# Spontaneous and induced out-of-body experiences during sleep paralysis: Emotions, "AURA" recognition, and clinical implications

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## Summary

Sleep paralysis is characterized by the incapacity to perform voluntary movements during sleep/wake transitions, and could bring great discomfort. During sleep paralysis, out-of-body experiences can occur. Out-of-body experiences refers to the sensation of being outside of the physical body and perceiving the world from this outside perspective; however, they are pleasant in comparison with other sleep paralysis hallucinations. Lucid dreams are dreams in which a subject becomes aware of being dreaming while the dream occurs. Here, we designed an online survey to study the predominant and specific emotions during sleep paralysis and/or out-of-body experience events as well as the somatosensory perceptions that preceded their occurrence. The sample ($N = 329$) was divided into experimental groups depending on the presence/absence of out-of-body experiences, capacity to induce (or not) out-of-body experiences, and perception/no-perception of the sleep paralysis. We showed that more positive emotions were associated with out-of-body experiences and more negative emotions were associated with sleep paralysis episodes, and for those who claim the ability to induce out-of-body experiences, positive emotions were more frequent in their episodes. We found that subjects perceived auditory, tactile and visual sensations before sleep paralysis episodes, and we proposed that these could be an "aura" of sleep paralysis. Furthermore, subjects that had out-of-body experiences but had never felt the sleep paralysis, perceived tactile and visual sensations to the same extent as subjects with out-of-body experiences that felt the sleep paralysis. Therefore, we proposed that the "aura" recognition could be used under controlled conditions for out-of-body experiences induction in patients with sleep paralysis to diminish the negative symptoms associated with sleep paralysis episodes.

**KEYWORDS**
autoscopy, consciousness, lucid dreams, parasomnias, sleep

## 1 | INTRODUCTION

Sleep paralysis (SP) is a condition where a person is paralysed upon waking or falling asleep, and could bring great discomfort (American Academy of Sleep Medicine [AASM], 2014; Hishikawa & Shimizu, 1995). It is characterized by mixed alpha and theta frequencies (Mainieri et al., 2021); thus, it has been proposed that it occurs in a transitional state between sleep and wakefulness (Terzaghi et al., 2012).

An intriguing characteristic of SP is their related hallucinations. Cheyne and Girard (2009) divided them into three different factors. The *Intruder* factor comprises the sensation of an evil and undesirable presence, and the sensation of being watched and observed. The *Incubus* factor involves breathing difficulties, feelings of choking, chest pressure, pain and thoughts of imminent death (Cheyne & Girard, 2009). These two factors are proposed to be the result of activation of the amygdala and cortical association areas that take place during rapid eye movement sleep (Fukuda, 2005). The third factor includes vestibular-motor hallucinations, which comprise illusory movement experiences (such as floating, rolling or motor sensations of displacement) and out-of-body experiences (OBEs).

Out-of-body experiences refer to the sensation of being "outside" the physical body and perceiving the world from this outside perspective (Blanke et al., 2005). They can occur during wakefulness as well as during sleep (Ehrsson, 2007; Facco et al., 2019; Smith & Messier, 2014), and have been reported as an extremely vivid experience, with the perceptual qualities of veridical perception (Blackmore, 1982).

In many different cultures, OBEs have been interpreted as spiritual experiences in which the mind or "soul" "leaves" the physical body (de Sá & Mota-Rolim, 2015, 2016; Irwin, 1988; LaBerge et al., 1988; Mota-Rolim et al., 2020). From a neuroscientific perspective, OBEs are linked with self-consciousness, which depends on multiple neurocognitive mechanisms and processes, including the experience that our body belongs to us, embodiment sensation, and being aware of the present moment (Ronchi et al., 2018). Self-consciousness is the result of successful multisensory integration of visual, tactile, somatosensory and vestibular modalities that take place constantly in our brain (Park & Blanke, 2019). OBEs are proposed to be the result of a transitory breakdown in the normal processing of information from multi-sensory association brain areas, with the temporo-parietal junction (TPJ) playing a major role (Blanke et al., 2005). The TPJ is involved in the perception of body parts, the entire body, self/other distinction, and sense of agency (Arzy et al., 2006; Cazzato et al., 2015; Sperduti et al., 2011). The sense of agency, which is present during the OBEs, could be the reason why these experiences are less terrifying in comparison with other factors of SP. Moreover, during OBEs a person could feel complex emotions, such as fear but also joy and, for this reason, are considered as a pleasant form of SP. Also, positive emotions present during pleasant SP episodes are greater in those who claim the ability to induce lucid dreams (LDs; Kliková et al., 2021).

Out-of-body experiences have been induced with electrical stimulation of the cortex in patients with temporal lobe epilepsy (Blanke et al., 2002), and in normal subjects using an adaptation of the Rubber Hand Illusion (Ehrsson et al., 2007), but none of these involved the induction of OBEs initiated from sleep, under controlled conditions in a lab setting. However, several reports have been found in non-scientific literature, suggesting the possibility to induce OBEs during sleep/wake transitions or during SP. These techniques are quite similar to those used for LD induction, such as sleep fragmentation (Gott et al., 2020), mnemonic induction techniques (Aspy, 2020; Erlacher et al., 2022; LaBerge, 1990) and conscious recollection of bodily sensations (Bruce, 2009; Ferrandiz, 2021; Raduga, 2011). Related to this point, it has been shown that SP is preceded by auditory perceptions such as tinnitus, this being suggested as a possible "aura" of SP (Shergill et al., 2019).

Here we study the experienced emotions during SP and/or OBE events as well as the somatosensory perceptions that occur before the SP and/or OBE events. We hypothesize that OBE episodes are more pleasant than SP as well as induced OBEs are more pleasant than spontaneous OBEs, and that this could be related to the capacity to raise more agency sensations and control of the oneiric experience (Kliková et al., 2021). We finally propose that SP has a visual, tactile and auditory "aura" that could be used to induce an OBE for diminishing negative symptoms associated with SP episodes.

## 2 | MATERIALS AND METHODS

We designed an online survey about SP and OBEs during sleep. The questionnaire was segmented into sections, each of these sections has questions about bodily sensations previous to the experience, associated emotions, and predominant emotions during the episodes (SP and OBE). None of the questions was mandatory.

We also asked subjects to describe their most memorable experience to ensure that they met the criteria for the SP and/or OBE conditions, and an additional section with items for collecting sociodemographic data. We further asked different questions about the perceived experience such as color perception, body position and environment control, among others. However, the analyses of these variables are not included in this manuscript.

The study was approved by the Biomedical Research Ethics Committee of Alberto C. Taquini Institute for Translational Medicine Research (IATIMET), in accordance with the principles expressed in the Declaration of Helsinki. Participants gave their online consent before their participation in the study.

### 2.1 | Criteria for SP

One or more episodes of having the inability to perform voluntary movements during sleep/wake transitions.

### 2.2 | Criteria for OBE

One or more episodes of having the sensation of being outside the physical body and perceiving the world from this outside perspective. This may occur during sleep.

### 2.3 | Participants

Respondents were recruited through advertisements on social media networks and university groups. The size of the sample was $N = 329$ (122 males, 226 females, 1 other). The mean age was 34 years ($SD = 0.59$; range from 18 to 67 years).

## 2.4 | Experimental groups

The sample was divided into three principal groups.
SP with OBE group ($SP^+OBE^+$, $n = 177$) – subjects who had SP and OBEs.

SP without OBE group ($SP^+OBE^-$, $n = 127$) – subjects who had SP without OBEs.

OBE only group ($SP^-OBE^+$, $n = 25$) – subjects who had OBEs during sleep and reported never having perceived an episode of SP.

To analyse the differences between SP and OBEs, we combine the answers of SP episodes (including SP episodes without hallucinations and SP episodes with Intruder and/or Incubus) of $SP^+OBE^+$ and $SP^+OBE^-$ groups (SP condition) and the answers of OBE episodes of $SP^+OBE^+$ and $SP^-OBE^+$ groups (OBE condition).

We further performed two subgroups, with the participants that experimented OBEs regarding whether they had learned how to induce an OBE or had it spontaneously.

Induced OBE group ($OBE_{induced}$, $n = 89$) – subjects who could induce OBEs.

Spontaneous OBE group ($OBE_{spontaneous}$, $n = 79$) – subjects who had spontaneous OBEs during sleep.

## 2.5 | Experimental design and statistical analysis

Statistical analyses were carried out using the statistical software IBM SPSS Statistics 25, and RStudio Version 1.3.1073.

Predominant emotions during episodes were separated into three categories: "Positive", "Negative", and "I feel no emotions".

**TABLE 1** Predominant emotions associated with SP episodes and OBEs

| | | | SP condition | | OBE condition | |
|---|---|---|---|---|---|---|
| | SP condition | OBE condition | Expected | Count | Expected | Count |
| Positive | 23/202 (11.0%) | 104/157 (66.0%) | 71.5 | 23 | 30 | 77.4 |
| Negative | 147/202 (73.0%) | 30/157 (19.0%) | 99.6 | 147 | 104 | 55.5 |
| I feel no emotions | 32/202 (16.0%) | 23/157 (15.0%) | 30.9 | 32 | 23 | 24.1 |

*Note*: The number of positive (yes) answers over the total number of participants that completed the sections of the questionnaire. Percent values are provided in brackets, and expected as well as observed frequencies are shown. SP condition included answers of the $SP^+OBE^-$ and $SP^+OBE^+$ groups. OBE condition included answers of the $SP^+OBE^+$ and $SP^-OBE^+$.
Abbreviations: OBE, out-of-body experience; SP, sleep paralysis.

**TABLE 2** Emotions associated with episodes of SP and OBEs

| | SP episodes | OBE episodes | Chi-Square | *p*-Value |
|---|---|---|---|---|
| Fear | 142/203 (70.0%) | 67/192 (34.9%) | 48.667 | **<0.0001** |
| Anxiety | 123/203 (60.6%) | 66/192 (34.4%) | 27.177 | **<0.0001** |
| Terror | 80/203 (39.4%) | 22/192 (11.5%) | 40.245 | **<0.0001** |
| Sadness | 13/203 (6.4%) | 9/192 (4.7%) | 0.553 | 0.457 |
| Anger | 15/203 (7.4%) | 7/192 (3.6%) | 2.629 | 0.105 |
| Disgust | 20/203 (9.9%) | 10/192 (5.2%) | 3.032 | 0.082 |
| Happiness | 17/203 (8.4%) | 69/192 (35.9%) | 44.014 | **<0.0001** |
| Love | 7/203 (3.4%) | 27/192 (14.1%) | 14.131 | **<0.0001** |
| Peace | 22/203 (10.8%) | 70/192 (36.5%) | 36.254 | **<0.0001** |
| Tranquility | 23/203 (11.3%) | 72/192 (37.5%) | 36.996 | **<0.0001** |
| Hope | 6/203 (3.0%) | 31/192 (16.1%) | 20.221 | **<0.0001** |
| Euphoria | 29/203 (5.0%) | 52/192 (8.0%) | 9.914 | **0.002** |
| Curiosity | 66/203 (14.3%) | 81/192 (27.1%) | 3.953 | **0.047** |
| I feel no emotions | 11/203 (5.4%) | 15/192 (7.8%) | 0.920 | 0.338 |

*Note*: Number of positive (yes) answers over the total number of participants that completed the sections of the questionnaire. Percent values are provided in brackets. SP episodes included answers of the $SP^+OBE^-$ and $SP^+OBE^+$ groups. OBE episodes included answers of the $SP^+OBE^+$ and $SP^-OBE^+$. Chi-square values as well as *p*-values are presented. Significant results are presented in bold.
Abbreviations: OBE, out-of-body experience; SP, sleep paralysis.

Participants had to choose the most representative emotion associated with the episodes of SP and OBEs. We compared the frequency of these three categories between SP condition (including the answers of $SP^{+}OBE^{+}$ and $SP^{+}OBE^{-}$ groups) and OBE condition (including the answers of $SP^{+}OBE^{+}$ and $SP^{-}OBE^{+}$ groups) with Pearson's Chi-square test. The difference between each condition was analysed comparing the expected and observed values (Table 1).

Furthermore, participants had to choose what kind of emotion they felt during the episodes of SP and OBE ("Fear", "Anxiety", "Terror", "Sadness", "Anger", "Disgust", "Happiness", "Love", "Peace", "Tranquility", "Hope", "Euphoria", "Curiosity", and "I feel no emotions"). They could choose more than one emotion. Thus, we compared the frequency of each emotion between SP (including the answers of $SP^{+}OBE^{+}$ and $SP^{+}OBE^{-}$ groups) and OBE conditions (including the answers of $SP^{+}OBE^{+}$ and $SP^{-}OBE^{+}$ groups) with Pearson's Chi-square test (Table 2).

We further compared the perceived emotions during the OBE episodes between the $OBE_{induced}$ and $OBE_{spontaneous}$ groups ("Positive", "Negative", and "I feel no emotions") with Pearson's Chi-square test. The difference between each condition was analysed comparing the expected and observed values (Table 3). Moreover, we compared

**TABLE 3** Predominant emotions associated with OBE episodes

| | $OBE_{induced}$ | $OBE_{spontaneous}$ | $OBE_{induced}$ | | $OBE_{spontaneous}$ | |
|---|---|---|---|---|---|---|
| | | | Expected | Count | Expected | Count |
| Positive | 56/73 (76.7%) | 32/61 (52.2%) | 47.9 | 56 | 40.1 | 32 |
| Negative | 6/73 (8.2%) | 20/61 (32.8%) | 14.2 | 6 | 11.8 | 20 |
| I feel no emotions | 11/73 (14.8%) | 9/61 (15.1%) | 10.9 | 11 | 9.1 | 9 |

*Note*: The number of positive (yes) answers over the total number of participants that completed the sections of the questionnaire. Percent values are provided in brackets. Expected and observed frequencies are shown.
Abbreviation: OBE, out-of-body experience.

**TABLE 4** Emotions associated with OBE episodes

| | $OBE_{induced}$ | $OBE_{spontaneous}$ | Chi-Square | *p*-Value |
|---|---|---|---|---|
| Fear | 25/88 (28.4%) | 37/78 (47.4%) | 6.397 | **0.011** |
| Anxiety | 29/88 (33.0%) | 28/78 (35.9%) | 0.159 | 0.690 |
| Terror | 9/88 (10.2%) | 12/78 (15.4%) | 0.995 | 0.318 |
| Sadness | 3/88 (3.4%) | 6/78 (7.7%) | 1.479 | 0.224 |
| Anger | 2/88 (2.3%) | 5/78 (6.4%) | 1.753 | 0.186 |
| Disgust | 4/88 (4.5%) | 5/78 (6.4%) | 0.280 | 0.596 |
| Happiness | 44/88 (50.0%) | 14/78 (17.9%) | 18.686 | **<0.0001** |
| Love | 17/88 (19.3%) | 5/78 (6.4%) | 5.993 | **0.014** |
| Peace | 36/88 (40.9%) | 21/78 (26.9%) | 3.587 | 0.058 |
| Tranquility | 36/88 (40.9%) | 23/78 (29.5%) | 2.355 | 0.125 |
| Hope | 21/88 (23.9%) | 3/78 (3.8%) | 13.397 | **<0.0001** |
| Euphoria | 34/88 (38.6%) | 13/78 (16.7%) | 9.833 | **0.002** |
| Curiosity | 41/88 (46.6%) | 28/78 (35.9%) | 1.947 | 0.163 |
| I feel no emotions | 7/88 (8.0%) | 6/78 (7.7%) | 0.004 | 0.950 |

*Note*: The number of positive (yes) answers over the total number of participants that completed the sections of the questionnaire. Percent values are provided in brackets. Chi-square values as well as *p*-values are presented. Significant results are presented in bold.
Abbreviation: OBE, out-of-body experience.

**TABLE 5** Bodily sensations previous to OBE episodes

| | $OBE_{induced}$ | $OBE_{spontaneous}$ | Chi-Square | *p*-Value |
|---|---|---|---|---|
| Sounds | 59/89 (66.3%) | 35/78 (44.9%) | 7.752 | **0.005** |
| Vibrations | 70/89 (78.7%) | 42/78 (53.8%) | 11.580 | **0.001** |
| Visual | 27/67 (40.3%) | 19/56 (33.9%) | 0.529 | 0.467 |

*Note*: The number of positive (yes) answers over the total number of participants that completed the sections of the questionnaire. Percent values are provided in brackets. Chi-square values as well as *p*-values are presented. Significant results are presented in bold.
Abbreviation: OBE, out-of-body experience.

**TABLE 6** Bodily sensations previous to SP episodes

| | $OBE_{induced}$ | $OBE_{spontaneous}$ | Chi-Square | *p*-Value |
|---|---|---|---|---|
| Sounds | 60/85 (70.6%) | 46/70 (65.7%) | 0.422 | 0.516 |
| Vibrations | 61/85 (72.6%) | 42/70 (60.0%) | 2.745 | 0.098 |
| Visual | 29/66 (43.9%) | 20/54 (37.0%) | 0.586 | 0.444 |

*Note*: The table summarizes the results of statistical analysis with respect to the three variables. The number (*n*/all answers) of subjects per group ($OBE_{induced}$, $OBE_{spontaneous}$) for the different variables is given. Percent values are provided in brackets. Chi-square values as well as *p*-values are presented.
Abbreviation: OBE, out-of-body experience.

**TABLE 7** Predominant emotions associated with OBE episodes of $SP^+OBE^+$ and $SP^-OBE^+$ groups

| | | | $SP^-OBE^+$ | | $SP^+OBE^+$ | |
|---|---|---|---|---|---|---|
| | $SP^-OBE^+$ | $SP^+OBE^+$ | Expected | Count | Expected | Count |
| Positive | 13/15 (86.7%) | 90/141 (63.8%) | 93.1 | 90 | 9.9 | 13 |
| Negative | 1/15 (6.7%) | 32/141 (22.7%) | 29.8 | 32 | 3.2 | 1 |
| I feel no emotions | 1/15 (6.7%) | 1/141 (13.5%) | 18.1 | 19 | 1.9 | 1 |

*Note*: The number (*n*/all subjects) of subjects per group for the different variables. Percent values are provided in brackets. Chi-square values as well as *p*-values are presented.
Abbreviations: OBE, out-of-body experience; SP, sleep paralysis.

**TABLE 8** Emotions associated with OBE episodes of $SP^+OBE^+$ and $SP^-OBE^+$ groups

| | $SP^+OBE^+$ | $SP^-OBE^+$ | Chi-Square | *p*-Value |
|---|---|---|---|---|
| Fear | 62/167 (37.1%) | 5/25 (20.0%) | 2.807 | 0.094 |
| Anxiety | 57/167 (34.1%) | 9/25 (36.0%) | 0.034 | 0.854 |
| Terror | 21/167 (12.6%) | 1/25 (4.0%) | 1.576 | 0.358[a] |
| Sadness | 9/167 (5.4%) | 0/25 (0.0%) | 1.414 | 0.234[a] |
| Anger | 7/167 (4.2%) | 0/25 (0.0%) | 1.088 | 0.297[a] |
| Disgust | 9/167 (5.4%) | 1/25 (4.0%) | 0.085 | 1[a] |
| Happiness | 58/167 (34.7%) | 11/25 (44.0%) | 0.812 | 0.368 |
| Love | 22/167 (13.2%) | 5/25 (20.0%) | 0.838 | 0.544[a] |
| Peace | 57/167 (34.1%) | 13/25 (52.0%) | 2.997 | 0.083 |
| Tranquility | 59/167 (35.3%) | 13/25 (52.0%) | 2.578 | 0.108 |
| Hope | 57/167 (40.4%) | 7/25 (28.0%) | 2.983 | 0.151[a] |
| Euphoria | 47/167 (28.1%) | 5/25 (6.0%) | 0.730 | 0.393 |
| Curiosity | 69/167 (41.3%) | 12/25 (14.0%) | 0.398 | 0.528 |
| I feel no emotions | 14/167 (8.4%) | 1/25 (4.0%) | 0.580 | 0.446[a] |

*Note*: The number (*n*/all answers) of emotions per condition for the different variables. Percent values are provided in brackets. Chi-square values, Yates' corrected Chi-Square values as well as *p*-values are presented.
Abbreviations: OBE, out-of-body experience; SP, sleep paralysis.
[a]Yates' corrected Chi-Square values.

the frequency of each perceived emotion ("Fear", "Anxiety", "Terror", "Sadness", "Anger", "Disgust", "Happiness", "Love", "Peace", "Tranquility", "Hope", "Euphoria", "Curiosity", and "I feel no emotions") between the $OBE_{induced}$ and $OBE_{spontaneous}$ groups with Pearson's Chi-square test (Table 4).

To analyse the existence of an OBE or SP "aura", we asked participants to choose whether they had perceived bodily sensations previously associated to the OBE episodes such as "Sounds", "Vibrations" and/or "Visual" perceptions (Table 5), and bodily sensations previously associated to SP (Table 6). The frequency of these three categories between the $OBE_{induced}$ and $OBE_{spontaneous}$ groups for the OBE and SP episodes was analysed with Pearson's Chi-square test.

We further analysed the perceived emotions during the OBE episodes between the $SP^-OBE^+$ and the $SP^+OBE^+$ groups with Pearson's Chi-square test (Table 7). We compared the frequency of each

| | $SP^{-}OBE^{+}$ | $SP^{+}OBE^{+}$ | Chi-Square | *p*-Value |
|---|---|---|---|---|
| Sounds | 8/25 (32.0%) | 99/176 (56.3%) | 5.171 | **0.023** |
| Vibrations | 12/25 (48.0%) | 118/176 (67.0%) | 3.476 | 0.062 |
| Visual | 6/15 (40.0%) | 49/131 (37.4%) | 0.039 | 0.844 |

**TABLE 9** Results of the statistical analysis of bodily sensations previous to OBE episodes in the $SP^{-}OBE^{+}$ and $SP^{+}OBE^{+}$

*Note*: The number (*n*/all answers) of subjects per group for the different variables. Percent values are provided in brackets. Chi-square values as well as *p*-values are presented. Significant results are presented in bold.
Abbreviations: OBE, out-of-body experience; SP, sleep paralysis.

perceived emotion ("Fear", "Anxiety", "Terror", "Sadness", "Anger", "Disgust", "Happiness", "Love", "Peace", "Tranquility", "Hope", "Euphoria", "Curiosity", and "I feel no emotions") between the $SP^{-}OBE^{+}$ and the $SP^{+}OBE^{+}$ groups with Pearson's Chi-square test and Yates' corrected Chi-Square test (Table 8).

We further analysed the perceived bodily sensations previously associated to the OBE episodes between the $SP^{+}OBE^{+}$ and $SP^{-}OBE^{+}$ groups with Pearson's Chi-square test (Table 9).

## 3 | RESULTS

### 3.1 | Emotions associated with episodes of SP and OBEs

We found that there was a significant association between the type of episode (SP or OBE) and the predominant emotion associated with the experience (Figure 1; $\chi^2$ [2] = 126.82, $p < 0.0001$). We further examined the expected and obtained values (Table 1), observing that the "Negative" and "Positive" categories differed between conditions, but no difference was found for the "I feel no emotion" one. Specifically, during SP episodes the frequency of negative emotions was higher than during OBE episodes, whereas the frequency of "Positive" emotions was higher during OBE episodes. Moreover, if we performed an analysis removing the "I feel no emotion" category, the results remained unchanged ($\chi^2$ [1] = 126.511, $p < 0.0001$), suggesting that the differences in the frequencies of experienced emotions between groups were not due to this category but to the "Positive" and "Negative" ones. Thus, in accordance with Kliková et al. (2021), during SP episodes more negative emotions and fewer positive emotions are perceived compared with OBE episodes.

### 3.2 | Type of emotions associated with SP and OBE conditions

We compared the frequency of each type of emotion experienced during SP and OBE episodes. We found that during OBE episodes the frequency of "Fear", "Anxiety" and "Terror" was significantly lower in comparison with SP episodes (Table 2). However, we found no significant differences between the frequency of "Sadness", "Anger" and "Disgust" (Table 2).

Furthermore, regarding positive emotions, we found that during OBE episodes, the frequency of "Happiness", "Love", "Peace", "Tranquility", "Hope", "Euphoria" and "Curiosity" was significantly higher in comparison with SP episodes. We found no significant differences between groups for "I feel no emotions" (Table 2).

Thus, despite OBEs being initiated from SP episodes, they could be perceived as more pleasant events than SP.

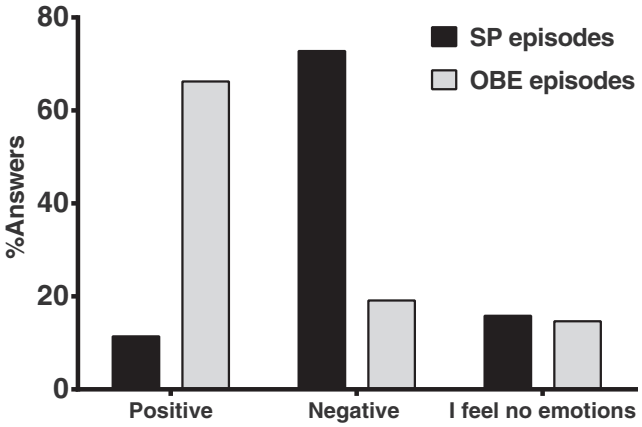


**FIGURE 1** Emotions associated with episodes of sleep paralysis (SP) and out-of-body experiences (OBEs). Percentages of predominant emotions associated with SP and OBE episodes are shown

### 3.3 | Emotions associated with induced and spontaneous OBEs

Given that OBEs can be induced or can occur spontaneously during sleep, we analysed the differences in the frequency of predominant emotions during OBE episodes between both groups. We found that there was a significant association between the type of OBE (induced versus spontaneous) and the predominant emotion associated with the experience (Figure 2; $\chi^2$ [2] = 13.316 $p = 0.001$). We further examined the expected and obtained values (Table 3), observing that the "Negative" and "Positive" categories differed between groups, but no difference was found for the "I feel no emotion" one. Specifically, during induced OBE episodes, the frequency of "Negative" emotions was lower whereas the frequency of "Positive" emotions was higher compared with the $OBE_{spontaneous}$ group. Moreover, if we performed an analysis removing the "I feel no emotion" category, the results remained unchanged ($\chi^2$ [1] = 13.309, $p < 0.001$), suggesting that the differences in the frequency of experienced emotions

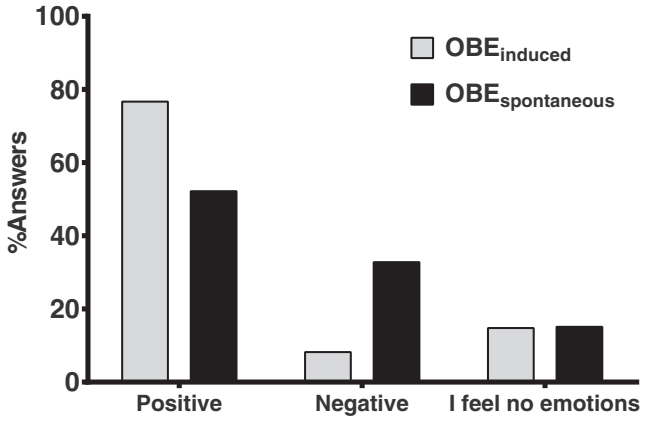


**FIGURE 2** Emotions associated with induced and spontaneous out-of-body experiences (OBEs). Percentages of predominant emotions associated with OBE episodes are shown

between groups are not due to this category but to the "Positive" and "Negative" ones.

### 3.4 | Type of emotions associated with induced and spontaneous OBE episodes

We further analyse the differences between specific emotions experienced during OBE episodes. We found that the $OBE_{induced}$ group had a significantly lower frequency of "Fear" emotion as well as a significantly higher frequency of "Happiness", "Love", "Hope" and "Euphoria" than the $OBE_{spontaneous}$ group. However, we found no significant differences between groups for "Anxiety", "Terror", "Sadness", "Anger", "Disgust", "Peace", "Tranquility", "Curiosity" and "I feel no emotions" (Table 4). Thus, we propose that inducing OBE episodes allowed participants to significantly perceive more positive emotions and less negative ones.

### 3.5 | Previous bodily sensations associated with OBE episodes

We analysed the differences in bodily perceptions experienced previous to the OBE episodes between the induced and spontaneous OBE groups. We found that the $OBE_{induced}$ group recognized significantly better bodily sensations such as "Sounds" and "Vibrations" that occurred before the beginning of the episode. However, no significant difference was found for the "Visual" perceptions (Table 5).

We further analysed bodily perceptions that occurred before the SP episodes. We found no significant differences between groups in any of the bodily perceptions studied (Table 6). Thus, given the fact that both groups can perceive bodily sensations before the occurrence of SP and OBE episodes and that the level of recognition is similar, we propose that what the participants perceived as an "aura" of OBE is the "aura" of SP. Thus, we suggest that the recognition of these bodily sensations before the occurrence of SP is the key to inducing an OBE during sleep.

### 3.6 | Emotions associated with OBE episodes of participants that never perceived SP

Interestingly, we studied a group of participants who reported never having felt SP; however, they had OBE episodes during sleep. Thus, we compared the predominant emotion associated with the experience between the $SP^{-}OBE^{+}$ and the $SP^{+}OBE^{+}$ groups. We found that there was no significant association between the groups and the predominant emotion associated with the experience (Table 7; $\chi^2$ [2] = 3.208, $p$ = 0.201), suggesting that the participants that had OBE episodes without perceiving the paralysis had a similar OBE experience to those who perceived SP.

### 3.7 | Type of emotions associated with OBE episodes of participants that never perceived SP

We further compared the frequency of each type of emotion experienced during OBE episodes between the $SP^{-}OBE^{+}$ and the $SP^{+}OBE^{+}$ groups. We found no significant difference between groups for any of the studied emotions (Table 8). Thus, participants that never experienced SP without an OBE perceived similar emotions during the OBE episodes to the participants who perceived SP.

### 3.8 | Previous bodily sensations associated with OBE episodes in participants that never perceived SP

We found that the $SP^{+}OBE^{+}$ group recognized significantly better bodily sensations of the "Sounds" than the $SP^{-}OBE^{+}$ group. However, they did not differ in the recognition of "Vibrations" or "Visual" perceptions (Table 9). These results suggest that the $SP^{-}OBE^{+}$ participants are perceiving the "aura" of SP, and that they could be having the OBE before the SP episode is perceived. However, participants that perceived the SP episodes can better recognize the "Sounds" as an "aura" of the SP/OBE.

## 4 | DISCUSSION

We here show that SP involves auditory, tactile and/or visual perceptions that precede the event. We proposed that these perceptions can be considered as a SP "aura", and that it could be used to induce OBEs. We further showed that subjects who learned how to induce an OBE perceived more positive emotions during the event such as happiness, love, hope and euphoria, and fewer negative emotions such as fear than subjects who have spontaneous OBEs. Moreover, we observed that some participants had never felt SP; however, they felt the SP "aura" and they have always had the OBE experience

immediately after it. We further corroborate that OBEs are perceived as episodes with more positive emotions and less negative ones than SP without OBEs. Thus, we propose that OBEs can be induced in patients who experienced recurrent SP to reduce the negative symptoms associated with SP episodes.

We first observed that OBEs are perceived as episodes with more positive emotions, such as happiness, love, peace, tranquility, hope, euphoria and curiosity, and less negative ones, such as fear, anxiety and terror, than SP. Similar results were reported by Kliková et al. (2021), who showed that vestibular-motor hallucinations such as OBEs generate more pleasant experiences than other SP hallucinations such as the Intruder or Incubus. Moreover, the authors found positive associations between pleasant episodes of SP and LDs as well as the ability to induce LDs (Kliková et al., 2021). LDs are dreams in which the subject is aware of the dream condition and, when they occur, subjects can act voluntarily due to the presence of agency. In some cases, dreamers can modify the dream environment. For these reasons, LDs have been proposed as a tool to overcome recurrent nightmares (de Macêdo et al., 2019; Holzinger et al., 2020; Mota-Rolim et al., 2020).

Taking this into account, it is important to highlight that although OBEs occur spontaneously during a SP, there are reports of subjects who claim to induce these experiences (Cheyne & Girard, 2009, Kliková et al., 2021).

There are several non-scientific techniques regarding how to induce OBEs. Most of them are quite similar to LD induction. However, one important difference in the OBE induction is the conscious recollection of bodily sensations such as the perceptions of sounds and vibrations that occur before the beginning of an OBE (Bruce, 2009; Ferrandiz, 2021; Raduga, 2011). These bodily sensations are the ones that we here found to be associated with SP and/or OBE initiation. We first showed that people who learned how to induce OBEs perceived significantly more sounds and vibrations before having an SP than people who had spontaneous OBEs. Moreover, induced OBEs experienced more positive emotions and fewer negative ones than spontaneous OBEs. This fact could be related to the ability to control the experience acquired during the OBE training. Furthermore, people that had OBEs during sleep but had never felt SP perceived tactile and visual sensations to the same extent as people with OBEs that felt SP. Thus, we suggest that this OBE "aura" is the same as the SP "aura". Therefore, people who experienced OBEs without ever having perceived SP could be induced or spontaneously have the OBE before being able to perceive SP. That would mean that the recognition of the SP "aura" could be used to induce the OBE without perceiving SP. We suggest that this could be possible due to the disembodiment sensation and perception of the nearby environment from a visuospatial perspective external to the own body, a phenomenon called autoscopy, characteristic of the OBE (Blanke et al., 2005). Thus, instead of perceiving the "paralysed" real body, the subject could be perceiving the "oneiric" environment and the bodily sensations of the "avatar" body, reducing the negative symptoms associated with the SP event.

Even though SP could bring great discomfort to those who experienced it, there is no specific treatment for SP. Sleep hygiene and/or serotonin reuptake inhibitors are recommended, but they are not effective in all cases (Sharpless, 2016). Regarding this, two psychotherapeutic interventions were proposed, the *Cognitive Behavioral Treatment for Isolated Sleep Paralysis* (Sharpless & Doghramji, 2015) and the *Relaxation-Meditation Therapy for Sleep Paralysis* (Jalal, 2016). The first one proposes working over the negative symptoms of SP using blocking strategies, decatastrophizing common thoughts, and imaginary rehearsal therapy. The other comprises meditation and relaxation techniques that may be used during the episodes. Both interventions use sessions that involve psychoeducation and relaxation strategies that later must be applied during SP episodes. However, to date, none of these interventions was validated with clinical trials.

Considering that OBEs are perceived as a positive experience, with more positive emotions than other SP hallucinations, we propose a new clinical approach for the treatment of recurrent SP, based on the recognition of bodily sensations before SP episodes (here defined as the SP "aura") followed by OBE induction, in combinations with psychoeducation about SP and OBEs and relaxation techniques. This novel approach would complement previous ones, but with the major difference that during OBEs, subjects would be able to act voluntarily like during LDs due to the presence of a sense of agency and giving them the possibility to take a more active role during their experiences.

## 5 | LIMITATIONS OF THE STUDY

It is important to consider that one limitation of our study is that in our online survey the questions were not mandatory, for this reason the number of answers for each condition changed between sections.

### AUTHOR CONTRIBUTIONS

NLH and CF made substantial contributions to the conception and design of the work. NLH and CF performed the research. NLH, MG and FTG acquired the data. NLH performed the statistical analyses. NLH and CF wrote the paper. NLH, FTG, MG, PMG and CF contributed to revising it critically. CF contributed in funding acquisition and project administration.

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### CONFLICT OF INTEREST

The authors declare no competing financial interests.

### DATA AVAILABILITY STATEMENT

The data will be available online as soon is the manuscript is accepted for publication. A link to access the data will be provided in the manuscript.

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