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Review
Spirituality and Religion in Epilepsy
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Abstract
Revered in some cultures but persecuted by most others, epilepsy patients have, throughout history, been linked with the divine, demonic, and supernatural. **Clinical observations during the past 150 years support an association between religious experiences during (ictal), after (postictal), and in between (interictal) seizures. In addition, epileptic seizures may increase, alter, or decrease religious experience especially in a small group of patients with temporal lobe epilepsy (TLE).**
Literature surveys have revealed that between .4% and 3.1% of partial epilepsy patients had ictal religious experiences; higher frequencies are found in systematic questionnaires versus spontaneous patient reports. Religious premonitory symptoms or auras were reported by 3.9% of epilepsy patients. Among patients with ictal religious experiences, there is a predominance of patients with right TLE. Postictal and interictal religious experiences occur most often in TLE patients with bilateral seizure foci. Postictal religious experiences occurred in 1.3% of all epilepsy patients and 2.2% of TLE patients. Many of the epilepsy-related religious conversion experiences occurred postictally. Interictal religiosity is more controversial with less consensus among studies. Patients with postictal psychosis may also experience interictal hyper-religiosity, supporting a "pathological" increase in interictal religiosity in some patients.
Although psychologic and social factors such as stigma may contribute to religious experiences with epilepsy, a neurologic mechanism most likely plays a large role. The limbic system is also often suggested as the critical site of religious experience due to the association with temporal lobe epilepsy and the emotional nature of the experiences. Neocortical areas also may be involved, suggested by the presence of visual and auditory hallucinations, complex ideation during many religious experiences, and the large expanse of temporal neocortex. **In contrast to the role of the temporal lobe in evoking religious experiences, alterations in frontal functions may contribute to increased religious interests as a personality trait. The two main forms of religious experience, the ongoing belief pattern and set of convictions (the religion of the everyday man) versus the ecstatic religious experience, may be predominantly localized to the frontal and temporal regions, respectively, of the right hemisphere.**
Introduction
The more subjective the phenomenon, the less easily can science focus on its image. Spiritual and religious experiences are deeply personal and verbally inexpressible. The scientific effort to dissect and define them may miss or destroy their essence. Yet, spiritual and religious thoughts are phenomena of the mind and brain with physiologic and structural correlates.
The presence of spiritual beliefs among all cultures strongly suggests that the human brain is programmed to experience and explain parts of

existence in spiritual terms. Like language, spirituality develops in different forms in different cultures, yet the emotional–cognitive processes and underlying anatomy probably share many elements. The aphasias helped usher in modern neurology 150 years ago. Linguists and cognitive neuroscientists actively study normal language function. In contrast, priests and, occasionally, psychiatrists focus on spiritual–religious disorders, but "normal" spirituality and religious experiences rarely reach the fringes of science. Thus, positron emission tomography and functional MRI are routinely used to study language, vision, facial recognition, attention, and other cognitive functions, but very few investigations have sought to identify the structures that are active during religious ideation. In one functional MRI study, the dorsolateral frontal and medial frontoparietal areas were activated during religious recitation in self-identified religious subjects [1]. Yet, it remains uncertain whether any elements of religious experience were activated as these results have not been replicated.
William James [2], in 1902, identified two broad categories of religious experiences. The first is the religion provided by our parents and society [p. 6]. The second, and more interesting one, is the "original experiences which were the pattern-setters to all this mass of suggested feeling and imitated conduct…individuals for whom religion exists not as a dull habit but as an acute fever…'geniuses' in the religious line" [p. 7]. James recognized intense religious experiences as special events, occurring in a small group and occasionally having an enormous impact on the larger population. He also cautioned against the reductionist medical materialism that "finishes up Saint Paul by calling his vision on the road to Damascus a discharging lesion of the occipital lobe, he being an epileptic" [p. 12].
James also recognized that those subject to intense religious experiences are often "creatures of exalted emotional sensibility…. led a discordant inner life…melancholy…liable to obsessions and fixed ideas…fallen into trances…heard voices, seen visions, and presented all sorts of peculiarities…classed as pathological…[that] helped to give them their religious authority and influence" [p. 8]. Differentiating genius from pathology may be most difficult regarding religious ideation and experience. Who is touched by madness, who by spirits, and who by both? Medically, we can readily diagnose a seizure if the EEG shows epileptiform activity and there are associated features such as olfactory hallucination followed by staring and oral automatisms. Similarly we can disagnose a psychotic disorder if there are nonreligious delusional ideas and characteristic hallucinations and negative symptoms. But how can we distinguish the physiology or validity of a religious experience in someone with epilepsy or psychosis from that of a religious sage? We can't.
Disorders of spiritual–religious function could result in a relative lack of or excess of activity. Normal function is culturally defined and varies radically. Many cultures actively endorse intense religious experiences through extreme environmental conditions (e.g., sweat lodge, prolonged isolation, fasting) and environmental hallucinogens, often in a ceremonial context. In contrast, several modern cultures (scientific, communist) endorse atheism. Yet, within this vast range, neurologic or psychiatric disorders can dramatically alter both types of James' religious experiences (ordinary man, ecstastic), which could enhance or diminish religious activity. Neuropsychiatry focuses almost exclusively on hyper-function, although hypo-function is probably of equal interest and importance, but is unrecognized.

Epilepsy, mood disorders (especially mania), and psychosis stand out among human disorders that trigger an excess of spiritual experiences. This review will focus on epilepsy.

Section snippets

Historical Background

Hippocrates began his discourse on the "sacred disease" by refuting the connection between epilepsy and the divine; he argued against the widespread beliefs of prophetic and mystical powers attributed to persons with epilepsy and the disorder's divine causation. However, Hippocrates attempt to dissociate epilepsy and religion was unsuccessful. Subsequent religious figures were asked to heal people with epilepsy. The New Testament gospels of Matthew (17:14–20), Mark (9:14–29), and Luke

Ictal Religious Experiences

Ictal religious experiences are a form of ecstatic seizures, occurring most often in patients with temporal lobe seizure foci. Other ecstatic seizures include the emotion of intense pleasure, joy, or contentment [29], [30]. Among patients with emotional simple partial seizures, between 7% and 23% reported pleasurable sensations [31], [32]. Of 606 patients with temporal lobe epilepsy (TLE), six (1%) had ictal religious experiences [33]. In a survey of 234 patients with epilepsy, one (0.4%) had a

Postictal Religious Experiences

Intense religious experiences and delusions often occur during postictal psychoses [43]. These symptoms tend to be prolonged, often lasting hours to days, in contrast with ictal phenomena, which typically last seconds or minutes. Howden [44] observed a man who had a religious conversion after a generalized seizure in which he was "in Heaven." The experience involved a depersonalized state, and it took three days for his body to be reunited with its soul. Mabille [45] described a patient who,

Interictal Religiosity

While ictal and postictal religiosity are "religious fevers," interictal religiosity usually takes the form of a heightened state of religious conviction. Unlike the "acute infections" of religious experience, interictal religiosity is a more continuous behavioral trait. Religiosity is an uncommon personality feature among individuals with epilepsy. Rather, it affects a subgroup of epilepsy patients, especially those with TLE [51], [52], [53]. These individuals have unusually strong religious

Indeterminant States Between Peri-ictal and Interictal Experiences

Determining the precise boundaries between premonitory, ictal, postictal, and interictal experiences can be difficult. Although a carefully obtained history can often distinguish between these states, they can merge with each other and overlap or transform over time. Thus, recurrent postictal psychosis can evolve to interictal psychosis [61]. Similarly, postictal phenomena that occur immediately after a seizure can have different clinical features and pathophysiologic mechanisms.

Determining the

Pathophysiology of Religiosity

The brain mediates religious experience, emotion, and thought. Ictal and postictal religious phenomena result from alterations in cortical function. Limbic system dysfunction is often postulated [53], [65], and is supported by the emotional content of these experiences. This is reflected in the term Spratling [36] used to describe auras with religious

content: paradoxical religious emotionalism. However, involvement of neocortical areas is supported by the complex visual and auditory

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Disturbed activity in the temporal lobes − as observed in patients with schizophrenia or epilepsy − may result in a disruption of the process whereby predictive signals are used to attenuate activity in sensory brain regions (Horga et al., 2014). **Indeed, traditionally religious experiences have been associated with altered functioning of the temporal lobes [for historical overview, see: (Devinsky and Lai, 2008). Patients with temporal lobe epilepsy may have profound religious experiences as a consequence of spontaneous discharges in temporal areas and the limbic system (Joseph, 2001; Saver and Rabin, 1997).**

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