RELIGIOUS EXPERIENCES AND MIND-BRAIN SCIENCES IN THE 21ST CENTURY

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Abstract

The classical work by William James in context of current ideas in religion and modern psychology points to the difference between a “moralist” and a religious or mystical understanding. James described that specific psychological mechanisms related to religious experience (“re-unification”) are compensatory influences on divided consciousness or heterogeneous self, which is determined by a conflict between moral and immoral behavior symbolized by a personified evil as for example the ‘Satan’. According to recent findings there is not widely accepted evidence about specific neural mechanisms of these processes related to psychological integration and re-unification. Nevertheless recent findings indicate very specific and significant influences of these specific experiences related to meditation on brain functions and morphology.

Key words: *Cognition; Religious experiences; Meditation; Neural mechanisms; William James*

1. INTRODUCTION

In “The Varieties of Religious Experience” James (1902) wrote that religious experience brings a sort of “enchantment” to life that gives a new sphere of power that enables to open human potential for development of consciousness. In the similar context also current scientific psychology suggests that specific potential related to religion may create an integral part in the development of human cognition (Rossano, 2011; Wynn & Coolidge, 2007; Kane & Engle, 2002; Sorensen & Leonard, 2001; Adler et al., 2006). According to some findings religiosity is specifically linked to development of moral reasoning that enables to increase capacities of the modern human mind (Wynn & Coolidge, 2007; Tomasello et al., 2005; Rossano, 2011 pp. 40) through particular development of inhibitory control which allows the pursuit of non-immediate goals, and maintaining attention on current task demand which is closely linked to various specific changes in the dorsolateral prefrontal cortex, and anterior cingulate cortex. (Ingvar, 1994; Curtis & D’Esposito, 2003; Kelly et al, 2006; Minkel 2006; Rossano, 2011 pp. 43). This religious thinking and behavior is also particularly linked to a specific way how human beings tend to understand the universe and create culture (Sperber, 1996; Boyer, 2000, Barret, 2000; Heider & Simmel, 1944; Guthrie, 1980; Lawson & McCauley, 1990; Guthrie, 1993; Rochat et al. 1997; Barret, 2000)

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Beyond the genesis of religious thought and practice, and further to the purpose that religion serves in the life of man, considerable evidence indicates that broadly defined forms of “shamanism” as the oldest forms of religion were found in almost all ancient societies (Winkelman, 1990; Townsend, 1999; Guenther, 1999; Lee & Daly, 1999; Vitebsky, 2000; Rossano, 2011 pp. 46). The shamans predominantly worked with the “altered states of consciousness which may be achieved by these types of practices and mainly include the evocation of intense emotion (Frecka & Kulscar, 1989; Rossano, 2011 pp. 47). In this context current data show that these ritualistic behaviors may be specifically associated with consistent increased activation in the dorsolateral prefrontal cortex and anterior cingulate cortex, areas associated with working memory and focused attention (Lou et al., 1999; Lazar et al., 2000; Azari et al., 2001; Newberg et al., 2001; Lazar et al., 2005; Beauregard & Paquette, 2006; Rossano, 2011 pp. 49). Additionally, altered states have been found to create long term alterations in brain structure and attentional capacities which is associated with learning and memory (Carter et al, 2005; Lazar et al, 2005; Newberg, 2006; Rossano, 2011, pp. 49).

James (1902) described that specific psychological mechanisms related to religious experience (“re-unification”) are compensatory influences on divided consciousness or heterogeneous self which is caused by a conflict between moral and immoral behavior symbolized by a personified evil as for example the ‘Satan’ in Christian traditions, who causes ‘sinful’ thoughts and behavior and this heterogeneous division leads to a high degree of psychological distress. According to James (1902) mystical experience enables to integrate these opposites. Recent empirical findings show that these types of experiences related to non-dual perspective might have very high occurrence in population, for example at about 60% (Hardy, 1979; Hay, 1994; Saver & Rabin, 1997 pp. 499). While the detailed anecdote does indeed seem at a minimum to resemble some other non-substance induced experiences, contemporary research in this area has taken a divergent direction. Most notably a study conducted in 2006 at Johns Hopkins University has found that through ingestion of a high dose of psilocybin, as high as 67% of spiritually active hallucinogen-naïve participants reported, 14 months after dosing that they found the experience to be one of the five most spiritually significant of their lives. As high as 17% reported the experience as being *the most meaningful*, and relative to control, significant changes in attitude, altruism, mood and behavior were reported (Griffiths, Richards, Johnson, McCann & Jesse, 2008 pp. 7). Further, almost 60% fully met the criteria for having had a mystical experience during the psilocybin session. Those criteria incidentally were based upon specifications defined in Varieties of Religious Experience and then further expanded upon by Stace (1960; Griffiths, Richards, Johnson, McCann & Jesse, 2008 pp. 9-10): Internal unity (pure awareness; a merging with ultimate reality); External unity (unity of all things; all things are alive; all is one); Transcendence of time and space; Ineffability and paradoxically (claim of difficulty in describing the experience in words); Sense of sacredness (awe) ; Noetic quality (claim of intuitive knowledge of ultimate reality); Deeply felt positive mood (joy, peace, and love).

2. NEUROPHYSIOLOGICAL CORRELATES OF RELIGIOUS EXPERIENCES

According to recent findings there is not widely accepted evidence about specific neural mechanisms of these processes related to psychological integration linked to the religious experience (Feuerbach, 1851; James, 1902; Hardy, 1979; Hay, 1994; Saver & Rabin, 1997 pp. 499) connected with specific types of subjective descriptions such as experiences non-duality, sensed presence, interconnectedness etc. (Damasio & Tramel, 1991; Saver & Damasio, 1991; Aggleton, 1993; Joseph, 1996; Saver & Rabin, 1997 pp. 507).

In this context, for example it has been reported that mystical-like experiences may be the result of weak electromagnetic currents in the deep temporal lobe, and it was hypothesized that this experience may be induced by exposure to weak pulsed electromagnetic fields (Persinger & Healey; Beauregard, 2011 pp. 61-62). The experiment was done by exposing 3

groups of university students (n=48) to weak pulsed electromagnetic fields over the right and left temporoparietal regions as well as equally across both hemispheres for twenty minute sessions. An additional fourth group was utilized as a sham control informed that they may be exposed to weak magnetic fields. Fully two-thirds of the subjects reported perceiving a 'sensed presence', the sensation that someone or something else was present in the administration chamber with them. Cited examples included mention of 'spirit guides', deceased family members, or more a general entity which moved when attempts were made to focus attention upon it. A higher proportion of these reported sensations were produced from subjects that were exposed to the electromagnetic pulse on the right or both hemispheres. However, perhaps partially discounting the finding, 33% of the sham control group also indicated the perception of 'sensed presence' (Persinger & Healey, 2002; Beauregard, 2011 pp. 61-62). Following this result, a group of Swedish researchers, did attempt to replicate Persinger's findings but did not confirm them (Granqvist et al., 2005; Beauregard, 2011 pp. 62-63).

Potentially partial explanation of this relationship may be linked to the existence of phenomena known as epileptic auras. Identified early by noted English neurologist Hughlings Jackson epileptic auras, adjacent to seizure create alterations to the perception of external reality in the subject (Jackson & Stewart, 1899; Saver & Rabin, 1997 pp. 500). Among the numerous potential aura effects are states including derealization, depersonalization, 'dreamy states', ecstasy, and autoscopy. The frequency of aura phenomena among persons experiencing partial complex seizures ranges widely from 23-83% and one quarter are psychic in content most commonly *deja vu*, *jamais vu*, memory recall, and visual and auditory hallucinations (Palmini & Gloor, 1992; So, 1993; Mendez, Cherrier & Perryman, 1996; Saver & Rabin, 1997 pp. 500; 503)

A very clear, strong commonality apparently exists between the epileptic aural phenomena and numinous mystical experience in non-epileptic persons. Persons undergoing a mystical experience frequently also experience sensations which can be categorized as depersonalization, derealization, and autoscopy. Devinski et al. (1989) reported that 6% of epileptic patients reported autoscopy during, or following the seizure. Among those with an identifiable focus of seizure, 88% were found to have temporal lobe seizures (Devinski et al., 1989; Saver & Rabin, 1997 pp. 503)

One type of aural event is identified as ecstatic and applied to two types of experience, often existing concurrently. The first is an emotionally highly pleasurable sensation and the second a cognitive sensation of essentially insight into the non-dual nature of the world with all interconnected, harmonious, and divine. Both types are very rare. Pleasure as an ictal experience is reported in less than 0.5% of epileptic patients (Williams, 1956; Devinsky et al., 1991; Saver & Rabin, 1997 pp. 503). One study found that all 7 subjects who experienced ecstatic sensation had a temporal or peritemporal focus (Williams, 1956; Saver & Rabin, 1997 pp. 503). Another authors (Cirignotta, Todesco & Lugaresi, 1980; Saver & Rabin, 1997) characterized a patient who experienced joy, bliss, ecstasy, and was "detached" from her current environment. EEG monitoring indicated right temporolimbic discharges. Conversely, Naito and Matsui (1988) characterized a patient who experienced joyous visions of God and the sun. EEG readings during a sleeping seizure indicated discharges in the left anterior and middle temporal regions. Dewhurst and Beard (1970) studied postictal religious convertants, finding that the often lasting conversion typically occurred following a series of complex-partial seizures originating in the temporal lobes (Beauregard, 2011 pp. 59). Further recent examination of ecstatic seizures by Hansen and Brodtkorb (2003) also show that of 11 subjects, the origination lateralization was well differentiated with, for example the 4 incidents of identifiable seizure onset locations spread equally between left and right, once occurring in the left parietocentral region rather than the temporal. Clearly definitive answers in this area remain elusive, an issue compounded by ecstatic seizures rarity and tendency to be unreported.

In addition some data indicate that there exists a significant correlation between religiosity and reduced right hippocampal volumes instigating conjecture and that the amygdala is likely playing an enhanced role in the neural processes related to religious experiences (Wuerfel et al. 2004; McNamara, 2009 pp. 93). Also there is some evidence that the parietal lobes have been found to have decreased activity during meditation while in the frontal lobes the activity is increased (Newberg et al., 2001; McNamara, 2009, pp. 107).

3. THE "NEURAL SELF"

Further research on the neuro-correlates related to the sense of self have been identified utilizing neuro-imaging (PET scans) and magnetic resonance imaging mainly focused on the anterior temporal as well as the prefrontal cortex (Craig et al., 1999; Feinberg & Keenan, 2005; McNamara et al., 1995; Miller et al., 2001; Seeley & Sturm, 2007; Vogele, Kurthen, Falkai, & Maier, 1999; McNamara, 2009, pp. 60). For example, it has been reported that dementia approaching from the frontotemporal right regions will tend to influence personality changes and alterations in the self that are prominent and immediate (Wang & Miller, 2007; McNamara, 2009, pp. 61). Further research has also indicated that a substantive disinhibition in behavior, losing the behavioral standard of the self, can be very strongly correlated with lesions in the right prefrontal and anterior temporal lobe regions (Starkstein & Robinson, 1997; McNamara, 2009, pp. 62).

Additional specific examinations of activated neural networks during self-referential tasks in very widely distributed neural networks have been reported which included mainly the orbital and adjacent medial prefrontal cortex, dorsomedial prefrontal cortex and the anterior cingulate (Gillihan & Farah, 2005; Seeley & Sturm, 2007; Uddin, Iacoboni, Lange, & Keenan, 2007; McNamara, 2009, pp. 60-61). The correlation between the right frontal/anterior-temporal cortex and neural association with the self seems to be linked to a dense grouping of afferent neurons connecting to the limbic and neostriatal systems. There is also a possibility that the frontal/anterior-temporal cortex receives increased stimulation from the noradrenergic and serotonergic cell groupings in the brain stem. (Bruder, 2003; Ongur & Price, 2003; McNamara, 2009, pp. 62). In addition, further the dopaminergic cell groups projecting from the right prefrontal cortex do display a more pronounced response to stress than do the left (Berridge, Espana, & Stalnaker, 2003; McNamara, 2009, pp. 62).

Contemporarily, the currently studied is meditation that from a neurological standpoint has been found to make alterations in the brain's morphology. Utilizing various measures of cortical thickness, gray matter concentration and volume, five recent studies found significant neuroanatomical differences in the: thalamus; left inferior gyrus; right hippocampus; brain stem; sensory cortex; orbito-frontal cortex; and right anterior insula (Lazar et al., 2005; Hölzel et al., 2008; Luders et al., 2009; Vestergaard-Poulsen et al. 2009; Ott, Hölzel & Vaitl, 2011 pp. 121-122; Ott, Hölzel & Vaitl, 2011, pp. 124-125). Additional recent findings in the field of meditation included also a potential relationship between cortical thickness and pain sensitivity in meditators. For example, Zen meditators showed a significantly higher threshold to achieving subjective moderate pain. This attribute has been previously associated with cortical thickness. (Grant & Rainville, 2009; Grant et al., 2008; Hölzel & Vaitl, 2011, pp. 126)

4. CONCLUSION

Already James proposed that the transformational phenomena of conversion or reunification experience exist in two forms, volitional, and also that by self surrender. The volitional is typically a gradual incremental transformation of new moral and spiritual habits. Conversely the self-surrender type is substantively more dramatic occurring rapidly with a perceived need of assistance from an outside power. While James notes that while there does remain still

an element of giving up the personal wills in the volitional process, a self surrender is a key and integral to the spontaneous reunification process. Also contemporary thought does continue along similar lines. For example, McNamara (2009) suggests that religion and spirituality did provide a possibly evolutionary advantage by way of the transformation of the practitioner into a more unified, or integrated entity possibly more closely resembling the ideal self of that entity. Elaborating, the unified self, not disrupted by conflicting behavioral priorities and possessing clear and strong executive function capable of suppressing immediate gratification for the pursuit of long term goals, can more clearly signal pro-social intent to cooperate with others towards shared goals, and better engage in combat or evade predators, being more prone to disregard fears possessed by a more fragmented self (Nichols & Stich, 2000; McNamara, 2009).

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