

The Role of Religious and Mystic Experiences In Human Evolution: A Corollary Hypothesis for NeuroTheology

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Abstract

The adaptive value of maintaining a portion of our population subject to religious, mystic or spiritual experiences is discussed. An evolutionary mechanism, which may be unique to humans, is posited in which all humans have the neural pathways supporting mystic experiences, but only a small portion of our population experiences them. Those that do will display signs and personality traits that are associated with temporal lobe electrical lability or sensitivity. These traits motivate behavior that benefits their social group. The cognitive and affective styles displayed by mystics ensure that multiple perspectives are expressed during collective decision-making processes. The perspectives mystics offer their societies increase the variation within the human "ideational pool". These perspectives improve their chances for advantageous choices in times of threats or opportunities. Such an adaptation, producing variety in problem-solving skills, might be the source for the exceptionally wide range of personality types found within our species.

Key Words: amygdale, hippocampus, evolutionary theory, anthropology, social group structure, neurotheology

NeuroQuantology 2010; 4: 495-508

Introduction

Individuals reporting religious and mystic experiences appear in all cultures and have been present for millennia. The dramatic impact of such reports, which often form the basis for widespread religious systems, suggests that individuals prone to such experiences may be an intrinsic feature of our species and part of an evolutionary strategy. One hypothesis for the

psychological advantage of spirituality for individuals is the attenuation of death anxiety (Persinger, 1985). The "spiritual experiences" with the implicit cognitive associations to existence beyond time and space, allow us to feel that death isn't threatening in an absolute sense while remaining mindful of threats to our group's survival. Religious beliefs indicate we don't die, but rather survive death and go on living in heaven, a spirit world, or reincarnate, becoming a human again. The belief that that no one ceases to exist when they die is critical to every religion.

Living in a complex culture can be considered the primary survival strategy for *homo sapiens*. Religion may be, or once may

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Acknowledgements: Thanks to Dr. M. A. Persinger for technical
comments and suggestions.

Submitted for Publication: Nov 4, 2010; final revision received Nov
10, 2010; accepted Nov 11, 2010.

have been, an evolutionary adaptation that contributes, or once contributed, to our survival. It's worth noting that no hereditary mechanisms are required for such an adaptation to be distributed through the total human population. Social rewards could motivate people to first acquire religious beliefs in childhood and then to integrate their implications into their cognitive styles and habitual thought patterns. In the absence of intellectual challenges within the relatively closed social groups with shared beliefs and expectancies (the most parsimonious definition of "culture"), the prevailing religious imaginary and neurocognitive patterns became very complex. They developed over time into sophisticated belief systems able to address enduring religious and philosophical questions.

Perceiving death as an illusion is a matter of belief. One can appreciate the survival value of a trait that would sharply reduce death anxiety specifically and anxiety in general so that the analytical and creative capacities of the human brain would contribute to group survival. However, belief may not be the only feature of religion with adaptive value. The capacity for religious or mystic experience and the propensity to report psychic perceptions, continuously appearing in a small subpopulation in every known culture, may play, or has played, a role in species survival.

There is a selective advantage for maintaining groups of people prone to such experiences within our populations. Because all experiences are generated by brain activity and perceptions are strongly influenced passively by specific neuropatterns within the temporal lobes while their organization are more associated with prefrontal function, the former may be a locus for these "alternative" perceptions. Temporal lobe (TL) activity, especially in its deeper limbic structures that include the hippocampal formation (the hippocampus and dentate gyrus) and amygdala, appears to be the source for most of the cognitive variance associated with religious experiences (Persinger, 1983). There are normative data (Persinger and Makarec, 1993; Makarec and Persinger, 1990; Persinger and Valliant, 1985) for people

prone to elevated temporal lobe activity or "indicators".

Mysticism and Temporal Lobe Signs and Behaviors

Psychometric data indicate that TL sensitivity exists in a continuum within the human species. There seems to be several groups of people who display higher-than-normal or altered patterns of activity in the temporal lobes within the two hemispheres, particularly the right hemisphere. The first, and best-known, are those who are diagnosed with partial complex epileptic seizures with a focus in the temporal lobes. Traditionally this condition was labeled as "temporal lobe epilepsy" (TLE). Other "non-epileptic" groups include people with frequent spiritual experiences (Persinger, 1984), some artists and poets (Makarec and Persinger, 1985), and people with certain psychiatric disorders. From a first order approximation it appears that our species maintains as many people with frequent "otherworldly" experiences as it does people who never have them at all.

The overall levels of temporal lobe activity can be inferred using questionnaires that query for complex partial epileptic signs or TLS (*Temporal Lobe Signs*). The construct validity of these questionnaires has been suggested by the systematic, moderate-strength correlations between the scores for the scales and the proportions of alpha rhythms or distribution of power within the theta (4-7 Hz) and gamma (35 to 45 Hz) ranges over either the left or right temporal lobes. Common altered-state experiences that are reported for people with Temporal Lobe Epilepsy (TLE) and for normal people who display TLS include *déjà vu*, *jamais vu*, the 'sense of a presence', hypnogogic imagery, vestibular sensations, and paraesthesias.

Elevated temporal lobe signs have been reported by people who engage in spiritual practices and who have a history of mystic experiences. People who report above average numbers of classical paranormal experiences are also likely to display elevated numbers of temporal lobe signs (Persinger, 1984). A similar pattern is evident for people who report more formal religious experiences (Persinger, 1984). TL signs are

also more frequent in people who meditate (Persinger, 1993), a process that is known to activate specific patterns of activity within the temporal lobes. Under certain conditions, people with elevated specific TLS are more likely to have Out-of-Body experiences (Persinger, 1995).

The measure of the frequency or incidence (rather than the prevalence within the population) of a person's TLS provides a rough indicator of the temporal lobe's sensitivity and propensity for producing altered states. This includes those diagnosed with Temporal Lobe Epilepsy, some psychiatric disorders, and proclivities (or a low threshold) for mystical states. The latter are often concomitant with paranormal and/or religious beliefs (Roberts, 1993). They are cognitive processes derived from experiences that shape our organizations of when, where, and why the perceptual world operates. When the influence from pejorative labels and culturally condoned forms are removed the modality-specific details are remarkably similar across all of these populations.

Some of those prone to elevated TL signs display quantitatively and qualitatively different behaviors compared to others. Those who display them more often (Persinger and Makarec, 1987) also show difference in the manner in which they verbally interact with other people, a trait that would have a strong impact upon the social group. Their common talkativeness (Bear and Fedio, 1977) 'viscosity' would provide a regular, if not constant, motivation to communicate their experiences both privately and in groups.

The continuum of temporal lobe lability was revealed by examining some of the more common altered state experiences, such as déjà vu, sensing a presence when no one is there, parasthesias, vestibular experiences, olfactory illusions, and feelings of meaningfulness, to name only a few. These more common altered-state experiences offer a context for the study of altered states throughout the population. They show less variation between individuals, and are less subject to personal interpretations than the less frequent, but better known, intense religious experiences.

Mystic experiences with ecstasy and rapture are even rarer.

We must wonder why our species would consistently produce a percentage of people who have mystic experiences, as well as people who don't have even their subtlest variations. Here, mystic experiences refers to such things as seeing God or spirits, out-of-body experiences, episodes of meaningfulness, spirit mediumship, vision quest experiences, prophesy, and hearing the voice of spirit guides. We should remember that these experiences occur within a wide range of spatial intensities (prevalence) and frequencies (incidence rates) enmeshed in the representations of different sensory modalities. Few people see God but many sense His or Her presence during prayer.

The meaning and implication of the phrase "mystic experience" are derived from the world's spiritual traditions, while psychiatric symptoms are defined from the context of psychology and neuroscience. Artistic inspiration, which has been found to correlate with elevated TL activity, is defined by the artists and poets who experience it. Outside of neuroscience, which focuses upon brain function, there are no commonly-shared criteria that will include all the types of people with elevated temporal lobe activity.

Here, the term mysticism is defined as the propensity to experience positive altered states of consciousness and to engage in behaviors that increase their probability. This definition implies both intense and subtle positive altered state experiences. The answer to why our species consistently includes people motivated to engage in spiritual practices and experience may lie in the cognitive and emotional styles found both in people with frequent altered-state experiences, as well as those who only have them only rarely, or not at all. Data from temporal lobe epileptics has been employed to make inferences about mystics because both have elevated temporal lobes signs and both share many behaviors and personality traits. This follows the principle that "mental forms follow neural function" and there is a common source for these signs and behaviors within different groups.

There are discriminable behaviors associated with partial complex seizures. In

one study (Waxman and Geschwind, 1975), four behavioral traits emerged for temporal lobe epileptics. One was hyperreligiosity, the tendency to fixate on spiritual themes and to find spiritual interpretations for events. Another characteristic was hypergraphia, the tendency to write at length (a trait that can also emerge as absorption in graphic arts). When speaking in conversation instead of writing, this emerges as difficulty in ending a conversation or changing the topic ("viscosity"). TLE patients will often continue a flow of words, in writing or speech, far longer than others.

Another trait is irritability, the tendency to experience frequent, but short flashes of anger. Such behaviors can significantly encourage subordinate responses amongst members of the group when applied strategically by increasing their vigilance to comments and reluctance to challenge their validity. Consequently the person with this trait begins to dominate the group. The fourth characteristic was altered sexuality, which refers to an either greater than average interest in sex, or a complete, or almost complete, lack of interest in it. The latter, which often involves traditions of celibacy, may be misinterpreted as the "cause" of the spirituality when in fact a third factor, temporal lobe lability, was responsible for both.

Other researchers (Bear and Fedio, 1977) have reported a much longer list of frequently occurring characteristics. They include: emotionality, mania, depression, guilt, humorlessness, altered sexual interest, aggression, anger and hostility, hypergraphia (excessive writing), religiosity, persistent philosophical interests, sense of personal destiny, hypermoralism, dependency, paranoia, obsessionality, circumstantiality, and viscosity. The composition of the specific aggregate of personality traits that appear for each TL epileptic depends on the locus of electrical lability within the temporal lobes.

One of the most typical modern neuroimage-based correlates of TLE is that the locus of activity is hyperactive during the experiences (and electrical seizures) but hypoactive (below level metabolic activity) when these experiences are not occurring. Similarly, the traits that appear in any individual mystic depend on which areas of

the brain supports their experiences. Presumably these will be areas of greatest sensitivity, which are strongly active during the mystic experiences and make greater than average contributions in to the content of their consciousness and behavior at other times.

Because the central idea of this paper is that some of the human population is prone to mystic experiences as a part of an evolutionary strategy, the assumption is that spiritual experiences are similar but not necessarily identical to epileptic events. Rather, we will regard the spiritual content of many seizures (as well as the interictal religious behaviors that TLE patients frequently display) primary recruitment or activation of sets of limbic and cortical pathways whose organic functions are responsible for mystic experiences. These pathways are expected to be recondite in most of the population. When numbers of recruited neurons exceed a critical threshold and spread to other areas, especially those involved with motor activity or the thalamic substrates that organize cerebral function, then formal epilepsy occurs. It's prevalence in the population is in the order of about 1%.

Not all mystics experience the same exact detail and some have them more often than others. Some experiences are faint and subtle while others are overwhelmingly salient. If these pathways are considered a feature of an evolutionary strategy, their activation (even only in a minority of the population) cannot be considered evidence of a disorder. Mystic experiences may occur in certain pathologies but that does not make them pathological. Mysticism seems to impose certain behavioral patterns on its practitioners, and these reflect the activity (or greater than normal sensitivity) of the motor patterns represented upon the temporal lobes (TL). Increased contributions to ideation and affect from the TL impose specific tendencies in cognitive and/or emotional style.

Specific Brain Regions Involved with Mystic Experiences.

Mental forms follow neural functions. In most cases, a mystic's experiences will reflect the activity of one neural region or the field of activation within several areas. The most

electrically labile structures in the brain are the amygdala and hippocampus. Because of this, these are the two areas most likely to become sensitive to subtle changes in cerebral chemistry, exogenous electrical input, and even environmental energies. When the experiential correlates are negative, we should expect psychiatric problems. When they are positive, we should expect mysticism and spirituality to appear.

The amygdala can be seen as an affective structure while the hippocampus is a cognitive structure. The spatial adjacency of the amygdala (rostral) to the hippocampus reiterates the importance of structure dictating function and why what is remembered has personal salience. The difference in their functions will give rise to some mystics who emphasize thought and others who emphasize emotion. Because these two structures are heavily interconnected, very few mystics will emphasize one to the exclusion of the other.

The structures most implicated in mystic experiences are the right hippocampus (RH) and the left amygdala (LA). This pattern of activation may be the bases of the shaman-type mystic. Of course, these regions would not be the only structures involved in anyone's mystic experiences. Our populations consistently include a percentage of mystics of each type. Some are more oriented towards prayer and faith in God (LA) while others are more oriented towards meditation and insight (RH).

Very strong mystic experiences will be supported by larger neural events for which the physical substrates can be selectively modified through "synaptic dropout". Preferential affects upon inhibitory interneurons, such as altered synaptic density or entry into states of "dormancy", would allow subsequent presentation of less intense exogenous stimuli to evoke mystical experiences. According to inferences from clinical and experimental observations during utilization of the Shakti technology, frequent experiences involving the right hippocampus or the left amygdala will favor intrinsic microstructural changes within both as well as functions to anatomically-associated regions.

Because these regions contribute strongly to the functional constructions of personality and the sense of self, coherent changes in the right hippocampus-left amygdala predictably alter personality by producing disinhibition of related functions. Because the way we think and feel are critical components of our sense of self, changes to these structures can create the perception that one's 'being' has changed (Persinger, 1993). The onset of mystic experiences (during a seizure, high fever, head injury, hallucinogenic compound, or maintained dream state that may shape synaptic organization, particularly in children) can be thus experienced as a 'rebirth', a 'spiritual death', or the perception that one's 'soul has been cleansed'. The person might perceive himself or herself in a new relationship to God and might "renounce" their previous ways of living.

The features of visitor experiences, during which a person experiences a meeting with a nonphysical being, are expected to follow the functions of deep temporal lobe structures, especially the amygdala. Some of the correlative experiences involve cosmic meaningfulness, vestibular experiences ("uplifting" sensations), and elaborate visual imagery. After intense experiences, behaviors similar to religious conversions often appear (Dewhearst and Beard, 1970; Persinger, 1989). These include: widened affect, a strong sense of the personal, a desire to 'spread the word', and concern about Man's destiny (which also happen between seizures for some temporal lobe epileptics). When these traits were exhibited in early human cultures, they would have been manifested by proselytizing and the proliferation of spiritual teaching (Persinger, 1989), with their authority buttressed by the shamanic credentials conferred by their mystic experiences.

Psychology of Mystics

The content of the majority of mystic experiences seem to be dominated by either the right hippocampus or the left amygdala. Consequently we should expect to find two types of cultural mystics. The first will have personality traits and experiences reflecting enhanced intermittent activity in the left amygdala while the second will have

personality traits and experiences reflecting more intermittent activity in the right hippocampus.

Normal subjects who were stimulated cerebrally with a complex magnetic signal whose pattern was derived from hippocampal activity reported significantly more pleasant experiences when the application occurred over the right hemisphere compared to the left (Persinger *et al.*, 1994). This structure is the primary (and possibly the only) source of a specific type of phase-modulated theta activity observed indirectly through electroencephalographic measurements (Richards *et al.*, 2002; Fischer *et al.*, 2002). Theta activity is associated with meditation, hypnosis, dreams, trance and other states characterized by the inhibition of external perceptions and processes "introspective states" (Lagopoulos *et al.*, 2009; Baijal and Srinivasan, 2010; Graffin *et al.*, 1995; Sandyk, 1993; Dotta and Persinger, 2009; Soubourin *et al.*, 1990).

The hippocampus within the right hemisphere is coupled to cognitive functions that process non-verbal information. It is also involved in spatial perception, music appreciation, the representation of experience (memory), and the consolidation of these representations (Stark, 2007; Richard, 2007). It's a major stimulatory source for dream imagery. The right hippocampus, like its contralateral counterpart, has powerful connections with the anteriorly adjacent amygdala, a structure heavily involved in fear when intensely stimulated and with sexual and aggressive behaviors during more intermediate (and frequent) states.

Both experimental (clinical) and spontaneous stimulation of the amygdala reliably evoke the six main ictal varieties of affect. They include: 1) the feeling of desire, such as "wanting someone near me" or sexual intimacy, 2) feelings of fear, such as "a scared, sinking feeling of impending death", or "someone is going to attack me or smother me", 3) anger manifested as intense rage, 4) dejected feelings, such as sadness, crying, or depression, 5) gratulant feelings such as pleasure, joy, and ecstasy, and 6) feelings of affection where the dominate theme is love or the intense sensation of being in love.

Baseline or tonic levels of activation would affect the tenor of the mystic experience as well as the perceptual specious present that influences which events will be linked as causal or significant.

A mystic whose experiences appear from an unusually responsive right hippocampus is expected to report themes dominated by right hippocampal (RH) functions. The RH role in spatial reasoning (Iaria *et al.*, 2008; Fortin *et al.*, 2008) and memory (Burgess *et al.*, 2002) is predicted to enhance experiences of 'eternity', the "infinite void", spaciousness, and the experience that the dimensions occupied by the sense of self is limitless ("one with the universe"), or existing in 'one-pointedness'. These phenomena may share characteristics with more common phenomena described as macropsia and micropsia.

The RH role in non-verbal information would foster the experience of inner silence, or freedom from 'mind chatter'. Its cognitive functions contribute to the experience of 'knowingness', and 'insight', in which understandings appear spontaneously. The right hippocampus' role in processing non-verbal information would give such mystics a propensity for experiences that are 'beyond words' or 'too subtle to be explained'. As a source for dream imagery (Dotta and Persinger, 2009) activation of the RH could produce experiences of 'alternate realities', 'other dimensions', the 'astral plane', and the 'dream time'. Less intense activation could include fleeting images that appear during hypnagogia and artistic visual inspirations.

Because of its role in creating and participating in the retrieval of episodic and autobiographical memories, the RH may be crucial in accessing inner images, including symbolic, spiritual, and artistic forms, a type of cerebral "entopic" series of complex geometric or anthropomorphic patterns. Its production of theta activity suggests a source of variance shared with trance and meditation (Luders *et al.*, 2009). Our earliest ancestors may have 'practiced' staring at fire (Rossano, 2007), gazing at water, or remaining still for long hours while waiting for game. For some individuals, with a more sensitive right hippocampus, the resulting spontaneous meditation could have affected

their personalities, ideation, and behavior over time.

A person with an unusually active or sensitive right hippocampus needed only to stay awake (tending the fire to spend long periods in meditation) especially between midnight and 4:00 am (Terzieva *et al.*, 2009), when melatonin levels are at their peak, to increase the probability of an altered state. Melatonin is an electrically stabilizing derivative of serotonin and during mild diminishments of concentration, such as those that precede normal dream states, the subsequently enhanced electrical activity within the hippocampal-amygdaloid system produces recruitment of brain regions (and the information associated with their functions) not typically involved with the waking state. Because increased geomagnetic activity, a frequent antecedent to adverse environmental and social events, has been shown to diminish nocturnal melatonin activity this variant of mystic would quickly learn that the specific types of “dreams” were reliable indicators of “things to come”.

Brain regions outside the hippocampus are co-activated during cognitive activities emphasizing this structure. The hippocampus is richly influenced by and in turn influences the frontal lobes, though the routes of connection are convoluted, such as through the cingulate gyrus (Miller, 1991) an area involved with love, addictive-like behaviors and bonding. Co-activation of the ventromedial prefrontal regions, strongly associated with moral decision making and judgement, can blend bonding with moral or ethical conviction that could be justify the amygdaloid-mediated aggressive behaviors. The aggregate structures, termed the hippocampal complex (the parahippocampal gyrus, the entorhinal cortex, and the perirhinal cortex), evoke a field-like state with the hippocampus functioning as pivotal node.

There are also extensive connections between the hippocampus and the temporal cortices. The dorsal hippocampal commissure, embedded within the rostral portion of the splenium of the corpus callosum, allows unique interhemispheric connections between the hippocampal complexes in both hemispheres. The cortices

of the ventral temporal lobes are connected interhemispherically by the anterior commissure, a structure whose size varies according to gender and individuals with same-gender preferences. By circumventing the direct pathways through the corpus callosum (the major interconnection involved with traditional “awareness” between the two hemispheres), “covert” experiences and their patterns of neuronal firing could kindle and shape the patterns of activity until a critical mass sufficient for “awareness” was achieved.

All other conditions being equal, trauma to the brain is more likely to produce loss of inhibitory pathways than excitatory ones (Persinger, 1995). A person may “become” a mystic through a dramatic neural event affecting the RH (a seizure, a minor head injury, lightning strike, microvascular (ischemic) anomaly or localized hypoxia). Such events, functioning as an initiation into mysticism, could easily cause the dropout (or “reformatting”) of synapses that would have previously inhibited communication from the RH to one or more of the areas connected to it. Given the remarkable neuroplasticity displayed at the interface between the dentate gyrus and the hippocampus as well as the most recent measurements that reactive neurogenesis occurs in the same region, marked and permanent structural matrices could emerge to produce new cognitive skills and to increase sensitivity to the temporal associations between subtle environmental stimuli to which most people would be oblivious.

Mystic experiences reflecting specific brain activity in and around the right hippocampus will also include many of its ‘partner’ structures. However, different ‘right hippocampal’ mystics will have more extensive connections to different neighboring structures, creating variations in the cognitive skills they display. For example, enhanced visualization skills would be expected if RH activity supporting mystic experience included sets of neurons in the entorhinal and parahippocampal cortices (Kreiman *et al.*, 2000), known to be involved with mental imagery. If RH mystic experiences recruited pathways reaching to the frontal lobes (via the cingulate gyrus) we

would expect the mystic to display enhanced social skills, moments of creative problem solving skills, and other 'executive functions'. When the ventromedial frontal regions are co-activated these solutions could be presented as ethical justifications.

If RH mystic experiences include pathways within the temporal cortices, we would expect the mystic to display an increased interest in music, drumming, and chanting. They would also be expected to have altered state and/or mystic experiences more frequently than other RH mystics, and be more prone to "exotic ideation" as they focus their attention on ideas and concepts that "feel" right rather than "making sense". This would reflect their higher than usual amount of right hippocampus-to-right-temporal-lobe connections, and the expected concomitant lower than usual right-hippocampus-to-frontal-lobe tonic activity.

Psychology of Left Amygdalar Mystics

In most people, the right hippocampus is not the most labile structure. That distinction belongs to the amygdala. However, the altered states dominated by the right amygdala will be expected to be negative, dominated by fear, anxiety, and depression (Lorenzetti *et al.*, 2010). As such, they would less likely to be labeled or actively pursued as mystic experiences, which have been defined as positive altered states of consciousness. According to the hypothesis, the analogue of mystic experiences dominated by the right amygdala, with its fearful phenomenology, will be more frequently diagnosed as psychiatric disorders. The differences would be equivalent to choices of hallucinogens. Whereas both serotonin- and acetylcholine-based hallucinogenic chemical compounds produce marked and similar alterations in perception, the latter is accompanied by such negative affect and side effects that this avenue is frequently avoided.

In contrast, a mystic whose experiences appear from an unusually responsive left amygdala (LA) is expected to report experiences dominated by left LA functions. Its role in supporting positive affect would be a substrate for experiences of bliss, religious ecstasy, joy, gratitude to God, and other emotional spiritual states (Persinger, 2001). In general the amygdala

assigns an affective tone to events so that we experience them as positive, negative or neutral. From an evolutionary context this helps us immediately respond to events which have been experienced as rewards or threats (Zalla *et al.*, 2000) or whose symbolic equivalents (words) imply these possibilities through the process of conditioned association.

This important affective skill is not shared equally by all human beings. When involvement of the mediodorsal thalamus and its prefrontal connections are activated with the amygdala, the emergent feeling of a "tone of meaningfulness" occurs. This pathway focuses the role of the left amygdala in the experience of meaningfulness that accompanies most left-hemispheric mystic events (Persinger and Makarec, 1992). In contrast, right-hippocampal mystic experiences are more likely to be accompanied by dispassion, detachment, or equanimity. When the sense of meaningfulness arises from more dominant left amygdala activity, we expect the person to anticipate a positive event. When the sense of meaningfulness is influenced by the right amygdala, there is a sense of foreboding, dread, or apprehensiveness, as though something negative is about to happen.

The left amygdala's social role in functions, including the capacity to recognize what others are feeling and its contribution to the 'sensed presence' experience, suggests it may be the organizing structure for the majority of the more elaborately detailed 'visitor experiences' (referring to visitations by putative non-physical beings). They have been interpreted as manifestations of the right hemispheric equivalent of the left hemispheric sense of self (Persinger *et al.*, 1994; Persinger and Tiller, 2008). The mystic's "visitor experiences" appear in many variations, from subtle (sensed presence) to compelling (angels and deities), and are subject to different interpretations in different cultures.

The amygdala responds to components of spoken auditory input that is experienced as the emotional tone of speech (Scott *et al.*, 1997). Its role in processing affective components of language implicates a central participation in 'linguistic' mystic

experiences, such as spirit mediumship. Less dissociative examples would include the experiences of having poetry or prose ‘write itself’ or be written by a being outside one’s self. The prototypical cultural reification would be the Muses of Ancient Greece. The amygdaloidal role in relating to others suggests that it may be instrumental to prayer which traditionally understood to be a social act.

Specific personality and behavioral changes will depend on which specific structures were affected by the physical event that precipitated the initiation into mysticism. These structures would thereafter support each individual mystic’s experiences. If the left amygdala (LA) dominates, the mystic can be expected to show traits such as irritability, a tendency to be verbose, elevated self-esteem, verbal skills, extroversion, and logical reasoning. They should also be expected to reflect LA phenomena in their spiritual beliefs, such as a strong faith in God and in the belief that the social order is divinely inspired. Throughout recorded human history mystics would have had an investment in the society’s structure and a corresponding advocacy of adherence to the social rules (avoiding sin and cultivating virtue). Prayer would probably be the most fulfilling spiritual practice for them.

Behavior and traits associated with Right Hippocampal Mystics

The more the right hippocampus or the left amygdala dominates a person’s personality, the more frequently they should display the correlated behaviors. If the right hippocampus is dominant in a mystic’s altered states, these individuals would be expected to show behaviors and display traits that reflect right hippocampal functions. The low-self esteem (Persinger and Makarec, 1991; Lazure and Persinger, 1992) would tend to make them taciturn and better able to listen carefully to other’s opinions before stating their own, a habit that would tend to help develop leadership skills. The right hippocampus’ well-known role in spatial perception and maintaining inner maps and navigational memories over land or sea might confer an enhanced ability to remember the tribe’s past movements,

making their advice reliable and valuable for survival. Only a handful of such individuals within a group would have strategic value because of the novelty and the paucity of competition from others with “similar” capacities.

A sensitive or very active right hippocampus provides a source for reports of enhanced intuition, reflecting its production of theta waves and the potential interaction with the fundamental modal operation of “earth” information through the 7 Hz to 8 Hz fundamental Schumann resonances. Circumcerebral neural stimulation using complex magnetic signals whose rates of change in frequency shifts were designed to simulate mystical experiences enhanced brain activity within the theta band (Persinger *et al.*, 2003). This stimulation, fully described elsewhere (Cook *et al.*, 1999), was found to improve the accuracy of remote viewing perceptions (Persinger *et al.*, 2002) as well as facilitating the acquisition of information by mechanisms not known to date (“telepathy”) between intimates who were tested as pairs of subjects (Persinger *et al.*, 2002). When the RH was the mystic’s most sensitive brain structure, we should expect them to have had a greater propensity to report “psychic perceptions” than the rest of the population. This is a highly adaptive behavior when the perceptions are veridical and the mystic has practiced techniques to minimize the “analytical overlay” from personal motives and cultural explanations.

The role of the RH in non-verbal and non-linear reasoning suggests that RH mystics will often find themselves unable to offer explanations for their words and actions. The sense of mystery surrounding their activities and the “origins” of the experiences would tend to create a feeling of meaningfulness in some people, further supporting their shamanic authority. Such individuals should be more musically inclined, reflecting the RH’s and right hemisphere’s role in the appreciation and production of music (Watanabe *et al.*, 2008; Herdener *et al.*, 2010). The presence of such individuals in early social groups would have encouraged the use of music in sacred contexts as well as for entertainment. Both of these behaviors would increase the number of memes operating within a culture, which

would increase the number of shared behaviors, creating stronger social bonds.

The introspective tendencies appearing in people with higher than average RH activity, or with lower than average RH activation thresholds, would tend to make them more "thoughtful". This would be a predictable consequence of a tonic elevation of right to left hippocampal activity mediated through the dorsal hippocampal commissure. The RH's extensive connections to the right amygdala would give shape a cognitive style (Hasler *et al.*, 2007) dominated by apprehensiveness and perhaps excessive focus upon "the negative future". These thinkers would be more likely to express the "understanding" of the ramifications regarding potential threats.

Behavior and traits associated with Left Amygdalar Mystics.

Mystic phenomenology appearing from an extra sensitive or unusually active left amygdala or intermittently diminished right amygdaloidal function would be most commonly the *visitor experiences* (Persinger, 2001). From this context the first-hand experience of God is the extreme end of the spectrum of *visitor experience* (Persinger, 1987). At the other end of the same spectrum is a plethora of mild *sensed presence* experience. In between, there is a mixture of configurations including visitations from dead friends and relatives, ghosts, and in more secular settings "aliens" and "other dimensional" creatures. Spirit mediumship and "channeling" would occur in those prone to dissociative capacities. Visitors of this type may be seen, heard, or just "sensed". The focus of activity is expected to be in the left amygdala when the presence is a positive or pleasant one and in the right amygdala when the presence is a negative or fearful one.

The *sensed presence* feels like another being. Often people feel as if they can interact with it. Prayer (or its introspective, repetitive variants) has been perhaps the most obvious method to elicit visitor experiences. In trying to deliberately invoke the presence of God, prayer will tend to activate the sets of pathways that support visitor experiences. These are believed to be based in the amygdala/hippocampal

complex (Persinger, 1995) in conjunction with the (tail of) caudate nucleus which is crucial in maintaining our emotional and cognitive habits. Recruitment of the caudate might even contribute to the reinforcing and "opiate-like" effects of prayer and ritual. An individual need only have minor success in prayer in order to experience changes in their emotional and cognitive style.

The ability to detect subtle personality patterns in others seen in many mystics make them ideally suited to offer personal advice and to counsel. In contemporary culture they would be the ideal therapists. The extra insight into the putative 'will of God' or 'the Gods', particularly in those who display unusually sensitive LA, will confer the ability to extrapolate specific guidance from their religious beliefs or the secular equivalents of philosophical perspectives. The frequently associated verbosity serves as a means by which the advice might be administered.

The pathways supporting LA mysticism can be expected to recruit structures outside the amygdala within the same hemisphere. If these include the insula or Island of Reil, we can expect the mystic's behavior to include frequent expressions of love (Bartels and Zeki, 2000; Najib *et al.*, 2004; Beauregard *et al.*, 2009; Noriuchi *et al.*, 2008), empathy (Decety, 2010) for others, and the counseling of compassion (Engstrom and Soderfeldt, 2010) and understanding whenever possible. If these include the language centers on the left side of the brain, we can expect a strong verbal component to the mystic's experiences and behaviors. For example, they may hear voices ("locutions") easily attributable to a god or spirit. The great philosopher Socrates of Ancient Greece was reported to have recurrent visits of voices he attributed to his prophetic power and his conceptual (verbal) acuity. In more extreme examples, a person might "channel" an entire scripture, as for example Neale Donald Walsch, the Author of "Conversations with God" (Walsch, 1996).

In a way not unlike seizureal 'kindling', mystic experiences should be expected to recur, recruiting the same underlying neural pathways repeatedly, allowing the person to learn to access them more readily over time. This would tend to make stable, if unusual,

personalities in those who display these “disinhibited” intrinsic pathways or reactive synaptogenic novel pathways. The cognitive habits that appear in each mystic would also tend to be stable and be integrated into their social behavior over time. These personalities would become increasingly reliable sources of proposals for adaptive actions by the social group.

Anthropological Implications

One of the enduring postulates of anthropology is that the social structures found today in hunting and gathering societies, as well as those practicing primitive horticulture, are valid exemplars for the social structures existing during our early evolutionary history. If this is so, then our early ancestors gathered regularly in tribal councils to make important decisions, which were confirmed by the chief. The chief’s job was often to give voice to the general consensus, rather than making decisions. Given the social nature of the human being and the size and activity of structures, such as the anterior cingulate, amygdala, hippocampus, and the prefrontal connections that integrate these areas, a persistent and important role of mystical experiences in cultural neurotheological phenomena would have been very significant. In fact they may have shaped the basic structure of all civilizations.

The human brain appears to be pre-wired for mystic experiences, even if only some of the population encounters the triggers to sensitize them. Dynamic stabilization of these pathways (Kavanau, 1994) would give much of the population the feeling that the teachings offered by the mystics of their tribe are valid in some way. Their opinions are worthy of a special respect. The opinions and concerns voiced in early tribal councils would reflect the emotional and cognitive styles within the social group. When confronted with an opportunity or a threat, “The People” or “The Humans” (a label by which almost cultures define themselves) would gather and discuss the matter.

The greater the numbers of cognitive and emotional styles, the more options and choices and hence potential survivability of the group would be possible. Those shamans

displaying more sensitive left amygdalas would tend to council action and encourage The People to be confident. Those with more sensitive right hippocampus would tend to advise caution and long reflection before important actions are taken (Persinger, 1993). Those with normal levels of temporal lobe activity, constituting the bulk of the population, would display a normal range of emotional and cognitive skills. The accuracy of the mystic’s experiences and predictions would demonstrate the saliency of their statements compared to the average person’s experience.

The majority of the population would have normal levels of activation in the temporal lobes, so that their frontal lobes would make more contributions to their emotions and cognitions than those whose temporal lobes were more active than usual: i.e., mystics. As the frontal lobes function to enable planning, anticipation, and foresight, especially in social situations, those with normal levels of sensitivity would be better able to recognize practical plans. However, given the association between creativity and enhanced temporal lobe sensitivity, it’s probable that such people were more likely to offer novel solutions to problems. People with less active temporal lobes would be less likely to conceive new solutions, but more able to review, approve, and act on them.

A population of mystics within a social group enhances the group’s versatility and ability to respond to crises and opportunities. Because of their greater dream recall, incidence of visions, and proclivity to be verbal, mystics are more able to introduce new memes into their cultures. This would tend to foster deeper cohesiveness within the social group, as well as alienating, to varying degrees, rival nations who do not share their cultural forms. The tendency to view the people of other nations with suspicion would also tend to strengthen the integrity of their culture.

In the more extreme form of Konrad Lorenz’ conception of the “dark side of culture”, people who do not believe in the same manner from other cultures would be considered less human which often legitimizes practices of subjugation and sometimes extermination for “the sake of the cultural religion”. Heterogeneous beliefs

threaten the validity of the religious assumptions of the reference culture. When the reality of the belief is challenged the person's immortality no longer has certainty. This ambiguity and the anxiety that is generated are most easily reduced by removing the perceived source of the challenge.

The speech of mystics in past generations often focused on the moral code of their social group and how it should be observed. In many hunting and gathering societies, the Shaman carries an authority that exceeds that of the political leader (e.g. chief). Their tendency to be judgmental and 'hypermoral' (Persinger and Makarec, 1987) would make them natural police for their social groups early in our evolutionary history. Their spiritual authority would lend weight to the political authority they presumed when they acted out these traits. These same traits, existing in a small section of the population, would ensure that the political ideology of religious adherence was always expressed in tribal councils.

Those who've either rejected dominant religious beliefs, or found themselves unable to live within their tenets, may have had more difficulty securing

mating partners. It's possible that learned religious behavior may have become integral to our species and those unable to accomplish this learning were slowly "bred out" of our species. Religious belief, including the belief that one continues to exist even after death, may be an example of Baldwinian adaptation (Weber *et al.*, 2007). The question of whether consciousness continues after death is separate from the advantages of believing so.

The continuum of temporal lobe lability existing in the human population is a major source of diversity. Human diversity, in turn, offers an almost limitless source of behaviors from which people can select. Just as random mutations offer new traits to a species, which are then selected according to their adaptive value, variations in human cognitive and emotional styles can engineer new behaviors, some of which will be selected for repetition. The continuum of temporal lobe sensitivity may have contributed to our survival by ensuring that a broad range of emotional and cognitive styles were expressed during the collective decision-making process. This would have allowed them to more effectively respond to both opportunities and threats.

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