A Brief Review of Studies of Out-of-Body Experiences in both the Healthy and Pathological Populations

Julia Sellers

Independent Researcher

julia.sellers@gmail.com

Abstract

This paper presents a brief overview of some of the out-of-body experiences (OBEs) studied in both the healthy and pathological populations, as well as experiences of paranormal phenomena, with features common to OBEs, in the healthy population. Since spontaneous OBEs in the healthy population are rare, there is a lack of studies describing possible psychological, as well as physiological, mechanisms driving this type of OBE. Consequently, most OBE research available today describes the semiology, phenomenology, etiology, as well as the neurocognitive features of OBEs within the pathological population, as opposed to the healthy population. Below we present an overview of some of the research aimed at identifying OBEs occurring in both healthy as well as pathological individuals.

Keywords: *out-of-body experience, temporal parietal junction, brain waves, consciousness, paranormal.*

1. Introduction

The phenomenology of out-of-body experiences (OBEs) has been described somewhat differently in individual studies. According to Blanke and Arzy (2005), an OBE is an event during which one's visual perspective

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and one's self are experienced to have departed from their habitual position within one's body. Irwin described OBEs as a state of the experiencer during which "the centre of consciousness appears, to the experiencer, to temporarily occupy a position which is spatially remote from his/her body" (Irwin, 1985, p.5). A study conducted by Messier and Smith (2014) described the OBE as an experience which is based on both visual as well as somaesthetic perception during which the physical body, seen from a third person point of view, is illusory. Blackmore suggested an OBE is an experience in which the experiencer "seems to perceive the world from a location outside his physical body" (Blackmore, 1982, p.1).

It is interesting that many people who have experienced OBEs reported that the experience itself felt very real while it was happening (Blanke, Brugger, and Mohr, 2006). The studies conducted on OBEs agree on a number of similar features which usually accompany the phenomenon. The main characteristics of a simple OBE include features such as a profound sensation of being located outside of the body (Messier and Smith, 2014, p.2), a subjective meaningfulness and enhanced reality (Anzellotti et al., 2011, p.5), and the sensory perception of floating in an elevated position (Blanke et al., 2002; Bos et al., 2016; Messier and Smith, 2014; Sellers, 2017). During an OBE, the unity of the body and the self seem to be broken as reported by many out-of-body experiencers, including the first hand experience of the author (Sellers, 2017).

Thorough scientific research as well as evidence that would specify neural correlates of OBEs within the healthy population is missing due to the fact that they occur so rarely. Consequently, only a handful of studies examining how the brain functions during an OBE were conducted with out-of-body experiencers representing healthy individuals. These include studies of Persinger, Tart, Osis, and Messier & Smith. Somatosensory

as well as vestibular challenges were recognized as typical elements of OBEs in many studies. Some researchers would posit that OBEs involve complex body illusions (Blanke, 2005). In their study, Arzy and Blanke (2005) implicated failure of multisensory integration between the physical body and the temporal parietal junction (TPJ) as the possible etiology of the OBE. On the other hand, research by Braithwaite, Daltrozzo, Guelers, Karim, and Kotchoubey (2016) found no role of the right TPJ in abnormal body perception. Whether insufficient multisensory own body processing is the probable cause of OBEs, as suggested by Blanke et al. (2004), would have to be identified by further research.

We posit that fully blown OBEs have to be distinguished from out-of-body-like experiences. These should be identified as a separate category as their etiology might be different from the etiology of fully blown OBEs. Out-of-body-like experiences might include cases of body parts distortions created under a virtual reality setting, or autoscopic hallucinations during which individuals are able to see their own physical body from the egocentric rather than elevated visuospatial perspective (Sellers, 2017). Prior research has already shown robotic gadgets might be able to elicit out-of-body hallucinations (similar to OBEs) by manipulating the sense of self-location (Chapuis, Fornari, Heydrich, Ionta, Lenggenhager, and Mouthon et al., 2011). Self-location is directly linked to the sense of self-consciousness. Furthermore, it was documented that virtual reality, under different settings, produced out-of-body sensations similar to OBEs, during an experiment which was able to break the existing unity between the physical body and the consciousness which it embodied (Blanke, Lenggenhager, Metzinger, and Tadi, 2007). The experiment resulted in making people believe a virtual body was their own. Further, OBEs can be induced by electrical stimulation of the cortex, shown by prior research studies. It is worth noting that the majority of OBEs caused either by an artificial stimulation of parts of the

brain, or elicited by brain damage, implicate the angular gyrus on the right side (Blanke, 2012).

2. OBE studies within the healthy population

2.1. The case of a 24-year- old student

OBEs studies reveal that more than 10% of the healthy population have experienced an OBE at some point (Blackmore, 1982; Irwin, 1985). According to Alvarado (1989), the first survey on OBE occurrence was conducted by Hart in 1954. In his study on the experimental induction of OBEs, Ehrsson (2007) claims his research demonstrated the first ever experimental method of induction of an OBE in the healthy population. However, Ehrsson, in his experiments, did not succeed in inducing a full blown OBE. Apart from experiencing the visual perception of their own physical body, from a location different than from within their own body, the experiencer failed to experience other important features accompanied by full blown OBEs such as the enhanced sense of reality, subjective meaningfulness, clear perception of the Self existing apart from the physical body, as well as seeing one's physical body from an elevated position. Consequently, the type of OBE induced in Ehrsson's study should be classified as an out-of-body-like experience. And regardless, the case study on OBEs conducted by Sellers (2017) indicated that seeing one's physical body, from a position that seems to be outside of the physical body, is not a prerequisite of experiencing an out-of-body state. Furthermore, one of the important differences, between OBE and OBE-like experiences, is the incidence of apparently nonphysical veridical perception (AVP), occurring in 19% of all documented OBE cases (Alvarado 2000). It is also worth noting that, in his study, Nahm (2015) correctly points out that reducing OBEs to OBE-like experiences, such as autoscopies, might convey a misleading concept of OBEs in general.

Messier and Smith (2014) claimed to have induced an OBE at will in a 24-year-old healthy female student. She reported having the ability to leave her physical body at will. She also reported instances of watching herself move from above, while perceiving herself clearly from outside of the boundaries of her own physical body. However, as indicated by the study, the OBEs of the student did not occur spontaneously. Instead, they were induced at will, as reported by the research subject. The other OBE element described in the study, which is not very common with OBEs, concerned the absence of feelings or any specific emotions linked to the patient's conscious mind when out-of-body. In most OBEs there is some form of emotion present. However, it is also true that some out-of-body experiencers report neutral, versus elevated, emotions when experiencing an OBE. Many out-of-body experiencers report fear of a "permanent separation of consciousness from the physical body" and fear of the "inability to return to the physical body" (Sellers, 2017).

Messier and Smith, in their study, refer to an OBE as an extra corporeal experience (ECE). The brain imagery of the subject experiencing the ECE revealed left-sided activation of the supplementary motor area. Furthermore, supramarginal and posterior superior temporal gyri were involved, to a certain degree. This is intriguing as the gyri are located at the temporal parietal junction (TPJ) which was implicated in OBEs by many prior researches (Blanke, 2002; Blanke & Mohr, 2005; Arzy & Blanke, 2005; Fang & Yan, 2014; Blanke et al., 2005). The supramarginal gyrus, which is close to the angular gyrus (also implicated in OBEs), might further be involved with the processing, as well as the perception, of a language. Dysfunctions in this area of the brain might cause the so-called receptive aphasia (challenges in understanding written as well as spoken language). This is in line with the study of Sellers (2017) reporting a case

of a spontaneous out-of-body experiencer who, when experiencing OBEs, would show some signs similar to aphasia, dyslexia, dyspraxia, agnosia (spatial and visual), as well as alexia.

The brain imagery as reported in Messier and Smith's study further showed decreased activity of the visual cortex (occipital lobe) of the brain (bilaterally) during the OBE of the experiencer, who during the experience was able to watch herself from above her own body, spinning along the horizontal axis. Interestingly, decreased activity over occipital regions was revealed by two other studies researching OBEs in healthy individuals, which are described in the chapters below.

The results of the study conducted by Messier and Smith implicating the left TPJ in eliciting OBEs in the healthy population are quite intriguing and should undergo further scientific research. Interestingly, the results seem to support the study conducted by Bos, Schouten, Smits, Spoor, and Vincent (2016), which too indicates implication of the left, as opposed to the right, TPJ in eliciting OBEs. The study involves the clinical population and describes a patient who underwent craniotomy while awake, during which she reported a floating sensation after subcortical stimulation near her left TPJ. During the operation, the left angular and supramarginal gyrus were stimulated, which apparently led to a full blown OBE. It is also intriguing that the region stimulated during the craniotomy was located in direct proximity to fibers running from the posterior thalamus to the occipital lobe. Both the posterior thalamus as well as the occipital lobes were implicated in OBEs of the healthy population in studies conducted by Persinger (2001) and Osis & Mitchel (1997).

2.2. The case of Ingo Swann

An interesting case of possible out-of-body experiences in a healthy

individual was described in Persinger's study (2001). It involved anomalous cognition of a talented remote viewer, Ingo Swann. The subject showed brain activity of 7 Hz over the occipital region of his brain (bilaterally) while engaging in remote viewing. It is interesting that the 7 Hz brain activity was of a paroxysmal nature and its proportion was in correlation with the accuracy of the information Ingo Swann was reporting during his remote viewing episodes. Furthermore, it is intriguing that the paroxysmal 7 Hz spike wave activity only showed during the individual remote viewing sessions and was not detectable during the time Ingo Swann was not engaged in remote viewing. Persinger speculated that a possible source of the 7 Hz wave activity might have been the hippocampal amygdaloid which is partially connected with perceptions of emotions. We can speculate that since the spikes correlate with the onset of normal sleep, they might be analogous to some sort of special waking dreams. Prior research suggested that waking dreams or states of drowsiness draw strong similarities with OBEs (Tart, 1998).

Another experiment involving Ingo Swann was conducted by Osis and Mitchel (1977). The results of the experiment clearly showed a decreased amplitude of EEG during Swann's OBE when compared to the amplitude of a normal non-OBE state of the brain. Furthermore, the strongest decrease in EEG amplitude was over the occipital lobes. This seems to be in line with the study of Messier and Smith (2014) which showed that one of the elements of the OBEs experienced by his subject (a healthy individual) was a significantly decreased activity within the visual cortex (in the occipital lobe). Interestingly, the results of the research of Osis (1979) studying the OBEs of Alex Tanous, who too represented the healthy population, showed a similar outcome. During the OBEs, the occipital region of Alex Tanous, where the visual cortex is located, showed lower activity. According to Osis, during the OBE, Tanous showed lower electrical activity in the back of his

brain. Osis hypothesized the decreased electrical activity indicated changes in Tanous' consciousness.

2.3. The cases of Miss Z and Robert Monroe

Another important study that shed much light on the nature of spontaneous OBEs within healthy individuals was the study conducted by Charles Tart. Tart (1968) conducted a couple of experiments with Miss Z, who claimed to experience OBEs at will. According to Tart, the EEG during the individual episodes of OBEs experienced by Miss Z was dominated by the so-called alphoid activity. Alphoid activity is one to one and a half cycles per second slower than the normal alpha rhythm. Furthermore, the OBE episodes of Miss Z were mixed with periods of waking. Tart would not elaborate further as to possible causes of the alphoid activity or what might have triggered the reported decrease in alpha activity. Also intriguing was that Miss Z reported an OBE always when an alphoid pattern without accompanying REMs was revealed by the EEG.

Further research on OBEs conducted by Tart involved Robert Monroe, a well known frequent out-of-body experiencer. During the experiment that took place in 1968, Monroe's OBEs showed a brain wave pattern similar to a Stage I ordinary dreaming pattern (Tart, 1998). It consisted of theta waves as well as some alphoid activity. Theta rhythm is typical for ordinary sleeping and is a part of the Stage I sleeping pattern. Alphoid activity, according to Tart, might be classified as drowsiness.

Interestingly, the findings drawn from the case of Miss Z show some general similarities with the key findings presented in the study of Monroe's OBEs. During the OBEs both Miss Z as well as Monroe showed EEG patterns of theta and alpha activity that is typical for ordinary dreaming. It further showed alphoid rhythm, which is a strange type of activity, similar

to that of a waking dream. It seems that the alpha rhythm was substituted by the alphoid rhythm. However, Monroe's alphoid activity was not as extensive as in the case of Miss Z. Additionally, Monroe showed REMs in his second OBE (the first OBE did not detect REMs), while Miss Z did not show REMs during her episodes of OBEs at all. Tart (1998) further speculated that the hypnagogic state produced deliberately by Monroe during his OBEs (involving theta and alphoid rhythms) might share some common features with the meditation of Zen masters. This seems to be in line with the study of the Hemi-Sync application aimed at observing synchronization of brain waves of different subjects (Sadigh and Kozicky, 2017). The study showed that after applying Hemi-Sync, the primary brain activity of an individual subject was that of synchronized theta, while the secondary activity was that of synchronized alpha. It is interesting that achieving fully synchronized theta states is also reported in Zen meditations and may be compared to the states of wake sleeping, wakeful dreams, or controlled dreaming (Tart, 1968). Individuals who learn how to produce increased alpha brain activity might be able to control their dreams and be fully aware of them.

3. Paranormal experiences in the healthy population with features similar to out-of-body experiences

3.1. Temporal lobe and paranormal experiences

In his study on the neuropsychiatry of paranormal experiences, Persinger (2001) described an interesting case involving anomalous cognition of Mr. Harribance. Reportedly, the subject was able to give readings to people who he met for the first time based upon images formed and perceived in his left visual space. The information Mr. Harribance received about the people came to him spontaneously. The study revealed that when engaged in this activity Mr. Harribance's EEG showed increased alpha activity over

the parietal and occipital regions. The increased activity of alpha rhythm in either the parietal or occipital region, similar to the case of Mr. Harribance, was revealed by the EEG rhythms of Alex Tanous, as well as Ingo Swann, when engaging in out-of body states. Furthermore, increased alpha activity was measured during the OBE episodes of Miss Z as well as Robert Monroe. However, the studies involving Miss Z and Monroe did not discuss specific regions of the brain which might have been involved in producing the increased alpha activity.

Another study of Persinger (1984) revealed intriguing EEG activity in separate cases of glossolalia and transcendental meditation. It showed delta wave activity in the temporal lobe that lasted about 10 seconds and occurred during transcendental meditation. The second case involved spike wave activity in the temporal lobe of an individual who performed glossolalia. Both cases represent healthy individuals with no history of pathology. Based on the study, Persinger hypothesized that experiences of mystical and religious nature naturally occur in the temporal lobe and are of a transient nature.

3.2. Temporal lobe disturbances

Persinger and Valliant (1985) conducted thorough research into disturbances in the temporal lobe pertaining to the healthy population, as opposed to the pathological population. The study surprisingly showed that temporal lobe disturbances within the healthy population lead to mystical and paranormal experiences. The study further reported auditory-vestibular experiences such vibrations, hearing one's name called, as well as olfactory auras, and depersonalization symptoms. According to Persinger, having a mystical or paranormal experience might be connected to temporal lobe transient electrical foci, which he proposed in his earlier study (Persinger, 1984).

Persinger further argued that anomalous perception, identified as "a sense of presence", in the healthy population can also be related to the disturbance of the temporal lobe (Persinger, 2001; Persinger and Makarec, 1986). This seems to be consistent with Sellers' case report (2017) in which a healthy subject experienced increased spirituality and mysticism, including the sense of presence, in some of his spontaneous OBEs. Moreover, Persinger suggested that "both the occurrence of paranormal experiences and their rates of incidence are associated with specific types of neuronal activity within the temporal lobes" (Persinger, 2001, p.515).

Results linking temporal lobe disturbances with anomalous perception in the healthy population were further demonstrated by the Cardiff Anomalous Perception Scale study (CAPS) aimed at researching anomalous perception. The research was conducted by Bell et al. (2006). During the study, the Cardiff Anomalous Perception Scale (CAPS) was presented to participants of the healthy population. The results showed that high scores of temporal lobe disturbances were linked with anomalous perception. Disturbances in the temporal lobe revealed by the CAPS mostly involved a feeling of sensed presence, sensations of being uplifted, and distortions of time, as well as own body distortions, among others. Apart from implicating temporal lobe instability, the study pointed out that the distortion of processing, pertaining to bodily sensations, is a significant sign of OBE in the healthy population. The study claimed to be the first to research a predisposition to OBEs in the healthy population. This seems to be in line with a more recent study, which suggested that temporal lobe instability played an important role in anomalous perception, such as own body processing, in participants of the healthy population who either reported having experienced an OBE before or with no prior OBE (Apperly, Braithwaite, Broglia, Hulleman, & Samson, 2011).

The connection between the disturbance of the temporal lobe and accounts of paranormal and anomalous cognition was established not only in the healthy population, but in the pathological population as well (Persinger, 2001). According to Persinger (2001), people with mild brain injuries would have frequent paranormal episodes, as well as mystical accounts, including the feeling of a presence. Most of the paranormal episodes would be attributed to the right side of the brain. Specifically, the patients would show heightened brain activity over the parietal and temporal regions. This is in line with the study of Devinsky who reported that individuals suffering from temporal lobe epilepsy would undergo religious or spiritual experiences in between, during, or after seizures (Devinsky and Lai, 2008). Furthermore, the study conducted by Blanke et al. (2002) found disturbances, similar to the ones associated with the temporal lobe within the healthy population as described by Persinger, to be associated with the angular gyrus at the TPJ within the pathological population.

4. OBE studies within the pathological population

From the literature available on OBEs it seems that the majority of OBE studies implicate the right TPJ as opposed to the left TPJ in OBEs of pathological individuals. One of the first studies of the phenomenon of OBEs in the clinical population conducted in 1941 revealed a connection between anomalous perception, such as out-of-body experiences, and disturbances in the temporal lobe (Penfield, 1941 as cited in Tong, 2003). The study showed that upon electrical stimulation of the right superior temporal gyrus in an epileptic patient, the patient would perceive a strange sensation of floating.

The commentary of Nakel and Lopez (2017) on the nature of the OBEs elicited during awake craniotomy claims that only five cases of OBEs, occurring after brain stimulation, have been published to date. They include cases of craniotomy, electrocorticography (electrodes placed directly on the exposed surface of the brain), and one case with chronically implanted electrodes.

A study conducted by De Ridder et al. (2007) showed that electrical stimulation of the right superior temporal gyrus, in a patient suffering from tinnitus, would produce an OBE. More specifically, increased brain activation was detected at the right angular–supramarginal gyrus junction and the superior temporal gyrus. The results are similar to the study conducted by Messier and Smith (2014), which described an experiencer, who would induce OBEs, repeatedly and at will. Similar to De Ridder's study, the brain scans of Messier's subject showed activation in the supramarginal and posterior superior temporal gyri. However, the activation happened on the left side as opposed to the right side implicated in De Ridder's study. Moreover, Messier's subject belonged to the healthy population, as opposed to the clinical patient in De Ridder's study. Based on the two studies we can conclude that electrical stimulation followed by activation within the angular and supramarginal giri is implicated in vestibular, as well as somatosensory, challenges which probably give rise to both OBEs as well as out-of-body-like experiences. This hypothesis seems to be in line with the study conducted by Blanke et al. (2002). He reported the induction of what we suggest be classified as an out-of-body like experience, as oppose to an out-of-body experience, in the pathological population; namely, an epileptic patient who experienced out-of-body-like experiences elicited by electrical stimulation of the right angular gyrus. Specifically, the study reported the onset of vestibular challenges such as feelings of floating or sinking, including an out-of-body-like experience

after the patient's angular gyrus in his TPJ was electrically stimulated on the right side of the brain.

It is interesting that the same stimulation of the right temporal lobe where the epilepsy was located would not produce neither an OBE nor an out-of -body like experience. Also intriguing was that the elicited of out-of-body like experiences did not occur during the patient's epileptic attacks. Rather, they only occurred after the right angular gyrus of the patient was electrically stimulated.

While the floating sensation of the epileptic patient in Blanke's study did not last long, and was apparently triggered by electrical stimulation of the TPJ region on the right side of the brain, it remains elusive what triggers spontaneous OBEs, or OBEs that are triggered at will, as well as sensations of a clear separation from the physical body produced by spontaneous OBEs in some healthy individuals (which are definitely not caused by any outside influence such as drugs, alcohol, hypnosis, trance, or other artificial stimulation (Sellers, 2017).

A research study conducted by Blanke and Mohr (2005) implicated the right TPJ in elicitation of OBEs. The results of the study suggest that the TPJ is a crucial structure for the conscious experience of the normal self, mediating spatial unity of self and body. Furthermore, the study suggests that impaired processing at the TPJ may lead to experiencing pathological self-consciousness, such as OBE. Fang and Yan (2014), in a study on the spontaneous OBEs in an epileptic 15-year-old child, also strongly suggested implication of the right TPJ region in OBEs. The study hypothesized that the TPJ region is vital to the etiology of OBEs. Subdural electrodes were placed in the right frontal lobe of the patient and an intracranial EEG was monitored during seizures. The results of the monitoring showed that when

the patient underwent episodes of OBEs, the EEG revealed sharp waves in the form of spikes, originating from the right TPJ region.

Another research study, by Blanke et al. (2005), linking OBEs and own body imagery at the TPJ, described an interesting OBE in an epileptic patient. The subject was a female suffering from epileptic seizures accompanied, among others, by fear based feelings, auditory aura, and impaired consciousness. The seizure that was accompanied by the OBE was identified with the right angular and the posterior superior temporal gyri. It is intriguing that the posterior superior temporal gyrus, but on the left side, was identified within an OBE episode of a healthy research subject, who was able to induce her OBEs by will (Messier and Smith, 2014). During one of the patient's seizures, which was accompanied by an OBE, she experienced a feeling of being located on the ceiling, floating above, seeing her own body as well as bed in the room from an elevated position. After the OBE episode subsided, the patient reported increased word-finding difficulties. This seems to be in line with Sellers' study (2017) which reported auditory auras as well as challenges in spoken language during, and after, the OBE episodes of a frequent out-of-body experiencer, who is a healthy individual. Moreover, the features of his spontaneous OBEs were similar to those of the OBE episode described by the patient. Both experienced a floating sensation, the elevated visuospatial perspective of seeing the physical body, a clear awareness of the ability to observe their surroundings from the ceiling, and the ability to see their physical body laying on the bed in the room (Blanke et al., 2005; Sellers, 2017). Furthermore, Sellers' case report of spontaneous OBEs in the healthy individual revealed that the subject experienced many similar, if not identical, OBE elements as those described in the studies of both the healthy as well as the clinical population mentioned in this paper (2017), including, but not limited to, brief states of vertigo, the sensation of falling into an

abyss, subtle sensations of floating, watching own body from an elevated position (usually from the ceiling or side walls in an enclosed space such as a room), the presence of different sound effects, a sensed presence, distortion in time flow, and vestibular challenges.

5. Conclusion

The majority of current OBE studies examine elicited OBEs in the pathological population rather than the healthy population, and OBEs which are induced artificially rather than at will or occurring spontaneously in the waking/active state. This study presented a brief overview of OBE studies both in the healthy, as well as the pathological populations. The explanation for the OBE accounts in the healthy population, where no pathological dysfunction was established, has not been sufficiently scientifically explained as of yet.

Based on my first-hand spontaneous OBEs, as well as the spontaneous OBEs of a healthy individual I have had a chance to observe for over 20 years, it is clear that OBEs involve different modes, are accompanied by different phenomenological and semiological elements, and have distinct features depending on the psychological, physiological, as well as neural mechanisms that are not well understood. Therefore, more research aimed at the explanation of qualitative differences within OBEs in healthy individuals should be conducted in the future.

The phenomenology as well as semiology of OBEs in the healthy population suggests that there are multiple diverse factors contributing to anomalous cognition and perceptual experience. The mechanism based on neural network processing, by which this kind of abnormal perception is experienced, would still need to be identified. Some of the elements

of spontaneous OBEs that we have studied indicate that visuo-vestibular processes might play an important role (Sellers, 2017). Furthermore, we speculate that spontaneous OBEs with no sign of inducement (made willingly or unwillingly) occurring in a healthy individual might be caused by intrinsic vibrational- oscillatory dynamics taking the form of pulses of a discontinuous and, as of yet, unidentified nature. We further posit that the pulses are based on the resonance produced and driven by feelings and emotions residing at the cellular level. The pulses might induce paroxysmal discharges which, in turn, induce an OBE. We further speculate that the role of synapses and synaptic firing might be pivotal in eliciting OBEs.

As stated earlier, contemporary research focuses mainly on OBE phenomena occurring in the clinical population. It would be interesting to do research on healthy individuals who claim to be experiencing OBEs on a regular basis, spontaneously or at will, versus individuals who represent the healthy population and have only experienced an OBE once in their life. Even more intriguing would be an in-depth comparison of OBEs reported in the healthy population versus OBEs elicited by epilepsy, or other pathological cases, in the clinical population.

To conclude, many questions pertaining to the real nature of the OBE phenomenon still remain unanswered as of today. We hope that further philosophical, psychological, as well as physiological research would be able to elucidate answers to some of the following questions: Is there a clear cut definition of an OBE? What is an OBE based on? Does a typical description of an OBE exist? What type of anomalous cognition should science include in the wide range of OBE phenomena? How do we define an OBE state from the neurological point of view? Is an OBE part of a dream or vice versa? What constitutes the projection of consciousness both conscious and unconscious? Is it identical to an OBE or a waking

dream? What is the difference between an OBE under full consciousness and an OBE while asleep? How do we define the phenomena of lucid dreaming, astral projection, microsleep, the sensed presence, heautoscopy proper, autoscopic hallucinations, REM intrusions such as hypnagogia or hypnopompia or false awakening, the Doppelgänger effect, OBEs induced by drugs, OBEs induced by trance, or other types of near OBEs such as body parts distortions created under a virtual reality setting. What are the neural correlates of OBEs under different circumstances such as in a light coma, deep unconsciousness, or undergoing cardiac arrest? What is the connection between an expanded or altered consciousness induced by ayahuasca or a deep meditation and an OBE? And finally, how does an OBE differ from a near-death-experience? It is worth noting that Alvarado (2000) and Nahm (2015) suggested to develop an "OBEs scale" similar to the "NDE scale" developed by Bruce Greyson to properly address and investigate the phenomenology of OBEs. Answering the above questions might provide clues about the true nature of conscious experiences.

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