Analysis of the Empirical Research on the Feeling of Presence

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The feeling of presence consists of the feeling that another person or entity is detected near the extrapersonal space without any clear sensory evidence. Its symptoms include visual hallucinations and wrong coding of sensorial input. The phenomenon is sometimes present in pathologies such as sleep paralysis or neurodegenerative diseases, but it can also be found in healthy subjects. It has been associated with folk beliefs, but there is now enough evidence of its brain basis. A total of 72 studies from Web of Science and Scopus were analyzed considering 12 classificatory variables that were constructed bottom-up. Prevalence of neurodegenerative disease was higher for males, whereas sleep paralysis was prevalent for females. Twenty-one studies included participants with multiple pathologies. The episodes were generally associated to fear and anxiety. Some structural and functional alterations were found in neuroimaging case studies. Scale validation studies were scarce, usually showing scores with good psychometric properties. Diverse scales comprised different dimensions according to their objectives. Feeling of presence is a neuropsychological phenomenon, as failures in perception and self-concept are due to brain electric maladjustment. Evidence corroborates that mismatches are localized in cortical areas such as the temporal-parietal or insular cortex, as well as in subcortical areas, such as the hippocampus. The phenomenon main characteristics, associated factors, and measurement scales vary according to the studied pathological entity. Given that most scales have not been validated, a more empirical approach that takes into account the variety of associated pathologies is needed.

Keywords: feeling of presence, review, sensed presence, testing, validity

Feeling of presence (FOP), also called felt or sensed presence, is a psychological phenomenon characterized by the feeling that another person or entity is near the extrapersonal space, without any clear sensorial evidence about it (Solo-

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This is a review article about the empirical evidence of the phenomenon "feeling of presence," a perceptual maladjustment usually linked with sleep disorders, such as narcolepsy or sleep paralysis, and neurodegenerative diseases. We declare that there are no conflicts of interests.

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monova, Frantova, & Nielsen, 2011). It is considered as a minor hallucinatory phenomenon (Cheyne & Girard, 2007a) that can be present in both healthy subjects and neurodegenerative diseases. It is frequent in the hypnagogic and hypnopompic hallucinations of sleep paralysis (SP).

The phenomenon could be associated with specific neurological diseases (e.g., epileptic auras in temporal lobes or insular areas; Persinger, 1994). It involves cortical and subcortical activation of diverse areas such as the amygdala or the occipital cortex. Some anxiety and depression symptoms are associated with FOP (Simard & Nielsen, 2005), and the FOP hallucinatory forms are associated with images of social and cultural content (Solomonova et al., 2008).

Among the main research lines, Persinger (1993) has developed the most cited one, vectorial hemisphere theory that proposes that FOP is caused by the intrusion of the right self-concept (right hemisphere) into the left hemisphere, altering interhemispheric connectivity. Other authors have proposed that injuries or electric alterations in cortical association areas may induce self-concept failures (Blanke et al., 2014).

Hypervigilance or autoscopic and vestibular-motor (VM) experiences are also related with FOP and a high parasympathetic alert state (Cheyne & Girard, 2007b). Suggestion or fantasies are some personal characteristics that have been seen more frequently in FOP samples (Bell, Reddy, Halligan, Kirov, & Ellis, 2007). In the same order, religion beliefs, a new-age way of life and pseudoscientific interpretations, were predisposing factors associated with FOP.

FOP is a central factor in the episodes of SP. This parasomnia is characterized by an involuntary state of muscular atony during awakening in the REM phase of the sleep cycle, accompanied by hypnagogic and hypnopompic hallucinations (Solomonova et al., 2008). The three hallucinations SP model is composed of (a) intruders (FOP), (b) physical aggressions, and (c) extracorporeal sensations (Cheyne, 2003). The FOP is the most recurrent and is usually presented concomitantly with the other two experiences. It is also described as an extension of the dream. High amygdala activation levels during REM produce a hypervigilance state that maximizes FOP characteristics (Fukuda, 2005).

Some subjects who report VM and FOP experiences are identified as habitual lucid dreamers, who can induce SP to trigger the experience (Cheyne & Girard, 2007b). Other results found positive correlations between SP and lucid dreams, which are also related with FOP and VM hallucinations during the SP episodes (Denis & Poerio, 2017).

The fact that the FOP could be induced artificially in many studies with nonpathological samples is evidence that it is a neuropsychological phenomenon. The desynchronization in FOP could be recreated artificially by magnetic simulation in temporal areas (Persinger, 1994), and also with LED or surgical stimulation, always in sensory deprivation contexts. Recently, a master-slave robotic system that generated specific sensorimotor conflicts could induce FOP without direct brain stimulation (Blanke et al., 2014). Given the neuropsychological relevance of the FOP phenomenon, the objective of this review was to analyze the empirical research on this matter, paying special attention to measurement instruments.

Method

Materials

Seventy-two studies from 59 empirical articles were selected from 389 abstracts obtained from "Web of Science" and "Scopus." The search was carried out using the keywords "Sensed presence," "Felt presence," "Feeling of a presence," and "Feeling of presence," usual terms to describe the phenomenon of "sensed presence."

Procedure

Figure 1 shows the decisions taken in the selection of materials. The first step was excluding all the publications that were not empirical research articles. Then, a total of 389 abstracts were analyzed before applying the inclusion and exclusion criteria. (a) All articles that use instrumentation to measure the phenomenon of "sensed presence" are included. (b) No time limit is established, including articles dating from 1992 onward. (c) There are no exclusion criteria about language. (d) All publications that were not articles (reviews, press releases, patents, and others) are excluded. (e) All articles that do not include instrumentation to measure the phenomenon of "sensed presence" are excluded. (f) All misclassified revisions are excluded. (g) All articles where the concept of "sensed presence" is not used to describe processes of perceptual alteration are excluded. (h) If two or more articles repeat the sample, the oldest ones will be excluded if the new publications include the previous results.

Finally, 59 articles with 72 studies were selected. The analysis of the information gives 11 variables: (a) age group, (b) sex, (c) presence of control group, (d) use of psychometric instrument, (e) use of neuroscientific technique, (f) type of construct, (g) reliability, (h) religiosity, (i) neural substrate, (j) pathology, and (k) felt presence. The methodological procedure is explained in Figure 1.

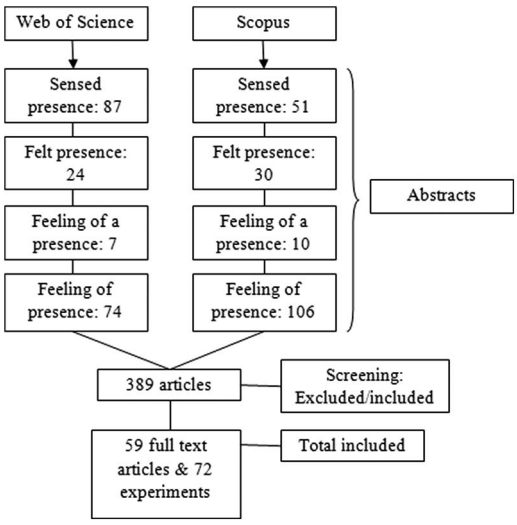

Figure 1. Articles and experiments selection process.

Results

According to gender, 38 of the study samples had female predominance that can be due to the fact that most studies were carried out on university samples. However, according to the pathology of the sample, a clear male predominance can be seen in Parkinson's disease studies, and a female predominance in the SP studies. The predominance of the samples with SP was in the ranges between 18 and 25 years and 26–35. The FOP studies in Parkinson's disease and Lewy Bodies included samples with ages older than 50 years.

Twenty-four studies included subjective reports of FOP sensations. In 17 studies, the phenomenon was associated with unpleasant feelings as fear or sadness. In most cases when FOP was associated with neutral or pleasant feelings, the presence was identified as a friend, a close family member, or a religious entity.

A total of 10 case reports with one subject as the sample were analyzed independently. In all 10 cases, neuroscientific techniques (NT) were applied, and in eight cases there was a preexisting pathology. The techniques used according to the present pathology are observed in Table 1. The most used tool was the neuroimaging instruments, like magnetic resonance, single-photon emission computed tomography, computerized axial tomography, tensor of diffuser images, and electroencephalogram (EEG). They were used twice in combination with magnetic stimulation techniques. EEG was used individually to find electrical alterations on traumatic brain injury (TBI) and Epilepsy cases.

When FOP was reported in TBI cases, EEG revealed a chronic electrical anomaly over the right temporal-insular region and also a greater coherence between temporal lobes in autoscopic concentration activities. FOP usually was associated with electrical alterations after a structural damage. One of the patient described that FOP was preceded by an "electric shock" sensation, a typical experience reported in "epileptic auras."

A focal epileptic patient with seizure due to cerebrovascular accident (CVA) reported FOP, and it was linked to temporal-parietal theta activity (EEG). The patient described the hallucination experience as pleasant and with familiar presences. This case put in doubt the autoscopic theory, where FOP is generally described as a somatosensory projection of the "self sense."

Neuroscientific techniques that are detailed in Table 2 reveal structural and functional alterations as a result of a preexisting pathology. At functional level, the

Table 1
Neuroscientific Techniques Based on Pathology

	Neuroscientific techniques			
Pathology	Combined	EEG	NI	Total
CVA	0	0	1	1
TBI	0	2	0	2
n/d	2	0	1	3
Epilepsy	0	1	3	4
Total	2	3	5	10

Note. EEG = electroencephalogram; NI = neuroimaging; CVA = cerebrovascular accident; TBI = traumatic brain injury; n/d = no diagnosis.

Table 2
Neuroscientific Techniques and Results

Neuroscientific techniques	Results
EEG	Abnormal electrical activity in right temporal lobe and especially in temporo-insular region and temporoparietal junction
	Concomitant FOP experiences with paroxysmal activity (4–5 Hz) in temporal lobes
NI	
MR	Left hippocampus hypoplasia
DTI	Right superior longitudinal fasciculus damage, which connects the parietal and frontal lobe, caused by an ischemic CVA
SPECT	Bilateral hippocampus hypoperfusion and left medial frontal hyperperfusion
	Parietal and occipital lobes hypometabolism
	FOP experiences associated with increasing activity of the right hemisphere parietal and occipital lobes
SPECT + MR	Hyperactivation in left anterior insula and ventral striatum areas
CAT	Left temporal lobe hypoplasia
Combined	
Magnetic stimulation and EEG	Quantitative EEG activity coherence increases between left temporal lobe and right prefrontal region. Specific increases within the bands 4–7 Hz and 15–21 Hz
	FOP experiences reported after temporal and hippocampus stimulation using weak magnetic fields
	Higher FOP reports behind the subjects.

Note. EEG = electroencephalogram; FOP = feeling of presence; NI = neuroimaging; MR = magnetic resonance; DTI = diffuser tensor images; CVA = cerebrovascular accident; SPECT = single-photon emission computed tomography; CAT = computerized axial tomography.

studies showed anomalous electrical activity in the right temporal lobe, especially in the temporal-parietal and temporal-insular junction. When EEG was combined with magnetic stimulation, FOP experience was induced and records showed an increased interhemispheric electrical coherence.

At the structural level, patients with epileptic focus showed left temporal lobe tissue and left hippocampus hypoplasia. The oxygen distribution also was anomalous. A patient also showed a hippocampal lateral hyperperfusion and left medial frontal hyperperfusion, as well as hyperactivation of the left anterior insula. Another patient with generalized epileptic seizures, presented by Landtblom, Lindehammar, Karlsson, and Craig (2011) showed cerebral hypometabolism on parietal and occipital lobes.

Table 3 shows the NT in combination with psychometric instruments. A total of 57 studies applied psychometric instrumentation, 47 applied NT, and 28 studies used combined techniques. In the first group, the exit questionnaires (EQ) were the most used with 18 applications, of which 17 were in combination with NT. Designed the EQs to measure the frequency of FOP during studies that included NTs such as magnetic stimulation Persinger designed the EQs through different studies. The EQs were designed and modified throughout different studies, to be applied in experimental conditions but not to detect FOP episodes in the general population.

The Personal Philosophy Inventory and the Hypnotic Profile Questionnaire were used in combination with EQs to evaluated predisposing personal characteristics. The combination usually was applied in presence detected protocol (DPP) designed by Persinger (1993), who described FOP as an epileptic experience,

Table 3
Psychometric Instruments Based on Neuroscientific Techniques

	Neuroscientific techniques								
Psychometric instruments	Est. Q	Otros	MSR	EEG	NI	DPP	Combined	N/tec.	Total
HIP	0	0	0	0	0	1	0	0	1
MUSEQ	0	0	0	0	0	0	0	1	1
ISPQ	0	0	0	0	0	0	0	1	1
SenPQ	0	0	0	0	0	0	0	1	1
NEVHI	0	0	0	0	0	0	0	3	3
DHQ	0	0	0	0	0	0	0	3	3
CAPS	0	1	0	0	0	0	0	2	3
PPI	0	1	0	0	0	1	0	2	4
WUSEQ	0	0	0	0	0	0	0	5	5
Other	0	0	0	1	1	0	2	4	8
Combined	0	0	0	1	1	2	4	1	9
N/i	0	0	0	3	6	0	5	1	15
EQ	1	0	3	1	0	7	5	1	18
Total	1	2	3	6	8	11	16	25	72

Note. Est. = established; MSR = master–slave robot; EEG = electroencephalogram; NI = neuroimaging; DPP = detected presence protocol; N/tec. = number of techniques; HIP = Hypnotic Profile Questionnaire; MUSEQ = Multi-Modality Unusual Sensory Experiences Questionnaire; ISPQ = ISP (Isolated Sleep Paralysis) and Sensed Presence Questionnaire; SenPQ = Sensed Presence Questionnaire; NEVHI = North East Visual Hallucinations Interview; DHQ = Durham Hypnagogic and Hypnopompic Hallucinations Questionnaire; CAPS = Cardiff Anomalous Perceptions Scale; PPI = Personal Philosophy Inventory; WUSEQ = Waterloo Unusual Sleep Experiences Scale; N/i = no instrument; EQ = Exit Questionnaire.

normally associated with temporal lobes alteration. The DPP was designed to induce FOP and its main component is four pairs of solenoids helmet located on the temporal lobes. The protocol is applied under relaxation and sensory deprivation conditions. It consists in the application of weak magnetic fields (100 nT to 5 μT), generated by a voltage range that varies according to the pattern sought (Persinger & Saroka, 2013).

Another NT used in combination with EQs was the robotic master–slave mechanism (MSR). During MSR subjects must perform some movements with their finger on a touchpad in front of them. The system reads the finger movements and executes the same movement pattern on subject backs with a robotic arm. The stimulation was applied under synchronous and asynchronous conditions. Diverse erroneous adjudications and FOP experiences were reported in the asynchronous condition mainly.

Table 4 showed six validation studies applied on four psychometric instruments: the Multi-Modality Unusual Sensory Experiences Questionnaire (MUSEQ), the Sensed Presence Questionnaire (SenPQ), Cardiff Anomalous Perceptions Scale (CAPS), and Durham Hypnagogic and Hypnopompic Hallucinations Questionnaire (DHQ). Three of them present a specific subscale to measure FOP (MUSEQ, DHQ, and CAPS). The SenPQ ($\alpha = .95$) instrument showed the highest reliability (internal consistency) was and its 16 items were designed to evaluate FOP.

All six studies included factor analysis to test construct validity. Regarding DHQ, both studies revealed a three-factor structure. The MUSEQ factor analysis confirmed an acceptable fit with correlation and bifactor models, and SenPQ also

Table 4
Psychometric Instruments Validation Studies

Psychometric instruments	Items		Validation					
			Internal consistency α		Test–retest reliability *r*		Effect size	
	Total	Sub.	Total	Sub.	Total	Sub.	*d*	Factorial analysis
MUSEQ	43	4	—	.77	.77	.69	.96	Correlational and bifactorial model
SenPQ	16	—	.95	—	—	—	.51	Bifactorial model
CAPS	32	—	.83	—	.75	—	—	Three factors
CAPS	32	—	.87	—	—	—	—	Three factors
DHQ	14	4	—	.85	—	.72	—	Bifactorial model
DHQ	14	4	—	.87	—	—	—	Three factors

Note. Sub. = Subscales; MUSEQ = Multi-Modality Unusual Sensory Experiences Questionnaire; SenPQ = Sensed Presence Questionnaire; CAPS = Cardiff Anomalous Perceptions Scale; DHQ = Durham Hypnagogic and Hypnopompic Hallucinations Questionnaire.

did it through a bifactor model. Two studies analyzed the CAPS factorial structure; the first one revealed a three-factors structure fit. In the second study, the main components analysis revealed that only "Presence" and "Auditory" subscales were adjusted, whereas the Visual subscale was not.

According to the constructs, MUSEQ was designed to evaluate hallucinations and other sensory experiences in the general population, whereas DHQ was designed to evaluate the experiences related to hypnogogic and hypnopompic hallucinations. The FOP is generally present in both situations and that is the reason why these instruments have specific subscales. The MUSEQs four-item subscale showed a good internal consistency and an acceptable test–retest correlation ($\alpha = .77$, $r = .69$). The DHQ validation studies demonstrated a strong internal consistency in FOP subscale ($\alpha = .85$ and $\alpha = .87$), as well as a higher test–retest correlation ($r = .72$).

The CAPS instrument evaluates anomalous experiences in the general population and does not have a specific subscale for FOP. This instrument showed a good internal consistency ($\alpha = .87$) in the original version and in its Spanish adaptation ($\alpha = .83$).

Two studies included different samples to evaluate the MUSEQ and SenPQ discriminating capacity. The MUSEQ was able to distinguish between clinical group (schizophrenic spectrum disorder) and nonclinical ($d = .96$), whereas the SenPQ could distinguish between religious and nonreligious groups ($d = 0.51$).

The main studies that included pathological sample are described in Table 5. In SP, Waterloo Unusual Sleep Experiences Scale (WUSEQ) was the most used instrument, which evaluates the sleep hallucinatory experiences, but the ISP (Isolated Sleep paralysis) and Sensed Presence Questionnaire seems to be the most appropriate one because its construct consists of evaluating FOP during SP episodes. The most used instrument for neurodegenerative diseases was the North East Visual Hallucinations Interview (NEVHI) that is specialized on visual hallucinations. Most studies included other instruments to evaluate FOP assassinated factors. Fear and anxiety were the most recurrent SP factors, whereas factors associated with a decreased vision, such as miscalculation, were described in

Table 5
FOP Data According to Pathology

Pathology	Instrument	Sample	% FOP	Control group	Sig. Diff.	Associated factor
Sleep paralysis	ISPQ	45	35.5	Yes	Yes	Fear and social anxiety
	OEQ7	248	53.63	—	—	Depression, bipolarity, and social anxiety
	WUSEQ	383	58	—	—	Hypervigilance state
	WUSEQ	418	11.24	—	—	Correlation between fear and FOP frequency and intensity
	WUSEQ	870	14.94	—	—	Fear
Parkinson's disease	PRD	58	29.31	Yes	Yes	—
	Structural interview	38	23	Yes	Yes	—
	NEVHI	59	13	—	—	Fear
	NEVHI	88	10	Yes	No	Double vision and erroneous calculation
	NEVHI	64	31	Yes	Yes	Worse scores on cognitive tests, brainstem dysfunction
Lewy bodies	Semi-Structural Interview and SPECT	100	20	Yes	Yes	Parietal and ventral occipital cortices dysfunction. Correlation between erroneous adjudications with limbic-paralimbic structures dysfunction and delusions with dysfunction of the frontal cortex

Note. FOP = feeling of presence; Sig. Diff. = significant difference; ISPQ = ISP (Isolated sleep paralysis) and Sensed Presence Questionnaire; OEQ7 = Other Experiences Questionnaire Subscale; WUSEQ = Waterloo Unusual Sleep Experiences Scale; PRD = parkinsonism-related disorder; NEVHI = North East Visual Hallucinations Interview; SPECT = single-photon emission computed tomography.

neurodegenerative diseases. Differences between clinical and control groups are evidence of the scales' internal validity.

Discussion

Results showed a sexual predominance variation according to the preexisting pathology. SP studies have a female predominance, and neurodegenerative disease studies a male one. These results could be contrasted with FOP report studies, where women registered a higher prevalence of the phenomenon (Tiller & Persinger, 1994).

Depression and anxiety have been described as associated and/or predictive factors, correlated with FOP frequency. In most subjective reports, FOP was associated with unpleasant feelings. According to vectorial theory, it could depend of the manifestation side of the presence (Persinger, 1994). When FOP was detected on the right side, fear or anxiety levels were higher, but when it was detected on the left side less unpleasant feelings were reported. Although FOP feelings are usually negative during SP due to darkness, hypervigilance system, and atony, waking episodes depend on the pathology.

The results of the actual review showed that FOP is a psychological phenomenon with an evident biological basis. It is defined as a perceptual alteration, determined by the distortion of the self-image, desynchronization of sensory inputs and outputs, and emotional coding. The electrical alterations in temporal lobes (Roll et al., 2012) and FOP usual association with epileptic symptoms characterized by irregular paroxysmal activity (Persinger & Tiller, 2008) evidenced that cerebral alterations caused by a CVA, TBI, or epilepsy could create the conditions for the perceptual disturbance. Other studies suggest electrical activity maladjustment in alpha and theta rhythms as a cause (Cook & Persinger, 1997), but in recent studies FOP was associated with increased interhemispheric electric coherence (Saroka, Caswell, Lapointe, & Persinger, 2014). Further evidence is the higher rate of cortical excitability that was found in subjects with some type of anomalous experience (Braithwaite et al., 2013).

The cerebral areas involved in FOP were showed through NT studies. At cortical level, temporal-parietal, insular, and temporal-frontal cortex were mainly affected. At subcortical level, the hippocampus and association pathways such as the right superior longitudinal fasciculus were affected when there was any injury. Electrical changes were recorded more frequently on the right hemisphere, but structural alterations such as hypoperfusion, hypometabolism, hypoplasia, and hyperactivation were seen on the left hemisphere. These results suggest that stimulation protocols that induce FOP through changing cortical excitability should be applied in the right temporal lobe or bilaterally. The hypothesis is supported by studies where more FOP episodes were reported when the stimulation was applied through the right side (Persinger & Healey, 2002). Also DPP protocols generated experiences very similar to epileptic ones (Persinger & Saroka, 2013).

FOP induction was achieved through LED stimulation (Karbowski, Saroka, Murugan, & Persinger, 2015), robotic mechanism (Blanke et al., 2014), and mainly with DPP protocols. FOP experience is not specifically relevant to typical dreams. However typical dreams, nightmares, and SP usually take place during REM phase. This phase is characterized by the presence of theta and beta electroencephalographic activity. Most studies included sensory deprivation and relaxation, a state characterized by theta rhythms proliferation on the temporal lobes. Those conditions increase interhemispheric coherence (Booth & Persinger, 2009), which seems to be a favorable factor to induce FOP. Other external factors such as the increase in geomagnetic activity have registered higher levels of interhemispheric coherence and therefore could be considered a predisposing factor (Saroka et al., 2014).

Validation studies for just four questionnaires have been reported. This is clearly insufficient given the amount of psychometric instruments that was found out. SenPQ was the instrument with the higher validity to evaluate FOP in general terms. MUSEQ and CAPS have a good reliability to discriminate FOP among other experiences when the diagnosis or the study required measuring FOP in concomitance with some other anomalous experience. When FOP was associated with hypnagogic or hypnopompic hallucinations, results showed that DHQ could be the most appropriated.

A large range of pathologies related to FOP and its characteristics were revealed in our review. The case studies included structural and functional alterations (CVA, TBI, and epilepsy). Other entities such as SP and ND were investigated through incidence studies. The most used instrument in the SP was the Waterloo Unusual Sleep Experiences Scale, and in PD the most used was the NEVHI.

The association between FOP, fear, and anxiety is substantially repeated in SP. Using social anxiety and depression questionnaires, significant differences were found between subjects with SP and FOP, in contrast with subjects with only SP (Simard & Nielsen, 2005). We can affirm that FOP is a central element of SP because, under involuntary immobility conditions, in conjunction with confusion and darkness, it activates a paroxysmal state that guides the form of the hypnagogic and hypnopompic hallucinations. Ambient conditions during FOP would activate a hypervigilance state that aggravates the episodes. These conclusions are congruent with the fact that FOP was associated with stalking sensation (Cheyne & Girard, 2007a) and is supported by the correlation between fear intensity and FOP frequency and intensity (O'Hanlon, Murphy, & Di Blasi, 2011).

FOP is also recurrent in neurodegenerative diseases, mainly in Parkinson's disease and Lewy body dementia. The NEVHI was the most used instrument to evaluate FOP as a component of visual hallucination. The factors associated with FOP in Parkinson's disease were a deteriorated vision, erroneous calculation, and brain stem dysfunction (Urwyler et al., 2014). These findings suggest that FOP is the product of a sensory alteration and discriminative failures; this is consistent with studies in which half of the sample recognized the identity of the presence, and 75% of the participants did not identify the presence as menacing (Fénelon, Soulas, Cleret de Langavant, Trinkler, & Bachoud-Lévi, 2011). Finally, FOP could simply be an age-associated degeneration result. A study found FOP in 4.79% cases of a nonclinical sample over 60 years old (Soulas, Cleret de Langavant, Monod, & Fénelon, 2016).

Our review reports strong evidence of FOP as a neuropsychological phenomenon. The brain electrical alteration would cause an interhemispheric maladjustment that could derive into perceptual and self-concept failures. These statements require further investigation.

The evidence also indicates that the maladjustments usually take place at the cortical level, mainly in the temporal-parietal and insular areas, but also in subcortical areas such as the hippocampus. The protocols designed to induce FOP (DPP, surgical or LED stimulation, and master–slave robotic systems) and its effectiveness, are another evidence of FOP biological basis. However, the possible psychological repercussions of the induction of this kind of experiences must be questioned.

The FOP characteristics, associated factors, and measurement instruments change according to the pathology, but there are no epidemiological studies that review FOP prevalence in general population. Regarding psychometric instrumentation, it is concluded that more validation studies are required to corroborate if the previously obtained results would be replicated.

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