RESPONSE

Existential neuroscience: a proximate explanation of religion as flexible meaning and palliative

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Introduction

The cognitive science of religion has made great strides in the past decade (e.g., Boyer, 2008), with more and better research from many disciplines asking basic questions about why religions exist, persist, thrive, and heal. The journal that is publishing these very words, *Religion, Brain & Behavior*, is testament to the accelerating nature of this interdisciplinary movement, as is the breadth and quality of the commentaries that our target article generated. We are grateful that these commentaries have forced us not only to think deeply about the ideas contained therein, but also to elaborate upon our own model.

Rather than addressing each reply in turn, we built our response around the major themes that emerged. Overall, there was consensus satisfaction with our basic neuroscience findings linking religious belief with brain-based error-related distress. There was less satisfaction, however, with the way we broadly interpreted these data. Paying heed to the most frequent questions and ideas put forth by the commentators, we organized our response as follows: we (1) discuss our use of the term "meaning," (2) contrast the kind of proximate explanations provided by the motivated meaning model with ultimate explanations provided by evolutionary models, (3) provide evidence for why flexible meaning systems like religion may be better palliatives than scrutable meaning systems like science, and (4) suggest that an affective interpretation of anterior cingulate cortex (ACC) activity accounts for more data than a purely cognitive explanation, but also note that both explanations might be functionally isomorphic. We end by mapping out the kinds of future studies that we are now planning and that were inspired by the valuable commentaries.

What do we mean by meaning?

We define meaning as "the perceived coherence between beliefs, salient goals, and perceptions of the environment." In other words, we define meaning as consistency between mental representations, which is a definition based on the structure and not the content of beliefs. In so doing, our work follows directly from the seminal research on cognitive dissonance theory (Festinger, 1957; Harmon-Jones & Harmon-Jones, 2008) that has inspired the multiple and related ways that people have defined meaning in the field (Baumeister, 1991; Silberman, 2005; Park, 2010; Taves & Paloutzian, this article). Baumeister and MacKenzie criticize this structural definition, which we find odd given that our own definition was (indirectly) inspired by

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Baumeister's (1991) – "meaning is shared mental representations of possible relation-ships among things, events, and relationships … meaning *connects* things" (p. 15).

We would like to add to the definition of meaning we provided in our target article by giving it a function. In our view, meaning is more than abstract connections of the mind; meaning has a real function and consequence – it allows people to act in their environments (Tullett et al., in press). Inspired by the action-based model of dissonance (Harmon-Jones & Harmon-Jones, 2008) and the model of reactive approach motivation (McGregor, Nash, Mann, & Phills, 2010), we suggest that meaning is required for action. As such, we define meaning as coherence between beliefs, salient goals, and perceptions of the environment that provides a foundation for our interactions with the world (Tullett et al., in press). Without this coherence, our actions would be ineffective, random, and disconnected from our surroundings. This is conceptually similar to Taves and Paloutzian's suggestion that meaning-making not only makes things cohere, but also allows for a process of valuation; a process for the identification and execution of important goals.

An implicit part of our definition of meaning is that people rarely notice when it's present; instead, they notice when there is a lack of meaning – when things are inconsistent. For example, no one thinks twice about getting wet in the rain; people's sense of meaning, however, would be threatened if they did not get wet despite being in the rain. So meaning comes to the fore when there is a lack of it. People focus on the absence of meaning because it is accompanied by an aversive affective state. Like cognitive dissonance (Elliot & Devine, 1994; Cooper, Zanna, & Taves, 1978), threats to meaning do not feel good; "they are characterized by a psychologically uncomfortable state that motivates [people] to reduce the source" of threat (Harmon-Jones & Harmon-Jones, 2008).

Religion offers meaning in one of two ways. First, it provides a coherent framework for understanding one's environment and interpreting specific events from one's life (Baumeister & MacKenzie). In so doing it acts like a blueprint for action and the setting of important goals. Second, when things go wrong, or when meaning is threatened (e.g., when a loved one dies), religion acts like a palliative that eases attendant feelings of anxiety. Religion, that is, allows people to transcend the inconsistencies, uncertainties, and cruelties of the real world (Burris, Harmon-Jones, & Tarpley, 1997). As such, it acts as a bulwark against the stresses and anxieties of everyday life. Importantly, religion offers a meaning system that is flexible; it can accommodate many varieties of meaning-threats because the order it offers is often inscrutable, only knowable to a super-natural, all-knowing, and all-powerful God.

Disentangling proximate and ultimate explanations

One of the important endeavors undertaken by psychologists is to establish the psychological needs of human beings – the things that motivate people to behave in one way versus another. Given the question "Why do people need X?" two broad categories of answers are potentially possible. The first type of answer involves an attempt to establish the way in which the needed thing can alleviate unpleasant states. If, for instance, someone answered the question "why do people need to eat?" the explanation might be something like "people need to eat because eating gets rid of their hunger." An alternative and orthogonal type of answer focuses on the way in which the needed thing can serve an adaptive function. With respect to the need to eat, this type of answer might be something like "people need to eat because

otherwise they will not consume the proteins, fats, carbohydrates, and nutrients that allow them to survive and reproduce.'' These two types of answers – termed proximate and ultimate, respectively – constitute two separate approaches to understanding psychological needs, and distinguishing between them is essential to avoiding confusion and wasted effort in the human behavioral sciences (Mayr, 1963; Scott-Phillips, Dickins, & West, 2011; Tinbergen, 1963).

In our target article, we propose that religion is functional in that it serves a need for meaning. Our explanation for why people need meaning is a proximate one: meaning is something that, when lacking, generates a negative state that people are motivated to resolve. In the case of meaning, we posit that this negative state is characterized by feelings of anxiety and uncertainty, and that this state creates a motivational drive to restore meaning. What is important to note about this explanation is that it makes no claims about the adaptive value or evolutionary importance of meaning or religion – accounts that do make these claims are providing ultimate explanations that tackle the notion of ''need'' from a different level of analysis.

In several of the thoughtful commentaries on our target article, the costly signaling model of religion was proposed as an alternative account to our own model of religion as motivated meaning-making. In some instances the explanations provided by these two accounts may be in real conflict, in which case further research might do well to pit the two possibilities against each other in experimental investigations. There are other instances, however, where we feel the conflict between the two models may be more illusory than real.

According to Alcorta, religion is comforting because it reduces anxiety by fostering feelings of trust and security. In her words, ''[religious] frameworks reduce personal anxiety by allowing us to predict the motives and behaviors of others and optimally pattern our own individual behaviors and choices''. First, it should be noted that this hypothesis does not *necessarily* follow from the ultimate hypothesis that religion is adaptive because it encourages trust and cooperation. The adaptive significance (or insignificance) of religion may bear no resemblance to the proximate motives that drive people to believe (just as people may not be proximately motivated by survival and reproduction when they decide to eat a hamburger). Nevertheless, Alcorta proposes a proximate hypothesis about the function of religion that differs from our own, and thus it makes sense to debate which is the stronger explanation. Future research that compares feelings of security and a sense of meaning as mediators of the link between religiosity and reduced anxiety could shed light on this debate.

In the commentary by Bulbulia and Schjoedt, however, the authors suggest that our model is weakened by the fact that ''motivated meaning is unlikely to be a basic evolutionary function.'' They propose that the costly signaling theory is a stronger explanation because it does a better job of accounting for things like the association between religion and social norms. Here, there has been a basic misunderstanding about the kind of explanation that we are proposing, and the kind of explanation that is offered by costly signaling theory. At its heart, costly signaling theory is an ultimate explanation of religion; it seeks to explain why religion offers fitness benefits to its adherents. The motivated meaning-making account instead offers a proximate explanation of why people are motivated to turn to religion – because it quells their anxiety – and is thus not in conflict with costly signaling theory at this level.

Raising another potential source of confusion in discussions of religion, van den Bos cautions against committing the naturalistic fallacy; that is, he warns that we cannot assume religion is good simply because it is widespread or ''natural.'' It is

certainly not our intent to argue that religious belief should be encouraged (or discouraged) and we recognize that there are some forms of religious belief that have the potential to be quite harmful. Pointing out that there are benefits to religion, however, does not amount to arguing that people should be religious. Thus, we see no inconsistency in agreeing with van den Bos: "The notion that adherence to religious beliefs may fulfill important psychological functions among believers does not make these beliefs right."

In addition to van den Bos's well-taken suggestions, Alcorta makes an important clarification when she notes that our model provides an account of "how" religion works (a proximate explanation), while the costly signaling model does a better job of explaining "why" religion works (an ultimate explanation). As Harmon-Jones and Harmon-Jones point out, "the need to manage anxiety may provide the proximate motivation for religion, whereas prosociality and group cohesion via costly signaling may be important distal, adaptive functions of the resulting religious behavior." We maintain that while ultimate explanations can shed light on fascinating issues surrounding the evolutionary history of religion, there is ample room for scientific curiosity and discovery surrounding the proximate mechanics that motivate people to believe.

The benefits of inscrutable meaning

Commentators questioned whether there is anything particularly unique about religion as a motivated meaning system. Preston, for example, argues that science is an alternative system that may fulfill many of the same functions as religion, namely, a coherent framework of answers and explanations that directs people towards the pursuit of specific goals and reduces uncertainty and distress in its adherents. Similarly, Haque, Shenav, and Rand suggest that individuals' need to create and sustain meaning can be satisfied by any type of ideology, whether supernatural or secular. Randles, as well, points out that the affirmation of religious beliefs may be just one of many "cultural tools" that have evolved in order for humans to quell anxiety. We agree that many other systems can reduce anxiety through the creation of order, explanation, and perceived control, and have said as much in our past work (Inzlicht, McGregor, Hirsh, & Nash, 2009; Inzlicht & Tullett, 2010). However, we suspect that religion may be a particularly powerful and adaptive system of meaning because it confers anxiolytic benefits across a wide variety of situations. That is, religion is more broad-based than most other types of ideologies, and its palliative effects likely function in a greater number of domains than other systems of meaning such as science.

There are some aspects of human experience to which non-religious ideological frameworks do not speak. For example, while religion can reduce the fear of death, it is unlikely that non-religious ideologies can offer relief in this domain. Using a terror management paradigm, for example, Jonas and Fischer (2006) demonstrated that individuals whose religious orientation was characterized by a sincere and deeply internalized belief system reacted to primes of their own mortality with less worldview defense and lower death-thought accessibility, suggesting that religion buffers the experience of terror associated with death.

The power of religious ideology can also be seen when one considers that even individuals who reject organized religion may make use of religious/supernatural ideas when they think about the purpose of life and/or what happens after death (Bering, 2011). For example, Bering (2002) found that, when asked to make

inferences about the physical and cognitive states of dead characters in hypothetical vignettes, participants who believed that consciousness ends at death sometimes characterized dead people as possessing emotions, desires, and knowledge. Indeed, there is evidence that both believers and atheists are susceptible to teleological reasoning – that is, assuming that everything happens according to a "master plan" (Bering 2011; Schrock, 2010).

Given that non-believers may utilize religious/supernatural concepts to think about issues of death and purpose, it is possible that scientific ideologies may not offer adequate epistemic structures for these domains of life. Or perhaps it would be more accurate to postulate that, under conditions of acute stress in which issues surrounding the purpose and meaning of life are salient, invoking a religious ideology may be more comforting than invoking a scientific ideology. Bering (2006), for example, recounts the story of how, the day after his mother's death, upon hearing her wind chimes start to sound outside her window he (an avowed atheist) automatically thought: "That's her! She's telling us not to worry!" (p. 148). Indeed, these kinds of thoughts may occur even in non-believers because when bad things happen, it may be more comforting to think about a supernatural master plan and afterlife than a rational scientific ideology in which tragedy is the result of randomness or natural processes, and death is simply the end of consciousness.

Some reviewers questioned whether religion is a beneficial meaning-making system given the inconsistencies inherent in religious ideologies. Schjoedt and Bulbulia, for example, raise the point that it is problematic to assume religion's most important role is epistemic coherence, given that "believers easily adopt conflicting propositions in their religious world-views." Johnson, Ball, Brewer, and Cohen similarly note that "religion doesn't always make sense." We agree that there are conflicting principles within religious systems; however, we do not think that these inconsistencies necessarily negate religion's ability to confer epistemic coherence. Believers in every type of ideology encounter epistemological inconsistencies and uncertainties, whether it is the Christian who observes the suffering inflicted by a natural disaster, the communist who perceives the unequal distribution of wealth in nations such as Cuba and China, or the scientist who takes note of research findings that support opposite conclusions about the same phenomenon. Religion, however, has a critical, unique "escape valve" that allows adherents to encompass any number of inconsistencies within their beliefs. Namely, religion provides an inscrutable meaning system, wherein *God works in mysterious ways* (to use theistic terms; see Tullett, Inzlicht, & Kay, 2011). If a believer notes that God said X and Y (which are inconsistent with each other), he or she will be unlikely to conclude that God is wrong. Rather, the response of the devout may be to utilize the "God works in mysterious ways" escape valve, which should reduce anxiety by providing complete epistemic coherence.

Conversely, if a scientist observes that the data say X and Y (which are inconsistent), he or she may conclude that there has been an error made somewhere along the line, since X and Y were determined by fallible humans. This type of explanation may be less effective at reducing feelings of inconsistency and attendant anxiety than the inscrutable order explanation provided by religion. As pointed out by Harmon-Jones and Harmon-Jones (also see Burris et al., 1997), an often-overlooked manner in which people reduce the distress caused by inconsistency is through the process of transcendence, which involves "reconciling of dissonant cognitions under a superordinate principle" (Burris et al., 1997, p. 20). We suggest that the superordinate principle of inscrutable order dictated by a higher power may

be very effective at reducing the negative emotions caused by inconsistency, and provides believers with "all-inclusive" epistemic coherence. The same cannot be said for secular beliefs.

The ERN: affective and cognitive explanations

While most commentators agreed with our affective explanation of the error-related-negativity (ERN) – where we suggest that this evoked brain potential indicates error-related distress – some dissented. Specifically, Schjoedt and Bulbulia preferred a cognitive model where a lower ERN indicates not less affect in response to errors, but less attention to the errors themselves. Similarly, Bulbulia and Schjoedt "lack confidence" in our interpretation, question whether cognitive reaction time tasks like the Stroop produce the kinds of distress that are relevant to a palliative model of religion, and instead prefer a cognitive explanation where the ERN indicates inattention to conflict and error.

We respectfully disagree with this alternative explanation. It would not be possible for us to cover the now overwhelming evidence that the ERN is related to negative affect and motivation, so we refer the interested reader to a recent and comprehensive treatment by Weinberg, Riesel, & Hajcak (in press). This paper is a contemporary antidote to the increasingly insufficient account supported by Schjoedt and Bulbilia.

Here, we focus on a few key points to support the ever more accepted view of the ERN as an affective signal. First, errors (even on the Stroop) are aversive. The ERN, as the name implies, is time-locked to errors, and errors are not affectively neutral events. Rather, errors are distressing because of the negative consequences typically associated with them. Errors on reaction time tests like the Stroop, for example, prompt increased skin conductance, greater heart rate deceleration, greater pupil dilation, and larger startle reflexes compared to correct responses (Critchley et al., 2003; Hajcak & Foti, 2008; Hajcak, McDonald, & Simons, 2003a). Second, individual differences in negative affect moderate the amplitude of the ERN. Indeed, studies have repeatedly observed enhanced ERN amplitudes in patients with anxiety and major depressive disorders (Chiu & Deldin, 2007; Gehring, Himle, & Nisenson, 2000). Similarly, healthy participants with higher trait negative affect consistently exhibit a larger ERN than those with lower trait negative affect (Hajcak, McDonald, & Simons, 2003b, 2004). In contrast, participants with low trait negative affect or those with high life satisfaction show lower ERNs (Larson, Good, & Fair, 2010). Finally, people who have suffered lesions to their anterior cingulate cortex, the hypothesized neural generator of the ERN, do not show deficits in attentional control (Critchley et al., 2003; Fellows & Farah, 2005), but instead show a profile of flat emotional responses (Critchley et al., 2003). The ERN, in sum, is related to negative affect. And, given the evidence that the ERN (and its neural generator) is dissociated from attentional control (Fellows & Farah, 2005; Inzlicht, Tullett, & Good, this issue; Weinberg et al., in press), it is hard to argue that the lower ERN observed among religious believers merely reflects "inattention" (Bulbulia & Schjoedt).

While the literature strongly suggests an affective interpretation of the ERN, we are quick to note that affective and cognitive interpretations might be functionally indistinguishable (Yeung, 2004). Whether the ERN reflects negative affect or attention, the function of the ERN might be the same – to orient people to uncertainty and conflict in order to defend against such aversive events (Hajcak &

Foti, 2008; Weinberg et al., in press). Religions, we propose, protect against such defensive responding and as such bring about salutary benefits to its adherents.

Future directions

We end our response by listing the future studies these commentaries have inspired. Johnson and her colleagues rightly note that a number of basic goals motivate the human animal, with an epistemological goal being only one of them. They then suggest that religion may serve to both satisfy and inhibit some of the goals. We find this idea fascinating and believe that examining the various motivational antecedents and consequences of religions will serve to provide a more complete picture of religion than a reliance on cognition alone. As mentioned above, Alcorta suggests that religion may affect the ERN because it fosters feelings of trust and security. Similarly, Baumeister and MacKenzie state that religion meets the need to belong, and one implication of this is that it is this sense of belonging that reduces error-related distress. Although these proximate hypotheses about religion are different from our own, we also suspect that they can complement the motivated meaning model and we look forward to examining the interplay of these two hypotheses. Randles offers a very interesting hypothesis when he wonders if religion's palliative qualities are selectively deployed. Is it the case, Randles wonders, that religion is a blunt palliative? Or does it mainly offer relief during times of stress and duress? These are good questions. Finally, Harmon-Jones and Harmon-Jones try to turn our results on their head when they wonder if religious people ever show greater (not lesser) error-related distress. They suspect that "behavioral violations of a religious belief (e.g., "sinning") might instead cause greater ACC activity in religious than non-religious individuals." This is a fascinating idea and we suspect that Harmon-Jones and Harmon-Jones are correct. In fact, partially inspired by these comments, we have already begun testing this idea on a large sample of Mormons, asking if after they are primed with the notion of a punishing God they will show heightened ERNs to a religious transgression (e.g., drinking alcohol).

We are grateful for the commentaries because they have forced us to sharpen our own motivated meaning model of religion. Moreover, we are grateful because they have supplied us (and others) with testable hypotheses that promise to push the scientific investigation of religion forward. We hope that the discussion that has been started here will inspire new and inventive research, and will foster an ever growing scientific interest in religious belief and other non-scientific epistemologies.

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