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Sensed presence as a correlate of sleep paralysis distress, social anxiety and waking state social imagery

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Abstract

Isolated sleep paralysis (ISP) is a common parasomnia characterized by an inability to move or speak and often accompanied by hallucinations of a sensed presence nearby. Recent research has linked ISP, and sensed presence more particularly, with social anxiety and other psychopathologies. The present study used a large sample of respondents to an internet questionnaire ($N = 193$) to test whether these associations are due to a general personality factor, affect distress, which is implicated in nightmare suffering and hypothesized to involve dysfunctional social imagery processes. A new measure, ISP distress, was examined in relation to features of ISP experiences, to self-reported psychopathological diagnosis, to scores on the Leibowitz Social Anxiety Scale and to scores on a new questionnaire subscale assessing social imagery in a variety of waking states. Three main results were found: (1) ISP experiences are only weakly associated with a prior diagnosis of mental disorder, (2) sensed presence during ISP is associated preferentially with ISP distress, and (3) ISP distress is associated with dysfunctional social imagery. A general predisposition to affective distress may influence the distress associated with ISP experiences; overly passive social imagery may, in turn, be implicated in this affect distress influence.

Keywords: Parasomnias; Sleep paralysis; Sensed presence; Social anxiety; Social imagery; Dreaming; Psychopathology

1. Introduction

Isolated sleep paralysis (ISP), more recently renamed as recurrent ISP, is a common, generally benign, parasomnia characterized by brief episodes of inability to move or speak combined with waking consciousness

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(ICSD-2; American Sleep Disorders Association, 2005). During these episodes of paralysis, there are often intrusions of frightening, dreamlike hallucinations. Episodes frequently occur either at sleep onset, when they are termed hypnagogic, or upon awakening from sleep, when they are termed hypnopompic. ISP is distinguished from narcolepsy which is characterized by cataplexy and excessive daytime sleepiness in addition to sleep paralysis and hypnagogic hallucinations (American Sleep Disorders Association, 2005). Feelings of fear and terror are the most prevalent emotional reactions during ISP experiences (Cheyne, Rueffer, & Newby-Clark, 1999). Variations in ISP prevalence estimates (5–40%) depend upon differences in operational definitions, age of subjects and sociocultural factors (Fukuda, Miyasita, Inugami, & Ishihara, 1987; Kotorii et al., 2001; Ohayon, Guilleminault, & Priest, 1999).

Among the various hypnagogic and hypnopompic hallucinations (HHs) accompanying ISP, the sensed presence is one of the most prevalent and frightening (Cheyne et al., 1999; Hufford, 1982). Sensed presence is a vivid perception-like impression that a sentient being is nearby. The apparent realism of this impression is not based upon real sensory information; nor does it appear to depend upon imagined sensations of seeing, hearing or being touched by the presence. Rather, the phenomenon appears to be hallucinatory activity of a purely spatial nature, akin to dreaming among the congenitally blind (Kerr, Foulkes, & Schmidt, 1982) (see also accompanying commentary, Nielsen, 2007). Pseudosensory HHs, such as footsteps, fleeting shadows or movements of the bed may nonetheless accompany these spatial occurrences and may render them even more concrete and realistic (for detailed case accounts see Hufford, 1982; James, 1890). Sensed presences are often perceived to be watching or showing interest in the individual and/or to possess malevolent intentions. In more extreme cases, the sensed presence may take the form of an assault, with accompanying fictive sensations of pressure on the chest, choking, battering or even rape (Cheyne, 2001; Firestone, 1985; Hufford, 1982).

Sensed presence experiences have also been documented for a wide range of situations and conditions that are independent of sleep paralysis *per se*. For example, we have observed that new mothers frequently experience the vivid presence of their infants in bed during non-ISP nightmares and confusional arousals that are accompanied by, not paralysis, but behavioral enactments (movements, speaking, emoting) of their dreams (Nielsen & Paquette, in press). Sensed presence is also seen in a variety of waking states, e.g., as a component of epileptic auras (Landtblom, 2006) and brain lesions (Brugger, Regard, & Landis, 1996), as a consequence of partial sensory deprivation (Tiller & Persinger, 1994) or as a side-effect of surviving extreme environments (Brugger, Regard, Landis, & Oelz, 1999). Experimental elicitation of sensed presence with transcranial temporal lobe stimulation has been reported in numerous studies (Cook & Persinger, 1997; Persinger & Healey, 2002) but has not withstood recent replication attempts using a double-blind design (Granqvist et al., 2005). It remains unknown what relationships such versions of sensed presence have to the commoner ISP variety; in the present study, such relationships are explored with a new measure of social imagery during wakefulness, a 7-item subscale of the Other Experiences Questionnaire (OEQ7).

1.1. Sensed presence, psychopathology and social anxiety

Several studies have linked ISP to various neurological and psychiatric disorders. For example, ISP is predicted by bipolar disorder, automatic behavior and use of anxiolytic medications (Ohayon et al., 1999). ISP, with or without sensed presence, is also linked to PTSD (Hinton, Pich, Chhean, Pollack, & McNally, 2005; Ohayon & Shapiro, 2000; Yeung, Xu, & Chang, 2005), panic disorder (Yeung et al., 2005), depression symptoms (McNally & Clancy, 2005a, 2005b), anxiety disorder with agoraphobia (Alfonso, 1991), panic disorder (Bell, Dixie-Bell, & Thompson, 1986; Bell, Hildreth, Jenkins, & Carter, 1988; Friedman & Paradis, 2002; Paradis & Friedman, 2005; Yeung et al., 2005), generalized anxiety disorder and social anxiety (Otto et al., 2006; Simard & Nielsen, 2005).

One explanation for the specific link between ISP sensed presence and social anxiety suggested by Simard and Nielsen (2005) was based on the notion that sensed presence during ISP and other states derives from a common mechanism governing production of social imagery. A dysfunction of this imagery mechanism would have ramifications in several spheres of functioning (Nielsen, 2007; Nielsen & Lara-Carrasco, 2007). In the case of social anxiety, social imagery comes into play during anticipatory images of threatening social situations or the vicarious fear of being exposed to others' scrutiny (American Psychiatric Association, 2000) and

of losing control over social situations (Rapee, 1997). The Clark and Wells (1995) cognitive model of social anxiety formalizes this principle in an ''observer'' perspective, defined as perceiving oneself as if from an other's point of view that is consistently distorted in socially anxious persons when they engage in social imagery such as remembering past social encounters or anticipating future feared situations (Hackmann, Clark, & McManus, 2000; Wells, Clark, & Ahmad, 1998). The fears associated with such social images may escalate to include extreme anxiety and the fear of impending death—much like during episodes of ISP with sensed presence. A growing experimental literature supports the notion that social imagery is a central component of social anxiety (Hackmann et al., 2000; Hirsch, Clark, & Mathews, 2006; Hirsch, Clark, Mathews, & Williams, 2003; Hirsch, Mathews, Clark, Williams, & Morrison, 2006; Hirsch, Meynen, & Clark, 2004; Leary, Kowalski, & Campbell, 1988), including evidence that attributes of such imagery are correlated with the Liebowitz Social Anxiety Scale (LSAS) used in the present study (Musa, Kostogianni, & Lepine, 2004).

Social anxiety and ISP sensed presence hallucinations share several other fundamental features, such as a heritable component (Dahlitz & Parkes, 1993; Stein, Jang, & Livesley, 2002) and first appearing in childhood or early adolescence (Beidel, 1998; Fukuda, Ogilvie, & Takeuchi, 1998; Kotorii et al., 2001; Liebowitz, 1999; Wing, Lee, & Chen, 1994). The feeling of ''being observed'' is probably the most apparent similarity. Sensed presence implicates an entity that often evaluates or scrutinizes the individual in some manner or addresses them while they are in a situation of powerlessness (Cheyne, 2001).

In support of this notion Simard and Nielsen (2005) found that subjects who had previously experienced ISP with sensed presence scored higher on a social anxiety measure than did subjects who had experienced ISP without sensed presence or had experienced neither phenomenon. Otto and colleagues (2006) also found an elevated rate of ISP among psychiatric outpatients with a comorbid anxiety disorder (35%) compared to patients without one (11%) although prevalences for specific disorders (panic, social anxiety, generalized anxiety) varied from 16% to 22%. Similarly, a 40% ISP rate was reported for patients with anxiety disorder with agoraphobia relative to healthy controls (20%) (Alfonso, 1991). While it could be argued that ISP prevalence rates of 35–40% fall within the range of estimates for the general population, these rates are nonetheless consistently high. Thus, further evaluation of ISP, sensed presence and social imagery among different pathological populations is needed to determine if ISP is related to a mechanism of social anxiety (dysfunctional social imagery) or more generally to a variety of psychopathologies. In the present study, ISP and sensed presence are evaluated in relation to self-reported psychiatric diagnoses, affect distress and social anxiety, and several measures of social imagery—one reflecting a presumed passiveness of imagery ('being observed' subscale of the LSAS) and one reflecting occurrences of social imagery in the waking state (the OEQ7 subscale).

1.2. ISP, nightmares and general affect distress

Recent advances in the conceptualization of *nightmare distress* may help to clarify the issue of ISP's relationship to psychopathology. ISP sensed presence hallucinations and nightmares share many neurophysiological and phenomenological qualities, such as a likely REM sleep substrate (American Sleep Disorders Association, 2005) and varied dream-like imagery accompanied by strong dysphoric emotions (American Psychiatric Association, 2000; Cheyne et al., 1999). Moreover, nightmare frequency correlates positively with ISP frequency (Kotorii et al., 2001). Like ISP, nightmares are associated with anxiety and other psychopathological symptoms (Levin & Nielsen, 2007; Nielsen, Laberge, Tremblay, Vitaro, & Montplaisir, 2000). However, trait measures of the impact of nightmares on waking life (nightmare distress) are more closely related to psychopathology measures than is nightmare frequency (Belicki, 1992; Blagrove, Farmer, & Williams, 2004; Levin & Fireman, 2002), prompting some authors to suggest that nightmare distress is the manifestation of a more general 'affect distress' personality factor (Blagrove et al., 2004; Levin & Nielsen, 2007). Affect distress is presumably also expressed in disorders involving anxiety and depression and in a variety of other psychopathological conditions. We suggest that a similar distress factor may contribute to frightening ISP experiences among subjects who are high in affect distress—which would be expected among socially anxious subjects but among other pathological populations as well. If so, then ISP distress, rather than ISP frequency, may be a better measure of the phenomenon's clinical importance, as is the case for nightmare distress. Accordingly, in the present study ISP distress is introduced as a dependent measure to complement standard measures of ISP frequency and intensity. ISP distress is a measure of the distress engendered by SP

experiences—with or without accompanying hallucinations such as sensed presence. To further explore relationships between ISP experiences, nightmares and psychopathology, ISP distress is assessed in relation to measures of nightmare distress and self-reported mental disorders, among other measures.

1.3. Research questions

The previous findings suggest that an affect distress personality factor may be associated with ISP sensed presence experiences and anxiety much as nightmare distress is associated with both nightmares and waking psychopathology. While some authors conceptualize these associations as evidence of a common underlying psychiatric condition (e.g., Ohayon et al., 1999), we suggest that they occur only to the extent that affect distress is comorbid with the condition—exactly as suggested for the concept of nightmare distress. Further, we propose that affect distress is determined, in part, by dysfunctional social imagery processes, i.e., imagery in which one's remembered or anticipated social interactions with others are passive and powerless rather than active and effective. Measures of passive social imagery should thus be correlated with ISP distress, but not necessarily with sensed presence frequency or intensity. This suggestion is also consistent with the likelihood that different measures of social imagery dysfunction in the waking state are intercorrelated. Three major research questions exploring these possibilities are described below.

1.3.1. Question 1. Are ISP experiences related to diagnoses of major mental disorders?

Research reviewed above suggests that ISP experiences with sensed presence are associated with several types of mental disorder (e.g., social anxiety, PTSD). However, if ISP is associated specifically with affect distress, then relationships between ISP experiences and specific medical/psychiatric diagnoses may not be clearly apparent.

1.3.2. Question 2. Is ISP sensed presence associated preferentially with affect distress?

In light of the association between nightmare distress and psychopathology, we were interested in determining if a new measure, ISP distress, is also associated with the frequency and intensity of ISP hallucinations—particularly with the experience of sensed presence which is the most distressing aspect of SP hallucinations. A corollary question was to determine if the generalized nature of affect distress will be revealed in relationships between ISP distress and diverse psychopathology measures such as social anxiety and nightmare distress.

1.3.3. Question 3. Is ISP distress associated with dysfunctional social imagery?

Consistent with the suggestion that dysfunctional social imagery (common imagined feelings of being passively observed or scrutinized) characterizes both ISP distress (but not necessarily sensed presence) and social anxiety, we wished to determine (a) if ISP distress (and to a lesser extent sensed presence) will be differentially related to the LSAS subscales that reflect passive vs. active social imagery, i.e., positively related to the "being observed by others" subscale but negatively or not related to the "social interaction," "public speaking" or "eating and drinking in public" subscales; (b) if ISP distress (and to a lesser extent sensed presence) will be correlated with other passive types of social imagery occurring in waking life as measured by the OEQ7 subscale; (c) if validity of the dysfunctional (passive) social imagery construct could be observed in correlations between LSAS and OEQ7 subscale scores, e.g., selective correlations between the LSAS "being observed" and OEQ7 subscale scores.

2. Methods

2.1. Internet questionnaire

A compilation of ISP and social anxiety questionnaires in English and French (see below) was made available on the www.alternativelibraries.org/spq.html website from November 2005 to June 2006. Potential subjects were presented with a consent form and were not allowed to proceed until they checked a box stating that they are 18 years old or older and have read and understood the consent form specifying that participation is voluntary and the results anonymous. Subjects were recruited from the McGill University undergraduate

subject pool selectively and through advertisements on newsgroups and forums pertaining to ISP more generally. In addition, many subjects participated after hearing about the study from someone else or simply as a result of searching for the topic of ISP on the internet.

2.2. Sleep paralysis items

ISP frequency and intensity were measured using selected items from the Waterloo Unusual Sleep Experiences Questionnaire (Cheyne et al., 1999). The first item "*Sometimes when falling asleep or waking from sleep, I experience a brief period during which I am unable to move, even though I am awake and conscious of my surroundings*" was used to screen for ISP. The remaining items included questions on frequency (on 4-point Likert scales, where 0 = never, 1 = occasionally, 2 = frequently and 3 = always) and intensity (on a 7-point Likert scale where 0 = does not apply, 1 = not intense at all and 7 = extremely intense) for sensed presence, visual, auditory, tactile (including pressure and touch) and out-of-body experience (OBE) attributes of the ISP experiences. Subjects were also asked to provide details about each of these attributes. The presence or absence of particular emotions during ISP experiences was assessed by checkbox items for fear, anger, sadness, ecstasy and happiness.

2.3. Sleep paralysis distress

ISP distress was assessed by adapting three items from the Nightmare Distress Questionnaire (Belicki, 1992) to the case of sleep paralysis: (1) *After having had sleep paralysis experiences, do you find you keep thinking about them and have difficulty putting them out of your mind?*; (2) *Are you ever afraid to fall asleep for fear of having a sleep paralysis experience?*; (3) *Do sleep paralysis experiences affect your well-being?* Responses were measured on 5-point Likert scales where 0 = never, 1 = rarely, 2 = sometimes, 3 = often, 4 = always. The total for the three items was taken as the ISP distress score, which had a possible range of 0–12.

2.4. Liebowitz Social Anxiety Scale (LSAS) and subscales

The LSAS total score was used to measure social anxiety while the LSAS subscales were used as exploratory measures of social imagery attributes. The LSAS has good internal consistency and convergent validity in comparison to other commonly-used measures of social anxiety (Heimberg et al., 1999). It consists of 24 items with 4-point Likert-type response scales assessing levels of intensity of fear/anxiety (0 = none, 1 = mild, 2 = moderate, 3 = severe) and frequency of avoidance (0 = never, 1 = occasionally, 2 = often, 3 = usually) of various social situations. The self-report version (LSAS-SR) has psychometric properties similar to the LSAS as used in clinical settings (Oakman, Van, Mancini, & Farvolden, 2003). The validated French version of the LSAS also has good convergent validity both in clinical settings and as a self-report instrument (Yao et al., 1999). We calculated LSAS total score (Cronbach's $\alpha = .97$), and scores on the four LSAS subscales: (1) social interaction (CA = .95), (2) public speaking (CA = .94), (3) eating and drinking in public (CA = .83) and (4) being observed by others (CA = .86). These subscales reflect four types of feared social situations and adequately address the multifactorial nature of social anxiety, including its active and passive aspects (Oakman et al., 2003; Safren et al., 1999).

2.5. Other Experiences Questionnaire 7-item social imagery subscale (OEQ7)

To assess other passive forms of social imagery related to sensed presence that occur in everyday life we used selected items from the Other Experiences Questionnaire (OEQ; Nielsen, unpublished). The OEQ deals with characteristics of spontaneously occurring social imagery and feelings of presence in a variety of sleeping and waking life situations. For the present study, we created a subscale of seven items (OEQ7) dealing specifically with passive experiences of sensed presence during wakefulness (see Appendix A). The frequency of each item was rated on Likert-type scales where 0 = never, 1 = rarely, 2 = sometimes and 3 = often. The questionnaire had acceptable reliability (Cronbach's $\alpha = .76$).

2.6. Other psychopathology measures

Presence or absence of a prior diagnosis of psychiatric condition was assessed with a self-report item asking '*Have you ever been diagnosed with a major medical/psychiatric condition? Yes__ No__*' followed by '*If Yes, please provide details*:_____' and '*What is your current condition?*_____'. Specified diagnoses—and whether they were now symptom-free—were subsequently tallied by an independent judge.

Nightmare distress was assessed on a single item, '*Typically, how distressed are you by your nightmares?*' followed by a 5-point scale with anchors 1 = not at all and 5 = very. This question is admittedly ambiguous in that it does not distinguish distress during nightmares from distress following nightmares and thus constitutes a different operational definition than that provided by the nightmare distress questionnaire (Belicki, 1992).

3. Results

A total of 248 subjects filled out the questionnaires, 193 (77.8%) reported having at least one ISP episode in their lifetime and only these were retained for further analyses. Of these, 65 (33.7%) were male, 114 (59.1%) were female, and 14 (7.3%) did not report their gender. Subject ages ranged from 18 to 87 years (mean = 31.8, $SD = 12.85$).

The distributions of attributes for all ISP HHs are summarized in Table 1. A majority of subjects with ISP (133/193 or 68.9%) reported having experienced sensed presence; this is 53.6% of the total sample.

3.1. Is ISP related to diagnosis of major mental disorders?

Out of the 193 subjects with ISP, 165 (85.5%) reported never having been diagnosed with a psychiatric condition (Table 2). Of the 28 subjects (14.5%) who had, 11 (39.3%) reported that they are now symptom-free. The diagnosed disorders included primarily depression (67.7%) and bipolar disorder (17.9%), but also social anxiety (10.7%), generalized anxiety disorder (10.7%), attention deficit disorder (7.1%), PTSD (7.1%), borderline personality disorder (3.6%) and narcolepsy (3.6%). Nine subjects (32.1% or 4.7% of all ISP subjects) reported more than one diagnosis.

Table 1
Prevalence of hypnagogic/hypnopompic hallucination (HH) attributes in ISP experiences for ISP subjects with sensed presence and ISP subjects with or without sensed presence

HH attribute	Subjects with sensed presence		Subjects with or without sensed presence		Examples
	n	%	*n*	%	
Visual	96	72.2	104	53.9	Suddenly I feel as though a presence, usually a dark shadow figure, is standing over the bed staring down at me or pacing back and forth
Auditory	91	68.4	107	55.4	At times I thought I heard floor boards creaking as if someone were in the house with me although I knew that I had been alone
Pressure	94	70.7	120	62.2	It pushes me down on the bed as if it's straddling me
Touch	69	51.9	74	38.3	Last time, I felt the strong grip of cold hands on my neck
OBE	71	53.4	90	46.6	I have left my body many times, sometimes I have only been as far as the ceiling. I have seen a being and it spoke to me
Fear	118	88.7	159	82.4	I certainly felt in this one experience that I was facing a mortal threat
Total[a]	133	100.0	193	100.0	

[a] Subjects could report more than one HH attribute.

Table 2
Prevalence of self-reported diagnoses of mental illness for subjects with ISP

Diagnosis	*N* subjects reporting diagnosis	% of subjects with diagnosis ($N = 28$)	% of all subjects ($N = 193$)
None	165		85.5
Depression	19	67.9	9.8
Bipolar disorder	5	17.9	2.6
Social anxiety	3	10.7	1.6
Generalized anxiety	3	10.7	1.6
Attention deficit disorder	2	7.1	1.0
PTSD	2	7.1	1.0
Borderline personality disorder	1	3.6	0.5
Narcolepsy	1	3.6	0.5
Total[a]	28	32.1	14.5

[a] Some subjects reported more than one diagnosis.

Independent samples *t*-tests were used to determine whether individuals with ISP experiences and who had or had not received a diagnosis differed on ISP distress or on the following attributes (for both frequency and intensity): ISP, sensed presence, visual imagery, tactile imagery, feelings of being physically touched, feelings of pressure on the chest or other body part, and OBE hallucinations. Of the 15 comparisons, only one difference was found for general intensity of ISP experiences ($t_{191} = -2.30$; $p < .003$); subjects who had received a diagnosis scored slightly higher ($M = 5.86 \pm 1.21$) than those who had not ($M = 5.02 \pm 1.14$). A similar set of comparisons was conducted for subjects who had experienced ISP sensed presence and who had or had not received a diagnosis. Of 15 comparisons, a significant difference was found only for intensity of being physically touched ($t_{131} = -2.05$; $p < .042$) and trends were found for frequency of being physically touched ($t_{131} = -1.92$; $p < .057$) and for intensity ($t_{131} = 1.82$; $p < .072$) and frequency ($t_{131} = 1.97$; $p < .051$) of OBE experiences. Subjects with a prior diagnosis reported both higher intensity ($M = 3.94 \pm 2.99$) and frequency ($M = 1.24 \pm 1.03$) of being physically touched than did subjects without a diagnosis ($M = 2.41 \pm 2.85$ and 0.77 ± 0.93, respectively), but *lower* intensity ($M = 1.53 \pm 2.85$) and frequency ($M = 0.41 \pm 0.80$) of OBE experiences than did the comparison subjects ($M = 2.86 \pm 2.82$ and 0.86 ± 0.89, respectively). Adjustment of these *p*-values with Bonferroni corrections for multiple comparisons eliminated all of these differences.

3.2. Is ISP sensed presence associated preferentially with affect distress?

Correlations between all of the principal measures used to examine this research question appear in Tables 3 and 4. It can be seen that, while ISP distress correlated positively with all ISP frequency and intensity measures; a preferential association with sensed presence is suggested by the fact that the two strongest correlations were between ISP distress and ISP sensed presence frequency ($r = .431$, $p < .001$) and intensity ($r = .413$, $p < .001$) as well as by the fact that a multiple regression analysis with ISP distress as the dependent measure, and frequency and intensity of the ISP attributes (sensed presence, visual, auditory, pressure, touch, OBEs) as independent variables yielded a 3-factor solution ($F_{3,189} = 23.120$, $p < .00001$, $R = .518$, 26% of explained variance) with the most sensitive predictor being frequency of ISP sensed presence ($t = 4.510$, $p < .00001$, $B = .914$, $\beta = .307$, partial $r = .312$, 18.5% of variance). Two other significant factors, frequency of ISP "pressure on the chest or other parts of the body" ($t = 3.369$, $p < .001$, $B = .691$, $\beta = .233$, $r = .238$, 6.1%) and intensity of ISP OBEs ($t = 2.389$, $p < .018$, $B = .190$, $\beta = .156$, $r = .171$, 2.2% variance), each accounted for much less of the explained variance. Affect distress is thus associated primarily with sensed presence but also with two other principal ISP types identified in previous studies studies (Cheyne & Girard, 2007).

The second part of this question, to determine if ISP distress is associated with social anxiety and nightmare distress, was addressed by several findings. First, an association was suggested by a significant, albeit weak, positive correlation between ISP distress and the LSAS social anxiety total score ($r = .191$, $p < .013$). Post-hoc correlations between ISP distress and the four LSAS subscale scores revealed all positive correlations (see Table 4), but only the "being observed by others" ($r = .259$, $p < .0007$) and "speaking in public"

Table 3
Pearson correlations between specific attributes of ISP experiences and principal measures of anxiety (ISP Distress, LSAS total) and dysfunctional imagery (OEQ7, LSAS subscales)

ISP feature	ISP distress	LSAS	OEQ7	LSAS subscales			
				Social interaction	Public speaking	Eating and drinking	Being observed
ISP							
Frequency	.398**	.174*	.104	.171*	.133	.154*	.149
Intensity	.371**	.033	.094	.030	−.036	.120	.082
Sensed presence							
Frequency	.431**	−.130	.250**	−.140	−.085	−.092	−.109
Intensity	.413**	−.019	.251**	−.014	.004	−.046	−.041
Visual HHs							
Frequency	.220**	−.134	.194**	−.107	−.150	−.040	−.148
Intensity	.300**	−.092	.179*	−.069	−.116	−.026	−.100
Feelings of pressure							
Frequency	.396**	.003	.206**	−.024	−.024	.073	.087
Intensity	.349**	.007	.199**	−.023	−.015	.075	.090
OBEs							
Frequency	.206**	.073	.167*	.054	.006	.132	.152*
Intensity	.283**	.072	.214**	.041	.010	.201**	.153*
Being touched							
Frequency	.318**	.019	.138	−.029	.024	.062	.114
Intensity	.275**	.024	.139	−.022	.043	.087	.086
Auditory HHs							
Frequency	.267**	−.003	.220**	.004	−.024	.030	−.005
Intensity	.278**	−.018	.161*	−.001	−.054	−.002	−.012

N for ISP = 193; N for LSAS scores = 169.
* $p < .05$ (2-tailed).
** $p < .01$ (2-tailed).

Table 4
Pearson correlations among principal distress and imagery measures

	NM distress	OEQ7	LSAS subscales				
			Total score	Social interaction (SI)	Public speaking (PS)	Eating and drinking (ED)	Being observed (BO)
ISP distress	.541**	.313**	.191*	.173*	.122	.130	.259**
NM distress	—	.226**	.266**	.242**	.233**	.147	.294**
OEQ7		—	.188*	.129	.158*	.187*	.286**
LSAS total score			—	.964**	.872**	.731**	.833**
LSAS-SI				—	.763**	.660**	.735**
LSAS-PS					—	.565**	.635**
LSAS-ED						—	.636**
LSAS-BO							—

* $p < .05$ (2-tailed).
** $p < .01$ (2-tailed).

($r = .173$, $p < .025$) scores were significant. A multiple regression analysis using ISP distress as the dependent variable and the four LSAS subscale scores as independent variables revealed a 1-factor solution ($F_{1,167} = 12.046$, $p < .0007$, $B = .144$, $\beta = .259$, $r = .259$, 6.7% explained variance) in which only the "being observed by others" subscale was predictive. A further regression analysis with the LSAS "being observed" subscale and the LSAS total (minus "being observed") as predictor variables and ISP distress as dependent measure produced exactly the same 1-factor solution. Note also that the correlation between ISP distress and LSAS total score (minus "being observed") was reduced somewhat but still statistically significant

($r = .166$, $p < .031$). An association between ISP distress and nightmare distress was indicated by a Pearson correlation between the two measures that was positive and highly significant ($r = .541$, $p < .00001$; see Table 4). Validation of both of these variables as measures of affect distress was also indicated by significant positive correlations between the LSAS social anxiety score and both ISP distress (see above) and nightmare distress ($r = .266$, $p < .0005$; see Table 4) as well as by the fact that a similar gender difference was observed for both ISP distress ($t_{177} = 3.314$, $p < .001$) and nightmare distress ($t_{176} = 4.964$, $p < .00002$), i.e., women scored higher than men on both ISP distress ($M = 5.13 \pm 3.47$ vs. 3.42 ± 3.08) and nightmare distress ($M = 2.21 \pm 1.27$ vs. 1.28 ± 1.10). Finally, ISP distress was found to be significantly higher for those subjects who reported the attribute of fear during their ISP experiences ($N = 162$; $M = 4.93 \pm 3.41$) than that for those who reported no fear ($N = 31$; $M = 2.32 \pm 2.47$; $t_{191} = 5.04$, $p < .00006$).

3.3. Is ISP distress associated with dysfunctional social imagery?

Having established ISP distress to be preferentially associated with sensed presence, we tested whether two proposed measures of social imagery dysfunction are more strongly related to ISP distress or to sensed presence and whether the two imagery measures are intercorrelated. For the first set of measures, the LSAS subscale scores, the multiple regression analysis from research question 2 was repeated twice using sensed presence frequency and sensed presence intensity as separate dependent measures and LSAS subscale scores as predictor variables in each case. In contrast to the highly significant findings for the previous test with ISP distress, no correlations with the "being observed by others" subscale or with any other LSAS subscales were found for these two sensed presence measures.

For the second measure, the OEQ7 subscale, the OEQ7 score and sensed presence frequency were entered as predictor variables and ISP distress as dependent measure into a multiple regression analysis. This revealed a 2-factor solution ($F_{1,190} = 28.443$, $p < .00001$, $R = .480$, 23% explained variance) with sensed presence frequency as the 1st predictor ($F_{1,191} = 43.474$, $B = 1.119$, $\beta = .376$, $R = .431$, $p < .00001$) and OEQ7 as an independent 2nd predictor ($F_{\Delta,1,190} = 11.111$, $B = .177$, $\beta = .219$, $R_\Delta = .049$, $p < .001$). Thus, the OEQ7 imagery score was related to ISP distress despite the latter's robust relationship with sensed presence. OEQ7 correlations with all variables appear in Tables 3 and 4.

Finally, correlations between the LSAS and OEQ7 subscale scores revealed concurrent validity of the dysfunctional social imagery construct in the form of a positive relationship between OEQ7 and the "being observed by others" subscale ($r = .286$, $p < .0002$); more moderate relationships were found with the "public speaking" ($r = .158$, $p < .040$) and the "eating and drinking in public" ($r = .187$, $p < .015$) subscales. A multiple regression analysis with OEQ7 as dependent measure and LSAS subscales as predictors revealed that the "being observed by others" subscale was the only predictor of OEQ7 ($F_{1,167} = 14.870$, $p < .0002$, $B = .201$, $\beta = .286$, $R = .286$, 8% explained variance).

4. Discussion

The prevalence of sensed presence that we observed for ISP subjects (68.9%) is consistent with percentages reported for internet samples (67.8%; Cheyne, 2001), university students (63%; Spanos, DuBreuil, McNulty, Pires, & Burgess, 1995) and other regionally-targeted groups (60%; Hufford, 1995). On the other hand, our estimated prevalence of 53.6% for ISP with or without sensed presence is higher than expected from previous research (21%; Spanos et al., 1995; 28.4%; Cheyne et al., 1999; 43%; Fukuda et al., 1987; 39.6%; Kotorii et al., 2001; 34%; Arikawa, Templer, Brown, Cannon, & Thomas-Dodson, 1999). The latter discrepancies are likely due to the different recruitment strategies used for our online questionnaires and the other studies. We recruited individuals with ISP by sending notices to online groups concerned with such experiences. However, we cannot rule out the possibility that sensed presence experiences are underreported in conventional research (see Section 4.1).

The consistency of our sample characteristics with those of other studies suggest that they are sufficiently representative of ISP experiences to assess our three research questions. These assessments, in fact, support our expectations about possible relations between affect distress, sensed presence and social imagery in a number of ways.

First, the absence of any strong association between ISP (with or without sensed presence) and self-reported diagnoses suggests that there may be no general relationship between ISP and major psychopathology. Among subjects who had experienced ISP there was a 9.8% lifetime prevalence of a diagnosis of depression, which is within the range of the general population for major depressive disorder. The prevalence rate for a diagnosis of social anxiety (1.6%) was even less than for the general population (American Psychiatric Association, 2000). For subjects who had reported both ISP and sensed presence, psychopathology estimates were even lower. Finally, comparisons between groups of subjects who had and had not had prior diagnoses resulted in few and inconsistent differences that did not withstand Type I error correction. Thus, these findings together suggest that ISP is unrelated to this self-report measure of psychopathology and are not consistent with relationships between ISP and psychopathology reported in prior studies. The discrepancy may reflect our use of a non-standard measure of psychopathology or the possibility that the low proportions of subjects reporting psychopathological diagnoses led to Type II errors. It may also mean that ISP is associated with a more general psychopathological factor such as affect distress, which is not specific to any diagnosis. In the case of nightmares, it has been suggested that a variety of psychopathological symptoms and personality attributes are associated with affect distress (Levin & Nielsen, 2007).

In fact, the validity of our ISP distress measure is supported by the strong correlations between this new measure and existing, validated distress variables, specifically, between ISP distress and (a) the LSAS—a widely-used measure of social anxiety, and (b) nightmare distress (Belicki, 1992; Blagrove et al., 2004).

Second, the fact that our ISP distress measure was found to correlate positively with all three previously identified (Cheyne et al., 1999) types of ISP experience, i.e., sensed presence (*Intruder*), pressure on the chest or other parts of the body (*Incubus*), and out of body experiences or OBEs (*Unusual Bodily Experiences*), demonstrates that the notion of affect distress is as pertinent to the spectrum of ISP experiences as it is to other pathological symptoms such as nightmares. However, its association with sensed presence is particularly strong.

Third, clues to a possible mechanism by which affect distress is produced were found in the pattern of correlations between ISP distress and other measures that we interpret to reflect dysfunctional social imagery processes. Correlations between ISP distress and the LSAS "being observed by others" and OEQ7 imagery subscales suggest that an overly passive type of social imagery may be at play in the production of ISP distress. A positive correlation between the two imagery subscales further validates this concept.

The results thus provide correlational evidence consistent with our suggestion that ISP distress—an expression of a more general affect distress personality trait—is related to specific biases or tendencies in social imagery generation. In the waking state, such imagery biases contribute to a variety of distressing experiences such as the impression that a deceased person is present, that ghosts or apparitions have appeared, that there is an intruder in the house or that one feels followed or observed by someone else. In the ISP state, such imagery biases contribute to distressing ISP experiences and, especially, to the production of associated sensed presence hallucinations.

From a more general perspective, our results can be construed to be consistent with findings within interpersonal psychology and attachment research suggesting that sense of self is dependent not only on the types of social interactions one has with others (Alden & Taylor, 2004) but on the imagined interactions one has while remembering past events or anticipating future encounters (Edwards, Honeycutt, & Zagacki, 1988; Hackmann et al., 2000; Honeycutt, Edwards, & Zagacki, 1989; Wells & Papageorgiou, 1999). The socially anxious have a tendency to imagine that others view them in a negative light (Leary et al., 1988) as well as to take on an "observer" perspective, i.e., to relate to social situations as if from another person's point of view (Hackmann et al., 2000; Hackmann, Surawy, & Clark, 1998). Further, an anxious/ambivalent attachment style is associated with having discrepant imagined interactions with a significant other whereas secure attachment is associated with imagined interactions that are not discrepant from real encounters (Honeycutt, 1998). The pattern of social imagery bias that we observed in the present study (being observed by others) parallels these findings in implicating social imagery that is discrepant from reality and depicts the self in an excessively passive aspect. This raises the possibility that frightening ISP sensed presence experiences—much like memories of real, adverse, social experiences—may contribute to maintenance of an individual's negative social imagery biases (cf. Hackmann et al., 2000) and that, conversely, cognitive-behavioral treatment of ISP experiences could help alleviate the more general social imagery dysfunction.

The fact that sensed presence in our study was not associated with social anxiety whereas other measures of imagery were suggests that sensed presence per se is not a direct expression of the hypothesized social imagery dysfunction that we propose underlies affect distress. Yet, since sensed presence is nevertheless so robustly correlated with affect distress, it may well be that it manifests independent of ISP but can become enmeshed in affect distress production in specific conditions among susceptible individuals, e.g., socially anxious individuals undergoing stress. This situation may be completely analogous to the relationship between dream characters and nightmares. During normal dreaming, characters are routinely represented and not necessarily linked with anxiety; however, when nightmares occur (in susceptible individuals under periods of stress) these characters frequently take on a frightening aspect that might well lead to distress.

It may be surprising that LSAS being observed scores were not correlated with other components of ISP experiences such as feelings of pressure or being touched whereas they were associated with OBE experiences. This may indicate that illusions of proximal contact such as pressure or touch are qualitatively distinct from more distal 'observation' type illusions but that OBEs are not. In fact, OBEs by definition require the impression of an altered visuo-spatial perspective (Blanke & Arzy, 2005) and subjects who have had OBEs are more likely to use the observer perspective in the recall of dreams (Blackmore, 1987).

Clearly, additional studies of relationships between sensed presence, psychopathology and potential mediating variables such as trait anxiety and imagery perspective are needed. More precise assessments of affect distress both during and after ISP experiences may also help to clarify the nature of the underlying imagery deficit.

4.1. Validity of Internet questionnaires

Similar to prior studies (e.g., Cheyne et al., 1999; Zavada, Gordijn, Beersma, Daan, & Roenneberg, 2005) and in line with the growing use of internet questionnaires to study sensitive personal information (McCabe, 2004; Ross, Mansson, Daneback, Cooper, & Tikkanen, 2005), our internet questionnaire proved useful for collecting detailed information about ISP experiences in a relatively short period of time. One advantage of such an online instrument is its total anonymity. Because ISP episodes are often referred to as spiritual or mystical, and because they often involve intense and realistic hallucinations, in conventional research settings individuals may be reluctant to disclose details of their episodes out of fear of being judged or categorized (Hufford, 1982, 2005; see review in Rhodes, Bowie, & Hergenrather, 2003). Online questionnaires also allow respondents to participate without interacting directly with a researcher and therefore to provide more detailed reports at their own pace. Absence of an experimenter is also a critical enabling condition for anxious individuals—especially those who are socially anxious.

A growing body of research suggests that internet samples constitute valid sources of personal information that may be superior in some respects to other sampling methodologies. Research suggests that people share information and experiences electronically that they might not disclose using traditional survey methodologies; further, online survey methods may reduce social desirability and yea-saying biases (Im et al., 2005; Knapp, Seeley, & St Lawrence, 2004). Furthermore, on-line surveys have been successfully validated against paper-and-pencil tests (McCabe, 2004), mail surveys (Ross et al., 2005) and national population studies (Rhodes et al., 2003). Other advantages include reaching hidden populations, reducing error and bias, and increased participation due to the increased control over when the questionnaires are completed and the fact that peer pressure to participate is reduced (Ross et al., 2005).

There are, however, problems related to the use of internet questionnaires. For instance, there is no guarantee that all items were understood correctly since subjects had no opportunity to resolve issues with an experimenter. There is also a clear self-selection bias toward younger respondents and more highly educated respondents. It is also impossible to determine whether subjects refer to a single ISP episode or to several separate ISP episodes when they respond to the different categories of HH features on the questionnaire. A greater level of precision would require prospective measures (see Cheyne & Girard, 2007) or use of a sleep laboratory. The relationship between OEQ7 subscale items and ISP experiences is also problematic. Although

it is clear that OEQ7 deals with occurrences of sensed presence in waking life, some items (e.g., an intruder in the house) could be interpreted as referring to ISP sensed presence since during ISP one usually feels wide awake. However, the fact that OEQ7 was more strongly associated with social anxiety measures than with ISP sensed presence does not support this interpretation.

Appendix A

Other Experiences Questionnaire: 7-item social imagery subscale (OEQ7)

The following questions concern some experiences that you may have had at some point in your life. Please use the scale at right to indicate how frequently you have experienced each one.

2.	Do you now have some kind of imaginary companion?	Never____Rarely____Sometimes____Often____
8.	When you are alone at home and you hear odd noises, do you ever have a strong feeling that that there is an intruder in your home?	Never____Rarely____Sometimes____Often____
10.	Have you ever had a vivid feeling that someone was standing right behind you or beside you only to find that nobody was there?	Never____Rarely____Sometimes____Often____
11.	Have you ever felt strongly that someone was watching you when it was probably not the case?	Never____Rarely____Sometimes____Often____
12.	Have you ever felt strongly that someone was following you when it was probably not the case?	Never____Rarely____Sometimes____Often____
14.	Have you strongly felt the presence of a deceased person in the room with you when you were wide awake?	Never____Rarely____Sometimes____Often____
16.	Have you ever seen a ghost or an apparition when wide awake?	Never____Rarely____Sometimes____Often____

Item and subscale means and standard deviations

	OEQ7 sum	Item 2	Item 8	Item 10	Item 11	Item 12	Item 14	Item 16
Mean	6.95	0.28	1.3	1.59	1.51	1.06	0.83	0.48
SD	4.22	0.71	0.95	1.05	1.03	0.94	1.01	0.87

Item and subscale correlations

	Item 2	Item 8	Item 10	Item 11	Item 12	Item 14	Item 16
OEQ7 sum	.345**	.480**	.813**	.796**	.734**	.652**	.543**
Item 2	—	.117	.219**	.146*	.125	.105	.060
Item 8		—	.262**	.334**	.392**	.021	−.003
Item 10			—	.686**	.528**	.497**	.306**
Item 11				—	.584**	.381**	.280**
Item 12					—	.307**	.265**
Item 14						—	.482**

*$p < .05$ (2-tailed), **$p < .01$ (2-tailed).

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