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Spiritual Neuroscience: A Review of an Emerging Field and Implications for Social Work Practice and Research

Hodge

Abstract

To help social work practitioners provide more effective services to clients that self-identify as spiritual or religious, this paper orients readers to the new field of spiritual neuroscience. Toward that end, the paper describes the parameters of this field, delineates the methods that serve to distinguish spiritual neuroscience, reviews seminal research, and discusses the resulting implications as they intersect social work practice and research. The findings in this emerging field shed a unique disciplinary light on the development of an empathetic stance and intervention selection, key practitioner concerns when working with spiritually motivated clients. The paper concludes by suggesting that social workers can make a significant contribution to advancing research on the relationship between spirituality and wellness by forming collaborative relationships with spiritual neuroscientists.

Spiritual Neuroscience: A Review of an Emerging Field and Implications for Social Work Practice and Research

Over the past few decades, the social work profession has increasingly acknowledged the importance of spirituality and religion (Al-Krenawi, 2016). To cite just one example, the number of publications in the profession's literature addressing this general topic has increased exponentially during this timeframe (Hodge, 2013). A growing awareness exists that spirituality plays an important role in the lives of many clients (Pathan, 2016). Spirituality is often central to clients' sense of personal identity (Van Hook, Hugen & Aguilar, 2001), and it frequently plays an instrumental role in fostering health and wellness (Canda & Furman, 2010).

Social work is not alone in recognizing the significance of spirituality. Fueled by changing philosophical currents, spirituality has emerged as

a topic of interest across many academic disciplines (Gray, 2008). Throughout the social and physical sciences, spirituality is examined through a variety of distinct disciplinary lenses, each of which provides a unique perspective on the topic (Koenig, 2013).

These unique perspectives may have the potential to help social workers provide more effective, client-centered services. A different disciplinary lens can shed new light on topics of interest to social workers by, for example, highlighting certain data from a distinctive angle (Gilligan, 1993). Furthermore, in an increasingly interdisciplinary environment, exposure to research conducted in other disciplinary settings may open up opportunities for synergistic collaborations that serve to advance scientific knowledge in areas of mutual concern (Uzzi, Mukherjee, Stringer, & Jones, 2013).

In keeping with this line of thought, the present paper examines some of the seminal research in the newly emergent field of spiritual neuroscience. This is followed by a discussion of the implications that flow from this research in the areas of social work practice and research. First, however, a brief orientation to the field is provided followed by a review of the methods that serve to distinguish spiritual neuroscience as a unique area of inquiry.

What is Spiritual Neuroscience?

Spiritual neuroscience can be understood as a subfield of neuroscience which, in turn, has traditionally been viewed as a branch of biology (Jeeves & Brown, 2009). More recently, neuroscience has emerged as a distinct interdisciplinary science that intersects a wide variety of disciplines including mathematics, chemistry, medicine, psychology, and, at least potentially, social work. Neuroscience is sometimes referred to in the plural form (i.e., neurosciences) as many different fields exist, including spiritual neuroscience, which has

David R. Hodge, MSW, PhD, is a Professor at Arizona State University School of Social Work.

arguably emerged a distinct field of study around the turn of the millennium (Dixon & Wilcox, 2016).

Spiritual neuroscience is distinguished by the application of the methods of neuroscience to identify the neural pathways that inform spirituality (Beauregard, 2011). In other words, spiritual neuroscience attempts to understand spirituality in neuroscientific terms. Like other dimensions of phenomenological experience, spirituality is assumed to be mediated by brain functioning (Fingelkurts & Fingelkurts, 2009). In keeping with this assumption, neuroscience methods are used to determine the neurophysiological correlates of spirituality, which is sometimes operationalized in the form of spiritual, religious, or mystical experiences (RSMEs).

Spiritual Neuroscience Methods

A number of procedures are widely used to identify the neural circuits that correlate with spirituality, including electroencephalogram (EEG), functional magnetic resonance imaging (fMRI), positron emission tomography (PET), and single-photon emission computerized tomography (SPECT; McNamara & Butler, 2013). These methods provide a window on the neurobiological changes that are associated with various expressions of spirituality. Following a review of these procedures below, the role of self-report measures in spiritual neuroscience is discussed.

EEG

An EEG measures electrical activity in the brain by tracking and recording brain wave patterns. It is administered through electrodes placed on the scalp. Traditionally, it has been used to assess brain disorders (e.g., epilepsy). In the context of spiritual neuroscience, it is widely used to measure neural oscillations during various forms of mediation.

Among the advantages of the EEG are its noninvasive nature, relatively low cost, and excellent temporal resolution (i.e., excellent measurement precision over time; Newberg, 2014). The latter characteristic is valuable in the sense

that it allows researchers to monitor changes in neural processing across a particular timeframe, an important strength when attempting to measure spiritual experiences that may manifest over time (Rahmim & Zaidi, 2008). A significant drawback of this procedure is low spatial resolution. In other words, an EEG does a relatively poor job of differentiating between specific neural pathways or regions in the brain in present space, especially when compared to the fMRI, PET, and SPECT procedures.

Functional MRI

Functional MRI (fMRI) represents a specialized form of MRI scanning that measures changes in blood flow. While an EEG directly measures brain activity, fMRI measures a proxy – blood-oxygen-level dependence (BOLD) signals that are assumed to represent neural activity (McNamara & Butler, 2013). When a certain area of the brain is more active (as might occur during a specific spiritual experience), it consumes more oxygen. The oxygen is supplied by increased blood flow. Functional MRI detects the changes in blood oxygenation and flow—via BOLD signals—that are hypothesized to correspond to neural activity in various areas of the brain (Ekstrom, 2010). Changes in different areas of the brain can be mapped as individuals engage in particular spiritual practices (e.g., meditation vs. a baseline resting state).

Functional MRI is characterized by very good spatial and temporal resolution (although the temporal resolution is not as good as an EEG; Newberg, 2014). The procedure images all areas of the brain and is relatively noninvasive, at least compared to PET and SPECT scans.

Disadvantages include the fact that the images are obtained while an individual is lying in a scanner. In addition, the scanners often emit distracting levels of sound, which can inhibit people's ability to engage in spiritual practices that require focused concentration such as mediation or prayer. The accuracy of the BOLD signal as a proxy for neural activity has also been questioned (Ekstrom, 2010). In addition, it cannot be used to identify neurotransmitter systems that may be relevant to spirituality, which is not the case with

following two nuclear imaging procedures.

PET and SPECT

Both PET and SPECT scans are invasive procedures that involve injecting a radioactive tracer with a brief half-life into the bloodstream (Rahmim & Zaidi, 2008). In a manner analogous to the fMRI procedure, the radioactive tracer concentrates in biologically active areas of the brain. Computers analyze the signals produced by the tracer during the scanning process. A three dimensional image of brain functioning is generated during various spiritual practices (e.g., reading a sacred text vs. reading a secular text). As alluded above, PET and SPECT scans provide more specific information, relative to the EEG and fMRI procedures, through their ability to shed light on different aspects of neurotransmitter activity (Newberg, 2014). Both procedures are also characterized by relatively poor temporal resolution, high cost, and invasiveness. Due in particular to the latter limitation, there is limit to the number of times people can undergo these scans due to the health risks involved. Although the strengths and limitations of SPECT and PET scan are generally comparable, some differences exist between the two procedures. For example, PET scans typically offer better spatial resolution while SPECT scans are somewhat less costly. It should also be noted that new tracers are continually being developed that offer the potential to shed light on new aspects of brain functioning.

Self-report Measures

Self-report measures also play a role in spiritual neuroscience (McNamara & Butler, 2013). Although considerable debate exists regarding conceptualizations of spirituality across the social and physical sciences (e.g., see: Beit-Hallahmi, 2015; Boyatzis, 2015; Martin, 2015; Neimeyer & Burke, 2015; Paloutzian & Park, 2015; Seitz & Angel, 2015; Stausberg, 2015; Wink, 2015; Zuckerman, 2015), there is wide agreement—at least in principle—that spirituality is a multidimensional construct (Crisp, 2010). A variety of instruments have been developed and validated to measure these various

dimensions (Hill & Hood, 1999).

In spiritual neuroscience, validated measures provide a reliable, baseline assessment of specific dimensions of spirituality. They can be used to "triangulate" the results obtained through the spiritual neuroscience methods reviewed above. They can also be correlated with other neuropsychological functions to yield important insights into spiritual phenomena. For instance, Greyson, Broshek, Derr, and Fountain (2015) used a validated mysticism scale, in conjunction with EEG results, to examine the relationship between mystical experiences and brain functioning among patients with epilepsy.

Research in Spiritual Neuroscience

To understand the neural correlates of spirituality, spiritual neuroscientists have focused on a number of populations, including people coping with significant neurological conditions such as temporal lobe epilepsy (Beauregard, 2011). Examining different groups is understood to provide multiple perspectives on the neuropsychology of spirituality (Newberg, 2014). The research that is perhaps most relevant to social work, however, consists of studies that have been conducted with relatively healthy people who are engaged in various spiritual practices. Nationally representative survey data suggests that members of this group have many counterpoints among the members of general public and, by extension, many of the profession's clients (Newport, 2012; Stark, 2008).

In an early study in this area, Newberg et al. (2001) employed a SPECT scan with eight experienced Tibetan Buddhist meditators. Two scans were conducted (baseline in which the subjects were at rest vs. active meditation). A comparison of the results indicated that active meditation was associated with a number of changes in brain functioning, including increased activity in the frontal lobe areas. Newberg, Pourdehnad, Alavi, and d'Aquili (2003) used a similar approach with three Franciscan nuns to examine the effects of centering prayer, a form of prayer in which people focus on a particular scripture or written prayer. Consistent with the previous study, the centering prayer condition

was associated with increased cerebral blood flow in the frontal cortex.

Different results were obtained in a subsequent study that examined the effects of glossolalia or speaking in tongues among five Pentecostal Christians (Newberg, Wintering, Morgan & Waldman, 2006). Scans were administered in two conditions: singing (a type of control condition) and speaking in tongues. In contrast to the two studies on meditation, the practice of glossolalia was associated with decreased frontal lobe activity, a finding that suggests that different spiritual practices may employ different neural pathways in the brain.

A recent study employed the same basic methodology with three Muslims (Newberg et al., 2015). Two different types of Islamic prayer were examined: regular daily prayers (i.e., Salat) and intense prayer (e.g., Dhikr). Consistent with the results obtained in the glossolalia study, intense prayer was associated with reduced activity in the prefrontal cortex and other frontal lobe structures. The authors speculated that an underlying sense of surrender to a supreme being (manifested during both speaking in tongues and Dhikr) may be linked to the use of similar neural mechanisms.

In another pioneering study, Azari et al. (2001) used PET scans with six committed Christians to assess brain activity during three different conditions. The conditions included reading the first verse of Psalm 23, a well-known children's nursery rhyme, and instructions on using a phone card. During the recitation of the spiritual text, but not the other texts, the frontal-parietal circuit was activated. The authors suggested this finding implicated the importance of cognitive schema in spiritual experiences. Beauregard and Paquette (2006) utilized fMRI scans with fifteen Carmelite nuns to assess the effects of mystical experience which, in the Catholic Carmelite tradition, is typically experienced in the form of union with God. Changes in blood oxygenation (in the form of BOLD signals) were measured in three conditions: baseline (a normal resting state), control (in which the nuns were asked to relive the most intense state of union with another human during their lives), and mystical (in which the nuns were asked to relive the most intense

mystical experience in their lives). When the control and mystical conditions were compared with the baseline data, the results revealed relatively different patterns of brain activation. Such findings raise the possibility that mystical experiences may be mediated by several distinctly unique areas of the brain.

Schjodt, Stodkilde-Jorgensen, Geertz, and Roepstorff (2008) utilized fMRI scans with twenty Protestant Christians to examine the effects of different types of prayer on the caudate nucleus, a brain structure that comprises the dopaminergic reward systems. Scans were conducted in five conditions: baseline (counting backwards from 100), improvised wishing to Santa Claus, repeating a structured well-known nursery rhyme, improvised personal prayer, and repeating the Lord's Prayer. The caudate nucleus was activated in both prayer conditions, particularly during the more structured Lord's Prayer condition. This result suggests that prayer may be capable of stimulating the dopaminergic reward systems of the brain. In a subsequent study that examined differences in improvised and structured prayer, Schjodt, Stodkilde-Jorgensen, Geertz, and Roepstorff (2009) found different types of prayer activated different neural systems, with the former type of prayer activating areas involved with social cognitive processes.

As these studies suggest, spiritual neuroscience is beginning to identify the areas of brain functioning associated with various types of spiritual experiences. Although the nascent state of the field should be noted, progress is occurring in understanding how various neural mechanisms mediate spiritual experience (McNamara & Butler, 2013). These insights have implications for social work, perhaps most notably in the areas of direct practice and research.

Implications for Social Work Practice

The findings obtained in the field of spiritual neuroscience have direct implications for clinical assessment and intervention, especially with clients who self-identify as spiritual or religious. As alluded to above, nationally representative survey data indicate that many, if not most, members of the public engage in the various

spiritual practices examined by spiritual neuroscientists (Newport, 2012; Stark, 2008). Meditation, prayer (whether improvised or structured, as in the case of reciting the Lord's Prayer), mystical encounters with a transcendent dimension of reality, and other spiritual experiences are reported by most members of the public in one form or other. These individuals often turn to social workers—the largest providers of mental health services in the nation—when they experience life challenges (National Association of Social Workers, 2016).

Spiritual neuroscience findings implicitly underscore the importance of conducting a spiritual assessment to ascertain whether or not these various spiritual practices and experiences may intersect service provision (Hodge, 2015). During assessment and subsequent interactions, adopting a supportive, empathetic stance plays an important role in facilitating positive clinical outcomes (Hepworth, Rooney, Rooney, & Strom-Gottfried, 2013). This is often particularly the case when working with clients from different religious traditions or cultures (NASW Standards and Indicators for Cultural Competence in Social Work Practice, 2015; Van Hook et al., 2001).

Dixon and Wilcox (2016) contend that understanding neuroscience findings aids in developing an empathetic posture during clinical interactions with clients. Spiritual neuroscience provides a unique window on clients' spiritual experiences. Understanding the effects of various spiritual practices on clients can help practitioners see clients' spiritual realities in a different light. Spiritual experiences are not just metaphysical abstractions, but lived realities that have an empirical, neurological basis (Beauregard, 2011). In turn, these neural mechanisms are associated with both cognitive and affective processes, a finding that underscores the importance of conducting a spiritual assessment.

In many cases, a spiritual assessment will reveal that spiritual practices—such as meditation or prayer—are salient features in clients' personal narratives. These practices can often be marshaled to help ameliorate problems (Canda & Furman, 2010). Once openness to the potential utilization of these practices to address presenting problems has been ascertained, practitioners can move toward

co-constructing relevant interventions.

Mindfulness meditation, in particular, has been associated with a number of positive outcomes (Hofmann, Sawyer, Witt & Oh, 2010). Findings in spiritual neuroscience shed additional light on this intervention. For instance, Gotink, Meijboom, Vernooij, Smits, and Hunink (2016) conducted a systemic review of an eight-week mindfulness intervention designed to ameliorate stress. The results suggest that the eight-week intervention evokes similar changes in brain functioning as traditional, long-term meditation practices. This raises the possibility that clients may obtain the benefits associated with extended meditation in a relatively short timeframe.

A related intervention implicitly highlighted by spiritual neuroscience is cognitive behavioral therapy (CBT). CBT is one of the most effective interventions (Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012), and social workers tend to be familiar with, and frequently use, this intervention in clinical work (Hepworth et al., 2013). A number of the neuroscience studies reviewed above point to the importance of cognitive processes in spiritual experiences. This research suggests that CBT may be especially suited to clients who self-identify as spiritual or religious (Dixon & Wilcox, 2016).

Furthermore, CBT can also be readily adapted to reflect clients' spiritual beliefs and practices (Hodge & Nadir, 2008). In this approach, standard CBT self-statements are modified to incorporate salutary beliefs and practices drawn from clients' belief system. As noted above, some research in spiritual neuroscience links repeating structured prayers—that are perceived to be personally meaningful—with the activation of the dopaminergic reward systems (Schjodt, Stodkilde-Jorgensen, Geertz, & Roepstorff, 2008). This suggests that involving clients in the process of creating structured, personally meaningful CBT self-statements may be especially effective. Such spiritually-informed CBT self-statements may activate neural reward systems. In turn, the rewards may reinforce clients' desire to implement the therapy, enhancing treatment compliance and reducing relapse. Although the implications of spiritual neuroscience are perhaps most apparent in the area of direct practice, research is another area

in which implications for social workers exist, particularly those conversant with the social science research on spirituality.

Implications for Social Work Research

As alluded to in the introduction, spirituality is widely recognized as an important dimension of human experience that facilitates wellness. Over the past few decades, thousands of studies across the sciences have examined the relationship between spirituality and a wide array of health outcomes (Koenig, King, & Carson, 2012; Koenig & Shohaib, 2014). Although variation exists, in aggregate, spirituality is positively associated with mental and physical health. To cite some examples, spirituality is inversely associated with anxiety, depression, cancer, heart disease, and hypertension, and positively associated with hope, quality of life, psychological well-being, social support, immune functioning, self-rated health, and longevity.

As a result of these findings, researchers across disciplines have increasingly sought to identify the mechanisms that may explain the link between spirituality and health. Spiritual neuroscience is poised to make substantial contributions to our understanding of the relationship between these two constructs (Newberg, 2014). The field is well positioned to identify the neural pathways that help elucidate the link between spirituality and various health outcomes.

In keeping with the growing emphasis on interdisciplinary collaborations across academia, social workers can play a significant role in this investigative process (Franceschet & Costantini, 2010). Schjodt et al. (2009) report that most studies examining the relationship between spirituality and brain functioning implicitly assume that spiritual experience is essentially a uniform category of human experience. This is a problematic theoretical stance given the diverse, culturally-informed expressions of spirituality that exist (Richards & Bergin, 2014; Van Hook et al., 2001). These cultural contexts likely interact with other variables to shape brain functioning (Schjodt, Stodkilde-Jorgensen, Geertz, & Roepstorff, 2009). Social workers, with their appreciation for diversity and other environmental variables, can

make important contributions to multidisciplinary teams in this area.

Similarly, social workers knowledgeable in the multidimensional nature of spirituality can help clarify the dimensions being studied in spiritual neuroscience. As noted previously, validated measures provide a unique window on constructs being examined using EEG and fMRI, PET, and SPECT procedures. Employing such measures can clarify the specific dimensions of spirituality under investigation (Greyson et al., 2015). Social workers, with their appreciation for complex, multidimensional nature of human functioning, can make a valuable contribution in this area by identifying the key measures that are most relevant to the particular dimension of spirituality being examined in a given study.

Conclusion

Social work, in tandem with other disciplines, has increasingly acknowledged the important role that spirituality frequently plays in the lives of clients (Pathan, 2016). In addition to being key factor in people's personal identity (Van Hook et al., 2001), it can often be operationalized in practice settings to help people deal with life challenges (Canda & Furman, 2010). Developments in the emerging field of spiritual neuroscience shed light on both of these issues.

Spiritual neuroscience findings suggesting a neurological basis for spiritual experiences may help more secular practitioners develop empathy for those clients whose spirituality forms the foundation for their social identity (Dixon & Wilcox, 2016). These findings indicate that spirituality is not just an esoteric concept, but has a biological basis that impacts people's lived realities through identifiable neural pathways. In turn, this underscores the importance of administering a spiritual assessment to understand the impact of spirituality on clients' lives. In terms of assisting clients ameliorate problems, the findings highlight the advisability of using interventions such as mindfulness, CBT, and other cognitively based interventions, especially if they can be modified to incorporate clients' spiritual beliefs and practices. Developing structured, spiritually-based interventions that are

perceived to have transcendent significance may activate dopaminergic reward systems which, in turn, may foster enhanced outcomes (Schjodt et al., 2008).

As experts in diversity, multidimensionality, and intervention research, social work scholars can contribute to the ongoing exploration of spirituality in neuroscience. Driven in part by the expectations of funders, interdisciplinary collaborations are increasingly common across the scientific enterprise (Franceschet & Costantini, 2010). As the field of spiritual neuroscience develops, social workers can play an important role in identifying and operationalizing key concepts in collaborative research designed to enhance clients' well-being. And, as indicated in the opening sentence of the NASW Code of Ethics (2008), such research should be a concern to all social workers.

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