, and that the trend for explaining spirituality as an automatic state is outdated and overly simplistic (Farias et al., 2017). The current project sought to add to this debate, by investigating the link between intuitive thinking and spirituality.

Chapter Seven of the current thesis reports a psychometric study using the SNAS scale, which measures spirituality as a concept that includes both personal and interpersonal modes of spirituality, mysticism, and religiosity. This measure was tested alongside various measures of cognitive tendencies, including Waytz, Cacioppo, and Epley's (2010) Individual
Differences in Anthropomorphism scale and Wakabayashi et al.'s (2006) short form of the Empathy Quotient. Together, these measures assessed the degree to which participants self-reported using agenticity and social cognition in their lives. The hypothesis of the current thesis was that both of these constructs would positively influence scores in spirituality and mysticism. A second area of investigation was to test the influence of faith in intuition on spirituality.

5.2.2 Naturalism: The Machinery of Nature

Before the empiricism of the scientific method became popularised, mastery of the world was associated with a knowledge of how to act, with a particular emphasis on behaviours that would benefit survival and social relationships. The world was spiritualised, such that agencies perceived in all levels of reality allowed for a satiety of meaning and purpose for actions and events. Over time, people sought to master the world through empiricism, and a naturalist worldview arose from cognitive styles that removed agency from models of reality, first experientially and then institutionally (Caldwell-Harris, 2012; Irzik & Nola, 2007; Peterson, 1999). The underlying cognitive functions that support the naturalism worldview, as well as the scientific traits it relates to, are those functions that interpret aspects of reality as physical and without agency.

Spiritual beliefs are related to the perception of agency, and include processes such as empathising, a set of social cognitions used to infer a state of mind and affect in other people (and objects) and perceive their understanding and intentions (Rosenkranz & Charlton, 2013), and atheism has been linked to a lack of this mentalising cognition (Norenzayan & Gervais, 2013). Naturalist beliefs seem instead to be founded on systemising, a set of cognitions used to create and perceive systems with mechanistic parts, and apprehend the underlying rules that explain the interaction of those parts (Baron-Cohen et al., 2003). Rather than
understanding the world through expressions of agent intentions, systemising cognitions perceive reality as a collection of materials interacting through non-conscious laws. Just as agenticity assisted predator detection (Gorelik, 2016; Shermer, 2011), and empathising cognition benefited social group cohesion (Baron-Cohen & Wheelwright, 2004), systemising cognition has been argued to benefit survival practices such as hunting, navigation of terrain and tracks, and the creation of tools (Baron-Cohen et al., 2003; Del Giudice et al., 2010).

There are two perspectives on the individual proclivity towards systemising, and the naturalist worldviews that follow from its application in higher abstracted representations of the world. First is the notion that the spiritual worldview and its underlying agenticity presents the most naturally evolved state of human minds, and that naturalism is therefore a conversion away from this initial way of perceiving the world (Caldwell-Harris, 2012). This is often understood as a process by which the automatic tendency to interpret the world through the presences of agency is overridden by conscious decision to use logical reasoning in order to understand the world, a position that is supported by empirical studies (Pennycook et al., 2012; J. M. Smith, 2013). Second, systemising can also be seen as an individual difference variable, such that the neurological modules associated with both social and systemising cognitions can be shaped by genetics or developmental conditioning (Caldwell-Harris, 2012). From this second perspective, people differ along a natural spectrum of degree to which they would utilise systemising cognitions. There are findings supporting this notion, particularly as social cognitions are statistically more prevalent in women and systemising cognitions are statistically more prevalent in men, suggesting that there are evolutionary niches that have developed in order to exploit the natural adaptive qualities of both types of cognition (Del Giudice et al., 2010).

Once the systemising capacities emerged, they could be used in imaginative processes such that all experienced phenomena – whether sensorimotor impressions or abstract
concepts – could all be imbued with the qualities of mechanistic action accountable by non-conscious laws. Intuitively, physical objects can be understood as non-conscious material objects, but also people, animals, internal thoughts and emotions, and large abstract concepts can all be regarded as systemic consequences of biological and chemical automata. Systemising cognitions treat associative patterns between phenomena as indicative of consistent, impersonal natural laws. When systemising cognition confronts the conceptual postulate, all of reality can be regarded as a non-conscious “clockwork” universe as described by theorists such as Leibniz (Davis, 1991). Even the self-concept can be experienced mechanistically – though seemingly inherent, experiences of first-person agency and subjectivity can vary and can even be modulated experimentally (Bayne & Levy, 2006; Moore, Wegner, & Haggard, 2009; Synofzik, Vosgerau, & Newen, 2008). Just as agenticity can be extended into any aspect of reality, so too can any aspect of reality be experienced as a non-conscious physical object.

Empirical research has shown that systemising tendencies are associated with the presence of naturalist worldview beliefs. For example, Rosenkranz and Charlton (2013) showed that a tendency for cognitive systemising was associated with beliefs about the epistemological value of science, logic, and rationality – and that these beliefs were correlated negatively with spiritual worldview beliefs. Similarly, atheists have tended to score higher in measures of ability and enjoyment of rational thinking, and it has been suggested that rejection of spirituality has been associated with rational thinking (Caldwell-Harris, 2012; Gervais & Norenzayan, 2012a)

Chapter Seven of the current thesis reports a psychometric study using the SNAS scale, which measures naturalism as a construct that includes worldview beliefs in the physical and non-conscious nature of the world and self, as well as attitudes about scientific and rational behaviours. This measure was tested alongside various measures of cognitive
tendencies, including Pacini and Epstein's (1999) measure of rational thinking and
Wakabayashi et al.'s (2006) short form of the Systemising Quotient. The hypothesis of the
current thesis was that both of these constructs would positively influence scores in
naturalism.

5.2.3 Agnosticism: The Psychology of Doubt

As with other worldviews, agnostic beliefs emerge from inherent cognitive processes.
The fact that people should even have the capacity to doubt their own mental representations
of the world is a curious paradox (Duveen, 2013). Mental representations are encoded from
perceptions of the world, so it is interesting that cognition would classify some mental
representations as untrue or unknowable. As will be explained, this classification becomes
necessary as mental representations attempt to hold a conceptual account of reality that
contradicts sensorimotor and social experiences. As conceptual qualifiers of uncertainty, such
as “unknowable,” become associated with the fundamental axioms of reality that constitute
worldviews, especially within dimensions relating to epistemology, agnostic worldviews
emerge. The current section demonstrates theoretically how cognitive development involves
a process inherently motivated to explore notions of truth, a process that inevitably leads
towards agnosticism.

Piaget's (1955) theories of cognitive development suggested that people tend towards
equilibrium, a state in which mental and behavioural schemas are adequate for understanding
and managing new experiences. When exposed to sensorimotor, social, or cultural stimuli,
cognitive processes assimilate new information to create mental representations of the world.
When it is not possible to organise new information cohesively into established mental
schemas, the schemas are instead altered to accommodate the new information. This model of
equilibrium, in line with contemporary cognitive models, illustrates cognitive development as
a continual process of adaptation, whereby cognition interacts with the world in a continuous feedback loop so that immediate experience activates and updates relevant mental representations, and those mental representations inform immediate experience and behaviour (Gabora, 2000; Piaget, 1955).

The first stage of child development deals with sensorimotor stimuli, in which the mental schemas attempt to maintain equilibrium of physical, pragmatic information (Piaget, 1955). This occurs before language and conceptual intelligence emerges, and the goals of sensorimotor intelligence therefore concern the generation of actions that are effective in the physical world. The child assimilates experiences of the world into behavioural schemas that are then reinforced or challenged to accommodate new information about the possibilities of physical action. There is no formalised truth at this stage of cognitive development, save for the unspoken learning of observational and behavioural outcomes.

As symbols become associated with specific stimuli (e.g., actions, objects) and their phenomenological qualities on the sensorimotor level of experience, language is developed to describe the world, invoking and manipulating concepts abstracted from their embodied contexts (Neuman et al., 2012). Language and conceptual thought emerge from the sensorimotor level of reality, but they are then superimposed over it by describing sensorimotor experience and assimilating and accommodating embodied stimuli into conceptual schemas. Rather than merely navigating the world with effective physical action, the goal of conceptual intelligence becomes a description of the world that harmonises with sensorimotor experiences of self and others, as described through conceptual experiences, in other words, the ability “to know and state truths” (Piaget, 1955, p. 7). Conceptual accommodations are necessary not only in order to make room for new sensorimotor experiences, but also to accommodate linguistic rules, as well as descriptions of reality from
other people. Conceptual equilibrium must not only be maintained internally but also socially, and so the establishing of facts as truth occurs largely through social verification.

Once cognitive development becomes concerned with the ability to describe truthfully the reality experienced by self and others, it becomes necessary to manage mental contradictions. Contradictions are encountered by the individual frequently in their process towards conceptual equilibrium. This can occur internally, because mental representations of the world, especially as they become more abstract, have an increasing potential to contradict embodied experience (Pyysiäinen, 1999). It can also occur socially, because two descriptions of experience can be distinctly at odds in their account of sensorimotor or conceptual reality. Cognitive-dissonance refers to the state of contradiction between beliefs, attitudes, and behaviours (Egan, Santos, & Bloom, 2007; Elliot & Devine, 1994; Festinger, 1962). Evidence has shown that cognitive-dissonance can be understood best as a motivational state that drives attitude change in order to reduce its generation of psychological discomfort. The changes in belief that reduce cognitive-dissonance are not only indicative of complex reasoning, but also largely automatic, immediate processes of cognitive regulation (Jarcho, Berkman, & Lieberman, 2011; Lieberman, Ochsner, Gilbert, & Schacter, 2001). As cognitive development attempts to harmonise its mental representation of the world with sensorimotor stimuli and social verification, it seems to be inherently motivated to reduce conceptual contradictions.

Young children are able to recognise inconsistencies between conceptual statements and the sensorimotor world at the very early stages of language development, and they are able to recognise inconsistencies in multiple conceptual statements from approximately six years old (Morris & Hasson, 2010). These inconsistencies must be managed internally and interpersonally in order to maintain conceptual equilibrium – that is, maintaining true conceptual representations of sensorimotor and abstract realities generated by self and others.
Evidence seems to suggest that people naturally believe new conceptual information by default – believing conceptual information is as automatic as perceiving physical stimuli (Gilbert et al., 1991; Mandelbaum, 2014). Concepts are simultaneously comprehended and accepted as provisionally true, and then in the face of inconsistencies some concepts are “tagged” with qualifiers of falsity, that is, they are subsequently deemed untrue in an attempt, often automatic, to reduce the psychological distress of cognitive-dissonance.

As children develop, they are increasingly able to assess the truth of new information, for example, by evaluating the credibility of its source (Mills, 2013; Mills & Elashi, 2014), differentiating between facts, preferences, and ideologies (Heiphetz, Spelke, Harris, & Banaji, 2013), and by discriminating between determinate and indeterminate problems (Fay & Klahr, 1996). Some studies have also highlighted the possibility that in certain situations, particularly when the designation of falsity between two conceptual statements could be equally meaningful, young children may be able to comprehend information without simultaneously believing it (Hasson, Simmons, & Todorov, 2005). By adolescence, that is, upon entering Piaget’s stage of formal operational cognition, most people are conscious of generalised doubt that forms part of an established epistemological stance (Boyes & Chandler, 1992; Piaget, 1972).

This cognitive capacity to withhold judgment about the truth of information represents an internalisation of three-valued logic, or fuzzy logic, where information can be associated either with truth, falsity, or a third stance of indeterminacy. It is not merely that the individual does not choose true or untrue, but that they have the capacity to make a third claim of suspended judgment (Friedman, 2013). To use Gilbert et al.’s (1991) analogy of the mind as a library cataloguing system, in which books might be marked as “true” or “untrue,” this position is not the same as simply leaving a book unmarked – it equates to marking a book with the tag of “unknown.” In other words, to denote a mental representation as being
unconfirmed in terms of its cohesion with sensorimotor or social verification. When this
tendency emerges consistently enough to be observable in personality, we understand it to be
weak agnosticism, that is, a stable element of uncertainty that can be generalised across
mental representations – though in the context of worldview psychology, this is focused on
an uncertainty about worldview dimensions, the most presuppositional aspects of reality.

The difference between weak and strong agnosticism is that strong agnosticism goes
further than just taking an indeterminate position about any given phenomenon; instead, it
posits that indeterminacy is itself an inherent quality of that phenomenon. If weak
agnosticism can be understood as a metacognitive process that marks mental representations
of reality as unverified, then strong agnosticism reflects a process that marks them as
unverifiable. Again, in the case of worldview psychology, this focuses specifically on the
fundamental qualities of reality, such that the conceptual postulates that represent reality as a
whole are associated with a qualifier of unknowability. This is not a lack of belief, but a
belief that concepts and language are not able to describe reality in a way that is harmonious
with sensorimotor and collective social accounts. The concept of unknowability, which can
be tagged onto any mental representation as a third alternative to true or untrue, becomes
further abstracted and associated with reality as a whole.

Unlike spirituality and naturalism, there is a lack of research empirically connecting
agnosticism with specific cognitive variables. The current project aimed to test the
association between agnosticism and cognition, and chose variables based on the theoretical
arguments put forward above. First, it was argued that the metacognitive stance of doubt and
uncertainty emerges out of self-reflective evaluation of knowledge. Therefore, it seems likely
that agnosticism would be correlated positively with need for cognition, which measures a
tendency to enjoy engaging with rational thought. This is supported by findings that have
shown dogmatism (a conceptually oppositional construct to agnosticism) to be negatively correlated with need for cognition (Crowson, 2009).

Second, it was argued that another source of the cognitive uncertainty underlying agnosticism was the pressure to verify information against accounts from other people. What would be expected, then, is that a cognitive tendency to appreciate the perspective of other people could be associated with greater likelihood of uncertainty in cognition, and thus a greater level of agnosticism. In other words, agnosticism could be predicted by cognitive tendencies that place greater attention on the perspective of others. This is supported by evidence that suggests that those who identify with agnosticism are concerned about their social standing and “seek to ally themselves with social norms and others’ expectations” (Silver, 2013, p. 196; Silver, Coleman, Hood, & Holcombe, 2014).

Chapter Seven of the current thesis reports a psychometric study using the SNAS scale, which measures both weak and strong agnosticism. This measure was tested alongside various measures of cognitive tendencies, including Pacini and Epstein's (1999) measure of rational thinking and Wakabayashi et al.'s (2006) short form of the Empathy Quotient. The hypothesis of the current thesis was that both of these constructs would positively influence scores in agnosticism.

5.3 Summary

The human organism can be understood at the lowest level as an interaction between the biological laws of the individual and its surrounding environment. The evolution of humans is such that these processes become more complex; eventually developing the capacity to store mental representations of the world, adapting the organism’s behaviours in response to these structures (Gabora, 1999, 2000; Piaget, 1955). Imaginative faculties developed to fill the gaps inherent in the perception and storage of mental representations,
with content from *other* mental representations and simultaneously occurring cognitive processes (Pelaprat & Cole, 2011). All mental representations have the potential to be generated in a more or less novel form, especially worldview beliefs, which are completely imaginative in that they fill in experiential gaps that can never be addressed with direct sensory experiences.

Thus, worldviews emerge as a natural part of each human’s biological, cognitive, and personal interaction with reality. Even though worldview beliefs involve mental representations far removed from sensorimotor experience, they are stored and activated in the same content-addressable nature as other mental representations and thus they are triggered in response to associated concepts, when the content of immediate experience demands it (Gabora, 1999, 2000). This is how, even in immediate experience, worldview beliefs, like other stored content, have an influence on behaviour, “in the sense that an individual’s behaviour is somehow consistent with that individual’s worldview” (Koltko-Rivera, 2004, p. 36). Furthermore, this behaviour shapes culture, which impacts the immediate experience of any others co-existing in that culture, and therefore helps to shape their worldview.

There are no strict boundaries between cognitive and personality processes (Canli, 2008, also see Figure 5). Biological processes blur into cognitive processes, and when these cognitive experiences generate behaviour with enough stability it can be observed as an enduring quality of an individual. Thus, if patterns are present at the cognitive level, they will be noticeable at the personality level. When we talk about worldview beliefs, for example, we tend to understand them as something more than thoughts. That is, the cognitive process of abstraction and imagination can allow us to experience the idea of God, or the idea of a deterministic universe, or of an afterlife. However, when these cognitive experiences become stable enough that they can be observed consistently as factors of behaviour, then they are
necessarily described on the level of personality. Due to this foundation on cognition, as well as the imaginative processes that generate worldview beliefs being directly informed by simultaneous cognitive processes (Pelaprat & Cole, 2011), tendencies towards certain cognitive styles would have a direct effect on the development and expression of some worldviews instead of others. Worldview beliefs are more than imaginative thoughts, they are enduring cognitive structures that are observable in terms of objective behaviours, or subjectively reported systems of meaning and understanding – persistent products of imagination that become part of what it means to be a person.

The current section has explained how spirituality, naturalism, and agnosticism are three distinct worldviews that emerge from universal cognitive functions. Spirituality seems to emerge as perceptions of agenticity and non-physicality are abstracted into concepts that are then associated with many other aspects of reality, including the conceptual postulate representing reality as a whole. Similarly, naturalism seems to emerge from perceptions of non-agency and physicality being abstracted and associated with reality. Finally, agnosticism was explained to emerge from a process of metacognition, whereby people learn to suspend judgment in their attempt to assimilate and accommodate linguistic descriptions of reality, towards an equilibrium that accounts harmoniously between sensorimotor and conceptual account from self and others. In this process, children learn to doubt and reject some information in order to reduce cognitive-dissonance. Eventually, they may develop this doubt into an enduring tendency to occupy a state of uncertainty about new information, a state of belief flexibility that can be called weak agnosticism. However, this internalisation of epistemological uncertainty can be abstracted further and associated with the conceptual postulate, whereby strong agnosticism makes positive claims about the limits of conceptual knowledge in general.
In each of these cases, distinct worldviews emerge from specific processes that are stable features of evolutionary and developmental cognition. Theoretically, people differ in their tendencies to use these cognitive processes, and these differences can be used to explain the observation of differences in worldviews. In order to test this theory, Chapter Seven reports on an empirical investigation of the associations between the cognitive styles and the three worldview constructs outlined above. An implication of these relationships is that worldviews can be understood as dimensional rather than categorical domains, whereby each person experiences and expresses each worldview to a certain degree, based on their individualised tendencies in the use of universal cognitive capacities.
Chapter Six: Worldviews and Well-Being

Perhaps the most important implication of worldview psychology is the potential for worldviews to influence well-being. Chapter One described how, even at the outset of the explicit discussion of worldviews, Wilhelm Dilthey described their function as a response to universal problems of being in the world (Kluback & Weinbaum, 1957; Naugle, 2002). The previous chapter placed this perspective in the vocabulary of cognitive psychology, by arguing that worldviews emerge in individual personality from universal cognitive processes, which in turn emerge from the interaction between the environment and human biology. From an evolutionary perspective, these functions probably exist in the form that they do because they presented adaptive qualities that have and may still contribute positively to human survival (Buss, 1995). Therefore, it makes sense to investigate the potential influence that worldviews may have on well-being.

One important foundation in discussing worldviews and well-being is to note that the anthropological and cognitive theory suggests that worldviews are inevitably and universally present. As Koltko-Rivera (2004) noted, people cannot have no worldview. So the question of the relationship between worldviews and well-being immediately becomes complex. It is not to investigate whether well-being might be influenced as a consequence of categorically having a certain worldview or not, but rather to investigate worldviews as dimensional constructs that are present in each person to varying degrees, which each have the potential to influence well-being.

There is another issue worth noting before continuing a discussion of worldviews and well-being, which relates to the notion of relativity. The question of whether different worldview constructs influence well-being is complicated by the fact that different worldviews contain contrasting assumptions about how well-being would even be understood. For example, well-being as a concept could look quite different to someone who
believes that the ultimate purpose of life is individualised power over nature and the experiencing of pleasure, when compared to someone who believes that the purpose of life is collective harmony with nature, and a self-transcendent servitude to a God or Higher Power. Therefore, it is not only a question of whether different worldviews influence well-being, but whether different worldviews influence the wide range of possible well-being dimensions.

Psychotherapists could benefit from this sort of investigation into the contrasting psychological impact that distinct worldviews might have on various aspects of well-being. This area has been largely ignored by the clinical literature, which is understandable. Worldview pluralism raises concerns for current diagnostic psychological frameworks – psychologists have good reason to be wary about colluding with or challenging client beliefs about what exists, what is good, and how we should live. Research has shown that this makes psychological practitioners uncomfortable, particularly when their spiritual beliefs are seen to be detrimental for client well-being (Jackson & Coyle, 2009). There is no sharp difference in what psychiatrists would classify as delusion between religious and psychotic groups (Peters, Day, McKenna, & Orbach, 1999). Gridley (2009) neatly exposed these challenges when she wondered, “does embracing cultural diversity… mean uncritical acceptance of multiple realities and truth claims? And if not, do the same tests of evidence apply equally to all systems of meaning and their accompanying practices?” (p. 10). It seems likely that ethical and practical challenges of analysing and comparing worldviews will be one of the issues psychology must face in the 21st century. The uncertainty about how psychotherapy might be applied across ontological pluralism would be best approached with further evidence concerning how different worldviews influence various well-being outcomes. The current thesis aims to continue exploration into the relationship between worldviews and well-being outcomes.
The following section begins by briefly outlining the evidence that worldviews are associated with positive psychological outcomes generally. This section also presents philosophical criteria that might be used to guide empirical investigation into general worldview benefit. The following section discusses the idea that worldviews can improve personal well-being, and provides evidence regarding the associations between personal well-being and spirituality, naturalism, and agnosticism in particular. Similarly, the section discusses the idea that worldviews can improve collective well-being, and provides evidence regarding the association between collective well-being and spirituality, naturalism, and agnosticism. In doing so, it is intended that the reader get a sense of the relevance that worldviews have for well-being in its many forms, and also have an understanding of how spirituality, naturalism, and agnosticism, as three distinct worldviews, can be used to test these claims empirically.

6.1 Worldview Functionality

Wide varieties of claims have been made about the benefit of worldviews for individuals and societies. Worldviews have been argued to decrease death anxiety, increase meaning in life, and generally help in “adjustment to psychological adversity, personality change, and the pursuit of goals” (Nilsson, 2013, p. 75). This fits with the longstanding notion that worldviews develop in adaptive response to universal problems generated in the experience of being human (Sire, 2004), and also with the cognitive foundation of worldviews to continually adapt behaviours and concepts into functional equilibrium (Gabora, 1999, 2000; Piaget, 1955). It seems likely that the purpose of worldview beliefs, that is, their function from an evolutionary and individual perspective, is to benefit the human organism (Boyer, 2000). What remains to be investigated is which worldviews are beneficial to what dimensions of well-being.
As mentioned in Chapter Four, Vidal (2012) provided a comprehensive discussion of the criteria that could evaluate the various impacts that worldviews have on well-being. He provided dimensions across which worldviews could be assessed, organised across first-order, second-order, third-order, and collective tests. First-order criteria describe the function of worldviews to provide consistency between perspectives of the world, personal values, and effective actions. Second-order criteria describe the accessibility of worldviews to be critically assessed, internally consistent, harmonised with other knowledge disciplines, and relatable to “real-world”, grounded issues. Collective criteria describe the function of worldviews to address larger interests of society, harmonise with most contemporary scientific findings, and be compatible with the objective world.

Chapter Four attempted to develop a psychometric inventory (the WFS) that could measure these various criteria of worldview functionality. Unfortunately, the model emergent from exploratory factor analyses only included content evaluating the personal benefit and interpersonal harmony of one’s worldview beliefs, and so did not comprehensively represent Vidal's (2012) criteria. However, this is a preliminary attempt, and further refinements can be made in other projects. For the current project, the WFS addresses a psychometric gap in measuring self-reported benefits and interpersonal harmony of beliefs, which can be used to compare these functions across diverse worldviews. Chapter Seven reports findings from an investigation of the association that spirituality, naturalism, and agnosticism each have with scores from the WFS.

Another way of testing the impact of distinct worldviews on Vidal's (2012) criteria is to use previously established inventories, to map the associations between worldview constructs and a wide variety of well-being dimensions. For example, first-order domains such as the Is-Act demand to have worldviews engender effective action in the world. This can be tested with self-report measures of personal autonomy and environmental mastery.
Collective criteria such as the *We-I* domain can be tested by comparing worldview relationships with measures of social well-being, which include personal integration with society and attitudes towards society as a whole. Researchers such as Gallagher, Lopez, and Preacher (2009) have generated collative models of well-being that cover a wide variety of its dimensions, and this allows for distinct worldviews to be compared in terms of their associations over these many different aspects of well-being.

### 6.2 Worldviews and Personal Well-Being

To cover the range of possible aspects of personal well-being, it was important to include both hedonic, eudaimonic, and existential concerns. Hedonic well-being refers to personal feelings of pleasure and happiness, while eudaimonic well-being relates more to personal presence of meaning, purpose, and other aspects of well-being that do not necessarily correlate with immediate feelings of gratification. It was also important to assess the impact that distinct worldviews have on death anxiety, in order to account for the role of worldviews in buffering against existential fears.

Regarding the relationship between worldviews and hedonic well-being, Koltko-Rivera (2004) argued that worldview theory would be able to contribute to psychological explanations of positive emotions. Positive emotions have been described as mechanisms that condition people to approach certain adaptive stimuli (Cacioppo, Gardner, & Berntson, 1999), as a facilitation of goal-setting and achievement (Bagozzi, Baumgartner, & Pieters, 1998), and also as a trigger for broadened potentials for actions that are then added to the pool of learned behaviour (Fredrickson, 2001). Positive emotions shape behaviour moment-to-moment as part of evolved approach and avoid mechanisms, and facilitate behavioural experimentation that can expand the range of possible long-term actions.
Worldviews have the potential to add explanation to these theories of positive emotions. First, the positive affect system has been argued to respond to appetitive stimuli as a way of adapting approach behaviours towards appropriate phenomena (Cacioppo et al., 1999). Worldviews have the potential to impact this process by shaping the perception of stimuli towards what might be either positively or negatively valanced. Research has suggested, for example, that certain paranormal or religious beliefs seem to play a top-down role in increasing the perception of faces in ambiguous stimuli (Blackmore & Moore, 1994; Riekki, Lindeman, Aleneff, Halme, & Nuortimo, 2013). Second, positive emotions have been argued to provide emotional rewards for the setting and achievement of goals (Bagozzi et al., 1998). Worldviews are implicated in this process, because the effort placed in striving towards goals, as well as the emotional payoff for achieving goals, has been shown to be increased when those goals are in line with core values (Sheldon & Elliot, 1999). Third, the broaden-and-build theory suggests that positive emotions facilitate expanded possibilities for action, which encourage the learning of new thinking styles and behaviours that might be adaptive (Fredrickson, 2001). It is very likely that worldviews have the potential to facilitate positive emotions that trigger the broaden-and-build state. For example, belief in God can lead to activation of adult attachment experiences (Kirkpatrick & Shaver, 1992), and these sort of attachment experiences have been shown to lead to the type of positive emotions that are associated with exploration and opportunism (Shiota, Keltner, & John, 2006). There is enough evidence to suggest that it is worth investigating the role that worldviews play in facilitating the experience of hedonic well-being.

The relationship between worldviews and eudaimonic well-being is even clearer in the literature. Taken from the ancient Greek term *eudaimonia*, the concept of eudaimonic well-being encompasses a state of personal striving towards and achievement of one’s own true potential. Ryff (1995) showed how many broad psychological theories have carried
forward the idea that psychological well-being must encapsulate some movement towards wisdom, maturity, personal development, self-actualisation, individuation, and competent functionality – and that the importance of these type of qualities surpasses, sometimes even despite of, the drives towards hedonic well-being. The reason worldviews are so clearly implicated in eudaimonic well-being is that worldviews represent the beliefs that people hold about what the realization of personal potential would even look like. Worldviews contain fundamental beliefs about what aspects of humanity are good, the ultimate purpose of humanity and individual lives, and the types of behaviours that should be used (Koltko-Rivera, 2004). Worldviews therefore seem to be at least one of the most important aspects that help to define the personal criteria according to which eudaimonic well-being can be assessed.

The third aspect of personal well-being examined in the current project is death anxiety, which represents one of the most fundamental existential concerns. Clinical psychological theory suggests that people often use unconscious mental mechanisms, referred to as defences, in order to reduce personal suffering in the face of stressors (Vaillant, 2000). For example, certain uncomfortable situations might be dealt with using humour, or distasteful personal drives might be suppressed. Similarly, the area of existential psychology has its own set of defence mechanisms. However, unlike those in mainstream psychopathology, existential defence mechanisms are used to reduce distress experienced in the face of awareness of ultimate concerns of existence (Yalom, 1980). Many of these existential defence mechanisms take the form of worldview beliefs. For example, belief in personal immortality or an ultimate rescuer might stave off distress caused by awareness of the inevitability of death (Yalom, 1980). Faith in a purposeful universe or deity, or in one’s own secular ethical code, are worldview beliefs that could reduce anxiety related to existential meaninglessness. From the perspective of existential psychology, the benefit of
worldview beliefs would be in their usefulness as defence mechanisms that address challenges inherent to life in the natural world, such as death, suffering, meaninglessness, groundlessness, personal responsibility, and evil (Sire, 2004; Yalom, 1980).

Personal well-being has been described in the current project across hedonic and eudaimonic dimensions, and also expanded to include death anxiety, which represents a small facet of existential anxiety. An argument has been made that worldview theory has the potential to increase understanding in each of these areas of personal well-being. The current project investigated how worldviews might influence these areas of well-being by testing the comparative effects of spirituality, naturalism, and agnosticism. The following sections briefly provide evidence in support of hypothesised relationships in this area.

### 6.2.1 Spirituality and Personal Well-Being

The expanding focus on the psychology of spirituality has led to an abundance of studies that have given mixed results about the relationship between spirituality and psychological well-being. One of the problems in this area has been that many conceptualisations and psychometric measures of spirituality have included well-being as one of its dimensions. If aspects of mental health are included in the definition of spirituality, then any attempt to assess the relationship between spirituality and mental health will be confounded (Kapuscinski & Masters, 2010). This has definitely contributed to a bias in research. A review of 35 clinical measures of spirituality found that they all focused on “spiritual well-being… none [addressed] the other end of the hypothesized spectrum of spiritual state (i.e., spiritual distress)” (Monod et al., 2011, p. 1355). Furthermore, if constructs that measure psychological well-being are explanatory in their own right, then there is no necessity to incorporate them under the banner of spirituality. Instead, spirituality should be represented as those beliefs and behaviours that specifically relate to
transcendence, agency, and non-physicality, and then these dimensions can be tested alongside psychological well-being measures. Spirituality as a concept does not include well-being, but may contribute to it.

There is no doubt that there exists “the potential for both positive and negative effects of spirituality on health” (Alves, Alves, Barboza, & Souto, 2010, p. 2108). Meta-analyses, international studies, and literature reviews have repeatedly found positive correlations between spirituality and quality of life (Rosmarin, Wachholtz, & Ai, 2011; Sawatzky, Ratner, & Chiu, 2005; Saxena, 2006; Unterrainer, Lewis, & Fink, 2014; Yonker, Schnabelrauch, & DeHaan, 2012). Conversely, research has also shown that dimensions of spirituality could be indicators of “a problematic or even disordered personality structure” (Unterrainer, Huber, Sorgo, Collicutt, & Fink, 2011, p. 363); and spiritual experiences and beliefs have been shown to reflect deep struggles (Exline, 2013), tragedy and social isolation (Lambert et al., 2013), and pathological guilt (Khosravi, Pasdar, & Farahani, 2011).

Furthermore, spirituality can lead first to negative and then to positive outcomes. Many findings suggest that spirituality can be associated with painful experiences that lead to subsequent personal development (Agrimson & Taft, 2009; Triplett, Tedeschi, Cann, Calhoun, & Reeve, 2012). Thus, it is difficult to account for the relationship between spirituality and well-being because disruptive psycho-spiritual distress, even spiritual crises, can both lead to and occur simultaneously with positive psychological growth and profound personal transformation. Spirituality could influence well-being negatively and then positively, and findings would depend on the stage of each participant throughout this process. Another possibility is that spirituality could lead to greater eudaimonic well-being, but at the same time be associated with less hedonic well-being. Therefore, as stated by Zinnbauer (2013), “…is spirituality healthy?—is a nonsense question. The more illuminating and integrative inquiry asks, for whom is spirituality healthy, in what context, by which
outcome, from which point of view, and at what point in time?” (p. 86). The current study aimed to focus particularly on the question of outcome, by examining the comparative influence that spirituality might have on many different aspects of well-being.

Regarding the relationship specifically between spirituality and hedonic well-being, research trends indicate that spirituality is likely to have a positive influence on subjective happiness and other dimensions of hedonic well-being. For example, on a day-to-day level spirituality does seem to increase the experience of positive affect (Ellison & Fan, 2008; Kashdan & Nezlek, 2012). It is also important to consider that spirituality seems to influence hedonic well-being through its influence on meaning in life. Spirituality has been suggested to act as a framework for increasing meaning, with some theorists even defining spirituality as a system for meaning-making (George & Park, 2013; Park, 2005, 2007; Park, Edmondson, & Hale-Smith, 2013). Models have shown that spirituality tends to increase meaning in life, which then impacts hedonic well-being – for example, by reducing anxiety and the impact of various life stressors (Ameli, 2016; Davis, Kerr, & Robinson Kurpius, 2003; Fabricatore, Handal, & Fenzel, 2000; Steger & Frazier, 2005; Temane & Wissing, 2006). So not only can spirituality have a positive influence on hedonic well-being directly, it also seems to influence hedonic well-being through its impact on eudaimonic well-being.

Regarding the impact of spirituality on eudaimonic well-being, spirituality has been shown through large meta-analysis to significantly and uniquely influence quality of life (Sawatzky et al., 2005). Many studies have shown that spirituality can increase quality of life, meaning and purpose in life, life satisfaction, and self-actualisation (Ganga & Kutty, 2013; George & Park, 2013; Ivtzan, Chan, Gardner, & Prashar, 2013; Kashdan & Nezlek, 2012; Kim, Miles-Mason, Kim, & Esquivel, 2013; Park, 2005; Sawatzky et al., 2005). It makes sense for meaning and purpose to be increased by spirituality, because spirituality relates fundamentally to a belief in agency, and agents that can understand and make goals are
required for meaning and purpose to exist. Spirituality has also been shown to have a positive, significant relationship with psychological well-being in general, and particularly the dimensions of personality growth and self-acceptance (Holmes & Findlay, 2016). Overall, research highlights the major potential for spirituality to act as a source of eudaimonic well-being.

In regards to the influence that spirituality has on death anxiety, evolutionary archaeologists have suggested that ritualistic attitudes and behaviours about death were one of the first elements of religiosity in humans – particularly the recognition of an afterlife from which ancestors could continue to contribute to the physical and social world (Rossano, 2009). Global religions emerged from these shamanic frameworks for understanding death, and spirituality has since emerged from these global religions as a personalised set of beliefs that may or may not include the notion of afterlife or rebirth.

Contemporary research into the influences that religiosity, spirituality, and afterlife beliefs have on death anxiety has provided mixed findings. Some evidence suggests that religiosity seems to reduce reported death-anxiety, but not the automatic anxiety associated with death-thoughts (Lundh & Radon, 1998). Other studies have found that belief in afterlife alone does not significantly reduce death anxiety (Rose & O'Sullivan, 2002), but that church attendance does (Aday, 1985). Similarly, studies have shown that religiosity, not spirituality in general, decreases death anxiety (Cohen et al., 2005; Harding, Flannelly, Weaver, & Costa, 2005; Norenzayan, Dar-Nimrod, Hansen, & Proulx, 2009; Wink, 2006). However, contrasting evidence has shown that spirituality, intrinsic religiosity, and afterlife beliefs decrease death anxiety (Harrawood, 2010; Hui & Coleman, 2013; Jong, Halberstadt, & Bluemke, 2012; Rasmussen & Johnson, 1994). There is uncertainty therefore, about whether spirituality, religiosity, or specific afterlife/supernatural beliefs are what helps to reduce death anxiety.
There seem to be two clear ways of making sense of this contrasting data. First, there is the suggestion that what matters in terms of reducing death anxiety is the shared cultural worldview (Burke, Martens, & Faucher, 2010). From this perspective, whether one sees their belief as “religious” or “spiritual” would not matter as long as they felt that their belief system was verified by other people. This perspective is supported by earlier discussion, which argued that a crucial element of worldview development is social verification. Second, there is the empirically supported suggestion that what really reduces death anxiety is the presence of meaning (Routledge & Juhl, 2010; Tomer & Eliason, 1996). From this perspective, spirituality and religiosity would both have the capacity to reduce death anxiety inasmuch as they are able to contribute to meaning in life. These two explanations are not contradictory, because it is probable that spirituality and religiosity may have the capacity to produce more meaning that is personal if they are socially verified.

6.2.2 Naturalism and Personal Well-Being

Compared to spirituality, there is very little research into the relationship between naturalism and psychological well-being. One of the problems in this field of research has been the previously mentioned tendency to treat naturalism as merely the lack of spirituality. Furthermore, there has been the tendency for naturalistic type worldviews to be cast as unnatural and therefore maladaptive when contrasted with the evolutionary benefits that anthropological accounts have given to spiritual worldviews (Caldwell-Harris, 2012; Morgan, 2013). The problem with these two approaches has been that the well-being impact of naturalist beliefs has been under-researched.

Regarding the relationship between naturalism and hedonic well-being, studies have focused more on comparing religious/spiritual vs nonreligious/nonspiritual people, rather than the direct influence of naturalistic beliefs on happiness. These trends have generally
found that spiritual and religious worldviews contribute more to subjective well-being when compared to atheism or nonbelief (Zuckerman, 2009). Recently, Yagiyayev (2015) shifted focus onto an examination of naturalist beliefs specifically, by comparing atheists with naturalist beliefs to atheists without naturalist beliefs, and found that there were no significant differences in their levels of positive and negative affect. So far, the picture painted by research is that the naturalism worldview does not significantly contribute to hedonic well-being.

In considering the influence of naturalism on eudaimonic well-being, again the evidence mostly focuses on a reverse argument by demonstrating that religiosity and spirituality increase well-being and therefore assuming that naturalism does not (see summary in Zuckerman, 2009). However, when Yagiyayev (2015) compared atheists with naturalist beliefs to atheists without naturalist beliefs, they found that a significant difference in the level of eudaimonic well-being could be explained by the presence of a naturalism worldview. Specifically, the naturalist worldview beliefs seemed to be associated with higher autonomy and purpose in life, although it was also associated with a lower search for meaning. This led Yagiyayev to argue that eudaimonic well-being needed “a confident and coherent system of views, [and] ontological naturalism may be utilized for this purpose” (p. 165). From all of this evidence it seems that many facets of eudaimonic well-being could be improved by the naturalism worldview, except for the areas related to meaning. Other studies have also shown that atheists tend to report lower meaning in life than religious people (e.g., Horning, Davis, Stirrat, & Cornwell, 2011) As was argued earlier, this makes sense logically because for meaning to exist in a universal sense there would need to be a universal agent capable of understanding.

In regards to the influence that naturalism might have on death anxiety, the scientific literature is again mixed. First, the same sort of reverse argument, mentioned above, is used
to demonstrate that religiosity, spirituality, and belief in an afterlife are associated with lowered death anxiety and therefore naturalist worldviews would have the opposite effect (see summary in Zuckerman, 2009). Second, research tends to show that naturalism does not increase meaning in life (e.g., Yagiayev, 2015), and evidence suggests that meaning in life is the key variable that leads to a decrease in death anxiety (Routledge & Juhl, 2010; Tomer & Eliason, 1996). However, it has been shown that belief in science does increase in response to mortality salience, which suggests that it is the strength of any worldviews, regardless of its content, that has the potential to buffer against death anxiety (Farias et al., 2013). This supports the notion that it is social verification in a shared cultural worldview that has the most influence on death anxiety (Burke et al., 2010) – although it is important to note that evidence suggests that typically spiritual beliefs tend to be implicated more in the buffering against death-thought accessibility (Schimel, Hayes, Williams, & Jahrig, 2007). Together, all of this evidence seems to suggest that individuals are likely to attempt to buffer against death anxiety using any culturally verified worldview, however it is unlikely that naturalism can succeed in this attempt because it does not seem to act significantly on meaning in life.

6.2.3 Agnosticism and Personal Well-Being

As early as the 1st century BC, the school of Pyrrhonism asserted that “knowledge of things is impossible and that the recognition of this, with the consequent suspension of belief, will lead ultimately to ataraxia: a state of calmness and contentment” (Le Poidevin, 2010, p. 36, italics his). It is surprising then, that there is such a lack of scientific focus on the impact of agnostic beliefs. Again, this seems to be because researchers have typically treated naturalism and agnosticism as points on a spectrum towards religiosity and spirituality, rather than distinct positions in their own right (Streib & Klein, 2013). This seems to be an
acceptable definition to take into account weak agnosticism, which denotes a lack of certainty either way.

However, as argued and evidenced in previous chapters, the strong agnostic worldview represents the presence of beliefs about the nature of reality, and the impact of these beliefs are worthy of investigation. Not only is this a worthy area in its capacity to clarify the influence of agnosticism on well-being, it also provides interesting data regarding the elements of worldviews that contribute to well-being more generally. If psychological well-being does require “a confident and coherent system of views” (Yagiyayev, 2015, p. 165), can a worldview that posits the impossibility of such a system be a source of psychological well-being?

Regarding hedonic well-being, the above quote illustrates how even in ancient Greek philosophy there existed the position that day-to-day psychological happiness could be achieved through agnosticism (Le Poidevin, 2010; Striker, 1990). Scientific trends that have treated agnosticism as a mid-point between belief and non-belief (i.e., weak agnosticism) have tended to show that uncertain beliefs have negative influence on emotional well-being (Galen & Kloet, 2011). This curvilinear trend suggested that weak agnosticism was associated with lower hedonic well-being. A systematic review confirmed this trend, by showing that it was the strength of worldview conviction that was associated with lower psychological distress (Weber, Pargament, Kunik, Lomax, & Stanley, 2012). However, research is lacking on whether strong agnosticism, the certainty of uncertainty about worldview content, has any bearing on hedonic well-being.

Research regarding the relationship between agnosticism and eudaimonic well-being is also very scarce. Agnosticism has been mostly grouped with other types of nonbelief in studies (Streib & Klein, 2013). Similar to the above results regarding hedonic well-being, when weak agnosticism has been investigated as a place of uncertainty between naturalism
and spirituality it has been associated with higher levels of depression than positions on both ends of the spectrum (e.g., Riley, Best, & Charlton, 2005). Again, evidence points to the notion that strength of worldview conviction increases psychological well-being (Weber et al., 2012), but there does not seem to be a body of research regarding the presence of strong agnostic worldviews and their impact on psychological well-being.

With regard to agnosticism and death anxiety, it seems logical to assume that, because spiritual and naturalist beliefs are strengthened in response to existential threats such as mortality salience (Burke et al., 2010; Farias et al., 2013; Schimel et al., 2007), then weak agnosticism would probably be ineffective in lessening death anxiety. In other words, if worldview certainty acts as a psychological buffer against death anxiety, then the presence of worldview uncertainty would surely have the opposite pattern. This is supported by studies that have shown weak agnostics to increase their religiosity when confronted with death-related thoughts (Vail, Arndt, & Abdollahi, 2012). However, as with the other dimensions of well-being, the impact of strong convictions about the agnostic position appears to have gone unstudied.

6.3 Worldviews and Collective Well-Being

Not only can worldview beliefs be beneficial for the individual, but they also can be beneficial for cultural groups. Worldviews have been argued to have great importance on a societal level, offering possibilities of group cohesion or even adaptive exploitation of people by leaders who encourage certain worldview beliefs (Gorelik, 2016; La Barre, 1972). It seems that one of the very important impacts of worldviews occurs on the collective level, and the current research project aims to address collective well-being in its exploration of general worldview principles.
From an evolutionary perspective, novel perceptions and beliefs are accepted in a society because of their usefulness, and perpetuated as an automatic function of neonatal transmission (Boyer, 2000; La Barre, 1972). Societal acceptance does not depend on the ontological accuracy of the worldview belief, *per se*, unless that accuracy makes a positive impact on societal well-being. Religious cults begin with a societal need, whereby a person emerges who can share perceptions and beliefs that provide psychological comfort or direction, and they emerge as a “leader-genius,” or “shaman-messiah” to the rest of their community (La Barre, 1970, as cited in Littlewood, 2011, p. 366). Anthropological evidence suggests that worldviews have played a major role in the survival and propagation of social collectives.

Gallagher et al. (2009), in their research to establish a comprehensive hierarchy of well-being, highlighted the importance of social well-being. Their model included the work of Keyes (1998), who investigated social well-being across various dimensions including integration with one’s community, contribution to the community, and acceptance of the community and one’s place within it. There are many theories that propose worldviews to be conducive of the group cohesion that would be indicated by measures of social well-being, however these have mostly focused on the social usefulness of religious or spiritual belief systems (e.g., Gorelik, 2016; La Barre, 1972).

One way of understanding the benefit of worldviews for collectives is to consider the benefit of worldviews for individuals as expanded into larger social groups. From this perspective, the psychological health of a society simply reflects the psychological health of each individual member of that community in an additive sense. The most adaptive worldview for the collective to adopt would be the worldview that was most psychologically healthy for each individual, for example, according to the personal well-being dimensions mentioned in the above section. However, this seems inadequate alone because some
worldviews have the potential to be beneficial for the individual but confrontational to the group and, as argued earlier, worldviews are only prolonged if they are selected and passed on by societies to subsequent generations.

Given the above, it is important to avoid conflating personal well-being with collective well-being, as it may be that some worldviews are conducive to personal psychological benefit but do not provide a capacity for generating communal meaning and goals. Certainly, the most important way of generating data about the group cohesion offered by distinct worldviews would be to attempt a sociometric analysis of collectives. Unfortunately, this is beyond the scope of the current project. Another way of investigating the social impact of worldviews is to use self-reported measures of social well-being. Keyes' (1998) widely used measure of social well-being captures an individually reported sense of integration with society, an ability to contribute meaningfully to society, an ability to understand and appreciate the organisation of society, a perceived positive trajectory of society, and a perception of the interpersonal and effective value of other people within society. By analysing the associations that distinct worldviews have with self-reported social well-being, it is possible to gain data about the influence that worldviews might have on collective well-being – as reported by individuals who are members of those collectives.

The reason that it is useful to test worldviews alongside social well-being is not only that it provides data about the influence on individuals, but also that it provides evidence regarding the likely benefit of that individual worldview to the group in which they belong. The acceptance or rejection of worldviews influences not only the well-being of the community, but also of the individuals who present worldviews. The ability to create especially original perceptions and beliefs has been associated with both genius and psychoticism (Littlewood, 1984; Shermer, 2011). On the extreme positive end of the spectrum, new beliefs that are widely accepted by the collective often cast the suggesting
individual as a social saviour (La Barre, 1972). On the extreme negative end of the spectrum, worldview beliefs that are seen as dangerous to the established culture can be seen as psychotic by other members of the society (Littlewood, 1984; Shermer, 2011). This negative feedback could not only damage the individual’s immediate social well-being, but the difference in their personally held worldview makes it likely that meaningful communication is not possible (Peterson, 1999). It is likely that when a personal worldview is at odds with the collective worldview, the differentiated individual experiences isolation, meaninglessness (the lack of verification of reality), fear of death, and other symptoms of societal exclusion – some of the very elements of reality that worldview beliefs act to ameliorate in the first place. There seems to be a direct relationship between the benefit that an individual’s worldview has for the well-being of the community and the benefit that the community then provides to the well-being of the individual. To measure the social well-being of an individual as a function of their worldview also presents, at least partly, some insight about the usefulness of that individual worldview to the group.

Another way of understanding the collective benefits of worldviews can be considered somewhat separately from the subjective or objective poles of any specific worldview: Worldviews foster group cohesion by establishing shared belief systems, regardless of their style or content. In other words, one of the social benefits of worldviews can stem simply from the fact that they are shared (Boyer, 2000; Peterson, 1999). This is not to say that everyone shares the benefits of a belief system that is useful, but rather to say that belief systems are useful because they can generate a framework by which people can navigate the world with unified goals and understanding. This goes deeper than accepting a belief consciously in order to have social cohesion, but instead points to the fact that social verification of perception and conceptual knowledge is built into the way that people develop the cognitive capacity to exist in the world (Peterson, 1999; Piaget, 1955). The social
verification of abstract concepts occurs before the cognitive stages that concern themselves with objective ontological comparison of different belief systems. In terms of collective benefit, the capacity for worldviews to be shared in social groups seems to be more foundational than the search for the objective truth of worldviews.

The function of worldviews to present socially cohesive interactions falls into the theoretical domain of morality. The impact that individually held worldviews might have on collective well-being can be thought of in terms of the influence that worldviews have on moral decision-making. Worldviews in general are often associated with morality (Jensen, 1997), which is not surprising because many worldview beliefs concern not only what is good or bad, but “what goals should be pursued” (Koltko-Rivera, 2004, p. 4). Koltko-Rivera's group of worldview dimensions related to behaviour highlights the differences in beliefs that people can hold about morality. For example, people can differ in their belief about the source of morality (e.g., generated by humans or revealed by a transcendent source), the standard of morality (e.g., relative or absolute), and the relevance of specific societal moral codes (e.g., important or not for personal behaviour). It is clear that morality and worldview beliefs are extremely interrelated concepts, and that worldviews that posit axiomatic goals for human action have relevance for beliefs that people have about proper moral behaviours.

It has been argued that religious and spiritual belief systems benefit society through the emphasis they place on judgement from a deity and the existence of a universal justice system (e.g., divine judgment, karma; e.g., Gorelik, 2016; Gervais & Norenzayan, 2012). However, even atheist worldviews have been associated with morality, as people who hold a Naturalist worldview also tend to self-identify with strong personal ethics (Guenther, 2014). The impact that different worldviews might have on attitudes towards various dimensions of morality would have great relevance to general principles outlining the importance of worldviews for collective well-being.
Moral beliefs seem to emerge as articulations of behavioural processes shaped by both biological and cultural forces. Grounded in evolutionary and anthropological data, Graham et al. (2011, 2012) explained that there are genetic predispositions towards certain behaviours that have a Darwinian benefit for groups, and that these behaviours are then refined by social structures. This fits with the aforementioned model, whereby the schemas for effective action in the world are first worked out on a sensorimotor level, and only afterward are translated into and refined by conceptual language (Peterson, 1999; Piaget, 1955, 1972). Morality at the level of individual personality can be understood as the level of concern and importance attributed to five conceptual domains when evaluating behaviour: The degree of care/harm, the degree of fairness/cheating, the degree of loyalty/betrayal, the degree of authority/subversion, and the degree of sanctity/degradation (Graham et al., 2012, 2011). Individual differences in the level of importance given to these dimensions are shaped by biological and environmental factors, in the same way that worldviews were shown to emerge in Figure 5.

There is a large conceptual overlap between worldviews and moral domains. In some sense it makes sense to consider some moral statements as worldview beliefs, for example, “it can never be right to kill a human being” (Graham et al., 2011, p. 385). However, separating worldviews from moral foundations allows an investigation of the relationship between people’s beliefs about the fundamental nature of reality, and the way in which their behaviour conforms differently to universal constraints. By testing how spirituality, naturalism, and agnosticism influence levels of importance given to these five dimensions of morality, findings may shed light on the way that worldviews might associate with moral constraints that represent different aspects of societal needs.

6.3.1 Spirituality and Collective Well-Being
The social systems that govern how individuals relate to each other seem to be driven by biological forces that manifest in behaviour, selected by social verification and group needs, and then transmitted by both childrearers and social institutions (Graham et al., 2012, 2011; Peterson, 1999; Piaget, 1955, 1972). From this perspective, religious movements can be understood as social institutions that have attempted to formalise the underlying rules for social conduct that emerged naturally, as individual drives were shaped by social pressures. It is no wonder then that rules for social conduct and moral codes form an integral part of every major religious system. There is historical evidence for the rise of moralising religious beliefs in conjunction with the emergence of larger socially cooperative groups, and there is contemporary evidence that links religious involvement with prosocial behaviour (Boyer, 2000, 2003; Norenzayan et al., 2016). Religion emerged partly as a system for overtly recognising and enforcing pragmatic social conduct.

Given the above findings, it would be expected that religious societies would be the most prosocial in the world. However, a review of social science statistics at the societal level suggests the opposite (Zuckerman, 2009). Although religion seems to be associated with greater well-being at the individual level, this trend seems to be reversed in analyses of large societies. This may reflect that the transcendent elements of the religious experience have the potential to be exploited by those who may use them for antisocial reasons (Gorelik, 2016), a notion that is supported by the reports of people who are spiritual but not religious having experienced injustice attributed to religious organisations (Zinnbauer et al., 1997). It also may reflect that rigid religious codes for social conduct may not be equipped to handle modern societal problems. This idea is supported by studies showing that spirituality is often seen as more adaptive and functional, as opposed to the seemingly static and impersonal institutions of religion that no longer provide adequate answers to spiritual questions (Houtman & Aupers, 2007; Zinnbauer et al., 1999). As was argued in Part One of the current project,
religion can be mostly understood as an interpersonal aspect of spirituality, which is a broader concept that encapsulates interpersonal alongside personal beliefs and practices. This complicates the above findings about societal comparisons, because secular societies often represent those that have turned away from religious organisation but not from spirituality, which seems to still contain the concern for what is socially good, functional, and compassionate (Zinnbauer et al., 1999).

Meta-analysis and international investigations have shown that spirituality is associated with greater quality of life, including social well-being (Sawatzky et al., 2005; Saxena, 2006). The difficulty of understanding the mechanisms of this relationship lies in teasing apart the contributions of religiosity, spirituality, and social support from specific religious communities. Recently, Joshanloo (2011) found that religiosity did not predict social well-being above the contribution of spirituality, which supports the idea that spirituality can incorporate the benefits of religiosity in improving social well-being. Recent empirical evidence supports the notion that both religiosity and spirituality benefit social harmony, and this seems likely because they emerged as systems that attempted to elucidate and commit to the socially verified principles that emerged from the social development of group conduct in the first place (Peterson, 1999).

Empirically, spirituality has been linked to high levels of moral development (Young, Cashwell, & Woolington, 1998). This makes sense if the perception of agents, which underlies the spiritual worldview, is itself the essence of moral judgment, as some have claimed (Gray, Young, & Waytz, 2012). Empirically, certain spiritual beliefs, such as the belief in an observing God, have been shown to relate to moral behaviours (Gervais & Norenzayan, 2012b). Even when modern spiritual people reject the traditional Judaeo-Christian perspective of God, other similar beliefs are usually present, such as the belief in a higher power or the belief in reincarnation (Houtman & Aupers, 2007). These beliefs
essentially extend social responsibility and encourage prosocial behaviour beyond the immediate presence or judgment of other people.

However, the influence of these types of belief point to a deeper connection between spirituality and morality. Religious doctrines arose at least partly as explicated rules for social conduct, and religious conformity involved commitment to these moral principles (Graham & Haidt, 2010). Interestingly, spirituality still contains the commitment to moral principles, but the source of those principles now seems to be more associated with an inner connection to spiritual ideals (Walker, 2003). Despite the differences in the authoritarian source of moral values, both religiosity and spirituality seem to involve a commitment to moral conduct. This is supported by recent evidence that the types of people who score highly on measures of both religiosity and spirituality also demonstrate concern across the board for all five moral foundations (Graham et al., 2012; Graham, Haidt, & Nosek, 2009; Graham et al., 2011; Haidt, 2007).

6.3.2 Naturalism and Collective Well-Being

Nonreligious belief systems have long been considered as amoral and even antisocial (Caldwell-Harris, 2012; Caldwell-Harris, Wilson, LoTempio, & Beit-Hallahmi, 2011; Edgell, Gerteis, & Hartmann, 2006; Morgan, 2013; Zuckerman, 2009). Religious belief systems have had a reputation for fostering collective purpose and prosocial behaviour, and delivering moral codes for people to follow. It follows that a belief system that directly challenges religious systems could be associated with the opposite of collective religious benefits. However, naturalism represents a worldview that puts forward its own system for perceiving and behaving in the world. It is worth examining the impact that naturalism might have in encouraging social well-being and moral behaviour.
There is evidence to suggest that the naturalist worldview would be associated with less social well-being. Evidence has already been presented to show that naturalism is most likely founded on cognitive functions that do not perceive agency within phenomena. This has been supported by studies showing that nonreligious people tend to be lower in agreeableness (Galen, 2009), and results from Study Two of the current project extended these findings to the naturalism worldview more generally. Evidence has also been found to show that atheists are more likely to experience less social obligation (Bainbridge, 2005), and less social supports in old age (Horning et al., 2011). It is likely that naturalism would not foster social cohesion for the individuals who hold it.

Theorists have noted that public perception of nonbelievers often includes an idea that they are behaviourally hedonistic (Morgan, 2013). Again, this seems largely reactionary in that if religion and spirituality were associated with moral restraint, then a worldview that directly contradicts these systems would abandon that moral constraint and result in hedonic behaviour. Thus, atheism has been historically charged as immoral, however recent investigations have shown that nonbelievers tend to have a unique profile for moral concerns (Caldwell-Harris, 2012; Smith, 2013). The case has been made that atheists, rather than being tied to a transcendent moral code, are more concerned with immediate and localised instances of social justice (Zuckerman, 2009). However, the difficulty in using social justice examples to make a case for more general morality is that decisions about social issues are difficult to connect to actual moral concerns without empirical evidence. For example, Zuckerman (2009) illustrates religious vs nonreligious attitudes towards gay rights to highlight the higher moral concern of atheists. However, differences in attitudes towards policy do not necessarily represent the motivation to minimise harm or unfairness, but may instead simply represent the notions about what decisions would lead to those better outcomes.
There is some evidence then, to show how naturalism might relate more directly to underlying moral values and motivations. The five moral foundations that have been uncovered by extensive multidisciplinary research are: care/harm, the degree of fairness/cheating, the degree of loyalty/betrayal, the degree of authority/subversion, and the degree of sanctity/degradation (Graham et al., 2012, 2011). The religious and spiritual belief systems tend to be associated with morality across all of these five domains (Graham & Haidt, 2010). This makes sense, because to some extent religious moral codes were explications of these moral domains as they emerged from biology and culture (Peterson, 1999). In contrast, nonreligious people have been associated with only the dimensions of care/harm and fairness/cheating (Haidt, 2007). In other words, naturalism seems to be unrelated to the three moral domains that are concerned with binding individuals to larger social groups and maintaining the integrity of those groups. Instead, naturalism as a worldview seems more likely to be concerned with the individualising domains, which maintain the integrity and safety of each individual person. Not only does this point towards the relationship between naturalism and moral identity, it also provides deeper support to the above-mentioned negative relationship between naturalism and social well-being.

6.3.3 Agnosticism and Collective Well-Being

Following similar trends to previous areas of research, in the area of social and moral concerns agnosticism has tended to be grouped with naturalism and atheism under the umbrella of nonbelief. In this they are also shown to have less social support compared to religious/spiritual counterparts, although this has not been shown to be a function of agnostic beliefs per se, but rather a lack of the social groups and shared beliefs that belong to religious communities (Galen & Kloet, 2011). However, Silver (2013) has worked to differentiate agnostics from atheists, and concluded that agnostics were more concerned with what people
thought of them and tended to conform to social groups. From this data, and in line with Galen and Kloet's (2011) curvilinear trend, it seems logical to suppose that weak agnosticism would foster social well-being. In terms of strong agnosticism, there is no data to support a hypothesis for either direction of relationship with social well-being.

Regarding morality, weak agnosticism measures a personal uncertainty in values and strong agnosticism measures a firm belief in uncertainty of values, and both options seem unlikely to have a rigid relationship with any particular moral values. The nature of the relationship between agnosticism and morality would therefore depend on whether morality is an intuitive, biologically driven phenomenon that is only rationalised post hoc, or whether it is essentially reflective of rational deliberation – and there is empirical support for both of these viewpoints (Haidt, 2001; Paxton, Ungar, & Greene, 2012). If morality is mainly determined by instinctual processes, then it seems logical for agnosticism to be associated with both individualising domains of morality but not the binding domains. This is because individualising domains are founded on instincts to maintain the safety and integrity of the individual, but binding domains are associated with religious and spiritual belief systems that aim to maintain the integrity of cultural groups (Graham & Haidt, 2010; Graham et al., 2012, 2011; Haidt, 2007). In this way, an investigation regarding weak and strong agnosticism’s influence on moral identity would also provide some insight into the debate regarding the intuitive vs deliberate sources of morality.

6.4 Summary

Theoretical and empirical evidence suggests that worldview beliefs can have enormous consequences for individuals, both in the immediate effect on their own well-being, and in terms of their integration with other people and society. The current project aimed to assess the comparative impact that distinct worldviews could have on different types
of well-being. First, it addressed the impact of distinct worldviews on participants’ own subjective interpretation of their own worldview functionality. To do this, the WFS was used to measure Worldview Benefit and Worldview Integration. Second, it addressed the impact of distinct worldviews on personal well-being, including hedonic well-being, eudaimonic well-being, and death-anxiety. Third, it addressed the impact of distinct worldviews on collective well-being, including social well-being and moral identity.

Chapter Seven reports findings from a study that used the SNAS to test how each of these cognitive and well-being constructs were associated with spirituality, naturalism, and agnosticism. Based on the above discussion, it was expected that spirituality would be associated with higher scores in worldview benefit and integration, higher scores in hedonic and eudaimonic well-being, lower scores in death anxiety, higher scores in social well-being, and higher scores in all five moral foundations. Furthermore, it was hypothesised that the relationship between spirituality and all aspects of personal well-being would be mediated significantly by meaning in life. Conversely, it was expected that naturalism would be associated with lower scores in worldview benefit and integration, no differences in hedonic well-being, lower scores in eudaimonic well-being, higher scores in death anxiety, lower scores in social well-being, lower scores in meaning in life, and higher scores in only the individualising domains of moral identity. Finally, it was expected that agnosticism would be associated with no changes in worldview benefit and integration, lower scores in hedonic and eudaimonic well-being, higher scores in death anxiety, higher scores in social well-being, lower scores in meaning in life, and higher scores in only the individualising domains of moral identity. Differences in these relationships between weak and strong agnosticism were of particular interested in the study.
Chapter Seven: An Empirical Study of Worldviews, Cognition, and Well-Being

The previous chapters presented substantiated theories that together explained how worldviews are manifestations of underlying tendencies, and how they lead to distinct outcomes. Spirituality, Naturalism, and Agnosticism were explained as three diverse worldviews that theoretically arise from different cognitive tendencies and lead to diverse outcomes. The current chapter reports on empirical tests for these theories, which used the SNAS to investigate how Spirituality, Naturalism, and Agnosticism differ in their relationships with specific cognitive processes and positive psychological outcomes. These results were intended to shed light not only on the specific relationships that these three worldviews have with cognition and well-being, but also help to extend these findings into an understanding of the psychological principles of worldviews in general.

7.1 Hypotheses

Chapter Five outlined theoretical and evidential justification for hypotheses regarding how spirituality, naturalism, and agnosticism each might relate to specific cognitive tendencies. Chapter Six did the same regarding how spirituality, naturalism, and agnosticism each might relate to a wide variety of both personal and collective well-being outcomes. These hypotheses are summarised below.

7.1.1 Cognition

For spirituality, the cognitive science of religion has an extensive literature that has associated spiritual experience and beliefs with certain cognitive functions. Specifically, it seems that many of the aspects of spirituality are made possible due to the generalisation of social cognitions such as empathy quotient, agency detection, and theory of mind (Gorelik, 2016; Pyysiäinen, 2012; Rosenkranz & Charlton, 2013; Shermer, 2011). Furthermore, that
these cognitive foundations occur before rational models about the world. It was hypothesised that scores for spirituality and mysticism would both incur a significant and positive influence from variances in: (a) empathy quotient; and (b) anthropomorphising. It was also of exploratory interest (c) to determine what extent spirituality would be influenced by faith in intuition.

Naturalism, which often contains contradicting beliefs to spirituality, seems to be founded on cognitive functions that are mechanistic rather than social. For example, rejection of religion and acceptance of science appears to be related to levels of systemising quotient, a cognitive tendency towards thinking about the mechanistic relationship between objects (Rosenkranz & Charlton, 2013). The tendency to enjoy rational cognition has also been associated with atheism (Caldwell-Harris, 2012), and so it seems logical that the naturalist worldview would also relate to this cognitive tendency. It was hypothesised that naturalism would incur a significant and positive influence from variances in: (d) systemising quotient; and (e) need for cognition.

Weak agnosticism refers to a flexibility and uncertainty in personal beliefs, whereas strong agnosticism refers to a belief that certain knowledge is impossible (Le Poidevin, 2010). One way of understanding the cognitive foundation of agnosticism is that it is encouraged by social verification that highlights the differences in worldviews between people (Boyes & Chandler, 1992; Piaget, 1972). Furthermore, agnosticism, like other types of nonbelief, has been said to be associated with enjoyment of rational thought. It was hypothesised that both weak and strong agnosticism would incur a significant and positive influence from variances in: (f) empathy quotient; and (g) need for cognition.
7.1.2 Well-Being

The current project aimed to investigate the influence of worldviews on self-reported worldview functionality, personal well-being, and collective well-being. Personal well-being included dimensions of hedonic well-being, eudaimonic well-being, and death anxiety. Collective well-being included dimensions of social well-being, and moral identity.

7.1.2.1 Worldview Functionality

When exploring the comparative benefit of different worldviews on well-being outcomes, it was important for the current work to also take into account self-reported benefits of worldviews, not only the influences on dimensions that have been decided by the researcher to be representative of well-being. The current conceptualisation of worldview functionality was based on work by Vidal (2012), who put forward a framework of criteria that could be used to assess worldviews based on their effectiveness in many domains of life.

Worldview functionality was measured as two distinct domains. First, the self-reported benefit of one’s own beliefs. Second, the self-reported integration possible of one’s own beliefs with those of other people. Based on the findings in Study Two, the only significant influence from any of the worldview constructs was hypothesised to be from spirituality and mysticism on the benefit domain of worldview functionality. It was expected that higher spirituality and mysticism scores would demonstrate significant positive influence on worldview benefit.

7.1.2.2 Personal Well-Being

The current project aimed to test the impact of worldviews on personal well-being, of which there are a number of dimensions. Gallagher, Lopez, and Preacher (2009) investigated the hierarchical nature of psychological well-being, highlighting the need to account for
hedonic and eudaimonic well-being. Hedonic well-being accounts for feelings of subjective happiness and pleasure. Eudaimonic well-being accounts for a personal sense of meaning and purpose, as well as the personal autonomy that makes it possible to strive for and achieve one’s goals. As well as increasing hedonic and eudaimonic well-being, worldviews also have the potential to impact personal well-being as defence mechanisms that buffer against the existential distress caused by difficult and universal aspects of life. As previously explained, Yalom (1980) has extrapolated these existential difficulties into the four domains of death, freedom, existential isolation, and meaninglessness. The issues raised within the themes of freedom, existential isolation, and meaninglessness are somewhat captured already by eudaimonic well-being, which includes the dimensions of personal purpose, meaning, and autonomy. This leaves the importance of accounting for attitudes towards death. Wittkowski (2001) has shown that attitudes towards death and dying are complex, and cover a number of dimensions that include the death of oneself and the death of others, as well as the process of death and the metaphysical finality of death. Investigating the impact of worldviews on all of these dimensions is beyond the scope of the current project, which therefore aimed to investigate attitudes towards death in particular.

Based on the theoretical and empirical evidence put forward in Chapter Six, it was hypothesised that spirituality and mysticism would demonstrate: (a) significant positive influence on hedonic well-being; (b) significant positive influence on eudaimonic well-being, including meaning in life; and (c) and significant negative influence on death anxiety. It was also hypothesised that (d) the influence of spirituality on some of these well-being outcomes would be mediated by meaning in life. It was hypothesised that naturalism would demonstrate: (e) no significant influence on hedonic well-being; (f) significant positive influence on eudaimonic well-being, except no significant influence on meaning in life; and (g) no significant influence on death anxiety. It was hypothesised that weak agnosticism
would demonstrate: (h) significant negative influence on hedonic well-being; (i) significant negative influence on eudaimonic well-being, including meaning in life; and (j) significant negative influence on death anxiety. Finally, it was of exploratory interest what the influence would be of strong agnosticism on each of these aspects of personal well-being.

### 7.1.2.3 Collective Well-Being

The current project aimed to test the impact of worldviews on collective well-being, by taking into account social well-being and moral identity. One limitation of the current survey-based research design is that even these collective aspects of well-being are investigated from the perspective of individual participants. While further research might use sociometric methods to investigate the impact of worldviews on the collective level, this is beyond the scope of the current project. Instead, the current investigations focused on collective well-being indirectly, through individual self-reports that offer subjective indications about each participant’s experiences and values that relate them to society.

Based on the theoretical and empirical evidence put forward in Chapter Six, it was hypothesised that spirituality and mysticism would demonstrate: (a) significant positive influence on social well-being; and (b) significant positive influence on both the binding and the individualising moral foundations. It was hypothesised that naturalism would demonstrate: (c) no significant influence on social well-being; and (d) significant positive influence only on the individualising moral foundations. It was hypothesised that weak and strong agnosticism would both demonstrate: (e) significant positive influence on social well-being; and (f) a significant positive influence only on the individualising moral foundations.
7.2 Methods

7.2.1 Participants

Most participants were recruited from a community sample of convenience, via email and word-of-mouth. Some participants were recruited as part of their assessment for an undergraduate psychology degree. After the screening process, the sample comprised 873 participants with ages ranging from 18 to 85 years. There were 221 men ($M = 37.72$, $SD = 14.13$ years), 640 women ($M = 35.22$, $SD = 12.49$ years), eight participants who identified as “Other” gender, and four participants who did not report their gender. When asked to report their highest level of education completed, approximately two percent of participants had not completed secondary school, 20% had completed secondary school or equivalent, 40% had a certificate or diploma, 23% had a bachelor or undergraduate degree, and 14% had a postgraduate, master, or doctorate degree. Seventy-one percent of participants had completed the survey as part of their university course.

Eighty-four percent of participants resided in Australia, 7% in the USA, 4% in Europe (including United Kingdom, England, Germany, Denmark, Ireland, Finland, Lithuania, Slovenia, Sweden, Spain, Serbia, Turkey, the Netherlands, Norway, and Wales), 1% in Canada, 1% in Asia (including China, Indonesia, Malaysia, Singapore, Korea, India, and Japan). There were four participants who resided in New Zealand, one participant who resided in Brazil, one participant who resided in Colombia, and one participant who resided in South Africa. Four participants did not report their country of residence.

Thirty-nine percent of participants reported their ethnicity as white, Caucasian, or Anglo-Saxon, 29% Australian, 9% European (including UK, Turkish, Swedish, Spanish, Slavic, Scandinavian, Lithuanian, Italian, Irish, Greek, German, English, Croatian, and British), 7% Asian (including Vietnamese, Taiwan, Sri Lankan, Malaysian, Indonesian, Indian, Filipino, Fijian, Chinese, Pakistani, and Lebanese), 2% mixed Australian (including
Australian-European, Australian-Asian), 2% Mixed, 1% New Zealanders (including Maori), 1% Middle Eastern (including Egyptian, Kurdish, Israeli, Arabic, and Palestinian), and 1% African (including South African and Eritrean). Three participants reported their ethnicity as Indigenous Australian, three reported Latin, two American, two Western, two Jewish, two Maltese, two Canadian, one Armenian, one Samoan, one Brazilian, and one Argentinian. Two percent of participants did not report their ethnicity. English was a first language for 90% of participants – with 1% of participants not reporting their first language.

Forty percent of participants associated their culture of upbringing with a religious institution (including Judeo-Christian religions, Buddhism, Hinduism, Islam, Sikhism, and Ringatu), while 59% did not (five participants did not report this). Nineteen percent of participants currently associated personally with a religious institution (including Judeo-Christian religions, Buddhism, Islam, Sikhism, Ringatu, Satanism, Theosophy, and various spiritualist groups), while 81% did not (eight participants did not report this). Forty-seven percent of participants never attend an organised place of worship, 26% attend once a year or less, 12% several times a year, 3% once a month, 4% several times a month, 6% once a week, 1% several times a week – three participants reported attending once a day, and one participant reported attending several times a day (five participants did not report this). Thirty-eight percent of participants never worship privately, 8% once a year or less, 10% several times a year, 4% once a month, 7% several times a month, 6% once a week, 10% several times a week, 7% once a day, and 7% several times a day (three percent did not report this).

7.2.2 Materials

Participants were asked to report their age, gender (Male; Female; Other), education level (not completed secondary school; secondary school or equivalent; certificate/diploma;
bac
helor degree/undergraduate degree; postgraduate/master/doctorate), ethnicity, country of residence, whether English was their first language (Yes; No), frequency of organised worship, prayer, or meditation (never; once a year or less; several times a year; once a month; several times a month; once a week; several times a week, once a day; several times a day), and frequency of private worship, prayer, or meditation (never; once a year or less; several times a year; once a month; several times a month; once a week; several times a week, once a day; several times a day). Participants were also asked to report whether they associate personally with a religious institution (Yes; No), and whether they associate their culture-of-upbringing with a religious institution (Yes; No). If they responded “yes” to either of these questions, they were given the opportunity to write which religion. Participants were asked whether they were completing the survey as part of university involvement (Yes; No). Participants also completed the following measures.

SNAS. Based on the results of the previous study, a revised list of items was administered to measure worldview beliefs across seven factors: Mysticism (mystical experiences and beliefs), Spiritual Practices (organised spirituality and relationship with God or Higher Power), Spiritual Belief, Scientism (belief in validity of science and involvement in science), Naturalism (beliefs about natural laws), Strong Agnosticism (beliefs about there being no certain truths), and Weak Agnosticism (a lack of rigidity in personal beliefs and values). Together these factors were measured with a total of 35 items, each on a 5-point, fully labelled Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Participants were told to interpret the term “God” to mean any specific God, group of gods, Supreme Being, Greater Power, or Higher Intelligence, or to provide their own preferred term.

WFS. Based on the results of the previous study, a revised list of items was administered measuring Worldview Functionality across two factors, Benefit and Integration.
The previous study achieved simple structure with four items for each scale, but a further item was developed for each factor so that each factor could be represented by five items – when each common factor is represented by more items it puts less pressure on the sample size necessary for robust analyses with the scale in future studies (Fabrigar et al., 1999). These ten items were measured using a 5-point, fully labelled Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

**Individual Differences in Anthropomorphism Questionnaire (IDAQ).** Waytz, Cacioppo, and Epley's (2010) IDAQ (measures tendencies for perceiving agency in objects and entities (e.g., “to what extent does the environment experience emotions?”), using 15 items on a Likert scale from 0 (not at all) to 10 (very much). The internal consistency for this scale was understandably poor, because the scale itself was intended to capture a spread of tendencies, rather than a unidimensional construct. However, Waytz et al. showed that the scale related logically with other anthropomorphism measures, and showed good predictive validity.

**Empathy and Systemising Quotients – Short Form.** Wakabayashi et al.'s (2006) short forms of the Empathy Quotient and Systemising Quotient measure tendencies to use social and mechanical cognition (e.g., “I can pick up quickly if someone says one thing but means another,” and “I am fascinated by how machines work”). Forty-seven items on a scale from 1 (Strongly Disagree) to 4 (Strongly Agree) were derived from the largely accepted longer format, showing good internal consistency (α > .89) and correlations with the original longer forms (Wakabayashi et al., 2006).

**Rational-Experiential Inventory.** Epstein, Pacini, Denes-Raj, and Heier's (1996) Rational-Experiential Inventory measures Need for Cognition (e.g., “I prefer complex to simple problems”) and Faith in Intuition (e.g., “I trust my initial feelings about people”),
using ten items on a scale from 1 (completely false) to 5 (completely true). Epstein et al. (1996) showed that the two factors both have acceptable internal consistency ($\alpha > .71$).

**Moral Foundations Questionnaire.** Graham et al.'s (2011) Moral Foundations Questionnaire measures the level of importance participants ascribe to certain moral concerns, using 20 items across two parts. The first part assesses the level of importance people place on certain aspects of morality when making decisions (e.g., “whether or not someone suffered emotionally”), while the second part assesses attitudes about moral domains (e.g., “compassion for those who are suffering is the most crucial virtue”). Both scales are measured from 1 (not at all relevant/strongly disagree) to 6 (extremely relevant/strongly agree). Graham et al. have shown that the MFQ has good reliability, construct validity, and predictive validity.

**Death Anxiety.** Two subscales from Wittkowski's (2001) Multidimensional Orientation Towards Dying and Death Inventory were used to measure Fear of One’s Own Death (e.g., “I am frightened by the by the idea that all my thoughts and feelings will stop when I am dead”) and Fear of Another Person’s Death (e.g., “I am afraid of losing loved ones through death”), using ten items on a scale from 1 (agree not at all) to 4 (agree almost totally). Wittkowski showed that these two subscales had good internal consistency ($\alpha > .87$) and test-retest reliability.

**Positive and Negative Affect.** Following methods of Gallagher, Lopez, and Preacher (2009) in their measure of hierarchical well-being, positive and negative affect were measured with six items asking participants how often they experience different emotions (e.g., nervous, content) on a scale from 1 (very slightly or not at all) to 5 (extremely). In the current study internal consistency was appropriate for both Negative Affect ($\alpha = .75$) and Positive Affect ($\alpha = .81$).
**Subjective Happiness Scale.** Lyubomirsky and Lepper's (1999) Subjective Happiness Scale measures how participants consider themselves generally, and when compared to others, using several 7-point scales (e.g., between *not a very happy person* and *a very happy person*). Gallagher et al. (2009) used this measure in their hierarchical model of well-being and found that it showed good internal consistency (α = .87).

**Scales of Psychological Well-Being.** Ryff and Keyes' (1995) Scales of Psychological Well-Being measures six facets of eudaimonic well-being (Purpose in Life, Autonomy, Environmental Mastery, Quality of Relationships, Personal Growth, and Self-Acceptance), using 18 items on a scale from 1 (*strongly disagree*) to 6 (*strongly agree*). Herholdt (2012) found that the internal consistency for each of the six facets was acceptable (Self-Acceptance, α = .84; Environmental Mastery, α = .80; Positive Relations, α = .84; Purpose in Life, α = .80; Personal Growth, α = .75; Autonomy, α = .76).

**Meaning in Life.** The Presence subscale of Steger, Frazier, Oishi, and Kaler's (2006) Meaning in Life Questionnaire was used to measure the present level of meaning (e.g., “I understand my life’s meaning”) using five items on a scale from 1 (*absolutely untrue*) to 7 (*absolutely true*). Steger et al. found that the subscale had good internal consistency (α > .82).

**Social Well-Being.** Keyes' (1998) Social Well-Being measure assesses various aspects of social well-being (Integration, Contribution, Coherence, Actualisation, and Acceptance; e.g., “I feel close to other people in my community”) using 15 items on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). The scale was validated by Keyes, and recent tests have shown that its subscales generally had appropriate internal consistency (Gallagher et al., 2009).
7.2.3 Procedure

In line with the previous study, participants were offered a chance to win one of four $250 gift vouchers, in order to increase responses without compromising data quality (Deutskens et al., 2014; Göritz, 2004). This was run the same way as in the previous study, whereby participants were given the option to voluntarily provide their contact details in order to participate in the lottery, provided that they were not completing the study as part of their university course. Respondents were told that their contact information would not be linked to their questionnaire responses but stored in a separate file so as to protect their anonymity. Upon completion of data collection, all participants who provided contact details were put into a database and four winners were selected using SPSS random number generator.

After receiving ethics approval, a questionnaire was made available online using Qualtrics software. Most participants were recruited from a community sample of convenience, via email and word-of-mouth. Some participants were recruited as part of their assessment for an undergraduate psychology degree. All participants completed the online survey voluntarily in their own time. The survey was accessible for four months and during that time it received 1069 attempts, and 873 complete responses, indicating a return rate of 82%.

7.3 Results

7.3.1 Data Screening

All analyses were conducted using SPSS version 22 and AMOS Graphics version 22. Before analysis, demographic variables were examined for inaccurate responses. The dataset was examined for missing values across all of the variables and within each separate
construct, using Little's (1988) MCAR test at the \( p < .001 \) level. None of the constructs had 1\% of data missing, and no case had 3\% of data missing.

Across all of the variables, Little's MCAR test showed that missing values were not missing completely at random (\( \chi^2 (28174) = 29117.37, p < .001 \)). Examination of the missing values pattern output showed no discernible pattern, and so it was concluded that these values were missing at random. Little's MCAR test showed that missing values were missing completely at random across the total SNAS inventory (\( \chi^2 (693) = 585.93, p = .934 \)), as well as each of the SNAS factors (Mysticism, \( \chi^2 (11) = 14.22, p = .221 \); Spiritual Practice, \( \chi^2 (6) = 7.95, p = .242 \); Spiritual Belief, \( \chi^2 (12) = 15.40, p = .220 \); God/Higher Power, \( \chi^2 (2) = 2.74, p = .255 \); Physicism, \( \chi^2 (14) = 11.68, p = .632 \); Scientism, \( \chi^2 (16) = 7.16, p = .970 \); Weak Agnosticism, \( \chi^2 (3) = 1.01, p = .799 \); and Strong Agnosticism, \( \chi^2 (6) = 3.54, p = .739 \).

Little's MCAR test also showed that missing values were missing completely at random for the Worldview Functionality items (\( \chi^2 (54) = 42.64, p = .868 \)), and for each worldview functionality variable separately (Integration, \( \chi^2 (12) = 6.97, p = .859 \); Benefit, \( \chi^2 (12) = 11.77, p = .464 \)). Little's MCAR test also showed that missing values were missing completely at random for the anthropomorphism items (\( \chi^2 (168) = 191.98, p = .099 \)), the EQ/SQ items (Total, \( \chi^2 (1377) = 1441.22, p = .112 \); EQ, \( \chi^2 (293) = 339.90, p = .031 \); SQ, \( \chi^2 (382) = 387.65, p = .410 \)), the Rational/Experiential Inventory (Total, \( \chi^2 (45) = 47.73, p = .362 \); Intuition, none missing; Need for Cognition, \( \chi^2 (20) = 19.55, p = .486 \)), the moral Foundations Questionnaire (Total, \( \chi^2 (209) = 191.12, p = .807 \); Moral Relevance, \( \chi^2 (63) = 62.55, p = .492 \); Moral Judgement, \( \chi^2 (36) = 31.82, p = .668 \)), the PANAS (Total, \( \chi^2 (19) = 18.24, p = .506 \); Positive, \( \chi^2 (5) = 3.63, p = .603 \); Negative, \( \chi^2 (2) = 1.68, p = .433 \)), the Subjective Happiness Survey (\( \chi^2 (11) = 9.52, p = .574 \)), Scales of Psychological Well-Being (Total, \( \chi^2 (182) = 153.63, p = .938 \); Self-Acceptance, \( \chi^2 (4) = 8.89, p = .064 \); Purpose in Life, \( \chi^2 (2) = 0.16, p = .922 \); Personal Growth, \( \chi^2 (4) = 7.63, p = .106 \); Quality of Relationships, \( \chi^2 \).
While Little's MCAR test showed that missing values were missing completely at random for anxiety around death of others ($\chi^2 (3) = 5.44, p = .142$), they were not missing completely at random for anxiety around death of self ($\chi^2 (24) = 67.41, p < .001$). Examination of the missing values in this construct showed no discernible pattern, and so it was concluded that these values were missing at random. Based on these findings, it was deemed appropriate to impute all missing values using the expectation maximisation method (Schafer & Graham, 2002; Tabachnick & Fidell, 2014). This was done separately within each of the construct item groups.

The items showed mostly non-linear relationships, non-normal distributions, significant skewness and kurtosis, and heteroscedasticity. However, transformation of variables was not desirable because that would obfuscate interpretation of structural equation models. Moreover, departures from multivariate assumptions were to be expected with Likert-scale data, and, as previously mentioned, evidence suggests that parametric tests do provide robust results despite the violation of these assumptions (Norman, 2010). Some cases were detected that might have represented univariate outliers, however it was decided to not remove these extreme scores, as some extreme $z$-scores are to be expected in large samples (Tabachnick & Fidell, 2014). Rather than scan the complete data set for multivariate outliers, this was done for each separate analysis, as each analysis used different sets of variables.
7.3.2 Measurement Models

The main aim of the current study was to use path analyses to determine the impact of cognition on worldviews, and worldviews on well-being outcomes. However, before doing this, measurement models needed to be tested in order to statistically support the way that each variable would be represented in the path analyses. The intention was to first clarify that each variable could be represented in a structural equation model with good fit, and second to determine whether the models representing each variable could be simplified to represent each variable in the most statistically sound manner, but with the fewest parameters. The less parameters needed for each variable, the greater the chance that a path analysis would be able to assess all of the cognitive, worldview, and well-being variables simultaneously and with robust findings. Ideally, the intention was the represent each construct using a single-indicator latent variable.

For all measurement models, confirmatory factor analysis with maximum likelihood estimation was used to analyse the data. However, maximum likelihood estimation assumes multivariate normality and the data was non-normal. Therefore, 1000 bootstrap samples with replacement were used to generate an adjusted chi-square distribution, resulting in the Bollen-Stine bootstrap alpha. Bootstrapping was also used to generate 95% bias-corrected confidence intervals for relevant parameters.

7.3.2.1 SNAS

The SNAS items were examined for multivariate outliers. Cases with Mahabalanobis distances at the $p < .001$ significance level were removed from the dataset and then the dataset was scanned again. Four iterations uncovered 58 multivariate outliers. Although these cases typically displayed extreme responses across many items, discriminant function analyses for initial iterations did not show any discernible pattern of items that accounted for
many cases. The subsequent confirmatory factor analysis was conducted with and without multivariate outliers in the dataset, and there were no substantial differences in results. Therefore, the following results are reported with multivariate outliers present.

Table 18 shows the means, standard deviations, range, correlations, and Cronbach’s alpha score for the worldview factors and their sub-factors. First, the original model with Spirituality and Naturalism as second-order latent variables (see Figure 4, p. 128). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. However, other fit indices were adequate ($CFI = .94$, $TLI = .93$, $RMSEA = .05$, $SRMR = .06$). The participant/parameter ratio was acceptable (6.47). Table 19 shows the regression weights between the latent factors.

In order to allow for better participant-parameter ratios in subsequent path analyses, it was ideal that the SNAS domains could be represented with fewer parameters. For this reason, a second model was tested, in which each factor was represented as a single-indicator latent variable. This was justified by the large standardised regression weights for both the individual items from their respective factors, as well as for Spirituality and Naturalism from their higher-order factors. It was also justified by the large Cronbach’s alpha scores for all factors and higher-order factors, indicating that they can each be treated as unidimensional variables. For all of the five factors (Spirituality, Naturalism, Mysticism, Strong Agnosticism, and Weak Agnosticism), Munck’s (1979) formula was used with current standard deviations and Cronbach’s alpha scores to calculate the regression coefficient and error variance so that this could be accounted for in the model.

Figure 6 below shows the measurement model for the SNAS factors as single-indicator latent variables. Correlations in the model were informed by previously found associations between the factors (see Table 18), and modification indices did not suggest further correlations. The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was
Table 18

Correlations, Means, Standard Deviations, Ranges, and Cronbach’s Alphas for SNAS Scores

<table>
<thead>
<tr>
<th></th>
<th>Mysticism</th>
<th>Naturalism</th>
<th>Strong Ag.</th>
<th>Weak Ag.</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Spirituality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.58** (.51, .64)**</td>
<td>-70** (-.75, -.64)**</td>
<td>-.19** (-.26, -.11)**</td>
<td>.02 (-.06, .09)</td>
<td>31.91</td>
<td>13.56</td>
<td>12-60</td>
<td>.94</td>
</tr>
<tr>
<td>God/Higher Power</td>
<td></td>
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<td></td>
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<td></td>
<td>7.08</td>
<td>4.05</td>
<td>3-15</td>
<td>.90</td>
<td></td>
<td></td>
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<td>Sp. Practice</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>9.26</td>
<td>5.01</td>
<td>4-20</td>
<td>.90</td>
<td></td>
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<td>Sp. Belief</td>
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<td></td>
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<tr>
<td></td>
<td>15.58</td>
<td>6.10</td>
<td>5-25</td>
<td>.92</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mysticism</td>
<td>-.45** (-.52, -.37)**</td>
<td>.05 (-.03, .13)</td>
<td>.16** (.08, .24)**</td>
<td>11.63</td>
<td>5.68</td>
<td>5-25</td>
<td>.86</td>
<td></td>
</tr>
<tr>
<td>3. Naturalism</td>
<td></td>
<td>.09 (.00, .17)</td>
<td>-.05 (-.03, .13)</td>
<td>32.34</td>
<td>8.57</td>
<td>10-50</td>
<td>.89</td>
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<tr>
<td>4. Strong Agnosticism</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>.16** (.07, .24)**</td>
<td>14.81</td>
<td>3.88</td>
<td>4-20</td>
<td>.79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Weak Agnosticism</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>8.13</td>
<td>3.81</td>
<td>4-20</td>
<td>.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 873

Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001
Table 19

Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for Confirmatory Factor Analysis of SNAS (see Figure 4)

<table>
<thead>
<tr>
<th>Factors</th>
<th>Regressions</th>
<th>Items</th>
<th>Regressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spirituality</td>
<td></td>
<td>I look to a spiritual community for support in tough times.</td>
<td>.83*** (.80, .85)**</td>
</tr>
<tr>
<td>Sp. Practice</td>
<td>.90*** (.86, .92)**</td>
<td>I participate in spiritual ceremonies with other people.</td>
<td>.81*** (.78, .84)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My life involves spiritual rituals or behaviours (e.g., prayer, meditation).</td>
<td>.82*** (.80, .85)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I follow guidance from spiritual leaders.</td>
<td>.87*** (.85, .89)**</td>
</tr>
<tr>
<td>God/HP</td>
<td>.98*** (.96, 1.00)**</td>
<td>In order to lead a full life, there must be some attention given to God, a Higher Power, or spirit.</td>
<td>.86*** (.84, .88)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Humans should live according to the will of God or a Higher Power.</td>
<td>.84*** (.82, .86)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I have a personal relationship with God or a Higher Power.</td>
<td>.90*** (.88, .91)**</td>
</tr>
<tr>
<td>Sp. Belief</td>
<td>.80*** (.77, .83)**</td>
<td>The universe unfolds according to a plan, or a conscious will.</td>
<td>.78*** (.75, .81)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is an ultimate meaning and purpose for life.</td>
<td>.83*** (.81, .86)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There exists an essential justice in the universe (e.g., karma, divine judgment).</td>
<td>.78*** (.75, .81)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is a divine purpose for each person's life.</td>
<td>.92*** (.90, .93)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is some form of life after death.</td>
<td>.82*** (.79, .84)**</td>
</tr>
<tr>
<td>Mysticism</td>
<td></td>
<td>Sometimes it seems as if my spirit, soul, or consciousness has merged or connected with someone else.</td>
<td>.67*** (.62, .72)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I have had an experience in which all things seemed sacred.</td>
<td>.75*** (.72, .79)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I have had an experience in which I seemed to transcend time and space, or time and space ceased to exist.</td>
<td>.77*** (.73, .80)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I have had an experience in which ultimate reality was revealed to me.</td>
<td>.72*** (.68, .76)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I have had an experience in which I merged completely with everything that exists.</td>
<td>.80*** (.77, .84)**</td>
</tr>
<tr>
<td>Naturalism</td>
<td></td>
<td>When trying to understand reality, people should assume that there is only physical matter.</td>
<td>.74*** (.70, .78)**</td>
</tr>
<tr>
<td>Physicism</td>
<td>.89*** (.85, .94)**</td>
<td>Reality is purely physical.</td>
<td>.70*** (.65, .74)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My choices are caused by purely physical events in my brain and body.</td>
<td>.74*** (.70, .78)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>People are really just organised physical matter.</td>
<td>.78*** (.74, .81)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Human consciousness is a by-product of the brain and body; it is controlled by physical forces and natural laws.</td>
<td>.70*** (.65, .74)**</td>
</tr>
<tr>
<td>Scientism</td>
<td>.81*** (.76, .86)**</td>
<td>I trust in the knowledge and wisdom of scientific experts.</td>
<td>.67*** (.62, .71)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>We should believe in what is scientifically proven with physical evidence.</td>
<td>.80*** (.77, .83)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Natural science provides true knowledge about the universe.</td>
<td>.60*** (.54, .64)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To know anything with certainty, we have to test it with the scientific method.</td>
<td>.78*** (.75, .81)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In order to discover true information, people should use physical senses and logic.</td>
<td>.73*** (.69, .77)**</td>
</tr>
<tr>
<td>Weak Ag.</td>
<td></td>
<td>My beliefs change from moment to moment.</td>
<td>.70*** (.65, .74)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My beliefs about reality change when it suits me.</td>
<td>.84*** (.81, .86)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I change my beliefs to suit each situation I am in.</td>
<td>.84*** (.82, .87)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My values change depending on my circumstances.</td>
<td>.72*** (.68, .76)**</td>
</tr>
<tr>
<td>Strong Ag.</td>
<td></td>
<td>There is no set of beliefs that can ever be completely true.</td>
<td>.68*** (.62, .72)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>It is not possible to know the absolute truth about anything.</td>
<td>.68*** (.62, .72)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No form of knowledge can be completely certain.</td>
<td>.69*** (.63, .73)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In the grand scheme of things, there are no absolute truths.</td>
<td>.75*** (.71, .79)**</td>
</tr>
</tbody>
</table>

N = 873

Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001
significant \( (p = .007) \), indicating a good model fit. Other fit indices were also good (CFI = .99, TLI = .97, RMSEA = .05, SRMR = .03). The participant/parameter ratio was acceptable (33.58). Table 20 shows the correlations and standardised regression weights for the factors. It was decided that the single-indicator latent variables for the SNAS domains would be used in subsequent path analyses.

Table 20

<table>
<thead>
<tr>
<th>Factors</th>
<th>Regressions</th>
<th>Mys</th>
<th>Nat</th>
<th>W.A.</th>
<th>S.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spirituality</td>
<td>.97 (.97, .97)**</td>
<td>.62*** (.57, .66)**</td>
<td>-66*** (-.70, -.62)**</td>
<td>-</td>
<td>-.14*** (-.20, -.09)**</td>
</tr>
<tr>
<td>Mysticism</td>
<td>.93 (.93, .94)**</td>
<td>-.43*** (-.49, -.37)**</td>
<td>.12*** (.06, .18)**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Naturalism</td>
<td>.94 (.94, .95)**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Weak Ag.</td>
<td>.93 (.93, .94)**</td>
<td>.17*** (.10, .25)**</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Strong Ag.</td>
<td>.89 (.88, .90)**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *\( p < .05 \), **\( p < .01 \), ***\( p < .001 \)
7.3.2.2 Worldview Functionality Scale

The WFS items were examined for multivariate outliers. Cases with Mahabalanobis distances at the $p < .001$ significance level were removed from the dataset and then the dataset was scanned again. Four iterations uncovered 31 multivariate outliers. Although these cases typically displayed extreme responses across many items, discriminant function analyses for initial iterations did not show any discernible pattern of items that accounted for many cases. The subsequent confirmatory factor analysis was conducted with and without multivariate outliers in the dataset, and there were no substantial differences in results. Although removing multivariate outliers changed the chi-square and Bollen-Stine goodness-of-fit results to significant, the other fit indices and regressions were still satisfactory. Therefore, the following results are reported with multivariate outliers present in the data.

Confirmatory factor analysis showed that both factors (Integration and Benefit) each had two items with low regression coefficients ($< .50$). The two unsatisfactory items in the Integration factor both related to the level of disclosure that one could make about their beliefs with other people (“If other people knew what my real beliefs were, they would be accepting of them”, and “I can be completely open about my belief system with other people”). The other three items in this factor were related to the level of agreement and understanding that can be shared with other people, and so it seemed that the difference related to an element of social acceptance or extraversion that was not ideally to be measured with this inventory. The two unsatisfactory items in the Benefit factor both related to an abstract sense of effective action in life (“My belief system helps me to get things done effectively”, and “my beliefs about reality help me to live my life well”). Conceptually, these two items do not fit as neatly with the other three items of this factor, and they negatively influenced the model fit. For these reasons, the four items were removed from the final model.
The final model contained two latent factors each explaining the variance in three measured items. Table 21 shows regression weights for each item. The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was not significant ($p = .004$), indicating a good model fit. Other fit indices were also good (CFI = .99, TLI = .99, RMSEA = .05, SRMR = .03). The participant/parameter ratio was good (41.57). The two factors were tested to be correlated, but results showed no significant relationship ($r = .01, p = .85; CI = -.06, .09, p = .85$). A second model was tested, in which both integration and benefit were represented as single indicator latent variables. The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was not significant ($p = .728$), indicating a good model fit. It was decided that, using Munck's (1979) formula, two single-indicator latent variables could be used to test the two domains of worldview functionality in subsequent analyses.

Table 21

*Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for Confirmatory Factor Analysis with WFS*

<table>
<thead>
<tr>
<th>Factor</th>
<th>$\alpha$</th>
<th>Item</th>
<th>Regressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration</td>
<td>.83</td>
<td>My beliefs about reality are shared by most other people.</td>
<td>.89*** (.85, .93)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My beliefs about reality would make sense to most other people.</td>
<td>.71*** (.67, .75)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I agree with most other people’s beliefs about reality.</td>
<td>.76*** (.72, .79)**</td>
</tr>
<tr>
<td>Benefit</td>
<td>.90</td>
<td>My beliefs are useful for people’s lives.</td>
<td>.84*** (.82, .87)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My beliefs about reality can lead to a real positive difference in the world.</td>
<td>.85*** (.82, .87)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My beliefs have value; they can make life better for people.</td>
<td>.91*** (.89, .93)**</td>
</tr>
</tbody>
</table>

$N = 873$

*Note.* Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, $^*p < .05$, $^**p < .01$, $^***p < .001$
7.3.2.3 Anthropomorphism

Waytz et al.'s (2010) IDAQ was originally created as a unidimensional measure of the individual tendency to anthropomorphise. However, when the 15 items were represented as a unidimensional model under one latent factor, the ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant \( (p < .001) \), indicating a less-than-ideal model fit, and all other fit indices were also inadequate \( (\text{CFI} = .55, \text{TLI} = .48, \text{RMSEA} = .20, \text{SRMR} = .17) \).

The 15-item scale contains five items that measure tendencies to anthropomorphise technological objects (e.g., cars, computers), five items related to objects in the environment (e.g., the ocean, mountains), and five items related to animals (e.g., fish, cheetah). The fit of the model was greatly improved when items were organised into their respective dimensions (see Figure 7; Full Model). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant \( (p < .001) \), indicating a less-than-ideal model fit. However, other fit indices were adequate \( (\text{CFI} = .94, \text{TLI} = .92, \text{RMSEA} = .08, \text{SRMR} = .05) \). The participant/parameter ratio was good \( (15.87) \). Table 22 below shows regression weights for each item.

One could argue that the regression weights from the second-order latent factor Anthropomorphism is less than adequate in explaining the variance in the three latent factors. In other words, it could be argued that this scale is best represented as three correlated factors not explained by the higher order variable. However, even if the higher-order Anthropomorphism factor represents a relatively small amount of variance shared by the three domains, it is this shared variance that could be said to represent generalised Anthropomorphism tendencies, and this is what is of interest in the current study. With this in mind, and the encouraging goodness of fit indices for the three-factor model, it was decided to represent Anthropomorphism in a simplified model, as a latent variable explaining the variance in the three summed factors (see Figure 7; Summed Model). There were not enough degrees of freedom to compute probability for this model, but minimum was achieved.
Table 22

*Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for Confirmatory Factor Analysis of Individual Differences in Anthropomorphism Scale*

<table>
<thead>
<tr>
<th>Factor</th>
<th>α</th>
<th>Item</th>
<th>Regressions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(To what extend does X have mind, intentions, consciousness, etc.?)</td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td>.80</td>
<td>.45*** (.33, .55)** Devices and machines</td>
<td>.57** (.51, .62)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Television set</td>
<td>.68*** (.63, .72)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Computer</td>
<td>.71*** (.67, .75)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Robot</td>
<td>.77*** (.73, .80)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Car</td>
<td>.80*** (.76, .83)**</td>
</tr>
<tr>
<td>Environment</td>
<td>.90</td>
<td>1.19*** (1.00, 1.54)** Environment</td>
<td>.74*** (.70, .77)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tree</td>
<td>.80*** (.76, .82)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mountain</td>
<td>.79*** (.76, .82)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wind</td>
<td>.86*** (.84, .88)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ocean</td>
<td>.87*** (.85, .89)**</td>
</tr>
<tr>
<td>Animals</td>
<td>.89</td>
<td>.37*** (.26, .45)** Fish</td>
<td>.72*** (.68, .76)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cheetah</td>
<td>.74*** (.70, .78)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cow</td>
<td>.75*** (.71, .78)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Insect</td>
<td>.85*** (.82, .87)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reptile</td>
<td>.85*** (.82, .87)**</td>
</tr>
</tbody>
</table>

N = 873

*Note.* Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001

7.3.2.4 Empathy Quotient

When Wakabayashi et al.'s (2006) short form of the Empathy Quotient was represented in a measurement model in which a latent variable explained the variance in all 22 items, the ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant
(p < .001), indicating a less-than-ideal model fit. Other fit indices were adequate (CFI = .82, TLI = .80, RMSEA = .09, SRMR = .07). However, the latent variable for Empathy Quotient explained an inadequate portion of variance in many items (e.g., in nine items less than 20% of variance was explained), which was problematic for the aim of representing the construct as a summed variable in future path analyses.

Muncer and Ling (2011) had developed a fifteen item version of the scale across three factors. However, their version contained items that were not included in Wakabayashi et al.’s (2006) short form of the scale. Therefore, in the current study only the cognition sub-factor was included. These five items were tested in a model explained by a latent variable representing empathetic cognition. The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant (p < .001), indicating a less-than-ideal model fit. However, other fit indices were improved (CFI = .96, TLI = .92, RMSEA = .12, SRMR = .04). Although

*Figure 7. Measurement models for Anthropomorphism.*
RMSEA was particularly high, this value is sensitive to degrees of freedom, and when
degrees of freedom are as low as in the current model, excessive RMSEA scores are expected
(Kenny, n.d.). The participant/parameter ratio was good (54.56). Table 23 shows regression
weights for each item under its respective factor. The internal reliability of the five item
measure was high ($\alpha = .84$). It was decided that, using Munck's (1979) formula, the summed
value of these five items would represent Empathetic Cognition using a single-indicator latent
variable in subsequent path analyses.

Table 23

*Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for
Confirmatory Factor Analysis of Empathy Quotient*

<table>
<thead>
<tr>
<th>Item</th>
<th>Regressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am good at predicting how someone will feel.</td>
<td>$.75*** (.71, .79)**</td>
</tr>
<tr>
<td>I am quick to spot when someone in a group is feeling awkward or</td>
<td>$.60*** (.56, .65)**</td>
</tr>
<tr>
<td>uncomfortable.</td>
<td></td>
</tr>
<tr>
<td>I can sense if I am intruding, even if the other person does not tell me.</td>
<td>$.64*** (.60, .69)**</td>
</tr>
<tr>
<td>I can tune into how someone else feels rapidly and intuitively.</td>
<td>$.82*** (.78, .85)**</td>
</tr>
<tr>
<td>I can easily work out what another person might want to talk about.</td>
<td>$.74*** (.70, .78)**</td>
</tr>
</tbody>
</table>

$N = 873$

*Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected
confidence intervals, *$p < .05$, **$p < .01$, ***$p < .001$*

7.3.2.5 Systemising Quotient

When Wakabayashi et al.'s (2006) short form of the Systemising Quotient was
represented in a measurement model in which a latent variable explained the variance in all
25 items, the ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. Other fit indices were also less than adequate
(CFI = .70, TLI = .67, RMSEA = .09, SRMR = .07).
Unlike with EQ, it is not possible to take one particular factor that can be said to represent the cognitive aspect of Systemising Quotient. The model was therefore changed in line with results found by Ling, Burton, Salt, and Muncer (2009), who represented Systemising Quotient using 18 items across four factors: Technicity, Topography, DIY, and Structure (see Figure 8; Full Model). When represented in a measurement model across these four factors, underneath a second-order latent factor to represent Systemising Quotient, the ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. However, other fit indices were improved (CFI = .86, TLI = .84, RMSEA = .07, SRMR = .07). The participant/parameter ratio was good (13.03). Table 24 shows regression weights for each item under its respective factor.

![Figure 8. Measurement models for Systemising Quotient.](image)
Table 24

Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for Confirmatory Factor Analysis of 4-Factor Model of Systemising Quotient

<table>
<thead>
<tr>
<th>Factor</th>
<th>Full Model</th>
<th>Simplified Model</th>
<th>Item</th>
<th>Full Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIY</td>
<td>.49</td>
<td>.66*** (.61, .71)**</td>
<td>If there is a problem with the electrical wiring in my home I would be able to fix it myself.</td>
<td>.51*** (.44, .57)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I find it difficult to understand instruction manuals for putting appliances together.</td>
<td></td>
</tr>
<tr>
<td>Topography</td>
<td>.70</td>
<td>.47*** (.40, .53)**</td>
<td>I find it difficult to read and understand maps.</td>
<td>.74*** (.68, .80)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I find it difficult to learn my way around a new city.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I can easily visualize how the motorways in my region link up.</td>
<td></td>
</tr>
<tr>
<td>Structure</td>
<td>.73</td>
<td>.69*** (.64, .74)**</td>
<td>In maths I am intrigued by the rules and patterns governing numbers.</td>
<td>.51*** (.45, .57)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>When I look at a piece of furniture I do notice details of how it was constructed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>When I look at a building I am curious about the precise way it was constructed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>When I hear the weather forecast I am not interested in the meteorological patterns.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>When I look at a mountain I think about how precisely it was formed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>When I am in a plane I do not think about the aerodynamics.</td>
<td></td>
</tr>
<tr>
<td>Technicity</td>
<td>.73</td>
<td>.72*** (.67, .77)**</td>
<td>If I were buying a car I would want to obtain specific information about its engine capacity.</td>
<td>.65*** (.61, .70)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I rarely read articles or web pages about new technology.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If I were buying a computer I would want to know exact details about its hard drive capacity and processor speed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If I were buying a stereo I would want to know about its precise technical features.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If I find it difficult to understand information the bank sends me on different investment and savings schemes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If I were buying a camera I would not look carefully at the quality of the lens.</td>
<td></td>
</tr>
</tbody>
</table>

*N = 873

Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001
In order to represent Systemising Quotient in subsequent path analyses using the fewest parameters, a simplified model was tested in which a latent variable explained the variance in the four summed factors (see Figure 8; Summed Model). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was not significant \( p = .428 \), indicating a good model fit.

7.3.2.6 Rational/Experiential Inventory

Faith in Intuition and Need for Cognition were tested in a measurement model where both of the latent factors explained the variance in each of their five items. The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant \( p < .001 \), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .94, TLI = .92, RMSEA = .08, SRMR = .06). The participant/parameter ratio was good (26.45). All items were significantly impacted by their respective latent factor. Table 25 below shows the regression weights for each item across both domains. The two factors were uncorrelated \( r = .12, p = .005; \) CI = .04, .19). Based on these findings, it was decided that both Need for Cognition and Faith in Intuition would be represented as two single-indicator latent variables in subsequent path analyses.

7.3.2.7 Hedonic Well-Being

In line with research into the structure of well-being (Gallagher et al., 2009), a model was tested in which the variance in Positive Affect, Negative Affect, and Subjective Happiness was explained by a second-order latent variable representing Hedonic Well-Being (see Figure 9; Full Model). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant \( p < .001 \), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .97, TLI = .96, RMSEA = .07, SRMR = .03). The participant/parameter ratio
Table 25

*Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for*

*Confirmatory Factor Analysis of Rational-Experiential Inventory*

<table>
<thead>
<tr>
<th>Factor</th>
<th>$\alpha$</th>
<th>Item</th>
<th>Regressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need for Cognition</td>
<td>.75</td>
<td>I don’t like to do a lot of thinking (reversed).</td>
<td>.84*** (.80, .88)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I try to avoid situations that require thinking in depth about something (reversed).</td>
<td>.76*** (.72, .79)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I prefer to do something that challenges my thinking abilities rather than something that requires little thought.</td>
<td>.56*** (.51, .62)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I prefer complex to simple problems.</td>
<td>.44*** (.37, .51)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thinking hard and for a long time about something gives me little satisfaction.</td>
<td>.48*** (.42, .53)**</td>
</tr>
<tr>
<td>Faith in Intuition</td>
<td>.88</td>
<td>I trust my initial feelings about people.</td>
<td>.80*** (.76, .82)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I believe in trusting my hunches.</td>
<td>.79*** (.75, .82)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My initial impressions of people are almost always right.</td>
<td>.77*** (.74, .80)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When it comes to trusting people, I can usually rely on my “gut feelings.”</td>
<td>.83*** (.81, .86)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I can usually feel when a person is right or wrong, even if I can’t explain how I know.</td>
<td>.66*** (.61, .70)**</td>
</tr>
</tbody>
</table>

$N = 873$

*Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *$p < .05$, **$p < .01$, ***$p < .001$*

was good (21.83). Table 26 shows the regression weights for each item across all three constructs.

In order to represent Hedonic Well-Being in subsequent path analyses using the fewest parameters, a simplified model was tested in which a latent variable explained the variance in the three summed factors. There were not enough degrees of freedom to compute
Figure 9. Measurement models for Hedonic Well-Being.

Table 26

Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for Confirmatory Factor Analysis of Positive Affect, Negative Affect, and Subjective Happiness

<table>
<thead>
<tr>
<th>Factor</th>
<th>$\alpha$</th>
<th>Item</th>
<th>Regressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA</td>
<td>.81</td>
<td>Calm and peaceful.</td>
<td>.72*** (.68, .75)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cheerful</td>
<td>.80*** (.76, .82)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Content</td>
<td>.79*** (.76, .82)**</td>
</tr>
<tr>
<td>NA</td>
<td>.75</td>
<td>Nervous</td>
<td>.62*** (.56, .67)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worthless</td>
<td>.74*** (.69, .78)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sad</td>
<td>.79*** (.75, .82)**</td>
</tr>
<tr>
<td>SH</td>
<td>.88</td>
<td>In general…</td>
<td>.70*** (.67, .73)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compared to others…</td>
<td>.90*** (.88, .91)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Happy characterisation…</td>
<td>.85*** (.83, .87)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not happy characterisation…</td>
<td>.83*** (.80, .85)**</td>
</tr>
</tbody>
</table>

$N = 873$

Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, $^*p < .05$, $^{**}p < .01$, $^{***}p < .001$

the probability level for this model, however minimum was achieved. Based on the above findings, it was decided to represent Hedonic Well-Being in a simplified model, as a latent
variable explaining the variance in the three summed factors (see Figure 9; Summed Model).

7.3.2.8 Psychological Well-Being

The Scales of Psychological Well-Being (Ryff, 1995) were initially represented with all six domains explaining the variance in their three respective items, underneath a second-order latent variable representing general Psychological Well-Being (see Figure 10; Full Model). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. Other fit indices were also less than adequate (CFI = .81, TLI = .78, RMSEA = .08, SRMR = .09). The participant/parameter ratio was good (11.96). Table 27 shows the regression weights for each item and factor.

Figure 10. Measurement models for Psychological Well-Being.
Table 27
Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for Confirmatory Factor Analysis of Scales of Psychological Well-Being

<table>
<thead>
<tr>
<th>Factor</th>
<th>α</th>
<th>Full</th>
<th>Summed</th>
<th>Item</th>
<th>Regressions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I like most aspects of my personality.</td>
<td>.50*** (.45, .55)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>In many ways, I feel disappointed by my achievements in life.</td>
<td>.64*** (.59, .68)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>When I look at the story of my life, I am pleased with how things have turned out.</td>
<td>.77*** (.73, .81)**</td>
</tr>
<tr>
<td>SA</td>
<td>.70</td>
<td>.88*** (.83, .93)**</td>
<td>.81*** (.78, .85)**</td>
<td>I live life one day at a time and don’t really think about the future.</td>
<td>.34*** (.30, .38)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I gave up trying to make big improvements or changes in my life a long time ago.</td>
<td>.53*** (.46, .59)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Some people wander aimlessly through life, but I am not one of them.</td>
<td>.66*** (.60, .72)**</td>
</tr>
<tr>
<td>Pu</td>
<td>.44</td>
<td>.91*** (.85, .98)**</td>
<td>.51*** (.46, .57)**</td>
<td>For me, life has been a continuous process of learning, changing, and growth.</td>
<td>.74*** (.69, .80)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I think it is important to have new experiences that challenge how you think about yourself and the world.</td>
<td>.67*** (.60, .72)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I sometimes feel as if I’ve done all there is to do in life.</td>
<td>.23*** (.15, .30)**</td>
</tr>
<tr>
<td>Gr</td>
<td>.51</td>
<td>.63*** (.57, .69)**</td>
<td>.46*** (.40, .52)**</td>
<td>People would describe me as a giving person, willing to share my time with others.</td>
<td>.51*** (.47, .55)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I have not experienced many warm and trusting relationships with others.</td>
<td>.67*** (.60, .73)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Maintaining close relationships has been difficult and frustrating for me.</td>
<td>.73*** (.66, .78)**</td>
</tr>
<tr>
<td>Rel</td>
<td>.60</td>
<td>.73*** (.68, .79)**</td>
<td>.60*** (.55, .65)**</td>
<td>The demands of everyday life often get me down.</td>
<td>.39*** (.34, .44)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>In general, I feel I am in charge of the situation in which I live.</td>
<td>.74*** (.69, .78)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I am quite good at managing the many responsibilities of my daily life.</td>
<td>.71*** (.66, .75)**</td>
</tr>
<tr>
<td>EM</td>
<td>.71</td>
<td>.86*** (.80, .91)**</td>
<td>.75*** (.71, .79)**</td>
<td>I tend to be influenced by people with strong opinions.</td>
<td>.51*** (.47, .55)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I judge myself by what I think is important, not by the values of what others think is important.</td>
<td>.51*** (.44, .58)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I have confidence in my opinions, even if they are contrary to the general consensus.</td>
<td>.74*** (.67, .80)**</td>
</tr>
<tr>
<td>Aut</td>
<td>.56</td>
<td>.62*** (.56, .67)**</td>
<td>.35*** (.28, .42)**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 873

Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001
Despite the somewhat low regression scores predicting variance in items from their respective sub-factor, the model representing Psychological Well-Being needed to be reduced in order to fit within larger path analyses. For this reason, a second model was tested in which general Psychological Well-Being explained the variance in each of the six summed factors (see Figure 10; Summed Model). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant \((p < .001)\), indicating a less-than-ideal model fit. However, other fit indices were adequate \((\text{CFI} = .95, \text{TLI} = .91, \text{RMSEA} = .09, \text{SRMR} = .05)\). The participant/parameter ratio was good \((45.95)\). In order to further reduce the number of parameters needed to include this model of Psychological Well-Being in subsequent path analyses, it was decided that these six facets would be summed so that the construct could be represented as a single-indicator latent variable. The internal reliability of all 18 items of the scale was high \((\alpha = .83)\).

### 7.3.2.9 Meaning in Life

Presence of Meaning was tested in a measurement model where a latent factor explained the variance in the five items. The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant \((p < .001)\), indicating a less-than-ideal model fit. However, other fit indices were adequate \((\text{CFI} = .99, \text{TLI} = .98, \text{RMSEA} = .08, \text{SRMR} = .02)\). The participant/parameter ratio was good \((54.56)\). Table 28 shows the regression weights for the model. Based on these findings, it was decided that Presence of Meaning would be represented as a single-indicator latent variable in subsequent path analyses.

### 7.3.2.10 Death Anxiety

Both the Death of Self and Death of Other factors were each assessed in a measurement model where they were influenced by a second-order Death Anxiety factor (see
Table 28

*Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for Confirmatory Factor Analysis of Meaning in Life*

<table>
<thead>
<tr>
<th>Factor</th>
<th>α</th>
<th>Item</th>
<th>Regressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence</td>
<td>.90</td>
<td>I have discovered a satisfying life purpose.</td>
<td>.81*** (.78, .84)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My life has no clear purpose.</td>
<td>.72*** (.68, .75)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I understand my life’s meaning.</td>
<td>.80*** (.77, .83)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My life has a clear sense of purpose.</td>
<td>.90*** (.88, .92)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I have a good sense of what makes my life meaningful.</td>
<td>.77*** (.74, .80)**</td>
</tr>
</tbody>
</table>

*N = 873

Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001

Figure 11; Full Model). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant (p < .001), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .96, TLI = .94, RMSEA = .11, SRMR = .06). The participant/parameter ratio was good (23.59). Table 29 shows the regression weights for the model. Based on these findings, it was decided that subsequent path analyses would represented both Death of Self and Death of Other as two single-indicator latent variables under the influence of a second-order general Death Anxiety variable.

![Full Model](image)

*Figure 11. Measurement models for Death Anxiety.*
Table 29

*Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for Confirmatory Factor Analysis of Death Anxiety*

<table>
<thead>
<tr>
<th>Factor</th>
<th>$\alpha$</th>
<th>$SRW$</th>
<th>Item</th>
<th>$SRW$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self</strong></td>
<td>.94</td>
<td>.79*** (.74, .83)**</td>
<td>The idea that my body will disappear after my death disturbs me.</td>
<td>.75*** (.72, .78)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I am frightened by the idea that all my thoughts and feelings will stop when I am dead.</td>
<td>.92*** (.91, .94)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Thinking beyond the threshold of my death makes me feel afraid.</td>
<td>.82*** (.79, .84)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The very idea that my entire personality will disappear forever with my death appals me.</td>
<td>.90*** (.88, .91)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The idea that I will never be able to think and experience anything after my death disturbs me.</td>
<td>.90*** (.88, .91)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The thought that I will be dead someday makes me apprehensive.</td>
<td>.80*** (.77, .83)**</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>.92</td>
<td>.73*** (.69, .78)**</td>
<td>I am afraid of losing loved ones through death.</td>
<td>.90*** (.88, .91)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The thought that a person close to me will simply disappear due to death appals me.</td>
<td>.76*** (.72, .79)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The thought of losing people close to me forever through death frightens me.</td>
<td>.91*** (.90, .93)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The possibility of losing another person forever through death disturbs me.</td>
<td>.87*** (.85, .89)**</td>
</tr>
</tbody>
</table>

$N = 873$

*Note.* Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *$p < .05$, **$p < .01$, ***$p < .001$*

### 7.3.2.11 Social Well-Being

The Scales of Social Well-Being (Keyes, 1998) were initially represented with all five domains explaining the variance in their three respective items, underneath a second-order latent variable representing general Social Well-Being (see Figure 12; Full Model). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. Other fit indices were also less than adequate (CFI = .84, TLI = .80, RMSEA = .09, SRMR = .07). The participant/parameter ratio was good (14.31). Table 30 shows the regression weights for each item and factor.

Despite the perhaps low regressions scores predicting variance in items from their respective sub-factor, the model representing Social Well-Being needed to be reduced in order to fit within larger path analyses. For this reason, a second model was tested in which
Social Well-Being explained the variance in each of the five summed factors (see Figure 12; Summed Model). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .90, TLI = .80, RMSEA = .13, SRMR = .05). The participant/parameter ratio was good (54.56). It is worth noting that modification indices suggested that the error variance for Actualisation and Acceptance be correlated, and that the error variance between Integration and Contribution be correlated, and these changes would have improved the fit indices into more acceptable levels (e.g., CFI = 95). However, these changes were not made. Instead, to further reduce the number of parameters needed to include this model of moral identity in subsequent path analyses, it was decided that these five facets would be summed.
Table 30

*Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for Confirmatory Factor Analysis of Scales of Social Well-Being*

<table>
<thead>
<tr>
<th>Factor</th>
<th>(\alpha)</th>
<th>Full (95%) CI</th>
<th>Summed (95%) CI</th>
<th>Item</th>
<th>Regressions (95%) CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration</td>
<td>.82</td>
<td>.68*** (.60, .75)**</td>
<td>.67*** (.61, .73)**</td>
<td>I feel close to other people in my community.</td>
<td>.85*** (.81, .88)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I don’t feel I belong to anything I’d call a community.</td>
<td>.74*** (.70, .78)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>My community is a source of comfort.</td>
<td>.76*** (.72, .79)**</td>
</tr>
<tr>
<td>Acceptance</td>
<td>.55</td>
<td>.89*** (.81, .97)**</td>
<td>.65*** (.59, .71)**</td>
<td>People who do a favour expect nothing in return.</td>
<td>.36*** (.27, .45)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I believe that people are kind.</td>
<td>.63*** (.56, .70)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>People do not care about other people’s problems.</td>
<td>.63*** (.56, .69)**</td>
</tr>
<tr>
<td>Contribution</td>
<td>.74</td>
<td>.62*** (.52, .70)**</td>
<td>.57*** (.49, .63)**</td>
<td>My daily activities do not produce anything worthwhile for my</td>
<td>.67*** (.62, .72)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I have nothing important to contribute to society.</td>
<td>.81*** (.77, .86)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I have something valuable to give to the world.</td>
<td>.65*** (.59, .70)**</td>
</tr>
<tr>
<td>Actualisation</td>
<td>.65</td>
<td>.80*** (.71, .88)**</td>
<td>.59*** (.52, .65)**</td>
<td>Society has stopped making progress.</td>
<td>.62*** (.57, .68)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The world is becoming a better place for everyone.</td>
<td>.52*** (.45, .58)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Society isn't improving for people like me.</td>
<td>.71*** (.65, .76)**</td>
</tr>
<tr>
<td>Coherence</td>
<td>.47</td>
<td>.61*** (.51, .70)**</td>
<td>.38*** (.31, .46)**</td>
<td>The world is too complex for me.</td>
<td>.65*** (.58, .74)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I find it easy to predict what will happen next in society.</td>
<td>.12** (.03, .21)*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I cannot make sense of what’s going on in the world.</td>
<td>.68*** (.59, .77)**</td>
</tr>
</tbody>
</table>

\(N = 873\)

*Note.* Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, \(*p < .05, **p < .01, ***p < .001*
so that Social Well-Being could be represented as a single-indicator latent variable. The internal reliability of all 15 items of the scale was high ($\alpha = .82$).

### 7.3.2.12 Moral Identity

Figure 13 below shows the path diagram used to test a model of Moral Identity, showing the variance of In-Group, Authority, and Purity domains (both relevance and judgment) as explained by the variance in a Binding factor, and the variance of Harm and Fairness domains (both relevance and judgment) as explained by the variance in an Individualising factor. The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. Other fit indices were adequate (CFI = .85, TLI = .82, RMSEA = .08, SRMR = .08). The participant/parameter ratio was good (9.39). Table 32 shows the regression weights for each item and factor. The two factors (Binding and Individualising) showed a significant, positive correlation ($r = .25, p < .001$; CI = .17, .33, $p < .01$). Table 31 shows the standardised regression weights, with bias-corrected confidence intervals for the Moral Identity model.

Despite the perhaps low regressions scores predicting variance in items from their respective sub-factor, the summed model representing the two facets of Moral Identity needed to be reduced in order to fit within larger path analyses. For this reason, a second model was tested in which the two facets (Binding and Individualising) explained the variance in each of the summed factors (see Figure 13, Summed Model). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .86, TLI = .82, RMSEA = .12, SRMR = .08). The participant/parameter ratio was good (26.45). The two factors (Binding and Individualising) showed a significant, positive correlation ($r = .26, p < .001$; CI = .18, .35). It is worth noting that modification indices suggested that the error variance for
Figure 13. Measurement model for Moral Identity.

Purity (relevance) and Ingroup (judgement) factors be correlated, as well as the error variance for Fairness (judgement) and Harm (judgement). This would have raised the fit indices into more acceptable levels (e.g., CFI = .90). However, rather than make these changes to the model, another model with further collation of factors was tested.
Table 31

Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for Confirmatory Factor Analysis of Moral Identity

<table>
<thead>
<tr>
<th>Factor</th>
<th>Full</th>
<th>Summed</th>
<th>Item</th>
<th>Regressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-group (Relevance)</td>
<td>.51</td>
<td>.97*** (.90, 1.05)**</td>
<td>Whether or not someone’s action showed love for his or her country.</td>
<td>.66*** (.60, .72)****</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.69*** (.63, .73)**</td>
<td>Whether or not someone did something to betray his or her group.</td>
<td>.52*** (.46, .58)****</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I am proud of my country’s history.</td>
<td>.61*** (.52, .68)****</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>People should be loyal to their family members, even when they have done so...</td>
<td>.47*** (.39, .54)****</td>
</tr>
<tr>
<td>Authority (Relevance)</td>
<td>.65</td>
<td>.96*** (.91, 1.01)**</td>
<td>Whether or not someone conformed to the traditions of society.</td>
<td>.60*** (.55, .65)****</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.75*** (.71, .79)**</td>
<td>Whether or not someone showed a lack of respect for authority.</td>
<td>.81*** (.76, .85)****</td>
</tr>
<tr>
<td>Authority (Judgment)</td>
<td>.44</td>
<td>.93*** (.85, 1.03)**</td>
<td>Men and women each have different roles to play in society.</td>
<td>.38*** (.31, .45)****</td>
</tr>
<tr>
<td>Purity (Relevance)</td>
<td>.69</td>
<td>.81*** (.75, .87)**</td>
<td>Whether or not someone did something disgusting.</td>
<td>.69*** (.63, .73)****</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.73*** (.69, .77)**</td>
<td>Whether or not someone violated standards of purity and decency.</td>
<td>.76*** (.71, .81)****</td>
</tr>
<tr>
<td>Purity (Judgment)</td>
<td>.67</td>
<td>.79*** (.72, .85)**</td>
<td>I would call some acts wrong on the grounds that they are unnatural.</td>
<td>.68*** (.63, .73)****</td>
</tr>
<tr>
<td>Harm (Relevance)</td>
<td>.74</td>
<td>.94*** (.90, .99)**</td>
<td>Whether or not someone cared for someone weak or vulnerable.</td>
<td>.74*** (.69, .79)****</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.82*** (.76, .86)**</td>
<td>Whether or not someone suffered emotionally.</td>
<td>.77*** (.73, .81)****</td>
</tr>
<tr>
<td>Harm (Judgment)</td>
<td>.51</td>
<td>.69*** (.60, .77)**</td>
<td>One of the worst things a person could do is hurt a defenceless animal.</td>
<td>.76*** (.72, .80)****</td>
</tr>
<tr>
<td>Fairness (Relevance)</td>
<td>.70</td>
<td>.97*** (.92, 1.02)**</td>
<td>Compassion for those who are suffering is the most crucial virtue.</td>
<td>.44*** (.36, .51)****</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.82*** (.77, .87)**</td>
<td>One of the worst things a person could do is hurt a defenceless animal.</td>
<td>.80*** (.72, .91)****</td>
</tr>
<tr>
<td>Fairness (Judgment)</td>
<td>.46</td>
<td>.67*** (.57, .76)**</td>
<td>Whether or not someone acted unfairly.</td>
<td>.71*** (.67, .75)****</td>
</tr>
<tr>
<td>Summed</td>
<td></td>
<td>.60</td>
<td>When the government makes laws, the number one principle should be ensuring...</td>
<td>.45*** (.37, .53)****</td>
</tr>
<tr>
<td>Summed</td>
<td></td>
<td>.68</td>
<td>When the government makes laws, the number one principle should be ensuring...</td>
<td>.68*** (.59, .77)****</td>
</tr>
</tbody>
</table>

Summed α SRW
In-group .60 .73*** (.68, .77)**
Authority .68 .87*** (.83, .91)**
Purity .76 .73*** (.68, .82)**
Harm .69 .70*** (.56, .82)**
Fairness .66 .87*** (.74, 1.08)**

Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001
In order to further improve model fit and reduce the number of parameters needed to include this model of Moral Identity in subsequent path analyses, another model was tested in which both the judgment and relevance sub-factors were summed within each domain (In-group, Authority, Purity, Harm, and Fairness; See Figure 13, Summed Model). The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .98, TLI = .94, RMSEA = .10, SRMR = .03). Although RMSEA was particularly high, this value is sensitive to degrees of freedom, and when degrees of freedom are as low as in the current model, excessive RMSEA scores are expected (Kenny, n.d.). The participant/parameter ratio was good (34.92). The two factors (Binding and Individualising) showed a significant, positive correlation ($r = .25$, $p < .001$; CI = .16, .34).

### 7.3.3 Path Analyses

Using the measurement models ascertained above, the path analyses presented in the current section aimed to investigate whether the cognitive variables would influence the five worldview domains, and whether the worldview domains would influence the well-being outcomes. Due to the number of parameters needed to represent all cognitive variables, worldview variables, and outcome variables, it was not possible to demonstrate all of these relationships in one model – the results would not be robust with the current sample size. Therefore, one model was used to test the relationship between cognition and worldviews, and another was used to test the relationship between worldviews and well-being outcomes. A third model was used to test the relationship between worldviews and well-being outcomes, as mediated by Meaning in Life. Finally, a fourth model was used to test the relationship between worldviews and Moral Identity.
7.3.3.1 Cognition

The model used to test the impact of cognitive variables on worldview domains is shown below in Figure 14. Correlations between the cognitive predictors were included in the model based on modification indices. The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant \( (p < .001) \), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .94, TLI = .90, RMSEA = .05, SRMR = .04). The participant/parameter ratio was good (9.00). All of the latent factors showed significant regressions for their summed factors, essentially unchanged from results in the previous measurement models. Table 32 shows the standardised regression weights between the cognitive and worldview variables for the model. Correlations between the worldview domains were relatively unchanged from the measurement model. Correlations between the cognitive variables are shown in Table 33.

*Figure 14.* Path analysis between cognitive variables and SNAS.
Table 32

*Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for Path Analysis between Cognitive Variables and SNAS*

<table>
<thead>
<tr>
<th>Cognition</th>
<th>Naturalism</th>
<th>Spirituality</th>
<th>Mysticism</th>
<th>Strong Ag.</th>
<th>Weak Ag.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthro.</td>
<td>-.21*** (-.27, -.15)**</td>
<td>.28*** (.22, .35)**</td>
<td>.35*** (.27, .43)**</td>
<td>.06 (-.01, .13)</td>
<td>.10** (.03, .17)**</td>
</tr>
<tr>
<td>Empathy</td>
<td>-.17** (-.28, -.06)**</td>
<td>.16** (.05, .26)**</td>
<td>.23*** (.12, .34)**</td>
<td>.07 (-.05, .20)</td>
<td>-.08 (-.19, .03)</td>
</tr>
<tr>
<td>SQ</td>
<td>.24*** (.14, .32)**</td>
<td>-.04 (-.13, .05)</td>
<td>.18*** (.08, .26)**</td>
<td>-.11* (-.21, -.01)*</td>
<td>-.03 (-.13, .07)</td>
</tr>
<tr>
<td>NFC</td>
<td>.01 (-.09, .10)</td>
<td>-.12** (-.21, -.04)*</td>
<td>-.12** (-.21, -.03)**</td>
<td>.08 (-.02, .20)</td>
<td>-.25*** (-.34, -.15)**</td>
</tr>
<tr>
<td>FI</td>
<td>-.01 (-.13, .09)</td>
<td>.05 (-.07, .15)</td>
<td>-.05 (-.16, .06)</td>
<td>.07 (-.05, .20)</td>
<td>.01 (-.10, .13)</td>
</tr>
</tbody>
</table>

N = 873

*Note.* Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001
Table 33

Correlations with 95% Bias-Corrected Confidence Intervals between Cognitive Variables

<table>
<thead>
<tr>
<th></th>
<th>Anthro.</th>
<th>FI</th>
<th>NFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empathy</td>
<td>.16*** (.10, .24)</td>
<td>.61*** (.55, .66)**</td>
<td>.24*** (.16, .32)</td>
</tr>
<tr>
<td>SQ</td>
<td>-</td>
<td>-</td>
<td>.41*** (.33, .49)**</td>
</tr>
<tr>
<td>FI</td>
<td>.24*** (.16, .33)</td>
<td>-</td>
<td>.16*** (.07, .23)**</td>
</tr>
</tbody>
</table>

N = 873

Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001

7.3.3.2 Well-Being

A model was developed to test the impact of worldview domains on well-being outcomes, shown below in Figure 15. Error terms for Psychological Well-Being, Hedonic Well-Being, and Social Well-Being were correlated, to represent relationships demonstrated in Gallagher et al.'s (2009) confirmed model. The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant (p < .001), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .93, TLI = .87, RMSEA = .08, SRMR = .08). The participant/parameter ratio was acceptable (8.91). All of the latent constructs showed significant regressions for their summed factors, essentially unchanged from results in the previous measurement models. Table 34 shows the standardised regression weights and correlations between the error variance of well-being between the worldview domains and well-being variables in the model.
7.3.3.3 Meaning in Life

A final model was tested in which the worldview domains influenced all of the well-being outcome variables, mediated through Meaning in Life (see Figure 16). Again, error terms for Psychological Well-Being, Hedonic Well-Being, and Social Well-Being were correlated, to represent relationships demonstrated in Gallagher et al.'s (2009) confirmed model. The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .92, TLI = .89, RMSEA = .07, SRMR = .06). The participant/parameter ratio was acceptable (10.39). All of the latent constructs showed significant regressions for their summed factors, essentially unchanged from results in the previous measurement models. Table 35 shows the standardised regression weights between the cognitive and worldview variables in the model. Correlations between the worldview domains, and between the error variance of well-being models, remained relatively unchanged from the previous model.
Table 34

*Standardised Regression Weights and Error Correlations with 95% Bias-Corrected Confidence Intervals for Path Analysis between SNAS and Well-Being Variables*

<table>
<thead>
<tr>
<th>Worldviews</th>
<th>SWB</th>
<th>PWB</th>
<th>Hedonic</th>
<th>Death Anx.</th>
<th>Integration</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regressions:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Naturalism</td>
<td>.07 (.04, .12)</td>
<td>-.02 (-.13, .10)</td>
<td>.01 (-.01, .21)</td>
<td>.11 (-.01, .23)</td>
<td>.18** (.06, .30)**</td>
<td>.16*** (.06, .27)**</td>
</tr>
<tr>
<td>Spirituality</td>
<td>.12 (.00, .26)</td>
<td>.10 (-.02, .23)</td>
<td>.24*** (.13, .38)**</td>
<td>.13 (-.03, .26)</td>
<td>.34*** (.19, .46)**</td>
<td>.26*** (.15, .38)**</td>
</tr>
<tr>
<td>Mysticism</td>
<td>.17** (.05, .28)**</td>
<td>.07 (-.03, .17)</td>
<td>.05 (-.07, .16)</td>
<td>-.17** (-.30, -.05)*</td>
<td>-.29*** (-.41, -.18)**</td>
<td>.24*** (.15, .33)**</td>
</tr>
<tr>
<td>Strong Ag.</td>
<td>-.06 (-.15, .04)</td>
<td>.08* (.01, .18)</td>
<td>-.02 (-.11, .07)</td>
<td>.05 (-.05, .16)</td>
<td>-.03 (-.12, .07)</td>
<td>-.04 (-.11, .04)</td>
</tr>
<tr>
<td>Weak Ag.</td>
<td>-.19*** (-.27, -.11)**</td>
<td>-.37*** (-.45, -.30)**</td>
<td>-.19*** (-.26, -.12)**</td>
<td>.24*** (.15, .33)**</td>
<td>.09* (.01, .17)*</td>
<td>-.28*** (-.35, -.21)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlations:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PWB</td>
<td>.70*** (.64, .76)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hedonic</td>
<td>.64*** (.57, .69)**</td>
<td>.82*** (.77, .85)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*N = 873

*Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001*
Table 35

Standardised Regression Weights with 95% Bias-Corrected Confidence Intervals for Path Analysis between SNAS and Well-Being Variables via Meaning in Life

<table>
<thead>
<tr>
<th>Worldviews</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naturalism</td>
<td>.06 (-.05, .15)</td>
</tr>
<tr>
<td>Spirituality</td>
<td>.31*** (.19, .41)**</td>
</tr>
<tr>
<td>Mysticism</td>
<td>.16*** (.06, .25)**</td>
</tr>
<tr>
<td>Strong Ag.</td>
<td>.02 (-.05, .10)</td>
</tr>
<tr>
<td>Weak Ag.</td>
<td>-.30*** (-.37, -.23)**</td>
</tr>
</tbody>
</table>

N = 873

Well-Being Domains

<table>
<thead>
<tr>
<th></th>
<th>PWB</th>
<th>SWB</th>
<th>Hedonic</th>
<th>Death Anx.</th>
<th>Integration</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meaning</td>
<td>.73*** (.69, .77)**</td>
<td>.62*** (.57, .67)**</td>
<td>.67*** (.63, .72)**</td>
<td>-.20*** (-.27, -.12)**</td>
<td>.08* (-.00, .15)</td>
<td>.47*** (.39, .52)**</td>
</tr>
</tbody>
</table>

N = 873

*Note. Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001*
Figure 16. Path analysis between SNAS and well-being variables via meaning in life.

7.3.3.4 Moral Identity

Figure 17 below shows the model used to test the hypotheses regarding the impact of worldview domains on Moral Identity. The ML-with-bootstrapping Bollen-Stine goodness-of-fit test was significant ($p < .001$), indicating a less-than-ideal model fit. However, other fit indices were adequate (CFI = .98, TLI = .95, RMSEA = .05, SRMR = .03). The participant/parameter ratio was acceptable (15.59). All of the latent constructs showed significant regressions for their summed factors, essentially unchanged from results in the previous measurement models. Table 36 shows the standardised regression weights between the cognitive and worldview variables in the model. Correlations between the worldview domains were relatively unchanged from previous models, as was the correlation between the two domains of Moral Identity ($r = .25, p < .001; CI = .16, .34$).
Figure 17. Path analysis between SNAS and moral identity.

Table 36

*Standardised Regression Weights with Bias-Corrected Confidence Intervals for Path Analysis between SNAS and Moral Identity*

<table>
<thead>
<tr>
<th>Worldviews</th>
<th>Moral Identity</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Binding</td>
<td>Individising</td>
<td></td>
</tr>
<tr>
<td>Naturalism</td>
<td>.11* (.01, .21)*</td>
<td>.22*** (.09, .33)**</td>
<td></td>
</tr>
<tr>
<td>Spirituality</td>
<td>.67*** (.56, .78)**</td>
<td>.40*** (.28, .54)**</td>
<td></td>
</tr>
<tr>
<td>Mysticism</td>
<td>-.34*** (-.43, -.24)**</td>
<td>-.15** (-.26, -.05)**</td>
<td></td>
</tr>
<tr>
<td>Strong Ag.</td>
<td>-.05 (-.14, .03)</td>
<td>.27*** (.16, .36)**</td>
<td></td>
</tr>
<tr>
<td>Weak Ag.</td>
<td>.10** (.02, .17)*</td>
<td>-.25*** (-.32, -.17)**</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Figures in parentheses are lower bound and upper bound 95% bias-corrected confidence intervals, *p < .05, **p < .01, ***p < .001
7.3.4 Demographics

**Age, Gender, and Education Level.** Table 37 shows correlations across the SNAS domains with participants’ age. Across the SNAS constructs, only Weak Agnosticism had a significant correlation with age, though it was weak.

An independent-samples t-test was conducted to investigate differences in mean scores between men and women across the worldview domains (see Table 37). Levene's (1960) test for equality of variances was used to account for differences in group variance. Amongst the SNAS factors, men scored significantly lower for Spirituality ($t(859) = -6.38, p < .001$), and significantly higher for Naturalism ($t(361.14) = 6.80, p < .001$). Men also displayed a trend for scoring lower on Strong Agnosticism ($t(357.64) = -2.05, p < .05$).

A series of one-way between subjects ANOVAs were conducted to compare the effect of education level on the SNAS domains. Means and standard deviations across the five education levels are shown in Table 37. The effect of education was not significant for any of the SNAS domains. However, its impact on Spirituality ($F(4, 866) = 3.27, p < .05$) and Naturalism ($F(4, 866) = 3.00, p < .05$) approached significance.

**Country of Residence, Ethnicity, and Language.** Independent-samples t-tests were conducted to investigate differences in mean scores for the SNAS domains, across country of residence, ethnicity, and English as first language (see Table 38). Levene's (1960) test for equality of variances was used to account for differences in group variance. For country of residence, the reference control group (Australia) had significantly higher levels of Spirituality ($t(867) = 4.06, p < .001$), and significantly lower levels of Naturalism ($t(167.44) = -4.85, p < .001$). For ethnicity, the reference control group scored significantly lower for Spirituality ($t(370.17) = -4.24, p < .001$), and showed a trend for scoring lower in Mysticism ($t(853) = -2.32, p < .05$). There were no differences significant at the $p < .001$ level between participants who did and did not have English as a first language. However, differences
Table 37

Age Correlations, and Differences in Mean SNAS Scores as a Function of Gender and Education Level

<table>
<thead>
<tr>
<th></th>
<th>Spirituality</th>
<th>Mysticism</th>
<th>Naturalism</th>
<th>Weak Agnosticism</th>
<th>Strong Agnosticism</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age ( (r) )</strong></td>
<td>.07*</td>
<td>.11**</td>
<td>-.08*</td>
<td>-.19***</td>
<td>.06</td>
</tr>
<tr>
<td>( N = 866 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Men</strong> 221</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n )</td>
<td>27.04 (13.37)</td>
<td>11.52 (6.04)</td>
<td>35.76 (8.76)</td>
<td>8.43 (4.04)</td>
<td>14.33 (4.09)</td>
</tr>
<tr>
<td><strong>Women</strong> 640</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n )</td>
<td>33.63 (13.20)</td>
<td>11.64 (5.52)</td>
<td>31.19 (8.18)</td>
<td>8.01 (3.71)</td>
<td>14.98 (3.77)</td>
</tr>
<tr>
<td><strong>NSC</strong> 15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n )</td>
<td>37.93 (15.01)</td>
<td>13.27 (5.85)</td>
<td>30.33 (7.12)</td>
<td>8.13 (3.60)</td>
<td>16.27 (3.73)</td>
</tr>
<tr>
<td><strong>SC</strong> 174</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n )</td>
<td>30.86 (12.28)</td>
<td>11.45 (5.83)</td>
<td>32.92 (8.29)</td>
<td>8.32 (3.87)</td>
<td>15.00 (3.67)</td>
</tr>
<tr>
<td><strong>C/D</strong> 352</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n )</td>
<td>33.31 (13.03)</td>
<td>11.66 (5.51)</td>
<td>31.27 (8.11)</td>
<td>8.35 (3.96)</td>
<td>14.69 (3.78)</td>
</tr>
<tr>
<td><strong>B/U</strong> 201</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n )</td>
<td>31.51 (14.23)</td>
<td>11.59 (5.66)</td>
<td>32.86 (8.90)</td>
<td>8.06 (3.81)</td>
<td>14.72 (3.95)</td>
</tr>
<tr>
<td><strong>P/M/D</strong> 125</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n )</td>
<td>29.21 (14.66)</td>
<td>11.51 (5.88)</td>
<td>33.86 (9.30)</td>
<td>7.42 (3.25)</td>
<td>14.94 (3.87)</td>
</tr>
<tr>
<td><strong>NSC</strong> 15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( N = 867 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** \( *p < .05, \ **p < .01, \ ***p < .001; \) NSC = not completed secondary school, SC = secondary school or equivalent, C/D = certificate/diploma, B/U = bachelor/undergraduate degree, P/M/D = postgraduate, masters, doctorate

Table 38

Differences in Mean SNAS Scores as a Function of Country of Residence, Ethnicity, and English as First Language

<table>
<thead>
<tr>
<th></th>
<th>Spirituality</th>
<th>Mysticism</th>
<th>Naturalism</th>
<th>Weak Ag.</th>
<th>Strong Ag.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Country</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Control</td>
<td>737</td>
<td>32.68 (13.32)</td>
<td>11.59 (5.58)</td>
<td>31.67 (8.22)</td>
<td>8.18 (3.80)</td>
</tr>
<tr>
<td><strong>Comparison</strong></td>
<td>132</td>
<td>27.52 (14.06)</td>
<td>11.73 (6.15)</td>
<td>35.97 (9.56)</td>
<td>7.87 (3.86)</td>
</tr>
<tr>
<td>( N = 869 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Control</td>
<td>629</td>
<td>30.62 (13.15)</td>
<td>11.33 (5.64)</td>
<td>32.33 (8.62)</td>
<td>8.09 (3.77)</td>
</tr>
<tr>
<td><strong>Comparison</strong></td>
<td>226</td>
<td>35.22 (14.31)</td>
<td>12.35 (5.74)</td>
<td>32.53 (8.56)</td>
<td>8.23 (3.96)</td>
</tr>
<tr>
<td>( N = 855 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Language</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>789</td>
<td>31.74 (13.59)</td>
<td>11.62 (5.76)</td>
<td>32.20 (8.51)</td>
<td>8.08 (3.80)</td>
</tr>
<tr>
<td>Non-English</td>
<td>76</td>
<td>33.63 (13.31)</td>
<td>11.61 (4.85)</td>
<td>33.61 (9.12)</td>
<td>8.67 (3.87)</td>
</tr>
<tr>
<td>( N = 865 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Country of residence: “Reference Control” is Australia; “Comparison” is all other nationalities. Ethnicity: “Reference Control” is Australian/White/Caucasian/Anglo-Saxon; “Comparison” is all other ethnicities.
approached significance for Strong Agnosticism, with those reporting English as a first language scoring higher ($t(863) = 1.99, p < .05$).

**Religious Association and Frequency of Worship.** Independent-samples t-tests were conducted to investigate differences in mean scores across the SNAS domains between religious and non-religious participants. One analysis investigated personal association with religious institutions, while the other investigated culture of upbringing association with a religious institution (see Table 39). Levene's (1960) test for equality of variances was used to account for differences in group variance. Results showed that personal association with a religious institution was associated with significantly higher levels of Spirituality and Mysticism, and significantly lower levels of Naturalism and Strong Agnosticism. Culture-of-upbringing association with a religious institution was associated with significantly higher levels of Spirituality.

Independent-samples t-tests were conducted to investigate differences in mean scores across the worldview domains and three worldviews between Judeo-Christian participants and participants with other religious orientations. One analysis investigated personal association with religious institutions, while the other investigated culture of upbringing association with a religious institution (see Table 40). Levene's (1960) test for equality of variances was used to account for differences in group variance. Results show that there were no significant differences between the groups at the $p < .001$ level.

Independent-samples t-tests were conducted to investigate differences in mean scores across the Worldview domains between worshiping and non-worshiping participants One analysis investigated private prayer, ritual, or worship, while the other investigated organised prayer, ritual, or worship (see Table 41). Levene's (1960) test for equality of variances was
Table 39

**Differences in Mean SNAS Scores across Religious and Non-Religious Groups**

<table>
<thead>
<tr>
<th></th>
<th>Personal Association</th>
<th>Culture of Upbringing Association</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Religious (n = 162)</td>
<td>Non-Religious (n = 703)</td>
</tr>
<tr>
<td><strong>Spirituality</strong></td>
<td>45.98 (10.80)</td>
<td>28.66 (11.97)</td>
</tr>
<tr>
<td><strong>Mysticism</strong></td>
<td>13.61 (5.62)</td>
<td>11.16 (5.59)</td>
</tr>
<tr>
<td><strong>Naturalism</strong></td>
<td>27.57 (7.94)</td>
<td>33.44 (8.31)</td>
</tr>
<tr>
<td><strong>Weak Agnosticism</strong></td>
<td>7.48 (3.74)</td>
<td>8.28 (3.82)</td>
</tr>
<tr>
<td><strong>Strong Agnosticism</strong></td>
<td>13.67 (4.42)</td>
<td>15.07 (3.70)</td>
</tr>
</tbody>
</table>

*Note. Figures in parentheses are standard deviations, *p < .05, **p < .01, ***p < .001*

Table 40

**Differences in Mean SNAS Scores across Judeo-Christian and Other Religious Groups**

<table>
<thead>
<tr>
<th></th>
<th>Personal Association</th>
<th>Culture of Upbringing Association</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Judeo-Christian (n = 112)</td>
<td>Other (n = 31)</td>
</tr>
<tr>
<td><strong>Spirituality</strong></td>
<td>48.64 (9.12)</td>
<td>43.61 (9.85)</td>
</tr>
<tr>
<td><strong>Mysticism</strong></td>
<td>12.84 (5.39)</td>
<td>16.29 (5.36)</td>
</tr>
<tr>
<td><strong>Naturalism</strong></td>
<td>27.13 (7.73)</td>
<td>27.20 (9.20)</td>
</tr>
<tr>
<td><strong>Weak Agnosticism</strong></td>
<td>7.06 (3.59)</td>
<td>8.10 (4.19)</td>
</tr>
<tr>
<td><strong>Strong Agnosticism</strong></td>
<td>13.30 (4.52)</td>
<td>14.24 (4.50)</td>
</tr>
</tbody>
</table>

*Note. Figures in parentheses are standard deviations, *p < .05, **p < .01, ***p < .001*
Table 41

*Differences in Mean SNAS Scores across Worship and Non-Worship Groups*

<table>
<thead>
<tr>
<th></th>
<th>Private Prayer, Ritual, or Worship</th>
<th>Organised Prayer, Ritual, or Worship</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No (n = 329)</td>
<td>Yes (n = 515)</td>
</tr>
<tr>
<td>Spirituality</td>
<td>21.74 (8.19)</td>
<td>38.58 (12.20)</td>
</tr>
<tr>
<td>Mysticism</td>
<td>8.45 (3.97)</td>
<td>13.69 (5.68)</td>
</tr>
<tr>
<td>Naturalism</td>
<td>36.64 (7.97)</td>
<td>29.58 (7.79)</td>
</tr>
<tr>
<td>Weak Agnosticism</td>
<td>7.88 (3.79)</td>
<td>8.19 (3.73)</td>
</tr>
<tr>
<td>Strong Agnosticism</td>
<td>15.06 (3.85)</td>
<td>14.67 (3.89)</td>
</tr>
</tbody>
</table>

*Note. Figures in parentheses are standard deviations, *p < .05, **p < .01, ***p < .001*
used to account for differences in group variance. At the $p < .001$ level, results showed that both private and organised prayer, ritual, or worship were associated with significantly higher levels of Spirituality and Mysticism, and significantly lower levels of Naturalism.

7.4 Discussion

This study aimed to investigate the relationships between worldviews, cognition, and well-being. Specifically, it was intended that findings could demonstrate whether specific cognitive tendencies would influence scores in distinct worldviews, and whether distinct worldviews would influence scores in both personal and collective well-being.

7.4.1 Worldviews and Cognition

It was hypothesised that scores for spirituality and mysticism would both incur a significant and positive influence from variances in (a) empathy quotient and (b) anthropomorphising. It also aimed to explore the link that spirituality and mysticism have with (c) faith in intuition. It was hypothesised that naturalism would incur a significant and positive influence from variances in: (d) systemising quotient; and (e) need for cognition. It was hypothesised that both weak and strong agnosticism would incur a significant and positive influence from variances in: (f) empathy quotient; and (g) need for cognition.

Regarding spirituality and mysticism, the hypotheses were partially supported. There was a significant positive influence of anthropomorphising on both spirituality and mysticism. This supported the initial theory that the experiences and beliefs involved in spirituality are founded on the cognitive capacity to perceive aspects of reality as having agency (Gorelik, 2016; Pyysiäinen, 1999, 2012; Shermer, 2011; Walsh, 1989). Empathy quotient demonstrated a significant positive influence on mysticism but only a positive non-significant trend for spirituality. This suggested that the influence of social cognition on
spirituality is more likely to influence the experiential familiarity with transcendent states rather than the holding of certain spiritual beliefs – although there is considerable overlap in the mysticism and spirituality constructs. This data lends partial support to findings associating empathy quotient with spirituality (Rosenkranz & Charlton, 2013). Results found no significant influence of faith in intuition on either spirituality or mysticism. This supported the findings of Farias et al. (2017), and suggested that intuitive thinking styles are not predictive of either spiritual beliefs or experiences. Taken together, the findings all support a general pattern in the literature that explains spirituality as an extension of agenticity and social cognition, but does not support the notion that this relationship is due to a thinking style that is especially intuitive.

Regarding naturalism, the hypotheses were partially supported. There was a significant positive influence of systemising quotient on naturalism. This supports the theory that naturalist beliefs arise from a cognitive tendency to perceive reality as mechanistic physical systems (Caldwell-Harris, 2012; Del Giudice et al., 2010; Pennycook et al., 2012; Rosenkranz & Charlton, 2013; J. M. Smith, 2013). Interestingly, results also showed that anthropomorphism had a significant negative influence on naturalism. This suggests that the greater one’s cognitive tendency to perceive agents in reality, the less likely it is that one would hold naturalist beliefs. This is in line with theoretical definitions of naturalism as primarily concerning non-agency. However, theorists have put forward the notion that naturalism emerges from a tendency toward rational thinking (Caldwell-Harris, 2012; Gervais & Norenzayan, 2012a), which was not supported by the current findings. Results showed that naturalism could be predicted by a tendency to cognise in terms of mechanics and non-agency, but that this was not associated with enjoyment of rational thinking styles.

Regarding agnosticism, neither of the hypotheses were supported. First, empathy quotient did not significantly influence either weak or strong agnosticism. This suggests that
empathy quotient is not a good indication of the extent to which one attempts to verify worldviews, and/or social verification does not significantly contribute to the acceptance of worldview plurality. Second, need for cognition did not positively influence weak or strong agnosticism, and in fact, it demonstrated a significant negative influence on weak agnosticism. This suggests that the more one enjoys rational and complex thinking, the more likely it is that one will become certain in their values and beliefs.

7.4.2 Well-Being

7.4.2.1 Worldview Functionality

It was hypothesised that higher spirituality and mysticism scores would demonstrate significant positive influence on worldview benefit. This hypothesis was supported – both spirituality and mysticism significantly and positively influenced scores in worldview benefit. This suggests that spirituality as a set of beliefs and transcendent experiences tend to be considered useful to oneself and others by those who hold them.

Other relationships with worldview functionality are worth noting. Regarding worldview integration, spirituality had a significant positive influence but mysticism had a significant negative influence. This suggests that spiritual beliefs and practices are considered acceptable to others, but personal transcendent experiences are not. Perhaps this inverse relationship points towards the association between novelty of beliefs and experiences with psychoticism, unless they are already accepted by the majority of the social group (Gorelik, 2016; La Barre, 1972; Shermer, 2011). Weak agnosticism demonstrated a significant negative influence on worldview benefit, suggesting that people who have personal uncertainty and flexibility of values and beliefs tend to consider it ineffectual to self and others.
7.4.2.2 Personal Well-Being

It was hypothesised that spirituality and mysticism would demonstrate: (a) significant positive influence on hedonic well-being; (b) significant positive influence on eudaimonic well-being, including meaning in life; and (c) and significant negative influence on death anxiety. It was also hypothesised that (d) the influence of spirituality on some of these well-being outcomes would be mediated by meaning in life. It was hypothesised that naturalism would demonstrate: (e) no significant influence on hedonic well-being; (f) significant positive influence on eudaimonic well-being, except no significant influence on meaning in life; and (g) no significant influence on death anxiety. It was hypothesised that weak agnosticism would demonstrate: (h) significant negative influence on hedonic well-being; (i) significant negative influence on eudaimonic well-being, including meaning in life; and (j) significant positive influence on death anxiety. Finally, it was of exploratory interest what the influence of strong agnosticism would be on each of these aspects of personal well-being.

Regarding spirituality and mysticism, the hypotheses were partially supported. Spirituality demonstrated significant positive influence on hedonic well-being, but mysticism did not. This supports the idea that day-to-day happiness and positive emotions are facilitated by spiritual beliefs and practices (Ellison & Fan, 2008; Kashdan & Nezlek, 2012), but not by immediate transcendental experiences. Neither spirituality nor mysticism had a direct significant influence on either eudaimonic well-being or death anxiety. However, when testing for the effects on meaning in life, spirituality and mysticism were the only significant positive predictors of meaning in life, which in turn had a significant and positive influence on all types of well-being, including eudaimonic, and a significant negative influence on death anxiety. This supports the notion that spirituality as a set of beliefs, practices, and transcendental experiences increases well-being and decreases death anxiety through their tendency to increase meaning in life (Burke et al., 2010; T. L. Davis et al., 2003; Fabricatore

Regarding naturalism and agnosticism, the hypotheses were partially supported. Naturalism demonstrated no significant relationship with hedonic well-being variables, nor on eudaimonic well-being, including meaning in life, nor on death anxiety. Weak agnosticism demonstrated significant negative influence on hedonic well-being, significant negative influence on eudaimonic well-being, including meaning in life, and significant positive influence on death anxiety. Strong agnosticism did not have any significant influence on hedonic well-being, eudaimonic well-being, meaning in life, or death anxiety. Taken together, these findings challenge some of the notions regarding the impact of worldviews on well-being. It does not seem to be that any strong belief system can increase personal well-being and buffer against death anxiety – strong naturalist or agnostic belief systems were not shown to have this effect. However, weak belief systems do tend to decrease personal well-being and increase death anxiety. For personal well-being, having belief uncertainty and flexibility seems to be detrimental, while the presence of strong naturalist or agnostic beliefs, seem to be ineffectual.

7.4.2.3 Collective Well-Being

It was hypothesised that spirituality and mysticism would demonstrate: (a) significant positive influence on social well-being; and (b) significant positive influence on both the binding and the individualising moral foundations. It was hypothesised that naturalism would demonstrate: (c) no significant influence on social well-being; and (d) significant positive influence only on the individualising moral foundations. It was hypothesised that weak and strong agnosticism would both demonstrate: (e) no significant influence on social well-being; and (f) a significant positive influence only on the individualising moral foundations.
Regarding spirituality and mysticism, the hypotheses were partially supported. Neither spirituality nor mysticism had a significant influence on social well-being. This seems to go against evidence that suggests spirituality has a role in improving social well-being (Joshanloo, 2011; Sawatzky et al., 2005). However, in the mediation model, both spirituality and mysticism seemed to contribute to social well-being through their positive influence on meaning in life. This supports the idea that the emergence of spiritual beliefs and practices were a way of benefiting social harmony, and can only contribute to social well-being insomuch as they foster the shared meaning that can facilitate positive group conduct (Peterson, 1999).

Spirituality and mysticism had different influences on moral foundations. Spirituality demonstrated significant positive influence on both binding and individualising moral foundations, which supports general trends in the research literature (Graham et al., 2012, 2009, 2011; Haidt, 2007). Spiritual beliefs and practices seem to foster a moral identity that is concerned with not only individual freedoms but also in-group harmony, cohesion, and purity. Mysticism, on the other hand, demonstrated significant negative influence on the binding moral foundations, and a negative non-significant trend of influence on individualising moral foundations. This seems to point to the fact that transcendent experiences occur separately from spirituality, though may then be associated with and inform spiritual beliefs and practices. Those who experience transcendental or mystical states seem to have lower concern for obeying moral codes or traditions that foster in-group or individual safety and cohesion. It might be that mysticism promotes a sense of connectedness and transcendence that goes beyond concern for individual self or group traditions (Gorelik, 2016). What is interesting is that these experiences then have the chance to become part of a spiritual worldview, and then are seen as moral codes in themselves that are shared and
followed by those who transform mystical revelations into spiritual doctrine (La Barre, 1972; Walsh, 1989).

Regarding naturalism, the hypotheses were supported. Naturalism showed no significant influence on social well-being, and demonstrated significant positive influence only on the individualising moral foundations. This supports previous ideas that naturalist beliefs, perhaps due to being founded on mechanistic rather than social cognitions, are associated with lower interpersonal agreeableness, a decreased sense of social obligation, and less social support (Bainbridge, 2005; Galen & Kloet, 2011; Horning et al., 2011). Furthermore, it supports the idea that naturalism is unrelated to the moral foundations that bind and maintain larger social groups (Haidt, 2007).

Regarding agnosticism, the hypotheses were not supported. Weak agnosticism demonstrated significant negative influence on social well-being, and strong agnosticism demonstrated no significant influence on social well-being. Based on evidence that agnostics tended to conform to social groups (Silver, 2013), it was expected that agnosticism would lead to greater social well-being, however the opposite was found – uncertainty and flexibility of values and beliefs had a negative impact on social well-being, and strong belief in epistemological uncertainty had no impact. Similarly, weak agnosticism had a significant negative influence on individualising moral foundations, whereas strong agnosticism had a significant positive influence on individualising moral foundations. People who reported uncertainty and flexibility of values and beliefs tended to be unconcerned with individual or collective well-being, which makes sense if that uncertainty and flexibility was generalised to moral concerns as well as epistemological concerns. People who reported a strong belief in epistemological uncertainty tended to be concerned with individual but not in-group well-being.
These findings are interesting in light of the debate between the instinctual or rational basis of morality. It has been argued that morality is a biologically, experientially driven process that is only rationalised post hoc (Haidt, 2001), and also that morality is grounded in the results of personal reflection and rational deliberation (Paxton et al., 2012). The fact that personally reported uncertainty of values and beliefs effects a decrease in concern for individualising morality, whereas a strong belief in epistemological uncertainty does not, tends to support the idea that, despite emerging from evolutionary and biological demands, moral concerns are shaped by the content of personal values and beliefs.

7.4.3 Demographics

Some demographic findings are worth noting in terms of group differences and also the validity of the SNAS and WFS scales. First, men tended to report higher naturalism and lower spirituality scores compared to women – a finding that could reflect sex differences in empathy and systemising quotients (Del Giudice et al., 2010; Rosenkranz & Charlton, 2013). These findings, being typical of the literature, lend validity to the SNAS instrument.

The reference control group of (Australian) residents seemed to have higher levels of spirituality, and yet the reference control group of (Australia/white/Caucasian/Anglo-Saxon) ethnicity seemed to have lower levels of spirituality. As with Study Two, it seems likely that this reflects a multicultural make-up of the Australian population in which those living in Australia who are from migrant backgrounds tend to report higher spirituality than those who live in Australia without migrant backgrounds. This would need to be confirmed with a study that has more detailed demographic analyses. These similarities with Study Two demonstrate a consistent reliability of the SNAS across multiple samples.

Results were also similar to the first two studies regarding association with religious institutions, Judeo-Christian orientations, and frequency of worship. These showed that
spirituality and mysticism were logically associated with religious association and frequency of worship, and that the SNAS scales were not exclusive to a Judeo-Christian religious framework of belief or practice.

7.4.4 Limitations

The non-experimental, quantitative methods of the current project matched the broad scale of its research aims. That is, it was intended that the current project provide data related to multiple principles of worldview psychology, and it was not feasible to attempt experimental manipulation in a project with so many variables under investigation. However, further research that uses experimental and qualitative methods could help to substantiate current findings. While the measures used were validated and appropriate, there remains the issue of reporting biases and ecological validity. Especially when considering the impact of behaviour being guided by biological and embodied motivations compared to reflective thought, it is important to note that the current projects have only had access to self-reported rationalisations of values and beliefs, rather than evidence grounded in embodied action.

Similar to earlier studies, sample limitations relate to the unequal sizes of reference and comparison groups for demographic data, and the exclusion of information regarding the level of expertise of participants in theology and philosophy – as these are important dimensions when testing the impact of worldviews.

7.4.5 Conclusion

This study aimed to investigate the relationships between worldviews, cognition, and well-being. Specifically, it was intended that findings could demonstrate whether specific cognitive tendencies would influence scores in distinct worldviews, and whether distinct worldviews would influence scores in both personal and collective well-being. Though many
of the hypotheses were only partially supported, results demonstrated a general pattern that was in line with theories suggested in Chapters Five and Six. Specifically, cognitive tendencies seemed to influence scores in distinct worldviews. Spirituality and mysticism were generally influenced by agenticity and empathy cognitions, while naturalism was influenced by a lack of agenticity and a tendency towards systemising, mechanistic cognition. Tendencies towards intuition or complex rational thought did not affect any specific worldview, except that a tendency to prefer rational thought seemed to lead to less uncertainty and flexibility of beliefs and values.

Spirituality and mysticism tended to have positive outcomes for both personal and collective well-being, especially as mediated through their positive impact on meaning in life. However, although spirituality in general seemed to lead to greater concern for both individual and in-group moral conduct, mysticism seemed to lead to less concern for both of these domains, as well as worldview integration, highlighting the complicated role that transcendence plays by simultaneously rejecting and supporting social norms. Naturalism seemed to have no impact on personal or collective well-being, and was associated with individualising but not binding moral concerns. Finally, weak agnosticism seemed to be detrimental to nearly every facet of personal and collective well-being, and led to lower concern for individualising moral domains – and yet strong agnosticism had no influence on personal or collective well-being, and led to higher concern for individualising moral domains. This supports the idea that weak and strong agnosticism should be considered as distinct psychological constructs.

Chapter Eight discusses the general trends uncovered in all three studies of the current project. Using this data, it discusses the implications of the findings on worldview theory in general, and the psychology of religion and spirituality in particular. Finally, Chapter Eight discusses the implications of the current findings for clinical psychology, particularly the
practical and ethical consequences of clinicians having access to data that links specific worldviews, cognitive tendencies, and well-being outcomes.
Chapter Eight: Theoretical and Clinical Implications

The current thesis aimed to further clarify the concept of worldviews in psychology, investigate its integration with trait theories of personality, and demonstrate the explanatory and predictive power of worldview constructs with relevance to both theoretical and clinical psychology. In line with these overarching goals, the current thesis examined how worldview beliefs relate to personality traits, cognition, and well-being, using three constructs to represent distinct worldviews – spirituality, naturalism, and agnosticism.

In order to investigate the relationship between worldviews and personality traits, two online studies, one using exploratory factor analyses (\(N = 412\)) and another using confirmatory factor analyses (\(N = 1056\)), were conducted to develop a psychometrically robust inventory to measure spirituality, naturalism, and agnosticism as amalgamations of both worldview beliefs and personality traits. The SNAS measured the spirituality worldview as spiritual practices, spiritual beliefs, and attitudes towards God/Higher Power, and a domain of mysticism that had a strong mutual association with spirituality. Naturalism was measured as physicism, a domain of belief about the materialistic and deterministic nature of reality, and scientism, a domain of belief, attitude, and behaviours towards empirical scientific methods. Agnosticism was measured as weak agnosticism, which reflects a personal uncertainty and flexibility of beliefs and values, and strong agnosticism, which reflects a firm belief in the unknowability of universal truths about reality.

A third online study (\(N = 816\)) used path analyses to test the relationship between worldviews and cognition, and between worldviews and well-being. First, this study tested how much variance in spirituality, naturalism, and agnosticism could be explained by the tendency to use certain cognitive processes. Second, this study tested how much variance in various well-being constructs could be explained by scores in spirituality, naturalism, and
agnosticism. Variables were selected to cover a comprehensive model of well-being that included both personal and collective domains.

The current chapter describes the theoretical and clinical implications of the findings in these three studies. First, it comments on worldview psychology as it relates to personality, cognition, and well-being. Second, it discusses the implications for the psychology of religion and spirituality, in terms of the cognitive foundations and well-being outcomes of spirituality, naturalism, and agnosticism worldviews specifically. Finally, it discusses the clinical implications of acknowledging data that implicates some worldviews as psychologically healthy.

8.1 Advances in Worldview Psychology

Koltko-Rivera (2004) outlined a research agenda for the study of worldviews, “the bottom line” being their potential to explain and predict human behaviour (p. 41). In line with this goal, the current thesis investigated how worldviews relate to personality, cognition, and well-being outcomes.

8.1.1 Worldviews in Personality

Major models of personality (e.g., McAdams & Pals, 2006; McCrae & Costa, 2008) have not yet explicitly incorporated worldview beliefs. They have accounted for individual subjectivity in personal narratives and characteristic adaptations, but worldview beliefs are more specified than this; they represent dimensions of human difference that, like the Big 5 personality domains of McCrae and Costa (1997), can be theoretically catalogued hierarchically into a taxonomy that represents individual differences across universal domains. Worldview dimensions are an inevitable aspect of cognitive development that relate the mind to specific aspects of reality that must be at least implicitly addressed (Gabora,
1999, 2000; Sire, 2004). To leave worldview beliefs out of personality constructs is to omit a fundamental part of personhood that is experienced by the people these theories are aiming to represent, an aspect that presents the possibility of greater theoretical comprehension, explanation, and prediction (Koltko-Rivera, 2004; Nilsson, 2013, 2014).

More than that, trait theories of personality have inherent philosophical issues that can be improved with the inclusion of worldview beliefs. First, personality psychology teaches that people are either mechanistic or free agents (Nilsson, 2013; Paranjpe, 2013; Smythe, 2013). Taking either of these extreme points of view has devastating consequences for personality theory, because mechanistic approaches fail to account for the lived experience of people, and agency approaches fail to comply with the notion of natured laws that support the scientific method. Second, this problem is only one small subset of philosophical quandaries that personality psychology rubs up against as it attempts to explain personhood with ecological accuracy and scientific scrutiny. For example, some worldviews present spiritual phenomena as valid aspects of reality, and these are dismissed as falsities by naturalist accounts of personality (Johnson & Watson, 2012). Incorporating worldviews into the teaching of personality would avoid making explicit or implicit assumptions about metaphysical truths that psychology cannot support (Slife et al., 2012). Third, trait models are circular in explanation, in that they make traits both the observable phenomenon under investigation, and also the explanatory causal force behind those phenomena (Nilsson, 2013). For example, a person might be labelled as highly conscientiousness because they are observed behaving industriously, and the explanation for their industriousness is that they are highly conscientious. These sort of philosophical issues are best resolved explicitly, so that the teaching and representation of personality psychology as a discipline can move forward on less shaky ground. Worldviews have an opportunity to assist this within the models of personality itself.
The current studies provide evidential grounding for a movement towards the resolution of these philosophical issues in personality psychology. First, the important issue of mechanistic principles versus agency can be represented within personality models by integrating worldviews that specifically address this dimension of reality. The current project measured spirituality, naturalism, and agnosticism – each of which takes a different fundamental stance on the issue of materialistic determinism and agency. If personality models explicitly incorporated these different worldviews as dimensions of belief variance in humans, in the same way as agreeableness varies along a continuum of behaviour, then the differences of presuppositional beliefs can be presented from an objective vantage point within the discipline. Second, this can be extended to the other aspects of philosophical difference that cause problems for personality psychology and its “myth of neutrality” (Slife et al., 2012, p. 214), such that personality models can eventually expand to incorporate the many dimensions of belief that can differ across laypersons and personality scientists alike. Third, by incorporating worldview beliefs into trait constructs, the circular reasoning of traits as observed and explanatory phenomena can be at least partially resolved by acknowledging that worldviews cause traits and vice versa. For example, “humans should live according to the will of God or a Higher Power” from the spirituality scale, and “to know anything with certainty, we have to test it with the scientific method” from the naturalism scale, both present beliefs that act as teleological forces that can motivate traits within their respective constructs. The incorporation of worldview traits into personality models resolves certain problems that are fragmenting diverse approaches to the representation of personhood.

Subsuming worldviews into personality models also assists the approach towards the psychological understanding of worldviews. For a long time, worldviews have been treated as categorical constructs, such that to study spirituality has been often to study spiritual people, and to study naturalism has been to study atheists or nonbelievers as a category of person.
Even when it tends to be treated as a fluid construct, this is in terms of it being a movement from one category to the other, rather than a simultaneous variance across distinct dimensions (e.g., Guenther, 2014; Silver et al., 2014; Smith, 2013; Zuckerman, 2009). By integrating worldview belief systems such as spirituality, naturalism, and agnosticism into personality constructs, the research of beliefs can be shifted into more nuanced and accurate grounds, whereby each person can score at a different level for each measure, in different contexts, at different times. This seems to be a more accurate way of representing worldviews, because people tend to use more than one worldview in order to interpret and act (Morris & Hasson, 2010). The outdated notion that people can be neatly organised into categories based on ancient strands of cognitive capacities that have emerged over the course of human civilisation can be at least partly overcome by treating worldviews as positions on universal dimensions of human variance, the same way that trait domains are treated in personality models.

Spirituality, naturalism, and agnosticism all demonstrated divergence from the Big 5 domains of personality, which suggests that they can add explanatory and predictive power to our understanding of personality. Furthermore, the structure of the SNAS suggests that worldview beliefs can be integrated with behavioural traits in order to develop more comprehensive and robust constructs; a direction that has been suggested as a necessary trend in the discipline of personality psychology (Nilsson, 2014). It seems very likely that the catalogue of worldview dimensions can continue to be incorporated into psychometric measures. Perhaps even the Big 5 domains would benefit from further psychometric development with a specific focus on adding worldview beliefs to each domain (e.g., by developing items that represent prescriptive beliefs about how people should behave).
8.1.2 Worldviews and Cognition

The basic premise put forward in the current project was that distinct worldviews emerge from different cognitive tendencies. As biological processes become more complex and allow for multiple ways that the human organism can respond to the same sets of stimuli, the processes are said to be more cognitive (Godfrey-Smith, 2002). Similarly, as cognitive processes become more complex, and amalgamated into behaviours that are observable with enough stability at the folk level, they are discussed as personality (Canli, 2008; Higgins & Scholer, 2008). Using spirituality as an example, we can see that the worldview is founded at least partially on a set of biological processes that expanded the range of phenomena that humans could cognitively perceive as agents with understanding, intentions, and motivations. Behaviourally, this became noticeable as a set of worldviews and traits, as early shamans developed a specific personality for relating to a wider range of agents in reality, including animist supernatural agents, and were recognised for this by the rest of their social group (Walsh, 1989; H. S. Webb, 2013). As these personality variables were passed onto future generations genetically and culturally, religiosity emerged as a personality variable that described an individual proclivity for relating to the supernatural agents put forward by the major world religions, as well as the beliefs and practices around relating to these agents. Eventually, spirituality emerged as a cross-religion set of these beliefs and practices, and the capacity to relate to supernatural agents outside any specific religious institution (Zinnbauer et al., 1999).

This model of worldview emergence has two implications. First, it supports the assertion that certain dimensions of worldview emerge inevitably from the universal set of human cognitive processes. Ever since the Darwinian account of human evolution, existential religiosity was understood to have developed due to natural cognitive tendencies (Culotta, 2009). Not only has cognitive science extended this to spirituality, but also nonbelief has
been argued to evolve naturally as humans develop new capacities for thinking about reality as objective mechanisms, or without any objectivity at all (Caldwell-Harris, 2012; Del Giudice et al., 2010; Le Poidevin, 2010). The current thesis supported these notions, and added to the evidence that the strength of spirituality, naturalism, and agnosticism can be explained according to variance in cognitive tendencies.

A second and more applicable implication is that data from worldview psychology can suggest methods by which worldviews can be changed. If personality constructs that integrate beliefs and traits are founded on cognitive tendencies, then addressing the cognitive habits of individuals has the potential to change not only their behaviour but also their fundamental beliefs about reality. This is not a new domain as cognitive psychologists have been assisting people to adjust their core beliefs about the self and the world for some time (Riso, du Toit, Stein, & Young, 2007; Wenzel, 2012). However, it is a relatively new suggestion that proposes that clinical psychologists might attend specifically to the worldview beliefs of their clientele. This presents important considerations especially in light of findings linking specific worldviews with well-being outcomes. This topic of clinical psychology will be returned to after a brief discussion of worldviews and well-being.

8.1.3 Worldviews and Well-Being

From the initial focus in philosophy, worldviews have been suggested as solutions to universal problems confronted by people as they face certain aspects of being human (Naugle, 2002). This is supported by the current findings that suggest universal worldview dimensions emerge from cognitive foundations that in turn have emerged from biological interactions with nature. Spirituality, naturalism, agnosticism, and other worldview dimensions inevitably developed from the cognitive functions that helped humans to evolve successfully. It is not that worldviews are bi-products of cognitive adaptations. Worldviews
are folk-level observations of the cognitive adaptations, amalgamated into patterns of belief and behaviour that are noticeable at the level of individual personality.

The current thesis aimed to investigate how worldviews were related to various aspects of self-reported well-being: Worldview functionality, hedonic well-being, eudaimonic well-being, meaning in life, death anxiety, social well-being, and moral identity. This was designed to address whether spirituality, naturalism, and agnosticism as specific worldviews contribute differently to well-being outcomes, and to answer questions about worldview principles in general. For example, is it the strength or the content of worldviews that is most important for well-being outcomes?

For spirituality, naturalism, and agnosticism, there were clear differences in the potential for well-being outcomes. It was clear that spirituality had the only obvious positive influence over well-being outcomes, and this was largely mediated by its capacity to increase meaning in life. Weak agnosticism was the only worldview domain to present clear detrimental influences on well-being outcomes – strong agnosticism did not. In terms of worldview principles more generally, these findings present some support for hypotheses that can direct further research. First, it seems that strength of worldviews alone is not enough to generate well-being outcomes. For example, strongly held spirituality seemed to be more beneficial than strongly held naturalism. However, weakly held beliefs tended to be associated with decreased well-being. So perhaps strong worldviews do help to buffer against detrimental effects on well-being, but to go beyond a mere neutralising of negative effects and foster increased well-being, the content of the worldview becomes pertinent. It seems likely, based on the current findings, that the content of worldviews must produce increased meaning in life in order to have a clear positive influence on other well-being outcomes.

These findings, which present spirituality as a psychological advantage over contradistinctive worldviews, have clear implications for the psychology of religion and
spirituality – these will be discussed further in the next section. However, it is important to note again that the current investigations did not use any sociometric data to explore the implications of worldviews for actual collective well-being. Instead, the impact of worldviews on collective well-being was obtained from an individual self-report method. This is especially important because researchers have noted that worldviews like naturalism appear to have inverse consequences for individuals when compared to groups, in that individual well-being seems to be increased with spirituality, but societies seem to fare better the more they are secularised (Zuckerman, 2009). This is especially interesting in light of the current findings, which have shown that spirituality leads to binding moral concerns but naturalism does not. Although the current thesis has shown that the spirituality worldview seems to lead to greater individual perception of personal and collective benefit, it does not address whether there are different worldviews that are more beneficial for community outcomes observable at the societal level.

One last general finding is worth mentioning in terms of individual well-being. Weak agnosticism was shown to have detrimental consequences for nearly all domains of well-being. However, strong agnosticism did not have a negative influence, and in fact showed a positive influence on individualising moral concerns. As mentioned above, this seems to suggest that any worldview, even a worldview positing epistemological uncertainty, is better than an uncertainty or flexibility of beliefs and values. This, coupled with the fact that need for cognition seems to reduce the scores in weak agnosticism, suggests that philosophy can be a psychohygenic activity. If individuals can be encouraged to value and enjoy complex thinking, it is more likely they will experience an increase in belief certainty and stability, which will lead to well-being outcomes. This does not need to exclude tolerance of other worldviews, because those rigid beliefs might include a belief in epistemological pluralism. The current findings supported the assertions of developmental theorists who see pluralistic
perspectives as a necessary emergence in formal or post-formal stages of cognition (Commons, 2008; Piaget, 1972). They also support current exploration by researchers such as Gorard, Siddiqui, and See (2017), who have found preliminary results pointing to the possibility for philosophy education, even in primary school aged children, to improve areas such as self-esteem and relationships.

For educators and practising psychologists, it might be that providing a philosophical framework for developing a robust worldview can help to improve a wide range of well-being outcomes. However, again this begs the question of how clinicians and teachers might go about selecting worldviews for promotion. This will be returned to in the final section, which will use the examples of spirituality, naturalism, and agnosticism to discuss the role of psychology in professionally managing worldviews. However, first it is necessary to qualify some emerging features in the psychology of religion and spirituality that were supported by the current findings – as these will have consequences for how the questions for clinical psychology can be addressed.

8.2 Advances in Psychology of Religion and Spirituality

The current project helped to conceptually place spirituality in the framework of worldview psychology, and also incorporated its links to both cognitive and personality psychology, satisfying a demand made to integrate different understandings of spirituality with established domains of psychology (Mahoney & Shafranske, 2013). As requested by McIntosh and Newton (2013) current findings also presented evidence to support mini-theories in the psychology of religion and spirituality, by confirming some trends already found in the literature, supporting recent changes in theory and offering evidence to suggest new important pathways in the field.
In terms of confirming previous trends in research, spirituality was shown to incorporate religiosity as a subdomain that assesses the institutionalised and interpersonal ways that people express their spirituality, a suggestion already made concerning psychometric measures of the construct (Zwingmann et al., 2011). Second, spirituality and mysticism were influenced by an agenticity and empathy quotient, which supports the long substantiated theory that spirituality emerged at least partly due to an extension of agency detection and theory of mind (Barrett & Zahl, 2013; Boyer, 1994; Gorelik, 2016; Petrican & Burris, 2012; Pyysiäinen, 1999, 2012; Rosenkranz & Charlton, 2013; Shermer, 2011). Third, spirituality was supported in terms of its importance for individual well-being, and also as a system that contributes vastly to meaning-making (Ellison & Fan, 2008; Holmes & Findlay, 2016; Kashdan & Nezlek, 2012; Park, 2005; Rasmussen & Johnson, 1994; Michael F. Steger & Frazier, 2005; Temane & Wissing, 2006; Zuckerman, 2009). Fourth, spirituality was shown to be a contributor to all five domains of moral foundations, which confirms its role in guiding conduct not only to protect the individual, but also to maintain the integrity and cohesion of in-groups (Graham & Haidt, 2010; Graham et al., 2012, 2009; Haidt, 2007). Together, all of these findings illustrate spirituality as a worldview that has largely been founded on interpersonal, empathetic cognitions. The varying beliefs and practices of spirituality in all its many forms are linked by their focus on non-physical agencies (e.g., perceived as supernatural gods or humanly souls). These agencies are the only force that can understand and intend, and so meaning and purpose are direct consequences of a focus on agencies, and ground spirituality’s capacity for acting as a system of meaning and social coherence in people’s lives.

In terms of the new trends in research, the current thesis showed that spirituality was not influenced by preferences for intuitive or rational thinking styles. This is in contrast to long held notions that spirituality was an especially intuitive and instinctual way of being in
the world, observable for the most part in people who tended not to think deliberately about experiences (Barrett & Zahl, 2013; Boyer, 1994). Instead, the current thesis supported the more recent claims of researchers such as Farias et al. (2017), which argue that it is outdated and simplistic to consider spirituality as an outcome of lack of rational thought. Put simply, all worldviews are founded on axioms that are abstract, imaginary, and basically unprovable – worldview beliefs rest at the bottom of a chain of supporting arguments (De Cruz, 2013; Pelaprat & Cole, 2011; Sire, 2004; Weick, 1989). Distinct worldviews seem to represent the personality variables that emerge from different ways of perceiving and thinking, rather than a presence or lack of thought.

In terms of new pathways for research in the psychology of religion and spirituality, the current thesis provides some avenues that seem beneficial for further attention. These include the function of transcendental states and mysticism in spirituality, the continued elucidation of naturalism and agnosticism as worldviews that go beyond the mere lack of spirituality, and the dimensional rather than categorical nature of spirituality and seemingly alternative belief systems. These will be discussed in the following sections.

8.2.1 The Paradoxical Role of Mysticism

Transcendental states are at the centre of religious and spiritual constructs (Kapuscinski & Masters, 2010). Mysticism can be understood as a tendency towards transcendental states. In the current measure, similar to previous scales of mysticism (e.g., Hood et al., 1993), the construct is represented as a tendency to transcend separateness, overcoming the embodied sense of time and space, the embodied separation of people, and the separation of information, such that reality is perceived as one, and ultimate truth is revealed. These types of transcendental, mystical states seem to be at the origin of shamanism, whereby a shaman would induce transcendental states for himself and/or others
(Walsh, 1989). The interpretation of these transcendental states form the backbone of the religious institutions that emerged from ancient religious rites, whereby the priests or other religious staff took on the role of the shaman in managing mystical states and their interpretation (Walsh, 1989). Religions can be understood as “culturally inherited, community-wide beliefs, and rituals associated with the supernatural… overlapping, but not necessarily congruent” with transcendent states (Gorelik, 2016, p. 2). In other words, transcendental or mystical states can be considered as one of the major motivating forces that generated religions.

Similar to the various items developed in the current mysticism measure, Gorelik (2016) described transcendental states, documented in the evolution of religious practices cross-culturally and pan-historically, as being related to group-directed, theory of mind evoking, aesthetic, or epistemic experiences. In other words, the mystical experiences can be induced by, and alter the experience of, the distinction between group and individual identity, the perception of agencies in reality, the experience of awe, beauty, and terror, and/or the experience of transcending current informational representation of the world. What seems to happen is that individuals transcend their current configuration of social identity and conduct, agenticity, aesthetics perception, and mental representations – and this literally disorientating experience presents the opportunity for either genius or psychoticism (Littlewood, 1984; Shermer, 2011), depending on the usefulness of the interpretation of such experiences. The shaman-messiah transcends the normal ways of being in the world, and then is able to interpret the experience back to the community in a way that is perceived as beneficial (La Barre, 1972).

However, the mystical experience itself appears to be amoral. In the current project, spirituality seemed to increase the level of concern for both binding and individualising aspects of moral identity, and to increase a sense of worldview integration with other people.
People who are more spiritual tend to be morally concerned with both individual and group cohesion and well-being, and feel that their beliefs are congruent with others. Mysticism, however, was shown to decrease concern for both binding and individualising aspects of morality, and decrease worldview integration. Even though the transcendental states are positively associated with spirituality, the two constructs have an almost opposite impact on collective norms, such that people who have had mystical experiences tended to be less concerned with individual and group moral codes, and felt that their worldview was less congruent with others. Mystical experiences seem to transcend normal individual and group moral boundaries.

The current findings may point towards a mechanism by which mysticism can lead to either positive or negative social norms. The cognitive evolution of religion seems to show that the moral codes of religious doctrines were explications of behavioural yet unspoken social norms. Spiritual leaders manage the process of transcendence for themselves and others, and the mystical experience is itself dissociated from the moral and social norms. As people transcended normalised cognitive and social schemas, they were able to explicate new schemas into sets of formalised belief systems (Peterson, 1999; Piaget, 1955). The interpretation of mystical experiences, if adopted by the group, can become a new set of moral and social norms that others follow. This allows for both a positive leadership of others by managing their experience and interpretation of transcendence in accordance with prosocial aims (i.e., pro-social religions), and also the possibility of exploitation, whereby transcendence and its interpretations can be managed on behalf of others for personal gain (i.e., anti-social cults; Gorelik, 2016). As spirituality continues to differentiate from religious institutions (Zinnbauer et al., 1999), the potential for benefits of mysticism to be brought about through a process of diminished moral norms and increased social isolation may demand cultural and perhaps even clinical attention.
8.2.2 Recognition of Naturalism and Agnosticism

One of the major areas of investigation in the current thesis was a comparison of spirituality against naturalism and agnosticism in terms of cognitive predictors and well-being outcomes. These three worldviews were chosen because they collectively covered more than half of the worldview dimensions listed in Koltko-Rivera's (2004) collated model, and were three very well-known concepts in philosophical and popular culture. Despite that, naturalism and agnosticism have gone largely unrepresented in the literature. Spirituality and religion have been often contrasted with atheism rather than naturalism, and agnosticism has only been represented in its weak format, as a personal uncertainty and flexibility of belief, rather than strong agnosticism, which represents a posited position of epistemological uncertainty. The current thesis forms part of a scientific movement towards a more comprehensive representation of non-belief.

In fact, the term non-belief becomes redundant in light of the current findings, because naturalism and agnosticism are not measured as increasingly low scores in the domain of spirituality. Instead, naturalism and agnosticism can be best understood as domains in personality that are somewhat separate to spirituality, domains that comprise beliefs in certain worldview content such as the valid epistemological sources of information, the appropriate way to understand reality, and explanations for the source and purpose of human behaviour. Not only are these domains distinct from spirituality in terms of their psychometric content, they have different and theoretically predictable influences from cognitive variables, which suggests that they too have emerged as functional capacities in models of personality.

Just as extraversion and agreeableness are not mutually exclusive, so too are spirituality and naturalism individual variables that can be observed at different combinations of degree in each person. It is not enough to simply measure the level of conscientiousness
and infer the level of agreeableness, and in the same sense it is not enough to simply measure
the belief in mechanistic determinism and infer the absence of a belief in personal volition. In
fact, the whole discipline of psychology plays both sides of these worldviews by conforming
research and models to the biological and physical laws of human organisms, while at the
same time championing the possibility for individuals to generate personal meaning and
motivational forces in therapeutic practice (Hackney & Cormier, 2013; Nilsson, 2013;
Paranjpe, 2013; Williams & Levitt, 2007). The picture being created in contemporary
research is that worldviews like spirituality and naturalism evolved from distinct streams of
cognitive processes, which can be utilised simultaneously in order to orientate towards reality
with different perceptual and conceptual capacities.

8.2.3 Dimensionality of Belief

In measuring worldview beliefs as an aspect of personality alongside traits, the
current project has treated worldviews as dimensional rather than categorical constructs. This
is desirable, because it makes the relationships between worldviews and other concepts in
psychology easier to understand, and allows for more detailed statistical analyses with
worldview measures (Clark & Watson, 1995; Koltko-Rivera, 2004). Furthermore, the
evidence seems to show that worldviews are dimensional rather than categorical phenomena
anyway. Even contradictory worldviews were shown to be distinct domains of belief that
might be observed simultaneously in the same individuals, and evidence has shown that
people can have simultaneous explanations for events that contradict at the level of
worldview (Legare et al., 2012). Worldviews, like traits, are degrees of individual variability
within universal domains that can be measured in each person across situations and over
time.
What this means for the psychology of spirituality and religion is that language usage and investigations need to begin treating various spirituality and religious beliefs and behaviours in terms of the degree to which they are observable in each person, rather than by categorically asserting that a person is spiritual or not-spiritual, religious or not-religious. For example, in this approach any individual who perceives or attributes agency within a person or other phenomena would demonstrate at least a low level of spirituality. Similarly, interpersonal behaviours that focus explicitly on spiritual experiences or beliefs are defined by the current constructs as an expression of religiosity. These observations might seem incongruent for individuals who believe in free will but wish to categorise themselves as not-spiritual, or to those who spend time discussing spiritual topics or attending spiritual groups but consider themselves a-religious, non-religious, or even anti-religious. In other words, this dimensional treatment of worldview constructs could challenge personal preferences that experts and laypeople might have about their own spiritual or religious self-categorisation.

But this incongruence is no more controversial than Pargament's (2013) definition of spirituality as an overarching motivational force in personality, despite many people rejecting spirituality as even a minor aspect of their identity. Dimensional concepts cannot be reduced to categories, and therefore it is not the responsibility of any definition to account for simplistic self-categories that people might have about themselves. Suppose an individual considers himself or herself not-spiritual, despite displaying a low level of spirituality based on their belief that humans have agency. This would be similar to an individual who considers himself or herself not-neurotic, despite displaying a low level of neuroticism based on occasional bouts of social anxiety. Researchers exploring worldviews in personality need to allow for some disparity between lay opinions about the self and the detailed models being uncovered by scientific research. In fact, it might be considered the duty of scientific educators to encourage dimensional rather than categorical ways of discussing worldview
belief, as this is what the data suggests is most accurate and useful. Even social psychology can treat group belongingness as a continuous rather than categorical variable, recognising the complexity and variability involved within the concept of group membership (e.g., Phinney, 1992). The current conceptualisations of spirituality, naturalism, and agnosticism are not defined as rigid categories delineating specific types of people, but as a dimensional structure of cognitive processes and patterns of traits and worldview beliefs present in varying degrees across individuals and over time. This seems to be the most appropriate direction forward in scientific research investigating the psychology of religion and spirituality.

8.3 Implications for Clinical Practice

There are two ways of considering the impact of current findings on clinical practice. First, data regarding the cognitive foundations and well-being outcomes of certain worldviews gives practitioners directives for assisting clients in worldview change, as well as a sense of potential outcomes of worldview change. Second, in light of the current emergence of worldview psychology, which will undoubtedly continue to advance the information regarding worldview change and outcomes; it is important to consider whether it is even appropriate for clinicians to engage in worldview change with clients, and what should guide this decision.

8.3.1 Modifying Worldviews

The current thesis adds to a longstanding scientific tradition that has sought to discover the cognitive underpinnings, and the well-being outcomes, of various belief systems. In the current project, spirituality was found to be influenced largely by the presence of anthropomorphising tendencies, which supports the idea that religiosity and spirituality have
emerged from cognitive processes concerned with agenticity (Barrett & Zahl, 2013; Boyer, 1994; Petrican & Burris, 2012; Pyysiäinen, 1999, 2012; Shermer, 2011). Conversely, it showed that naturalism was influenced largely by a lack of anthropomorphising tendencies, as well as a proclivity for mechanistic, systemised thinking – again supporting an emerging trend in research (Caldwell-Harris, 2012; Del Giudice et al., 2010; Rosenkranz & Charlton, 2013). Current results also showed that weak agnosticism was decreased by a need for cognition, which suggests that an appreciation for and enjoyment of complex thinking leads to less uncertainty and flexibility of beliefs and values. All of this data provides new tools for how worldviews might be directly and indirectly included in the therapeutic process.

Clinical psychologists have been using cognition as leverage to adjust the thinking styles and the core beliefs of clients for a long time (Beck et al., 1979; Riso et al., 2007; Wenzel, 2012). Inspired by the stoic philosophers, Beck et al. (1979) suggested that many psychological problems can be traced to problems in cognition, and resolved by making changes to the way that clients think about themselves and the world. Meta-analytic findings for the effectiveness of cognitive therapy in treating depression are well documented (e.g., Biesheuvel-Leliefeld et al., 2015). There are different levels at which cognition can be adjusted – from the surface level automatic thinking styles to the deeper core beliefs that generate these everyday ways of thinking (Hackney & Cormier, 2013; Riso et al., 2007; Wenzel, 2012). A clinical example of a depressive core belief might be “I am just no good,” and this can lead to everyday cognitive biases towards thoughts that support this core belief, such as “I made a fool of myself again.” Based on practitioner training and client preferences and goals for treatment, cognitive therapy can involve working at both of these different levels, for example, by helping clients to become aware of the everyday thoughts and exploring alternatives, or by exploring the core belief and alternatives. The intention is to move the client towards core beliefs and thinking styles that help to produce their desired
outcome – whether relief from symptoms of psychological distress, the overcoming of specific limitations, or the general movement towards flourishing in life.

Results from the current project provide examples for worldview change in clients following a cognitive model. Surface level thoughts might cognize everyday experiences as reflective of mechanistic processes or of personal agencies, and alternatives might be explored. Increasing a sense of personal agency is a large part of many therapeutic approaches (Williams & Levitt, 2007), and research has shown that there are priming techniques that can impact the immediate sense of agency (Moore et al., 2009). However, just as a cognitive practitioner might explore the core beliefs underlying everyday negative thoughts, practitioners might also trace everyday interpretative thoughts back to their worldview content. For example, a client may upon questioning report a naturalist worldview belief, “reality is purely physical” - and alternatives might again be explored.

For example, using techniques from cognitive therapy, a clinician and client might collaboratively decide to increase spirituality in order to reduce psychological distress or remove barriers to life goals. Current results suggest that spirituality leads to more well-being outcomes, especially as it increases meaning in life. Meta-analyses have shown that spiritually-oriented therapies can be beneficial in addressing issues such as depression and anxiety (Smith, Bartz, & Richards, 2007). This is understandable, as meaning and purpose can only exist in the context of an agent that can understand and intend, and therefore personal meaning and purpose and universal meaning and purpose can only logically exist if personal or cosmic agencies are perceived (Pyysiäinen, 1999). It is understandable then that many theorists have argued for spirituality to be incorporated into psychiatric and psychotherapeutic practices (e.g., Barrera, Zeno, Bush, Barber, & Stanley, 2012; Hodge, 2006; Jones, 1994; Koszycki, Raab, Aldosary, & Bradwejn, 2010; Mohr, Gillieron, Borras, Brandt, & Huguelet, 2007; Murray-Swank & Pargament, 2011; Pargament, Murray-Swank,
& Tarakeshwar, 2005; Vieten et al., 2013). By modifying interpretation of agency as it occurs in daily life, or by exploring or maximising specific worldview beliefs, clinicians and clients may find that a focus on worldviews opens new possibilities for beneficial therapeutic outcomes.

For example, when considering the increase in agency-beliefs specifically, autistic traits are characterised by a detriment in social cognition, theory of mind, and agency detection (Blair, Frith, Smith, Abell, & Cipolotti, 2002; Del Giudice et al., 2010; Frith, Morton, & Leslie, 1991). One of the great challenges in treating autism has been to generalise social skills outside of laboratory settings into larger spheres of life, and this seems to be related to a fundamental perception of other people as objects rather than living agents. But research shows that awe-inducing experiences can be used to increase cognitive tendencies supporting theory of mind, and also supernatural beliefs (Valdesolo & Graham, 2014), which validates the notion that these constructs are intertwined, and provides an avenue for effective worldview change for targeted outcomes. Studies have even used psychedelics to induce mystical states that have been associated with sustained positive impacts on autistic traits, depression, and death anxiety (e.g., Griffiths et al., 2016; MacLean et al., 2011; Ross et al., 2016; Rucker, Jelen, Flynn, Frowde, & Young, 2016; Sigafoos, Green, Edrisinha, & Lancioni, 2007). Facilitating spirituality as a worldview, perhaps through mystical experiences, may have the potential to foster improved hedonic, eudaimonic, and social well-being.

Although in some cases the increase in spirituality and agenticity might be clinically beneficial, at extreme levels these tendencies can lead to schizotypal experiences (Del Giudice et al., 2010; Unterrainer et al., 2011). First, the content of people’s belief in supernatural agencies or ultimate meaning and purpose can be problematic, if they are incongruent with reality or lead to antisocial behaviours or personal distress, and techniques
to reduce the negative impact of spirituality in such cases has been discussed (Richards & Bergin, 1997). Second, mystical experiences were shown in the current findings to increase feelings of dissociation with society, and a lack of moral considerations and values.

Disordered thinking and behaviour could be driven either by rigid spiritual worldviews, or by a state of transcendent disorientation. In either case, cognitive therapy can again be used to modify worldviews by exploring alternative everyday naturalistic interpretations for events, or by exploring worldview beliefs that might offer a naturalist alternative to non-physical worldviews (e.g., “human consciousness is a by-product of the brain and body”). Cognitive therapies have been shown to be effective for psychosis (Chadwick, Birchwood, & Trower, 1999), and worldview data would offer new avenues for clinicians and clients in treatment.

A final implication for clinical practice, especially in the context of worldview moderation, is that weak agnosticism was shown to be associated with many decreased well-being outcomes, but strong agnosticism was not. These findings point to a subtle difference in the mechanism by which therapists might consider the expansion or alteration of client beliefs and values. Clients who feel unsure about what they believe or value, or feel that their beliefs and values might change moment to moment, are more likely to experience negative well-being outcomes, and yet a set of beliefs and values that reflect a firm postmodern stance is far less likely to produce the same negative outcomes. This supports the work of family therapist Mason (1993), who recommended that therapists help to move their clients from a position of “unsafe uncertainty” to a position of “safe uncertainty” (p. 35) by demonstrating an attitude by which this is possible emotionally and intellectually. Perhaps, as with spirituality and naturalism, worldview psychology can offer cognitive therapists data in support of adopting this approach explicitly.

In the context of the current findings, it is also worth noting recent attempts to introduce philosophical exercises into schools (Gorard et al., 2017). Philosophy has been
noted to be generally therapeutic (Fischer, 2011), and even argued to be targeted at the specific goal of worldview construction and change (Leontiev, 2007; Vidal, n.d.). The current findings show that, by developing sophisticated worldviews that can buffer against weak agnosticism, it may be possible to avoid a range of detrimental influences on well-being. Other research has also shown that incongruence between student worldviews and those of their teachers or curriculum can act as a barrier to learning (Hansson & Lindahl, 2010; Liu & Lederman, 2007), offering further support for the attention on worldviews in educational settings.

8.3.2 The Ethics of Worldview Change

While data seems to suggest new avenues for providing worldview change in clients, it also provides justification for making those changes. Current findings compared spirituality, naturalism, and agnosticism in terms of their influence on a wide spectrum of well-being outcomes. Evidence points to some worldviews having particular psychological benefits in certain circumstances. Spiritual beliefs and behaviours appear to be associated with wider dimensions of moral identity and increased meaning in life, and subsequently have a positive influence on hedonic, eudaimonic, and social well-being, and death anxiety. In particular, spirituality and its non-physical, agency-focused cognitions seem likely to assist in situations such as depression and autism, where there is a paucity of meaning and empathy. In contrast, the agency-centred thoughts and beliefs typical of spiritual worldviews might be problematic in psychotic presentations, and instead the naturalistic worldview and related mechanistic cognitions might be remedial. Thus, worldview research leads to interesting dilemmas for clinical psychologists in terms of the ethics behind the concept of worldview change. What role do psychologists have in providing psychoeducation regarding the health impacts of worldviews, and in suggesting the potential avenue of worldview change when it
appears to be relevant for client-desired outcomes? At what point do the potential benefits of worldview change outweigh allegiance to client cultural backgrounds?

Cultural competencies are the abilities of the clinician to understand and effectively engage with the perspectives of clients, while taking into account the dynamic traditions, histories, and worldviews inherent to their identified culture (Roysircar, 2009; Whaley & Davis, 2007). They do this by being aware and knowledgeable about their own worldviews, as well as the worldviews of their client, and by shaping their practice in such a way as to “be the most effective practitioners (therapists) for all clients” (Arredondo et al., 2003, p. 392). From this perspective, the endpoint of therapy is not to provide the client with a worldview that is an accurate representation of reality in any objective ontological sense, but to use the worldviews of both clinician and client as tools for arriving at agreed upon therapeutic goals. This echoes the view outlined by William James, who suggested that truth in psychology can be best understood as sets of beliefs or theories that are pragmatically useful, rather than objective descriptions of the real nature of reality (James, 2011; Tourinho & Neno, 2003). On the surface this might seem uncontroversial, seeing as all worldview beliefs are unproveable, and it is not psychology’s obligation per se to investigate the existential truth of any claims as this would be delving too far into the realms of metaphysics. Furthermore, research has highlighted the capacity that some cognitive distortions have for maintaining well-being in the face of adversity (Taylor & Brown, 1988).

If we consider the place of worldviews in psychological treatment as a purely pragmatic issue, then the data suggests that in some cases psychologists might be called upon to challenge the worldviews of clients where it is seen to be clinically relevant. The difficulty lies in psychologists making the judgment of application alongside their clients, and avoiding the mistake of treating a worldview as problematic when it is not, or treating a worldview as not problematic when it is. These decisions are mostly straightforward to navigate in cases
whereby clients exhibit clearly derogatory cognitions about the self, or in which clients have enough insight to put their own undesired cognitions on the agenda for therapeutic challenge, but what about cases in which the therapist is specifically asked or dutifully compelled to offer avenues for positive change, knowing that the data suggests a particular worldview shift is likely to have the desired outcomes for the client? Would psychologists confidently suggest that research suggests worldviews can be considered plastic dimensions of personality capable of being moulded to suit certain ends? How much evidence is required before psychoeducation regarding worldview dimensionality is warranted; or before a client’s perspectives of worldviews as categories are challenged?

Psychology as a discipline might have difficulty in explicitly incorporating some worldview beliefs as legitimate individual difference variables, because perceptions, beliefs, and ideas that stray too far from sanctioned norms of specific cultures (e.g., a scientific or religious group) are typically classified as hallucinations, delusions, or thought disorders. For example, imagine that an individual were to undergo bizarre alterations to their everyday way of perceiving the world, perhaps combined with the subjective sense that they were realising a profound insight from a source that might be ineffable, or even a non-physical entity. Depending on the worldview with which this experience was understood, it could be interpreted as a spiritual or mystical vision, one that for a shaman or religious leader might traditionally have “psychotherapeutic and psychogenic importance” (Frankl, 1973, p. 49; La Barre, 1972), or it could be interpreted as “the misfiring of a disordered brain distorting the everyday world” (Fenwick, 2010, p. 9). Similarly, spiritual ideas and beliefs might be indistinguishable from psychotic delusions (Clarke, 2010a), and even negative symptoms such as social withdrawal can be seen as the kind of isolation necessary for mystical initiation (Lukoff, 2010). Presentations of spiritual beliefs and experiences can be very similar to presentations of psychosis, and evidence suggests that clinicians are likely to consider them
pathological, particularly if the client has no perceived connection to a religious institution (O’Connor & Vandenberg, 2005).

While there is no doubt that many people who experience problematic distortions in perception and belief seek and deserve proper treatment, evidence suggests that the naturalist-psychosis and spirituality-transformation worldview frameworks might be indicated in different situations. The capacity for clinicians to decide between these interpretations depends on their knowledge, training, and clinical perspective (Chandler, 2012). For many of the disorders described in the DSM-5 (APA, 2013), the manual includes a section outlining information about the way that symptoms might be interpreted differently across cultures, highlighting the need for assessing clinicians to acknowledge the subjectivity of normality in client experience. For example, under the description of schizophrenia, the DSM-5 cautions that hallucinations or delusions with religious content might be a normal part of religious experience in some cultures. Similarly, hallucinations might arise from stress in a way that is normative for some cultures, and that inferences about thought and affect distortions must account for normative differences in expression across cultures. The DSM-5 also includes the Cultural Formulation Interview, which can help clinicians to understand the presenting problem from the perspective of the client’s cultural background.

The limitation with these diagnostic warnings is that they centre on the cultural background of the client, which fails to capture the unusual presentations of some clients as part of a spiritual but not religious experience. Declaring one’s counterintuitive beliefs and experiences as part of an accepted religion has historically been a safety net for avoiding psychotic diagnosis – but emergence of a spirituality concept that can divorce counterintuitive experiences from established religious groups makes this issue troubling. Statistics show that Western membership in religious institutions is rapidly decreasing, while personal approaches to spiritual and mystical experiences are rapidly increasing (Lukoff, Lu,
The cultural background of the client might have nothing to do with current presentations, and yet there still remains the option of differentiating spiritual crises from psychosis. Again, the worldview of the client and of the practitioner both come into play in the therapeutic process in beginning to make sense of the experiences.

During the development of the Diagnostic and Statistical Manual – Fourth Edition, Lukoff et al. (1992) submitted a proposal that psychoreligious or psychospiritual problems be represented in the manual. They argued that this separate diagnostic category would reduce problems associated with misdiagnosis of spiritual and religious distress, incite research that could enhance treatment in these areas, and promote practitioner training around the recognition and treatment of these types of issues. The proposal was accepted, such that both the fourth edition and the most recent DSM-5 both contain the V code diagnostic category of Religious and Spiritual Problems. However, there are considerable differences between the published version of this category and the initial proposition. Originally, Lukoff (1985) had suggested that a new diagnostic category recognise Mystical Experience with Psychotic Features. Building on this, the Religious and Spiritual Problems category was intended to capture troubling experiences relating to religious involvement, and also relating to personal spiritual experiences with a transcendent being or force, near-death, or mystical states. However, instead of including full descriptions for both psychoreligious and psychospiritual issues, the published Religious and Spiritual Problems category integrated them into one definition, which describes distress centred on the loss of faith in a traditional religious belief system, a change in religious membership, or the questioning of spiritual values.

The main limitation around this new category is that it does not stand as a weighty diagnostic alternative to psychotic disorders. It encourages an understanding of spiritual problems as the conscious questioning of institutionalised beliefs. And yet, studies in
transpersonal psychology have identified that the process of psychospiritual development, often referred to in the literature as “spiritual emergency” (Prevatt & Park, 1989), can manifest as hallucinations and ineffable mystical experiences that might appear as delusion or thought disorder if communicated poorly (Lukoff, Lu, & Turner, 1998). Furthermore, the fact that V codes cannot be used to bill insurance companies in many countries means that the DSM-5 inclusion of this category acknowledged spirituality “in a way that marginally impacted assessment or treatment” (Chandler, 2012, p. 579). While the inclusion of the Religious and Spiritual Problems category does encourage more consideration for the attitude that practitioners bring to their interpretation of client issues, it is limited in actually being considered as an alternative diagnostic approach to the presentations characteristic of psychosis.

Does it really matter if problematic symptoms characteristic of psychosis are always diagnosed as such, rather than spiritual emergency? On the surface, it is tempting to take the stance that treatment should simply focus on the most empirically-based approach to dealing with distressing symptoms and their impact on client well-being. However, empirical research in support of treatment models is largely shaped by the diagnostic categories included in the DSM-5, and so the justification for limiting possible diagnostic categories based on their clinical usefulness is somewhat circular. The only way we could empirically discover whether a more robust diagnostic category for spiritual distress, such as Lukoff's (1985) Mystical Experience with Psychotic Features, holds as much clinical usefulness as the psychotic disorders, is if it were given a similar amount of attention amongst clinical researchers. To achieve this, it would need to first be fully represented in the diagnostic system (Chandler, 2012; Lukoff et al., 1992).

Furthermore, although the DSM-5 is a diagnostic rather than treatment manual, it is naïve to suggest that its framework has no impact on choice of treatment. The exclusion of a
differential diagnostic option directs treatment of unusual experiences towards a psychosis framework that can carry extreme stigma and have negative outcomes for some clients (Lukoff, 2010). This limit in diagnostic options also impacts the frequency with which people experiencing troubling perceptions and ideas might seek treatment, from fear of being pathologised (Jackson, 2010). For many, the psychosis symptomology, with its attached preference for systematic clinical and psychopharmacological treatment, is seen as a framework that “plunges them instantly into one of the least favoured categories in our society, which is in itself highly destabilising to mental health” (Clarke, 2010b, p. 196).

Distinguishing between psychosis and spiritual emergency is not easy. However, there are many projects that have aimed to clarify their differences so that clinicians can make informed decisions (e.g., Lukoff, 2010). Treatment options for spiritual emergencies can then be tailored to suit client preferences and available support. Spiritual interventions can normalise unusual experiences, not merely in terms of their frequency, but in a way that communicates their usefulness across human history. Treatment can also recognise the importance of withdrawal from stimulating activities, such as media that disrupts what can be understood as an ongoing process of intense spiritual transformation. The individual can be advised to stop spiritual practices such as meditation, and they are more likely to adhere to this directive if it acknowledges the validity of these practices in producing the kind of spiritual transformation that they are currently experiencing in a problematic fashion. These are some of the many approaches that have been shown to help clients with spiritual emergencies closely resembling psychosis, and evidence suggests that these techniques can show improved outcomes compared to psychiatric approaches (Bola & Mosher, 2003; Lukoff, 2010).

All of this discussion is to provide a clear example of one area in which there is a justification for considering how worldviews might be considered loose frameworks in
clinical practice. This can challenge clinicians’ preferences for how to understand reality and mental illness. Data in worldview psychology presents each client as a unique task of cultural competency, in which the practitioner can be aware of the worldviews that both therapist and client present, and consider both positions as ontologically unfounded, malleable, and dimensional structures that have the potential to hinder or aid the therapeutic process. As O’Donohue (1989) explained:

Whether a given problem is described in terms of medical/disease entities, behavioral excesses or deficits, unconscious conflicts, or existential problems in living is determined by the therapy program… that psychologists view a certain state of affairs as problematic is influenced by our metaphysical views concerning such issues as what constitutes the good life, human nature, and morality. No firm barrier separates our beliefs qua clinical psychologists from all our other beliefs. The results of our efforts to understand and help other human beings are a function of our entire web of belief. This web, and especially beliefs central to it, need at times to be considered open questions – indeed open metaphysical questions – and to be subjected to the best criticism we psychologists can muster. (p. 1467-1468)

As worldview psychology begins to investigate the contextual associations between various worldviews and positive psychological outcomes, practitioners will begin to obtain a pool of data regarding the different impacts that shifts in worldviews might have for their clients. This challenges psychologists to consider seriously William James’ pragmatic philosophy in which the truth of concepts are judged purely in terms of their functionality. Whatever a clinician might think of concepts that run counter to established empirical movements (e.g., spirits, souls, gods, free will, the value of mystical experiences), they are
doubtlessly real in the sense that they are enduring cognitive experiences with varying consequences for many people (Pyysiäinen, 1999).

What seems helpful is for psychological practitioners and scientists to adopt a pragmatist, constructionist, and methodologically agnostic stance in their care and research. For clinical treatment, this means recognising that sometimes explanatory models at the foundation of psychiatric aetiologies might need to be held flexibly by the practitioner in order to accommodate the worldviews of clients that might challenge empirical reductionism (Brendel, 2003). Equally, it might mean avoiding exclusivist positions that posit the unshakable reality of spiritual values even where they might pose problems for clients (Zinnbauer & Pargament, 2000). Psychology has a lot to lose by overreaching its ability to make metaphysical, presuppositional claims, and much multicultural beneficence to gain from instead considering impartially the impact that various worldviews might have on people’s lives.

**8.4 Directions for Further Research**

The current project indicates several strands worthy of research in the continued theoretical clarification of worldviews in psychology, and also in the role of worldviews for clinical practice.

**8.4.1 Theoretical Research**

The current project developed an instrument to measure spirituality, naturalism, and agnosticism as three distinct worldviews that could be understood as individual difference variables in personality. While initial data suggests that the SNAS does robustly assess these three worldviews across five domains, further validation of these domains is warranted in diverse samples. In particular, research could extend the pool of comparison groups in order
to further support the universality of the worldview domains – in particular, that spirituality
and mysticism represent constructs that cut across specific religious and cultural groups.
Furthermore, both weak and strong agnosticism were reduced to quite small item pools in the
final models, and further iterations of item testing could extend and then refine the scales
towards comprehensiveness and robustness. The Multitrait-Multimethod approach could add
further validity to the existence of these distinct worldviews as constructs in personality, in
particularly by utilising varied method to measure the three worldviews, perhaps even just
with alternative response sets to the self-report surveys (Campbell & Fiske, 1959).

The suggestions that worldview beliefs such as spirituality are domains that are
distinct and beneficial alongside the Big 5 representation of personality was supported by
current research, however further studies can clarify this using the developed scales. For
example, for practical reasons Big 5 personality domains were not included in the surveys
that assessed the influence of the worldview constructs on well-being outcomes, and so it is
unclear to what extent the Big 5 domains might have accounted for variance in well-being
outcomes currently attributed to the worldview domains. However, conformity to
longstanding theoretical and empirical associations between spirituality and the well-being
outcomes would suggest that the contribution of worldviews would remain significant.
Perhaps even more interesting is whether the explicit incorporation of worldview beliefs into
the Big 5 domains of personality would expand their explanatory and predictive power in
psychological research.

As well as accounting for personality in tests of outcome, it would have been useful to
measure other demographic factors that are known to have an influence on meaning in life
and the other domains of well-being. For example, the current studies did not account for
socioeconomic status or life achievements, which might have changed the degree to which
worldview were implicated in the well-being variance.
The current project tested a theoretical model whereby cognitive tendencies underlie variance in worldviews, and variance in worldviews influence well-being. Thus, the structural equation models tested these hypotheses specifically, and not alternative models in other directions, whereby worldview beliefs might have an influence on cognitive tendencies, and well-being variables may have a significant influence on the worldviews that people are likely to experience or report. It is very possible that these alternative models could demonstrate significant findings. Some recommendations have been made for researchers to test alternative and non-equivalent models in order to reduce these ambiguities (e.g., Tomarken & Waller, 2003). However, extensive testing of alternative models was not feasible in the current project, and too many post hoc tests of this nature risk an inflation of Type 1 errors and unreplicable findings. Furthermore, if alternative relationships are also observable in the general population it would not discount the usefulness in knowing the direction of influence highlighted in the current studies – it is very likely that both directions of influence occur. The current hypotheses were supported by a cohesive theoretical framework substantiated by accounts from evolutionary psychology, cognitive psychology, and the psychology of religion and spirituality, and the findings pertaining to the direction of influence in the current models provide clear avenues for cognitive engagement with worldviews in therapeutic practice. As Tomarken and Waller (2003) suggest, readers are encouraged to consider that relationships may exist in different directions to those currently studied, and, given that worldviews and well-being are both concepts of enormous breadth, it is likely that more variables would significantly contribute to the sort of models currently tested, which may chance statistical findings. Researchers are encouraged to design further studies that can specifically address these issues, by focusing on other plausible interactions between worldviews, cognition, and well-being.
In order to strengthen the data regarding the influence of cognition on worldviews, and worldviews on well-being, experimental studies could be employed. For example, these might use strategies to prime certain cognitive tendencies (e.g., a sense of personal agency, anthropomorphising, systemising, or mystical experience) and measure influence on worldview scales compared to control groups. If worldviews can be reliably altered using these techniques, then experimental studies could also be designed to test the influence of worldview change on well-being outcomes. In either case, longitudinal studies linking worldviews with well-being outcomes, accounting for various demographic information, are desirable.

It is important to again note the differences between the influences of worldviews at the individual versus the socio-political levels. The current project used self-report data to situate worldviews in the context of individuals, and comments on the associations between internal constructs. One implication of this is that stronger belief in spiritual worldviews was associated with greater well-being. However, this tends to run counter to socio-political data that suggests societies demonstrate higher quality of life if they are more secular. Furthermore, flexibility and uncertainty of personal belief was associated with detrimental impacts at the personal level, but this is counterintuitive to theories that suggest in-group/out-group conflicts might be greater for those who are less flexible with their belief systems. Comparisons of individual, social, and socio-political data would shed necessary light on the complex functionality of worldviews at the different levels of human life. Johnson, Hill, and Cohen (2011) have mapped out an agenda for worldview psychology that would link data from individual psychology to cultural, sociological, and linguistic domains.

Finally, as has been mentioned, the current studies are subject to the usual limitations surrounding self-report data, in the form of a range of response biases. In validating the SNAS, it was shown that the worldview domains did not correlate even moderately with
either impression management or self-deception enhancement, which indicates that the constructs are not particularly conducive to self-report distortion. However, these same tests were not completed in subsequent studies to measure socially-desirable responding alongside cognitive tendencies or well-being variables. When testing worldviews, these issues are further complicated by the possibility of measuring what Levy (2018) has called meta-beliefs, that is, a subject’s belief that they believe a given proposition. This suggests that self-reporting biases are not limited to distortions for egoic enhancement, but rather can simply represent people’s tendency to be unclear about the beliefs that actually inform their actions in the world accurately. For example, there may be significant discrepancies between participants who report high belief in determinism and non-agency, but who nevertheless exhibit behaviours and thoughts that treat themselves and others as free agents in the world. Studies have found that implicit supernatural beliefs were evident even when explicit reporting denied them (Jong et al., 2012).

These meta-beliefs are worthy of empirical research in their own right, and point to the need for further experimental, and ideally embodied research into worldviews. Research could also validate the current measures alongside experimental or qualitative worldview data (e.g., Cassar & Shineboume, 2012; Hodge, 2001) in order to test the accuracy of the scales in this regard.

### 8.4.2 Clinical Research

Current findings were used to suggest cognitive therapy approaches to worldview modification, especially in instances where a strength or weakness of specific worldview beliefs are potentially problematic to the client. Clinical trials might be developed in order to test the efficacy of cognitive worldview change individually and in groups, or indeed worldview change through other therapeutic approaches. Data also suggests that mystical
experiences might be an effective method by which to engage spiritual worldviews and their associated foundations in social cognition and anthropomorphising. It seems there is enough evidence to suggest that this could be useful for certain clinical populations, for example, those with clinical depression linked to a lack of meaning in life, and those whose autism-like traits might indicate a need for radical increase in social cognition. Not only do clinical trials need to assess the potential for cognitive therapy and mystical states to effectively change worldviews, but also to assess the capacity for safe achievement of specific outcomes.

It was suggested that an embracing of worldview pluralism in psychological treatment and research might require some degree of pragmatist philosophy on the part of scientists and practitioners. For the very same ethical reasons that make this shift necessary, the changes in attitude cannot be forced on those in the field. Research could focus on the opinions of researchers and practitioners regarding the perceived benefits and dangers of incorporating pluralist, pragmatic approaches to worldviews in psychology. To some extent the vocabulary used in the DSM-5 affects and limits the direction of funding for clinical research and subsidised practice. It is worth assessing how well this reflects the true ambitions and ethical stances of those working in the field. Based on this information, systematic research can be conducted to clarify new diagnostic subtleties and treatment modalities that have the potential to capture presentations from multiple perspectives, while still justifying focus from trained clinicians. This will also encourage psychologists and training facilities to become familiar with the ways that worldviews of clients and practitioners influence the therapeutic process, and might encourage treatment approaches can become even more appropriate and effective.

8.5 Conclusion

The current project investigated principles of worldviews in psychology using spirituality, naturalism, and agnosticism as three example constructs. Results showed that
worldview constructs provide distinct domains of variance in individual personality, and suggest that worldview beliefs could be incorporated into personality constructs alongside traits in order to represent personality more comprehensively, and overcome some philosophical problems when trait theory is represented without worldviews. Subsequent research can continue to test the extent to which the explanatory and predictive power of trait personality constructs are improved with the inclusion of worldview beliefs.

Current findings suggested that worldview constructs have logical association with cognitive tendencies. This supports emerging trends in evolutionary and cognitive science, which suggests that certain perceptual and conceptual capacities emerged as survival adaptations, and that worldviews can be best understood as amalgamations of those capacities observed at the level of personality. Especially with the current examples of spirituality, naturalism, and agnosticism, this has implications for how researchers treat distinct worldviews – most importantly that they are considered to be dimensions of variance across universal categories, observable in degrees of strength across people, over time, and in different contexts. These findings also suggest that there are cognitive avenues for worldview modification.

Finally, the current project examined the influence that spirituality, naturalism, and agnosticism had on a wide gamut of well-being outcomes. Predominantly these findings showed that spirituality was a greater contributor to individual well-being. In terms of worldviews generally, these findings might indicate that the strength of worldviews is necessary to avoid detriments to well-being, but that beyond the negation of negative effects, the content of worldviews need to provide to meaning in life to be of well-being benefit.

All of these findings together have large implications for research and clinical practice. The continued integration of worldview beliefs into personality constructs appears to be a warranted endeavour, but carries with it the demands of further psychometric
validation, and perhaps even the revisiting of well-established measures with the aim of introducing explicit items capturing semantically relevant worldview beliefs.

For both scientists and clinicians, the ethical demand for cultural competencies, combined with data from worldview psychology, invites a complex acknowledgement of the potential for worldviews to influence research and therapy methods. This seems to point towards a serious revisiting of the pragmatist philosophy put forward by James (2011) at the outset of modern psychology, which can approach the wide variety of worldviews presented by clients, practitioners, and scientists with the aim of using them as tools to explore the possibilities for effective ways of engaging with ourselves, each other, and the world.
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Appendix A – Study One Ethical Clearance

To: A/Prof. Roger Cook
cc: Dr Jeffrey Pfeifer, FHAD/ Mr Oliver Holmes

Dear A/Prof. Cook

**SHR Project 2014/238 Spirituality, Naturalism, Mysticism and Agnosticism in Personality**
Dr Roger Cook, FHAD/ Mr Oliver Holmes
Approved Duration: 30/10/2014 to 30/03/2015

I refer to your correspondence received in hard-copy on 23 February 2015 in which you requested a modification to the project by changing the Principal Investigator/Student Supervisor. The documentation was reviewed by a SHESC2 delegate.

I am pleased to advise that, as modified to date, the project/protocol may continue in line with standard ethics clearance conditions previously communicated and reprinted below.

Please contact me if you have any queries about on-going ethics clearance, citing the SUHREC project number. Copies of clearance emails should be retained as part of project record-keeping.

As before, best wishes for the project.

Kind regards,
Astrid Nordmann

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Dr Astrid Nordmann
Research Ethics Officer
Swinburne Research (H68)
Swinburne University of Technology
PO Box 218, Hawthorn, VIC 3122
Tel: +613 9214 3845
Fax: +613 9214 5267
Email: anordmann@swin.edu.au

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From: Kaye Goldenberg
Sent: Thursday, 30 October 2014 3:15 PM
To: Jeffrey Pfeifer; Oliver Holmes
Subject: SHR Project 2014/238 Ethics Clearance

Dear Dr Pfeifer,

**SHR Project 2014/238 Spirituality, Naturalism, Mysticism and Agnosticism in Personality**
Dr Jeffrey Pfeifer, FHAD/ Mr Oliver Holmes
Approved Duration: 30/10/2014 to 30/03/2015

I refer to the ethical review of the above project protocol by a Subcommittee (SHESC2) of Swinburne’s Human Research Ethics Committee (SUHREC) at a meeting held 26 September 2014. Your response to the review, as emailed on 20 October was reviewed by a SHESC2 delegate.

I am pleased to advise that, as submitted to date, the project may proceed in line with standard on-going ethics clearance conditions here outlined.
- All human research activity undertaken under Swinburne auspices must conform to Swinburne and external regulatory standards, including the current National Statement on Ethical Conduct in Human Research and with respect to secure data use, retention and disposal.
- The named Swinburne Chief Investigator/Supervisor remains responsible for any personnel appointed to or associated with the project being made aware of ethics clearance conditions, including research and consent procedures or instruments approved. Any change in chief investigator/supervisor requires timely notification and SUHREC endorsement.
- The above project has been approved as submitted for ethical review by or on behalf of SUHREC. Amendments to approved procedures or instruments ordinarily require prior ethical appraisal/clearance. SUHREC must be notified immediately or as soon as possible thereafter of (a) any serious or unexpected adverse effects on participants any redress measures; (b) proposed changes in protocols; and (c) unforeseen events which might affect continued ethical acceptability of the project.
- At a minimum, an annual report on the progress of the project is required as well as at the conclusion (or abandonment) of the project. Information on project monitoring, self-audits and progress reports can be found at: http://www.research.swinburne.edu.au/ethics/human/monitoringReportingChanges/
- A duly authorised external or internal audit of the project may be undertaken at any time.

Please contact the Research Ethics Office if you have any queries about on-going ethics clearance. The SHR project number should be quoted in communication. Researchers should retain a copy of this email as part of project recordkeeping.

Best wishes for the project.

Yours sincerely,

Kaye Goldenberg
Acting Secretary, SHESC2

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Appendix B – Study Two Ethical Clearance

From: Astrid Nordmann
Sent: Friday, 12 June 2015 8:05 AM
To: Roger Cook
Cc: RES Ethics; Oliver Holmes; Bruce Findlay
Subject: SHR Project 2015/132 - Ethics clearance
To: A/Prof. Roger Cook - FHAD

Dear Roger,

SHR Project 2015/132 – Validating a measure of worldviews
A/Prof. Roger Cook, Mr Oliver Holmes, Dr Bruce Findlay - FHAD
Approved duration: 12-06-2015 to 03-11-2015 [adjusted]

I refer to the ethical review of the above project protocol by a Subcommittee (SHESC1) of Swinburne’s Human Research Ethics Committee (SUHREC). Your responses to the review, as per the email sent on 11 June 2015, were put to the Subcommittee delegate for consideration.

I am pleased to advise that, as submitted to date, the project may proceed in line with standard on-going ethics clearance conditions here outlined.

- All human research activity undertaken under Swinburne auspices must conform to Swinburne and external regulatory standards, including the current National Statement on Ethical Conduct in Human Research and with respect to secure data use, retention and disposal.
- The named Swinburne Chief Investigator/Supervisor remains responsible for any personnel appointed to or associated with the project being made aware of ethics clearance conditions, including research and consent procedures or instruments approved. Any change in chief investigator/supervisor requires timely notification and SUHREC endorsement.
- The above project has been approved as submitted for ethical review by or on behalf of SUHREC. Amendments to approved procedures or instruments ordinarily require prior ethical appraisal/clearance. SUHREC must be notified immediately or as soon as possible thereafter of (a) any serious or unexpected adverse effects on participants any redress measures; (b) proposed changes in protocols; and (c) unforeseen events which might affect continued ethical acceptability of the project.
- At a minimum, an annual report on the progress of the project is required as well as at the conclusion (or abandonment) of the project. Information on project monitoring, self-audits and progress reports can be found at: http://www.research.swinburne.edu.au/ethics/human/monitoringReportingChanges/
- A duly authorised external or internal audit of the project may be undertaken at any time.

Please contact the Research Ethics Office if you have any queries about on-going ethics clearance. The SHR project number should be quoted in communication. Researchers should retain a copy of this email as part of project recordkeeping. Best wishes for the project.

Yours sincerely,
Astrid Nordmann
SHESC1 Secretary

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Appendix C – Study Three Ethical Clearance

To: A/Prof. Roger Cook, FHAD

Dear Roger,

SHR Project 2015/310 – Worldviews, Cognition and Well-Being
A/Prof. Roger Cook, Mr Oliver Holmes (Student), Dr Bruce Findlay - FHAD
Approved duration: 14-12-2015 to 01-06-2016

I refer to the ethical review of the above project by a Subcommittee (SHESC2) of Swinburne’s Human Research Ethics Committee (SUHREC). Your responses to the review as emailed on 08 December 2015 were put to the Subcommittee delegate for consideration.

I am pleased to advise that, as submitted to date, ethics clearance has been given for the above project to proceed in line with standard on-going ethics clearance conditions outlined below.

- All human research activity undertaken under Swinburne auspices must conform to Swinburne and external regulatory standards, including the National Statement on Ethical Conduct in Human Research and with respect to secure data use, retention and disposal.

- The named Swinburne Chief Investigator/Supervisor remains responsible for any personnel appointed to or associated with the project being made aware of ethics clearance conditions, including research and consent procedures or instruments approved. Any change in chief investigator/supervisor requires timely notification and SUHREC endorsement.

- The above project has been approved as submitted for ethical review by or on behalf of SUHREC. Amendments to approved procedures or instruments ordinarily require prior ethical appraisal/clearance. SUHREC must be notified immediately or as soon as possible thereafter of (a) any serious or unexpected adverse effects on participants and any redress measures; (b) proposed changes in protocols; and (c) unforeseen events which might affect continued ethical acceptability of the project.

- At a minimum, an annual report on the progress of the project is required as well as at the conclusion (or abandonment) of the project. Information on project monitoring and variations/additions, self-audits and progress reports can be found on the Research Intranet pages.

- A duly authorised external or internal audit of the project may be undertaken at any time.

Please contact the Research Ethics Office if you have any queries about on-going ethics clearance, citing the Swinburne project number. A copy of this email should be retained as part of project record-keeping.

Best wishes for the project.

Yours sincerely,
Astrid Nordmann
SHESC2 Secretary

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