Supposed ‘Spirit possession’ may be associated with altered brain states: Case report from Oman

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Abstract
The view that spirits may possess humans is found in 90% of the world’s population, including Arab/Islamic societies. Despite the association between possessive state with various neurological and psychiatric disorders, available literature has yet to correlate possessive state with functional brain imaging, single photon emission computed tomography (SPECT). This paper describes the clinical case of a 22-year-old male Omani patient who presented to us with an altered state of consciousness that his caregiver attributed to possession. We examined whether the patient’s mental state correlated with neuro-imaging data. The patient’s distress was invariably associated with specific perfusion in the left temporal lobe and structural abnormality in the left basal ganglia. The case is discussed within the context that possession is a culturally sanctioned idiom of distress, and highlights the importance of studying cross-cultural presentations of altered states of consciousness within biomedical models.

Keywords: culture-bound syndromes, spirit possession; case-report; psychotic; basal ganglia; SPECT; Oman, Arab/Islamic
**Introduction**

From phrenology to modern neuroscience, there has been a long-standing interest in deciphering the complex relationship between human behavior and brain function. The ultimate quest of such endeavors is to elucidate the underlying biological mechanisms of the development of psychiatric disorders so that evidence-based knowledge on prevention and management of abnormal behavior can be consolidated [1]. In many areas of clinical medicine within the central tenet of biomedical models, linking signs and symptoms to underlying biological processes is a *sine qua non*. Such an achievement has yet to prevail among mental health professionals despite Emil Kraepelin’s idealization that psychological disorders are ‘housed’ within the brain [2]. In the case of altered states of consciousness or abnormal mental states, biomedical models have not yet been proven to be a fruitful approach. It is commonly held that psychiatric disorders are amorphous entities and sometimes simply represent an exaggeration of normal psychological processes [3]. It is within these constraints that the modern quest for psychopathology still dwells on descriptive phenomenology, as exemplified by both the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) and *International Classification of Diseases* (ICD) [3].

In traditional societies, altered states of consciousness (which would be deemed as manifestations of ‘disease’ states in psychiatric parlance) are attributed to a state of possession in which a person's behavior is thought to be controlled by an anthropomorphic being that has entered one’s body [4]. The observed personality changes tend to vary according to the character of the spirit seeking incarnations [4]. A belief that spirits may impersonate human beings is found in 90% of the world's population [5]. Such human-possessing spirits are often blamed for physical and mental disease and the beliefs and rituals involved in spirit possession constitute culture-specific idioms of distress [5].

To our knowledge, no study has examined whether possessive state can be related to indices of cerebral blood flow perfusion. The current paper presents a case study of an Omani patient who presented with an altered state of consciousness (believed to be caused by spirit possession according to the Omani idiom of distress), and examines whether the patient’s dissociative state correlates with functional abnormality in specific
brain regions. The case is discussed from an anthropological perspective on altered state of consciousness due to supposed spirit possession and the relevancy of linking such a phenomenon to a biomedical model.

Case Presentation

A 22-year-old right-handed Omani man first presented to us in 2002. His family brought him into our clinic reporting a history of a recent change in personality and impairment of sensory perception. The patient complained of abnormal auditory experiences when alone. He also complained that the appearance of his father changed to that of a 'devil'. He claimed that his meals were shared by jinn (genies) which 'made the food taste nasty'. According to the patient’s family, the patient had become isolated, disinterested and withdrawn. He had poor sleep with unremitting restlessness.

The patient reported altered attention and concentration coincident with the emergence of his personality change. His personality change had been attributed to various causal agents including supernatural forces such as Jinn, contemptuous envy (Hassad), the envy-related "eye' ('Ain) and sorcery (Sihr). He had previously sought traditional treatment for his condition. However, consultation in a traditional healing practice failed to return him to his premorbid self. The family also took him for Umra (optional Muslim pilgrimage to Mecca). Due to the stress of traveling, upon returning from Umra he became increasingly agitated and often resorted to violence towards his family members.

The patient had a positive family history of psychiatric illness, as one of his uncles has suffered from symptoms akin to a psychotic illness. Approximately 7 years ago, the patient was involved in a road traffic accident and incurred head trauma with no evidence of loss of consciousness or seizures. Immediately after the accident, most of the typical post-concussion syndromes dissipated and he regained physical functionality. Approximately six months after the road traffic accident, his conduct was noted by the family member to be very different from his premorbid state. He deteriorated in academic competency, which resulted in repeated academic failures and a leave from school. He was noted to be less stressed and to engage in less social interaction and his self-care drastically regressed to the point at which his welfare was dependent on others. This
marked deterioration in performing daily living activities coincided with the emergence of auditory hallucinations that came to the attention of the caregivers approximately 9 months after the road traffic accident.

Prior to seeking consultation with us, he had been seen in two different psychiatric hospitals and had received electroconvulsive therapy (ECT) in one of them, but his condition remained impervious to the treatment. During this time, all tests conducted (CBC, blood biochemistry, immunological work up and ECG) produced normal results. He sought consultation with an ophthalmologist for double vision, and was diagnosed with retinitis pigmentosa. He was seen by a neurologist for vertigo, double vision, headache and abnormal movements, and was diagnosed with migraine. A computerized tomography (CT) scan done at that time showed an encephalomelacia in the left basal ganglia. Electroencephalography (EEG) suggested possible temporal lobe epilepsy (bilateral with no generalization), but no seizure activity was observed. There were no other abnormal findings. No treatment course had been approved by his family. Due to his obvious personality changes, they continued to attribute his distress to supernatural forces. Hence traditional healing approaches were sought but did not improve his condition.

Approximately two years ago, he was referred to our tertiary care center. Our preliminary consultation indicated an abnormal temperament, and his social behavior deviated from his culture’s social modesty and local etiquette. Concurrently, his cognitive functioning was severely compromised. Cognitively, he was inattentive and distractible, and showed a strong presence of auditory hallucinations. His psychosocial history did not indicate the presence of alcohol or drug misuse, and physical examination indices were unremarkable. Although there was no indication of respective and expressive language impairment, he had a disturbance in word generation, suggestive of aphonia, and indicative of dysarthria. He was disinterested in maintaining a prosocial behavior and never initiated conversation with others. He remained motionless unless prompted. In formal cognitive testing using Folstein Mini-Mental State Exam, his scores were in the clinical abnormal range. Blood tests revealed normal CBC, blood biochemistry, thyroid functions and lipid levels. Brain perfusion single photon emission tomography (SPECT) was performed 45 min after injecting a dose of 740 MBq Tc-99m-ethyl cysteinate dimer
(Tc-99m-ECD) (Bristol-Myers Squibb Medical Imaging) through an existing intravenous line. The image acquisition parameters were 360 degrees of rotation, 64 images, 20 s/image with a 128 x 128 pixel matrix [6]. Brain perfusion SPECT was analyzed by an iterative reconstruction method [6]. The indices of tomographic imaging during acute exacerbation of the symptoms are shown in Figure 1; they clearly indicate low perfusion in the left temporal lobe.

The patient was initially prescribed Risperidone (2 mg HS), approximately 3 month later was combined with Lamotrigine (50 mg BD). The patient showed a marked improvement in his mood, cognitive functioning, and social behavior after having been on the medications for 3 weeks. His perceptual disorders gradually receded. He relapsed when he was allowed to spend a weekend at home during which he was not compliant to the medications. Following his relapse, he was given medication (Risperdal Consta) in the clinic on a biweekly regimen for a period of 4 months. On subsequent follow-ups, he appeared to have returned to his premorbid self. He was well-oriented to time and place, was cooperative, and all indicative psychotic features had fully receded. His quality of life had improved, and he had resumed his studies and had progressed in his quest for a certificate-granting secondary school. In addition to these behavioral changes, repeated brain perfusion studies (Figure 2) showed an improvement of perfusion in the left temporal lobe.

Discussion
The reported case is of a patient who sought psychiatric consultation from tertiary care. Following protracted neurological, psychiatric and medical observation, the patient’s distress was critically associated with specific functional changes in the temporal lobe and structural abnormality as well as encephalomelacia in the left basal ganglia. Following treatment with pharmacological intervention, the patient’s emotional and cognitive distress eventually receded. The psychological and behavioral improvements coincided with measureable changes in blood perfusion in temporal regions of the brain. Despite the severity of the patient’s condition before treatment and the fact that seven years much time had elapsed since head trauma was incurred (likely to be a precipitating factor), the patient’s recovery was dramatic, but seemingly consistent with available
literature. While the exact mechanisms by which atypical antipsychotics (such as Risperidone) produce their ameliorative effects remains unclear, such treatment frequently alleviates symptoms such as those in the presented case (i.e., delusions, auditory hallucinations, catatonic behavior [6,7,8].

To our knowledge, this is the first case report associating neurobehavioral impairment, neuro-imaging data and, a common local idioms of distress in Oman—spirit possession. Within traditional Omani society, abrupt personality changes or altered states of consciousness are attributed to spirit possession [4]. The belief in possession is testified in social-cultural teaching where invisible spirits are deemed to inhabit the earth and influence mankind by appearing in the form of an anthropomorphic being. In anthropological literature [9, 10], possession is classified into three types. The first is the symbiotic type where the spirit and the human being have a 'platonic' type of relationship. The second type of possession is a partial possession that is reminiscent of dissociative identity disorders in psychiatric parlance [4, 10]. The final type (which is the type that is discussed in the present case) represents total possession, where a person's behavior is totally controlled by a spirit. Psychiatric interest in possession owes its origin to the writing of Jean Etienne Esquirol who detailed the phenomenology of spirit possessions as ‘disease’ [11]. Despite similarities between neurologically-induced disorders and the “abnormal behavior” deemed to be triggered by possession, there has yet to be a report linking possession to brain abnormality. This problem is compounded with critiques urging that even if biomarkers are found for psychological disorders, identifying whether such defects are truly representative of the pathology, or simply by-products of a compensatory adaptation to the distressed state will prove to be even more difficult to establish [12].

From a biomedical perspective, the condition of the current patient would suggest symptoms of chronic schizophrenia, a diagnosis which is supported by a family history of psychosis. In the parlance of modern psychiatry, the patient met criteria for schizophrenia and responded to Risperidone, a known treatment for psychosis. A closer observation of his sustained traumatic brain injury revealed the presence of intransigent and persistent cognitive and behavioral dysfunctions, abnormal EEG activity, and poor response to ECT, which could point to organic pathology. It is interesting to note that many who are
diagnosed with schizophrenia have a history of traumatic brain injury [13]. From the perspective of the present case, functional (SPECT) and structural neuro-imaging data indicated abnormalities in left temporal lobe and left basal ganglia, regions that have been shown to accentuate the spectrum of cognitive, emotional and motor disorders, as observed in the present case [14].

By correlating functional brain activation with spirit possession, this case study bridges the gap between cultural phenomena and modern psychiatry. In order to come to grips with this complex issue, as well as to explain variants of mental illness, Kiev [15] suggested that the “hardware” or pathology of mental illness can be traced back to brain abnormalities while the phenotypical presentation of the observed “abnormal behavior” constitutes “software”. The present study suggests that possessive states—in this context, culture-bound syndromes—may be accompanied by specific neural structural and functional activities which warrant further investigation. SPECT revealed that the patient described herein had a biological illness with two possible diagnoses, schizophrenia or sequel of brain injury. Hence there is heuristic value to undertaking more biological research on culture-bound syndromes.

Conclusion

This case report suggests that culture-bound phenomena, such as spirit possession in Oman, can have a biological basis. Biological studies of patients with culture-bound syndromes should be pursued in order to shed light on the possible overlap between culture-bound syndromes and psychiatric disorders described in the DSM and ICD.

Competing interests
The authors declare that they have no competing interests.

Consent
Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Authors’ contributions
AAG, AH and YAO were the physicians responsible for the care of the patient, SH and FA were involved in executing and analyzing neuro-imaging data and SA reviewed the relevant literature and provide neuropsychological underpinning of the case. All the authors contributed to writing of the paper and editing the final manuscript prior to submission.
References


Figure Legends:

Figure 1: Pre-treatment brain perfusion SPECT showing low perfusion in the left temporal lobe.

Figure 2: Post-treatment brain perfusion SPECT showing perfusion improvement in the left temporal lobe.