

Article

Comparison of Different Measures of Religiousness and Spirituality: Implications for Neurotheological Research

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Abstract: The neuroscientific study of religious and spiritual phenomena requires the development of methodologies that can target both the biological as well as the subjective dimensions of such phenomena. The purpose of the current study was to compare various subjective questionnaires evaluating neuropsychological dimensions of religiosity. Many scales and questionnaires have been developed over the years, but they have rarely been compared to each other. As part of an online survey of peoples' spiritual experiences, we had individuals complete several questionnaires including the Quest Scale, the Religiousness Measure, the INSPIRIT, the Death Anxiety Measure, and the Intrinsic Motivation Scale. Some of these scales also have subcomponents which can be evaluated separately. We compared these scales to each other, and also to a variety of demographic variables such as age, gender, religion, and socioeconomic status. Importantly, these scales have neurological correlates that can be the targets of future studies in the field of neurotheology. The evaluation of such qualitative data has important implications for methodological challenges in future neurotheological research.

Keywords: brain; religion; neurotheology; religiousness; spirituality; behavior; subjective measures; qualitative data; methodology

1. Introduction

Neurotheology is an emerging discipline that seeks to explore the relationship, or link, between the brain and religious and spiritual phenomena (Newberg 2018). As a term, and a field, neurotheology should be considered a two-way street in the sense that it is not a narrow scientific reductionism of religion, nor is it a theological evaluation about the merits of science. Neurotheology should be regarded as a multidisciplinary field that seeks to utilize the best methods and approaches from both the scientific as well as the spiritual perspective.

The two components of neurotheology, namely the “neuro” and the “theology” parts, must be regarded broadly (Newberg 2010). In this way, the “neuro” part should include not only cognitive neuroscience, but neurology, psychiatry/psychology, medicine, consciousness studies, and even anthropology. By utilizing this multidisciplinary approach there is the opportunity to thoroughly explore religious and spiritual phenomena. The theology side of neurotheology also must be regarded to extend beyond simply the discipline of theology. Theology proper is the expansion of meaning and understanding within a given religious tradition such as Christianity or Judaism. However, neurotheology, while able to look at theological processes, must be expanded to include religious and spiritual beliefs, attitudes, practices, and experiences. In fact, all aspects of religious and spiritual phenomena can be included as targets of research for the field of neurotheology.

With these ideas in mind, neurotheology should be regarded as a distinct field of scholarship that incorporates philosophical and theological ideas, religious and spiritual beliefs and practices, topics regarding the human mind and consciousness, and aspects related to human health and well-being. Importantly, given the multidisciplinary nature and expansive topics of neurotheology, it is essential to develop strong methodologies for this field. Specifically, there are neuroscientific, psychological, philosophical, and spiritual methods that all must be considered when evaluating methodological challenges for the field of neurotheology. In addition, each of these fields have unique epistemological perspectives that must be taken into account. The religious/spiritual and the scientific approach towards understanding reality is part of what must be included in the field of neurotheology. In addition, it is important to evaluate differences in definitions of concepts like spirituality, religion, mind, brain, etc. It is also important to clarify distinctions between psychological and spiritual constructs such as hope, meaning, motivations, quest, etc. In the psychology of religion, such concepts are often overlapping and thus we might discuss a “spiritual quest” or “religious hope”.

Neurotheology would utilize such concepts to not only explore what they might mean psychologically, but neuroscientifically as well. Thus, all of these issues such as epistemology, definitions, and methods, can be considered from the neuroscientific perspective—how the brain helps us to consider these topics and apply them. In addition, we can relate various experiences, feelings, and beliefs to biological correlates. But it is imperative that various measures, both personally subjective as well as biologically objective can be merged in a way to help advance our overall understanding of how the brain is related to religion and spirituality.

In the evaluation of religious and spiritual beliefs, neurotheology would require an analysis of the underlying brain processes that support such beliefs. In order to do this, such beliefs must be fully characterized. There have been a number of scales developed over the past 30 years that have tried to measure various dimensions of such beliefs (Hill and Hood 1999). Most of these scales were developed in isolation from other scales and tested initially for their validity and internal consistency. However, most of these questionnaires have not been tested in large, diverse populations and compared to each other to determine whether their measures are correlated. The ability to compare different scales on religiosity and spirituality is critical if we are going to better understand how religion and spirituality affects people. By applying a battery of questionnaires, there is the opportunity to cross compare results to each other, evaluate the influence of various demographic data, and advance our understanding of how people perceive and experience religion and spirituality. Related studies have begun to explore the use of such surveys and questions to better establish the religious and spiritual beliefs and influences in various populations of people (The Baylor Institute for Studies of Religion 2006; Pew Forum on Religion & Public Life, and Pew Research Center 2008; Patel et al. 2018).

Furthermore, we have interest not only in understanding beliefs, but also the subjective experiences associated with those beliefs so that more accurate correlations with neurophysiological processes, using techniques such as functional neuroimaging, can be established. Thus, we hoped to better understand the specific elements of beliefs and experiences related to emotions, cognitions, and experiences to link these elements to specific brain structures. For example, the limbic structures of the amygdala and hippocampus may be associated with emotional aspects of religious and spiritual experiences. Beliefs and other cognitive elements are likely related to memory areas of the temporal and parietal lobes. In addition, experiential processes, particularly pertaining to visual or auditory stimuli, might be associated with the visual and auditory cortex.

In order to establish a larger database of the various subjective elements of religious and spiritual experiences, we launched a web-based survey that requested information on demographics (age, gender), religious affiliation (current and original), religious practices (meditation, prayer, rituals, etc.), and spiritual experiences (provided through a narrative in response to the question, “please describe in detail the various spiritual and/or religious experiences that you have had and how they have affected you”). We included both multiple choice type questions (e.g., What practices do you perform? Meditation, prayer, dance, etc.) as well as open ended questions (e.g., Please describe the

emotional feelings you had during your spiritual experience?). We also included a battery of previously validated self-report questionnaires to assess different domains of religious and spiritual beliefs. The scales included the Quest Scale, the Religiousness Measure, the Index of Core Spiritual Experiences (INSPIRIT), the Death Anxiety Measure, and the Intrinsic Motivation Scale (see descriptions and sample questions below).

The reason for including these scales is that we have used them extensively in our prior research utilizing brain imaging of various religious and spiritual practices. Some of these scales have helped us to ensure that various subject populations met various criteria for inclusion in the studies. However, as our neuroimaging studies have progressed, we have realized more and more that we need to better correlate the scale results to biological correlates. This will help us to deepen our understanding of how the brain is related to various spiritual practices. In particular, we can try to evaluate subjects at baseline in comparison to their questionnaire results, and we can consider whether the scale results influence the neuroimaging studies of the practices performed by our subjects. For example, we might expect that those people that rate highest on certain religiosity scores might experience greater brain changes during religious practices. But to ascertain such relationships, we need to advance our understanding of these scales, how they relate to each other and how they might relate to various brain processes.

The purpose of this paper is to present the findings of these questionnaires in a diverse population of people. We hypothesized that scales that measure the strength of religiosity or spirituality would correlate well with each other. We also hoped to show how different dimensions of religiosity might affect other aspects. We also hypothesized that other variables such as gender, socioeconomic status, and religion, would affect each of these scales in a similar manner.

The results of such an analysis will inform future studies that also focus on the neurobiological correlates of religious and spiritual phenomena. Each of the scales considered in the current paper have cognitive, emotional, and experiential elements that can be related to cortical, limbic, and sensory areas of the brain. The ability to determine which brain areas are involved in supporting such elements can be explored utilizing current methods for evaluating brain function such as functional magnetic resonance imaging (fMRI), positron emission tomography (PET), and single photon emission computed tomography (SPECT), among other techniques (Newberg 2018).

2. Results

We selected the respondents from the first two years of the survey and used only those who completed the full survey as described in the Materials and Methods (Section 4). The sample consisted of 393 respondents, there were 212 males and 181 females (age range from 18 to 91 years with a mean of 65.8 ± 16.2). The ethnicity breakdown was 234 Caucasian, 106 Black, 32 Asian, and 21 Hispanic. Religious identification was as follows: 34 Catholic, 60 Protestant, 33 other Christian, 15 Jewish, 12 Muslim, 17 Pagan/Earth based, 98 atheists, and 96 who identified as other spiritual. Subjects responded to the question regarding the current religion and were given the option of selecting “other” which they could then describe. The “other Christian” were associated with those people who selected the “other” category, but specifically mentioned Christianity as an essential part of their beliefs.

When comparing the results from each of the scales detailed in the Materials and Methods (Section 4) to each other, we found a number of significant correlations (see Table 1). In general, the Quest Scale correlated with religious involvement (on the Religiousness Measure scale), the INSPIRIT and several subcomponents of the death anxiety scale. Religious involvement, religious influence, and religious hope all correlated significantly with each other. This supported these subcomponents as being related to similar constructs. They also correlated significantly with scores on death anxiety and with intrinsic motivation. However, religious involvement correlated negatively with intrinsic motivation. The INSPIRIT correlated with religious involvement, influence, and hope. The INSPIRIT also correlated significantly with three of four death anxiety subcomponents and with the intrinsic

motivation scale. Intrinsic motivations for religion correlated significantly with the religious and nature subcomponents of the death anxiety score.

Table 1. Correlations between the various survey questionnaire responses. The correlation is given as the r value with the p-value below.

	questtot	relinf	relinv	relhope	insptot	deathmyst	deathrel	deathnat	deathcreat	intrintot
questtot	1.00	-0.05 0.30	0.15 0.002	-0.05 0.30	0.17 0.0009	0.37 <0.0001	0.07 0.19	0.26 <0.0001	0.28 <0.0001	-0.07 0.16
relinf	-0.05 0.30	1.00	-0.60 <0.0001	0.44 <0.0001	0.48 <0.0001	0.04 0.46	0.36 <0.0001	-0.26 <0.0001	0.015 0.76	0.66 <0.0001
relinv	0.15 0.002	-0.60 <0.0001	1.00	-0.49 <0.0001	-0.53 <0.0001	0.15 0.0035	-0.43 <0.0001	0.40 <0.0001	0.06 0.27	-0.65 <0.0001
relhope	-0.05 0.3025	0.44 <0.0001	-0.49 <0.0001	1.00	0.52 <0.0001	0.01 0.77	0.57 <0.0001	-0.21 <0.0001	0.07 0.15	0.55 <0.0001
insptot	0.17 0.0009	0.48 <0.0001	-0.53 <0.0001	0.52 <0.0001	1.00	0.31 <0.0001	0.66 <0.0001	-0.14 0.004	-0.02 0.6279	0.69 <0.0001
deathmyst	0.37 <0.0001	0.04 0.46	0.15 0.0035	0.01 0.77	0.31 <0.0001	1.00	0.16 0.0016	0.29 <0.0001	0.10 0.05	0.03 0.56
deathrel	0.07 0.19	0.36 <0.0001	-0.43 <0.0001	0.57 <0.0001	0.66 <0.0001	0.16 0.002	1.00	-0.14 0.0058	-0.02 0.76	0.58 <0.0001
deathnat	0.26 <0.0001	-0.26 <0.0001	0.40 <0.0001	-0.21 <0.0001	-0.14 0.004	0.29 <0.0001	-0.14 0.006	1.00	0.18 0.0002	-0.33 <0.0001
deathcreat	0.28 <0.0001	0.02 0.76	0.06 0.27	0.07 0.15	-0.02 0.63	0.10 0.05	-0.02 0.76	0.18 0.0002	1.00	-0.07 0.18
intrintot	-0.07 0.16	0.66 <0.0001	-0.65 <0.0001	0.55 <0.0001	0.69 <0.0001	0.03 0.56	0.58 <0.0001	-0.33 <0.0001	-0.07 0.18	1.00

We examined whether individuals who are actively practicing a religion expressed a belief in God, as indicated by the Religiousness Measure. Out of the people surveyed who stated that they were currently practicing a religion, 84% responded that they believed in God, 11% responded that they did not believe in God, and 5% did not respond. For the individuals surveyed that stated they were not currently practicing a religion, 48% responded that they believed in God, 50% responded that they did not believe in God, and 2% did not respond. This is an intriguing finding since there is a tacit assumption that persons who practice a religion believe in God and those who do not practice a religion do not believe in God. Our findings indicate that there are persons who do not believe in God who practice religion and persons who believe in God who do not practice religion. Such a finding may be consistent with the fact that a number of the respondents were young adults who have generally been identified to have an increasing number of atheists or those who consider themselves spiritual but not religious, in which case the notion of a belief in God but not part of a faith community is not so odd. These types of individuals could be an interesting target for future research studies of religious attitudes and the underlying brain processes that support these perspectives.

We then further examined which religions had a greater percentage of followers who believed in God. Significant findings included that 100% of currently practicing Protestants and Muslims that responded stated that they believed in God. There were also groups that had significantly lower percentages of followers that believed in God. Of the people currently practicing Buddhism, 30% replied that they believe in God, and out of the individuals practicing secular philosophies, 50% answered that they believe in God. We also examined whether there exists a correlation between gender and belief in God in the overall population studied, as assessed by the Religiousness Measure. Of the males, 64% responded that they believed in God, and of the females, 79% responded that they believed in God. Such findings related to gender may have interesting consequences with regard to neurophysiological differences between males and females.

3. Discussion

Overall, the purpose of this paper is to reveal a variety of interesting data regarding subjective aspects of religious and spiritual beliefs that could be utilized to develop future studies of such beliefs as well as advance neurotheological studies exploring the connection between brain processes and the emotional, cognitive, and experiential elements of religious and spiritual phenomena. Although the present data is useful on its own, the results also highlight the methodological challenges that are important to consider in future neurotheological research.

In reviewing the results of this survey, a number of important findings were uncovered that deepen the understanding of how religiosity and spirituality are reported, and how they might be related to similar cognitive and affective processes. For the most part, there were good correlations between many of the measures and each other. In and of itself, such correlations suggest potentially common neurophysiological substrates. Thus, the correlation between the Quest Scale and the INSPIRIT score may be associated with cognitive processes involved in spiritual questioning and exploration.

The Quest Scale also correlated significantly with religious involvement, but not religious influence or hope, on the Religiousness Measure. Theoretically, this makes some sense since the term “quest” refers to a search for answers and thus, it may limit the ability of specific religious ideas to convey hope or influence over the individual. It is also possible that religious involvement involves more of the social aspects of brain function rather than cognitive ones. In this way, an analysis of these correlations helps to establish those domains which are similar and also distinct from each other.

As mentioned above, there was a strong correlation between the Quest Scale and the INSPIRIT scores. This might be explained because the INSPIRIT reflects mystical or spiritual experiences which are frequently reported to enhance an individual’s search for religious or spiritual goals. Much of our earlier work explored the physiological substrate associated with mystical experiences. Such studies have revealed a complex network of structures that appear to have a unique pattern of activity associated with intense spiritual or mystical experiences that would arguably be captured via the INSPIRIT questionnaire. Such individuals report a cluster of cognitive elements including a sense of clarity, sense of unity, sense of intensity, sense of surrender, and sense of transformation (Newberg and Waldman 2016). These elements all have possible underlying neurobiological substrates. For example, the sense of unity may be associated with reduced activity in the parietal or temporal lobes (Newberg et al. 2001). The sense of surrender may be associated with reduced activity in the frontal regions, particularly the prefrontal cortex (Newberg et al. 2015). Future studies might explore how well brain volume and brain activity correlate with specific aspects of the INSPIRIT questionnaire. The Quest Scale also correlated with death anxiety which might reflect a person losing their fear of death in favor of the deeper issues associated with their quest. Fear responses are typically associated with activation of the amygdala and insula, and future studies might explore more specifically how these, and related brain structures might influence, or be influenced by, various mystical experiences or cognitive processes associated with a quest for higher meaning.

Within the results from the Religiousness Measure, religious influence, involvement and hope all correlated with each other significantly. It certainly is consistent that the three subcomponents of this scale should correlate significantly with each other. Arguably, religious influence and involvement should correlate since the more an individual is involved with religion, the more influence it should have over the person’s life including thoughts and behaviors. An excellent research paper by Patel et al. (2018) utilized a complex survey to evaluate the effect of various influences on the strengthening or weakening of religious beliefs in a population of college students. This survey included measures for factors that might change religious beliefs and practices by having participants respond using a five-point Likert scale for each item (e.g., How has learning more about “teachings specifically about evolution” affected your religious belief? How has the “greater realization of disagreements and conflicts about religion” affected your religious beliefs?) The questionnaire also collected demographic data related to gender, academic major, year in school, ethnicity, and self-reported degree of religiosity including whether they were an “atheist,” “agnostic,” “believer, but not active,” “active believer,” or

“evangelical.” The survey of 1662 students from Texas A and M University revealed that the university culture enhanced religious beliefs in 33% of students, and religious practices in 48% and diminished beliefs in 18% of students and religious practices in 22%. Interestingly, the results indicated that the pre-college religious perspective was amplified with believers tending to strengthen their beliefs, and skeptics becoming more skeptical. Data such as this one of college students and our current survey study are essential for better understanding religious and spiritual beliefs as well as the life factors that they influence and that influence them.

The ability to evaluate changes in religious and spiritual beliefs also directly relates to neurotheology and the relationship between the brain and those beliefs. For example, cognitive neuroscience research has long demonstrated the progressive strengthening of neuronal connections with repeated exposure to a given stimulus. If the stimulus has a religious connotation, then neural connections that support that particular religious idea or practice are likely to become strengthened in the individual’s brain over time (Mudge et al. 2014). In this way, religious involvement takes advantage of the brain’s neuroplasticity. However, it might also be argued that persistent exposure to specific ideas also weakens the brain’s ability to be open to alternative ideas. In this way, the brain may become “close-minded” to new beliefs.

Hope is an interesting cognitive process with surprisingly little neuroscientific research behind it. One important question is whether hope and optimism are distinct cognitive constructs. There are some studies of dispositional optimism—generally defined as having a more positive outlook on future events. Hope is similar, and can have both a secular or religious basis. Religions frequently engage the concept of hope and it might be interesting to determine which brain areas are involved in optimism and hope, and whether there is overlap with regard to supporting brain structures. One morphometric MRI study revealed a larger thalamus and parahippocampus in those with higher scores of dispositional optimism (Yang et al. 2013).

Interestingly, higher scores on the INSPIRIT questionnaire were correlated negatively with religious involvement. This is consistent with what many individuals describe as a move away from traditional religions after intense spiritual or mystical experiences. It seems that part of the reason for such a shift is that the mystical experience is so unique and different from what most religious doctrines describe that it becomes difficult to continue to follow that rigid structure of a given religion. From a brain perspective, it seems that the effect of an intense spiritual experience prevents rigid belief systems from being maintained, perhaps via effects on both memory and salience networks. In other words, what was once important to the individual is now no longer of the same importance. Furthermore, the transformative element of such experiences suggests a more permanent change in the brain’s networks, perhaps as reflected in functional connectivity changes (Hernández et al. 2018).

While these initial results are fascinating in terms of evaluating various dimensions of religious and spiritual attitudes and beliefs, they will help inform future research in the field of neurotheology on several fronts. As much as this data provided information about how people feel about religious and spiritual attitudes, there are a number of methodological challenges that should be elaborated. To begin, neurotheology must begin with defining terms such as religiousness, spirituality, meditation, prayer, ritual, consciousness, mind, brain, soul, and God (Newberg 2010). Questioning people about their perceptions of these concepts is worthwhile. However, the basis for the definitions of these terms can come from multiple sources. Certainly, the writings of the various spiritual and religious traditions should be considered. The Catechism of the Catholic Church, the writings of the Talmud, and many other texts should be consulted when it comes to definitions of many of these terms. The writings of well-known scholars in related fields such as philosophy, theology, or psychology should be included. But neurotheology would also argue that it is essential to use methods such as those reported in this paper, that evaluate how the general population of people, both religious and non-religious, think about these terms. After all, if one is studying a specific prayer practice and the people performing it do it differently than how it is prescribed in a sacred text, great care must be taken when interpreting the results as they relate to the practice.

It might be valuable to convene several groups of scholars to try to address specific definitions and the continue to test and revise such definitions over time as more and more data becomes available. Space does not permit a detailed evaluation of various definitions used in neurotheology, but there are a number of resources that have already worked on clarifying these definitions (Newberg 2010, 2018). Definitions become essential for incorporating neuroscientific data in this research. For example, if we plan to use a neuroimaging technique to study religious versus spiritual meditation, it is necessary to understand these distinctions in order to adequately interpret the results of the imaging data. Regardless of how definitions are established, it is essential for any given research study or scholarly article to be clear about its own use of various terms to ensure that everyone evaluating that work are starting with the same frame of reference. For example, survey studies should try to define their terms as much as possible for the participants as well as when presenting the results to the scientific and religious community.

Once definitions of specific terms are clarified, the next issue is how to measure religious and spiritual phenomena. In addition, one of the most important issues related to the measurement of religious and spiritual phenomena involves correlating subjective and objective measures. For example, if a particular type of prayer practice reduces heart rate or is associated with changes in cerebral blood flow, it is critical to know what was subjectively experienced by the individual and how that can be correlated with the objective findings.

The book, *Measures of Religiosity*, (Hill and Hood 1999) is an excellent starting point and the source of the questionnaires used in this study. There are some 125 questionnaires described in this book. Some have been assessed for validity and reliability which is critical if these scales are to have any use in future research studies. Testing the validity implies that the results return information about what the scale is supposed to measure (Patten 2000). For example, a valid scale regarding the fear of death would ask questions regarding the amount of fear a person has. If this scale did not address fear, but rather sadness, it would not be a valid measure of the fear of death. Reliability assesses whether the scale when given to the same person at different time points yields roughly the same results (Patten 2000). While it is important to assess the reliability and validity of scales, this is difficult when it comes to religious and spiritual phenomena which are inherently difficult to isolate and define. Reliability is also a problem in the study of spirituality and religiousness since both can naturally be quite variable over time within any given individual.

Another problem with individual scales is whether they are useful across traditions and cultures. For example, many scales in the research literature have historically been Christian-based, and thus, potentially less useful when studying Muslim or Buddhist perspectives. Fortunately, many scales have a more universal quality or at least can be modified to accommodate other traditions and perspectives. However, this might bring into question the validity and reliability of such scales in these different contexts.

There is another interesting problem with scales that attempt to measure the subjective nature of spiritual or religious phenomena. This arises from the fact that most scales of spirituality and religiousness require the individual to respond in terms of psychological, affective, or cognitive processes. Thus, questions are phrased: How did it make you feel? What sensory experiences did you have? What did you think about your experience? On one hand, such measures are very valuable to individuals interested in exploring the neural correlates of such experiences because psychological, affective, and cognitive elements can usually be related to specific brain structures or function. The problem with phrasing questions in this way is that one never actually escapes the neurocognitive perspective to get at something that might be “truly” spiritual. It might be suggested that the only way in which an investigator can observe something which is truly spiritual would be through a process of elimination in which all other factors—i.e., cognitive, emotional, sensory—are eliminated through the analysis, leaving only the spiritual components of the experience. In other words, the most interesting result from a brain scan of someone in prayer would be to find no significant change in the brain during the time that the individual has the most profound spiritual experience.

Finally, the current results indicate a diversity of individuals who participated in the survey given the range of gender, age, and religious affiliations obtained from the demographic questions in the survey, but also demonstrates an important area of methodological challenge for this field—subject selection. The issue of who to study with regard to religious and spiritual phenomena depends somewhat on the definition of the phenomena. Obviously, if a researcher wanted to evaluate the experience of prayer, there could be thousands of different possible groups to consider studying. It is important to determine which elements of a particular practice or experience are of most interest. The more specific a researcher wants to be in terms of the phenomena, the more focused will be the subject group. Another major issue in terms of subject selection relates to comparison groups. One could compare various practices and experiences to each other within a given population or across populations. Thus, one could study various Catholic practices and experiences or one could compare Catholic prayer to Jewish prayer to Muslim prayer. Other variables are also important to consider regarding differences across ages, gender, intelligence, and socioeconomic status.

The current survey must be considered in light of self-selection bias since all of the participants willingly chose to participate in the study. It would be helpful to perform a similar evaluation of a more random sampling of individuals. Furthermore, it will be helpful to explore how people from different countries, cultures, and specific traditions around the world respond in order to determine if the same correlations hold. If the correlations hold, it would suggest that these survey questionnaires are valid for specific cultures and traditions as well as across them. On the other hand, if the correlations do not hold for specific traditions, then they should be regarded as more limited and will need to be more fully evaluated to determine which traditions they can be applied to. Another aspect regarding the use of these questionnaires is whether it is more valuable to evaluate broad questions or focus on specific hypotheses. Scientific analyses strive to be hypothesis driven, but in the early development of various fields, it can be more important to be more explorative in order to determine the best hypotheses to test in the future.

In addition to evaluating the general population, one might consider evaluating people who are more specifically engaged in religious activity such as rabbis, priests, imams, monks, or nuns. We have already initiated such an exploration in rabbis with a survey of approximately 160 from each of the four major denominations—reconstructionist, reform, conservative, and orthodox (Newberg and Halpern 2018). By asking questions related to their use of emotions, cognitions, and experiences in guiding their beliefs, we were able to uncover fascinating information directly related to neurotheology. In addition, we asked questions about specific experiences (e.g., Have you had a mystical experience?) and also specific beliefs (e.g., Do you believe in God and in what way?). All of these data can be utilized to formulate and study the underlying neurophysiological substrate of religious and spiritual phenomena.

4. Materials and Methods

The various scales on religiosity, perceptions of death, and mysticism were tested through an online survey in which people from the general public, as well as those who specifically attended programs related to the intersection of science and religion, were welcome to participate. As described in the Results (Section 2), we evaluated respondents from the first two years of the survey which consisted of 393 subjects who completed the survey in its entirety including all of the questionnaires as well as the questions related to demographics, religious background, and religious practices. The scales included the Quest Scale, the Religiosity Measure, the INSPIRIT, the Death Anxiety Measure, and the Intrinsic Motivation Scale. Each of these additional scales was thought to help provide a construct validity for the belief acceptance scale.

The Intrinsic Religious Motivation Scale (Hoge 1972) measures the motivations behind religious activity with questions regarding whether “my faith sometimes restricts my actions” or “my religious beliefs are what really lie behind my whole approach to life”. The scale has specific advantages since it only mentions “God” in one question and generally avoids the issues of religious behaviors and beliefs (Hill and Hood 1999). In particular, this scale measures intrinsic motivations which refer to issues of

ultimate importance to the individual and extrinsic motivations which refer to instrumental or outward goals of religion such as moral behavior. This scale was designed originally to help differentiate between more personal and more social motivations. Thus, the intrinsic questions deal with religious faith involving all aspects of a person's life. In other words, the religious belief system is the most important thing in the person's life. Extrinsic questions deal with how much a person does not require religion to be part of their everyday life functions and decisions. The scale consists of 10 questions on a Likert scale (seven intrinsic and three extrinsic questions). The responses are either strongly disagree, moderately disagree, moderately agree, and strongly agree. The higher the total score the more an individual has intrinsic motivations for religion. In the early studies using this scale, the average item score was approximately 2.0. Reliability testing showed that the Chronbach alpha was 0.84 (Hoge and Carroll 1978). The test also appears to have relatively good validity correlating with a $R = 0.59$ between the scale and external judgments by the participants' ministers.

The Quest Scale is based upon a distinct motivational construct from the intrinsic and extrinsic orientation. Quest is characterized as the "degree to which an individual's religion involves an open-ended, responsive dialogue with existential questions raised by the contradictions and tragedies of life" (Batson et al. 1993). What is particularly important about the quest scale is that it measures an individual's appreciation of the complexities of the issues involved with religion and religious beliefs and also demonstrates a relative tentativeness and changeable stance towards religious convictions (Batson et al. 1993). The current scale is a 12-item questionnaire which is intended to assess the three distinct but interrelated aspects of the quest orientation with questions such as "I am constantly questioning my religious beliefs" or "there are many religious issues on which my views are still changing". The first domain is a "readiness to face existential questions without reducing their complexity". The second domain focuses on "self-criticism and perceptions of religious doubts as positive". The third domain focuses on and individuals "openness to change" (Batson and Schoenrade 1991). Responses are graded on a nine-point scale with one meaning strongly disagree and nine meaning strongly agree. An important part of the quest scale is that its assumptions and wording are relatively nondenominational with a reference to God in only one question. The reliability of the quest scale as it reported Cronbach's alpha of approximately 0.75 to 0.8 (Batson and Schoenrade 1991; Burris et al. 1996).

The Religiousness Measure (Sethi and Seligman 1993) was designed as an attempt to correlate religiosity with attribution to all styles and optimism (Hill and Hood 1999). This questionnaire, which consists of 17 questions most of which are on a Likert scale ranging from one (strongly disagree) to seven (strongly agree), evaluates three different aspects of religiousness. The first is the influence of religion on daily life, the second is an individual's personal involvement in religion and the third is the sense of religious hope that the individual holds. Religious involvement is determined by asking questions such as, "How often do you pray?" Religious influence is determined by questions such as whether religious beliefs are important in decision making processes. Finally, common religious hope is assessed through questions that ask whether an individual believes in heaven or being rewarded for suffering. No formal attempt has been made to test the reliability of the religious measure. There were significant differences found between various types of religious individuals ranging from fundamentalist to liberal. The authors suggested that these differences confirmed the original division of the groups into three broad categories. Each of the three religious measures also correlated positively with optimism as measured by the Attributional Style Questionnaire (Schulman et al. 1989). The correlations were low but significant due to the large sample size.

The Index of Core Spiritual Experiences was originally developed to identify experiences that are described in more intense or concrete terms than specifically religious concepts such as the belief in God. This scale is based on a set of core elements associated with spiritual experiences and asks whether people have had "an experience of God's energy or presence" or "an experience of complete joy and ecstasy". These characteristic elements include distinct events that result in a personal conviction of God's existence and the perception of a highly internalized relationship between God and the

individual. The INSPIRIT contains seven items that were developed by the National Opinion Research Center and several other investigators (Greeley 1974; Kass et al. 1991; Smith et al. 2019). The items ask questions regarding how religious or spiritual and individual considers themselves to be, how close they have ever felt to a powerful spiritual force, how close they feel to God, and whether they ever had an experience that convinced them that God exists. On the INSPIRIT each item receives a score from one to four and the subjects total score is the mean of all items weighted equally. Means scores in two different study groups were 2.97 ± 0.74 and 2.80 ± 0.83 (VandeCreek et al. 1995). The Cronbach's α for the INSPIRIT was 0.90 which is extremely high. Studies of validity for the INSPIRIT revealed a high degree of correlation between the INSPIRIT and other measures of religious or spiritual experiences. Related to the present study, the INSPIRIT was found to correlate strongly with the intrinsic religious motivations scale (Hoge 1972).

For the analysis of the quantitative results, we initially determined the cross correlation between each scale and the others. Some of the scales were actually scored with subcomponents so in those cases, we evaluated the subcomponents individually. We compared the results from each of the scales with various demographic data using ANOVA Duncan's multiple range test. This provided an assessment of the scores across different subpopulations of the test group.

5. Conclusions

The results presented in this article showed a translational analysis from qualitative results to potential neurophysiological correlates that can be studied in future research. Specifically, we can now use this data to explore the neurophysiological correlates of these various questionnaires such as the sense of a quest for spiritual pursuits, motivations for religious beliefs and practices, and the various types of spiritual, or even mystical, experiences, and their emotional, cognitive, and experiential elements. These results can help guide future research to explore specific elements of religious and spiritual phenomena (i.e., what aspects to target with neuroimaging or other neuroscientific techniques). Furthermore, we can try to observe similarities and differences in brain function associated with religious or spiritual attitudes that correlate with each other compared to those that do not. We can even consider how we might use these questionnaires to screen participants in future studies or evaluate subjects as additional variables to consider in the context of neuroscientific studies. Ultimately, it is equally important to obtain subjective data regarding religious and spiritual experiences as it is to obtain objective data based on neuroimaging and related scientific methods. However, there are numerous methodological challenges highlighted by the current data that also need to be addressed in future research.

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