Unusual Sleep Experiences and Mental Health: Investigating Psychological Correlates and Impacts in the General Population

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Abstract

Sleep-related hallucinations, such as hypnagogic and hypnopompic experiences, have often been overlooked despite their significant psychological effects. This thesis examines the psychological links of unusual sleep experiences, both with and without sleep paralysis, through a systematic review and an empirical study. The review synthesised findings from 18 studies investigating the connection between sleep paralysis and mental health, highlighting strong associations with trauma, anxiety, dissociation, and stress, especially among individuals in clinical settings and those exposed to trauma. However, methodological challenges, including the increasing reliance on cross-sectional designs and the lack of standardised assessments, hinder causal interpretation tools.

To build on these findings, an empirical study surveyed 84 participants from the general population to investigate how frequently unusual sleep experiences occur, the associated distress, and their links to psychological and sleep-related variables. The results revealed that 94% of participants had reported such experiences at some point in their lives, with 44% experiencing them in the last month. Importantly, over half of the recent occurrences happened without the presence of sleep paralysis. Regression analyses demonstrated that insomnia and stress were significantly associated with frequency, while anxiety and substance use were associated with the level of distress. Additionally, hallucination-proneness and dissociation appeared as contributing factors.

These findings collectively suggest a dimensional and transdiagnostic perspective on sleep-related hallucinations, indicating the influence of both trait vulnerabilities and situational stressors. The thesis highlights the need for enhanced clinical awareness of these experiences and calls for longitudinal studies to investigate causal mechanisms and intervention strategies. Incorporating sleep assessments into psychological practice may help in identifying and assisting individuals who are distressed by these phenomena.

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Chapter 1

Introduction

Word count: 553 words

Introduction

Sleep is a fundamental biological process essential for physical and mental well-being. It is characterised by distinct stages, including non-rapid eye movement (NREM) and rapid eye movement (REM) sleep, each playing a crucial role in cognitive functioning, emotional regulation, and overall restoration. The amount and quality of sleep required for optimal health vary among individuals, but guidelines suggest that adults should aim for seven to nine hours per night (National Health Service, 2021). When sleep is disrupted in either quantity or quality, it can have serious consequences for both physical and psychological health. While conditions such as insomnia and nightmares are widely recognised as contributors to mental health problems, other parasomnias, such as sleep paralysis (SP), remain underexplored despite their strong association with psychiatric disorders.

Approximately one-third of UK adults experience sleep difficulties, with 6–10% meeting the diagnostic criteria for insomnia disorder (Wilson et al., 2019). Sleep disturbances are known to have a bidirectional relationship with mental health, poor sleep exacerbates psychiatric symptoms, while mental health conditions negatively affect sleep quality (Hertenstein et al., 2023). Research has predominantly focused on common sleep-related phenomena, such as nightmares, which are particularly prevalent in psychiatric populations (Rek et al., 2017). However, SP, a transient REM-related parasomnia that involves temporary immobility during sleep-wake transitions, has received comparatively less attention despite its significant psychological impact (Sharpless & Barber, 2011).

SP is characterised by an inability to move or speak during transitions between wakefulness and sleep, often accompanied by vivid and distressing hallucinations (Rauf, et al., 2023; Sharpless., 2010). Although SP is commonly associated with neurological conditions such as narcolepsy, it also occurs in the general population, with an estimated lifetime prevalence of 7.6% (Sharpless & Barber, 2011). Notably, its prevalence is significantly higher, around 31.9% in psychiatric populations, suggesting a strong yet underexamined link between SP and mental health disorders (Denis et al., 2018). While occasional episodes of SP are not inherently pathological,

frequent and distressing occurrences have been associated with post-traumatic stress disorder (PTSD), depression, and psychosis (Denis et al., 2018; Jalal et al., 2021).

Despite this, SP remains under-recognised in both clinical and research settings. Unlike insomnia and other well-studied sleep disorders, SP is rarely assessed in mental health services, and its role in psychiatric conditions is not well understood. Given the established bidirectional relationship between sleep disturbances and mental health (Hertenstein et al., 2023), further research is needed to understand the mechanisms linking SP to psychopathology. By addressing this gap, this study aims to contribute to a more comprehensive understanding of sleep disturbances in mental health, emphasising the need for improved recognition and assessment of SP in clinical practice.

In light of the above, this thesis explores the psychological factors associated with unusual sleep experiences, specifically SP and hypnagogic or hypnopompic hallucinations. A deeper understanding of SP and its psychological correlates is first developed through a systematic review and narrative synthesis of existing literature. This is followed by an empirical paper, which uses an online survey to investigate the psychological predictors of frequency and distress associated with unusual sleep experiences in a general population sample. Together, these complementary studies aim to enhance understanding of how emotional vulnerability, stress, and perceptual sensitivity contribute to the occurrence and impact of sleep-related hallucinations, with implications for psychological theory, clinical assessment, and future research.

Chapter 2

Systematic Review

Sleep Paralysis and Mental Health:

A Systematic Review

This paper has been developed for submission to Psychiatry Research.

Author guidelines are outlined in Appendix A.

Word count limit: 5,000 words

Word count: 4,646 words

Sleep Paralysis and Mental Health:

A Systematic Review

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Abstract

Sleep paralysis (SP) is a transient parasomnia marked by immobility and inability to speak during sleep-wake transitions, often with vivid hallucinations. Despite supernatural interpretations, research links SP to REM sleep disturbances and psychological vulnerabilities. This review examines SP prevalence and psychological correlates in those with mental health disorders, focusing on anxiety, depression, and post-traumatic stress disorder (PTSD). A search of PsycINFO and MEDLINE yielded 1471 results. After applying inclusion criteria, 18 studies were included in a narrative synthesis. Data extracted for analysis included study characteristics and key findings. Most studies found that SP increased psychological distress, with clinical populations reporting more frequent and intense episodes than non-clinical ones. PTSD symptoms show strong associations, particularly in trauma-exposed individuals, while anxiety and depression are also significant correlates. Potential mechanisms include hyperarousal, REM sleep disruptions, dissociative experiences, and maladaptive cognitive appraisals. While limitations such as cross-sectional designs and diverse assessment methods limit causal conclusions. The review emphasises the need for longitudinal designs and standardised measures to clarify directionality and guide interventions. Increasing SP awareness in clinical settings and culturally sensitive education may alleviate distress and improve care for those affected individuals.

Keywords:

Parasomnia

Sleep paralysis

Sleep disorder

Hypnogogic hallucinations

Hypnopompic hallucinations

Hallucinations

Mental health

1. Introduction

Sleep paralysis (SP) is a parasomnia associated with rapid eye movement (REM) sleep, characterised by a temporary inability to move or speak during transitions between sleep and wakefulness. These episodes are often accompanied by hypnagogic or hypnopompic hallucinations, which may include multisensory phenomena, such as visual, auditory, tactile, and proprioceptive experiences. While SP has traditionally been interpreted through supernatural and cultural frameworks, including demonic visitation, spirits, or witchcraft, these interpretations vary across cultural contexts and continue to influence how individuals understand their experiences (Hinton et al., 2005; Jalal & Hinton, 2015). The literature suggests that cultural background, stressors, and beliefs can shape both the content and emotional impact of SP episodes (Denis et al., 2018).

Scientific explanations for SP point to a variety of underlying mechanisms, including REM sleep intrusion into wakefulness, sleep-state dissociation, mirror neuron dysfunction, and perceptual anomalies that resemble psychotic-like experiences (Castelnovo et al., 2018; Foffani, 2023). SP also occurs in the context of neurological conditions such as narcolepsy and Parkinson's disease, where it contributes to broader patterns of sleep–wake dysregulation and neurochemical imbalance (Ohayon & Pakpour, 2022; Plazzi et al., 2011). However, the present review focuses specifically on SP in the context of mental health and excludes studies where SP is primarily attributable to a neurological condition disorder.

The lifetime prevalence of SP in the general population is estimated to be around 7.6%, although reported rates vary depending on sample characteristics and measurement methods (Denis et al., 2018; Ohayon & Pakpour, 2022). Higher rates have been observed among students (28.3%) and individuals with psychiatric diagnoses (31.9%) (Sharpless & Barber, 2011),particularly those with anxiety, mood, or psychotic disorders (Denis et al., 2018; Rauf, Sharpless, et al., 2023). However, a binary distinction between 'clinical' and 'non-clinical' populations may be overly simplistic. Subclinical anxiety, elevated stress levels, irregular sleep patterns, and heightened arousal have also been associated with SP, indicating that

susceptibility exists along a continuum rather than in discrete categories (Alderson-Day et al., 2022; João et al., 2018).

SP has also been linked to psychological factors such as trauma exposure, post-traumatic stress disorder (PTSD), anxiety sensitivity, and dissociative experiences (Bless et al., 2021; Denis et al., 2018), many of which contribute to the onset or persistence of broader mental health difficulties. Psychological vulnerabilities, irregular sleep, and heightened arousal states have all been identified as contributing factors, indicating overlapping mechanisms that warrant further investigation (Rauf et al., 2023). This supports the view of SP as a transdiagnostic phenomenon that occurs across a spectrum of psychological functioning. Rather than being confined to psychiatric populations or regarded as a rare sleep disturbance among otherwise healthy individuals, SP may reflect the interplay of disrupted sleep regulation and emotional dysregulation.

Recent research has highlighted phenomenological similarities between SP-related hallucinations and those found in psychosis, including auditory verbal hallucinations, felt presence experiences, and out-of-body phenomena (Alderson-Day et al., 2022; Foffani, 2023). These overlaps have led to suggestions that SP may provide a model for studying transient hallucinatory states within a broader neurocognitive framework (Cheyne & Pennycook, 2013; Waters et al., 2016). Nonetheless, evidence suggests that SP-related hallucinations differ from those in psychosis in terms of their frequency, duration, context, and emotional intensity (Bless et al., 2021; Foffani, 2023). The nature of the relationship between SP and psychiatric symptomatology remains complex and not yet fully understood.

While research interest in SP has grown in recent years, several gaps remain. It remains unclear whether the elevated rates of SP in clinical samples are due solely to comorbid sleep disturbances or whether mental health symptoms themselves act as moderators or mediators. Furthermore, few studies have investigated differences in SP phenomenology across diagnostic groups or examined the directionality of associations between psychological distress, sleep quality, and SP frequency.

This systematic review aims to synthesise current evidence on the prevalence, psychological correlates, and potential mechanisms linking SP and mental health conditions. In doing so, it seeks to clarify whether SP represents a comorbid symptom, a marker of psychological vulnerability, or a distinct phenomenon with clinical significance. The review further aims to inform future research and guide the development of targeted interventions that address sleep-related experiences in mental health contexts.

Research Question: What is the relationship between sleep paralysis and mental health?

2. Methods

2.1 Study registration

The review was pre-registered on the International Prospective Register of Systematic Reviews (PROSPERO) on 16th July 2024 (registration number: CRD42024554682). The review methodology follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). A completed PRISMA checklist is available in Appendix B

2.2 Inclusion and exclusion criteria

Inclusion criteria

To ensure the relevance and methodological consistency of the included studies, studies were included if they:

1. Investigated SP in relation to mental health factors or diagnoses
2. Were published in full-text format and in the English language.
3. Utilised validated measures or structured interviews to assess mental health correlates of SP.
4. Examined SP independently of neurological conditions, such as narcolepsy.

Exclusion criteria

Studies were excluded if they:

1. Focused primarily on neurological conditions known to cause SP (e.g., narcolepsy, Parkinson's disease).
2. Were published in languages other than English.
3. Did not employ standardised or validated psychological assessments.
4. Exclusively explored cultural or lifestyle factors without conducting in-depth psychological analysis.
5. Had not been peer-reviewed
6. Studies that used unstructured or narrative assessments of sleep paralysis

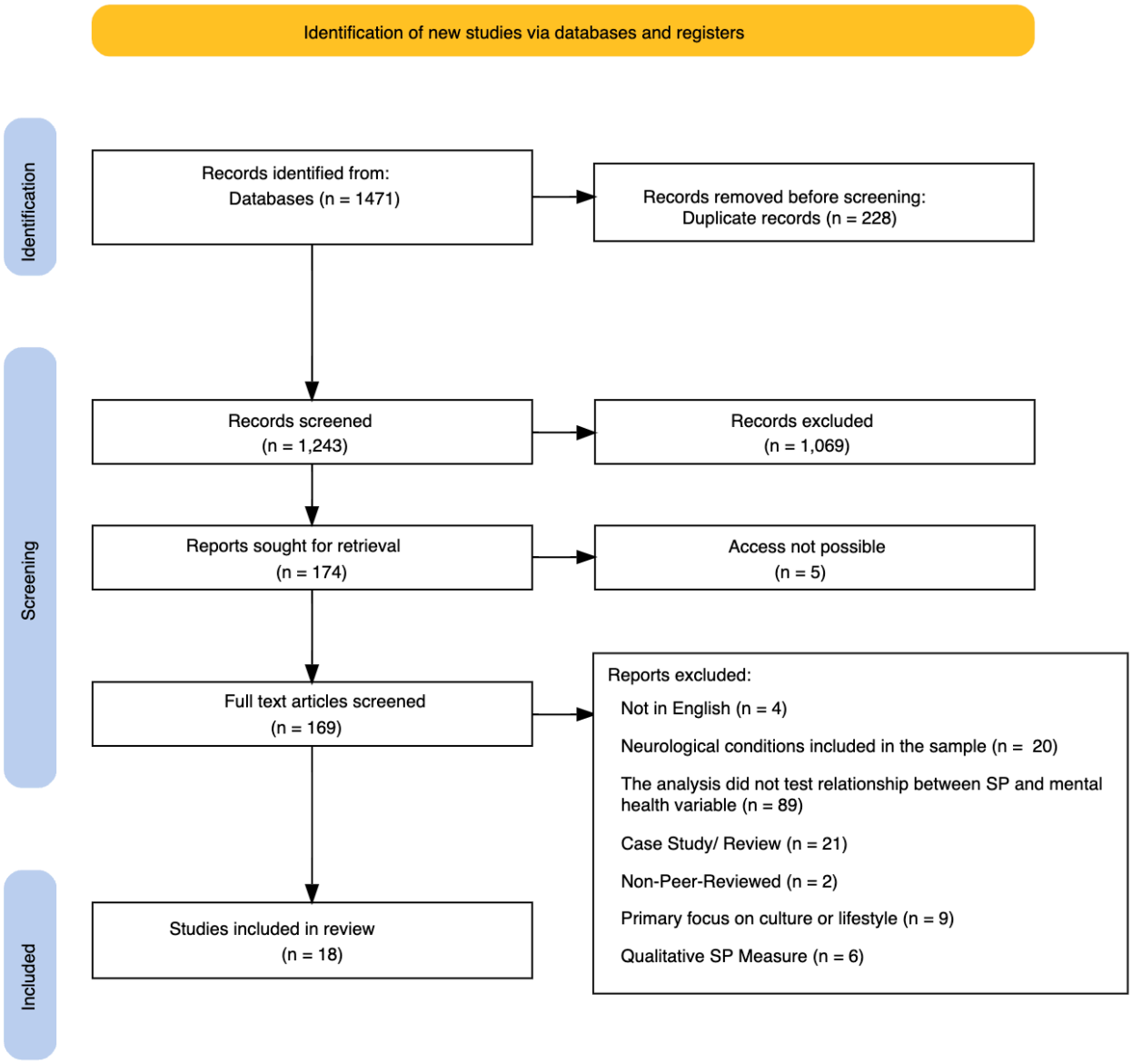
2.3 Study selection and data collection

On 19th September 2024, the primary investigator conducted a comprehensive systematic search of the literature to identify studies examining the relationship between SP and mental health. Specifically, the search targeted studies reporting the psychological correlates of SP and their implications for mental health conditions. Studies were included if they focused on SP and how it relates to conditions such as anxiety, PTSD, depression, or other psychological disorders and provided either quantitative or qualitative data on the psychological correlates of SP.

The search was not restricted by timeframe, but all studies were required to be published in English to ensure accessibility and consistency in interpretation. Two primary electronic databases, PsycINFO and MEDLINE, were systematically searched (*Figure 1*). The search terms were designed to comprehensively capture the spectrum of psychological correlates of SP, using the following Boolean combination: "sleep paralysis" AND ("sleep paralysis OR isolated sleep paralysis OR hypnogogic OR hypnopompic OR incubus OR sensed presence OR parasomnia AND Psychological health OR Mental OR psychiat* OR affect* OR depress* OR Mood OR Stress OR anxi* OR phobi* OR "obsessive compulsive disorder" OR OCD OR PTSD OR "post-traumatic stress disorder" OR psychos* OR psychotic OR schiz* OR bipolar OR hallucination* OR delusion* OR "eating disturbance" OR anorexia OR bulimia OR "binge eating").

ScienceDirect was excluded from the search due to its limitations in handling wildcard searches, which could compromise the systematic retrieval of relevant studies. Similarly, grey literature was not included to ensure the analysis was based exclusively on peer-reviewed studies.

Figure 1. PRISMA Flow Diagram of Study Selection Process



2.4 Quality appraisal

The methodological quality of the included studies was assessed using the Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018), a validated instrument designed to evaluate a range of study designs, including quantitative non-randomised and quantitative descriptive studies.

The MMAT provides a systematic approach to assessing the robustness of studies across key domains, such as the clarity of research questions, appropriateness of measurement tools, representativeness of the data, and methodological rigour in data collection and analysis.

Two reviewers conducted quality assessments independently to minimise bias and ensure reliability. Any discrepancies between reviewers were resolved through discussion, and if a consensus could not be reached, a third reviewer was consulted to adjudicate. To maintain the integrity of the review, only studies meeting the minimum quality threshold specified by the MMAT were included in the synthesis.

The quality appraisal results (*Table 1*) provide an overview of the evaluation process and the methodological rigour of the included studies. In accordance with recent guidance on the application of the MMAT, an overall percentage score was calculated for each study by dividing the number of criteria met by the total number of applicable criteria (Hong et al., 2018).

2.5 Data analysis

Data extracted from the analysed studies included population demographics, study design, assessments of SP and mental health, and significant findings. A narrative synthesis was used to identify common themes and trends across the studies, examine the relationships between these themes, and identify gaps in the existing literature.

3. Results

3.1 Study characteristics

All 18 studies were quantitative, employing a cross-sectional design, focusing on prevalence rates, correlates, and characteristics of SP.

Sample sizes varied considerably, ranging from 45 participants in Simard & Nielsen (2005) to 2,689 in larger epidemiological surveys (Hinton et al., 2019). The percentage of female participants ranged from 3.3% to 86%. Ethnicity was only reported by 10 of the included studies.

Most participants were aged 18–35 years (range = 16–86 years). Studies were conducted in various countries, including Canada (n = 3), the USA (n = 9), Poland (n = 1), Cambodia (n = 1), Egypt (n = 1), the Netherlands(n = 1), the UK (n = 1), and Italy (n = 1), reflecting the global scope of SP research; however, studies were predominantly conducted in Western countries (n = 16), and some did not provide detailed geographical information (n = 8).

Study populations included a range of specific groups: eight studies involved university students, one of which compared students to psychiatric inpatients (Molendijk et al., 2022), and two focused specifically on psychiatric populations. Seven studies examined other specific groups, including firefighters, refugees, African Americans, twins, and individuals who had experienced childhood sexual abuse. One study used participants who had consented to being contacted for future research after completing a prior study (Cheyne & Pennycook, 2013).

Despite some international representation, the collective sample may not be considered fully diverse; for example, there were no studies from South America, and only one each from Africa and Asia.

3.2 Quality assessment

The methodological quality of studies varied (*see Table 1*). Quality percentages calculated using the MMAT ranged between 40% and 80%, with a mean of 65.56%. Limitations were primarily associated with small and homogeneous samples, reliance on self-reported data, and methodological constraints. A common limitation was the lack of diverse, representative populations, with many studies focusing on university students, specific cultural groups or clinical populations.

Table *1. MMAT Quality Assessment*

	Quantitative Non-Randomised Criterion					Quality Assessment %
Study	**1**	**2**	**3**	**4**	**5**	
Murray et al., 2008	CT	Y	CT	Y	N	40
Benham, 2022	Y	CT	Y	CT	Y	60
Cheyne & Gordon, 2013	Y	CT	Y	CT	Y	60
Colombo & Cellini, 2024	Y	CT	Y	CT	Y	60
Denis et al., 2015	CT	Y	CT	Y	N	40
Hinton et al., 2005	Y	CT	Y	CT	Y	60
Hinton et al., 2019	Y	Y	Y	CT	Y	80
Jalal & Hinton, 2015	Y	Y	Y	CT	Y	80
McNally & Clancy, 2005	Y	Y	Y	CT	Y	80
Molendijk et al., 2022	Y	Y	Y	CT	Y	80
Otto et al., 2006	Y	Y	Y	CT	Y	80
Paradis et al., 2009	Y	Y	Y	CT	Y	80
Ramsawh et al., 2008	Y	Y	Y	CT	Y	80
Sharpless et al., 2010	Y	CT	Y	CT	Y	60
Simard & Nielsen, 2005	Y	CT	Y	CT	Y	60
Szklo-Coxe et al., 2007	Y	CT	Y	CT	Y	60
Watson et al., 2015	Y	CT	Y	CT	Y	60
Wróbel-Knybel et al., 2021	Y	CT	Y	CT	Y	60

Note: Y = Yes; N = No; CT = Can't Tell. Criteria 1–5 refer to the MMAT items for quantitative non-randomised research: 1 = Are participants representative of the target population? 2 = Are measurements appropriate regarding both the outcome and intervention (or exposure)? 3 = Are there complete outcome data? 4 = Are the confounders accounted for in the design and analysis? 5 = During the study period, was the intervention (or exposure) administered as intended? Quality Assessment % reflects the proportion of criteria rated "Yes" (each "Yes" = 20%).

3.3 Assessment tools

Assessment tools encompassed a range of subjective and objective measures. Different tools were employed to evaluate SP and its related mental health factors (*Table 2*).

Table 2. Summary of sleep paralysis measures and mental health measures used in included studies

Reference	SP Measure (s)	MH Measure(s)
Abrams et al., 2008	WUSEQ	CSA History PCL-C Centre for Epidemiologic Studies Depression Scale (CES-D)
Benham, 2022	Sleep Paralysis Questionnaire (self-report of SP episodes).	Inventory of College Students' Recent Life Experiences Perceived stress scale
Cheyne & Pennycook, 2013	WUSEQ	DASS SP Supernatural Beliefs Scale. SPPEDS
Colombo & Cellini, 2024	USEQ	BDI-II STAI-Y2
Hinton et al.,2005	Sleep Paralysis frequency and Duration Interview SP-PA Questionnaire SP Hallucination Interview	CAPS Post-SP Panic Attack Questionnaire
Denis et al., 2015	PSQI	Zung self-rating depression scale. STAI
Hinton et al., 2019	CSSA	HSCL-25 CSSA
Jalal & Hinton, 2015	SPQ	PCL STAI-T PSWQ PANAS
McNally & Clancy, 2019	Sleep Experiences Questionnaire	BDI
Molendijk et al., 2O22	WUSEQ	Inpatient diagnosed with schizophrenia spectrum disorder vs undergraduate students
Otto et al., 2006	Sleep Experiences Questionnaire	SCID-IV MINI
Paradis et al., 2009	USEQ	Self-reported measures for anxiety and if ever received a diagnosis of mental illness
Ramsawh et al., 2008	ISP Interview and ISP Questionnaire	Diagnostic interviews using the ADIS-IV-L ASI

Sharpless., 2010	FISPI	ADIS-IV Panic Disorder Severity Scale Shipley Institute of Living Scale. ASI
Szklo-Coxe et al., 2007	Likert Scales polysomnography (EEG and ectromyograpghy, electro-oculography.	Zung self-rating depression scale. STAI
Watson et al., 2015	Two 3hour clinical interview ISES and ISDI	IDAS-II PLC-5 GADQ-IV MASQ Social Phobia Scale FQ, APPQ, SPQ PHQ-9 and Anhedonia scale from the Personality Inventory. PID-5

Note: WUSEQ = Waterloo Unusual Sleep Experiences Questionnaire; USEQ = Unusual Sleep Experiences Questionnaire; SPQ = Sleep Paralysis Questionnaire; ISP = Isolated Sleep Paralysis Interview/Questionnaire; FISPI = Fearful Isolated Sleep Paralysis Interview, SP-PA = Sleep Paralysis–Panic Attack Questionnaire; SPPEDS = Sleep Paralysis Phenomenology, Experience, and Distress Scale; SP Supernatural Beliefs Scale = Assesses supernatural interpretations of sleep paralysis experiences; CES-D = Centre for Epidemiologic Studies Depression Scale; DASS-21 = Depression Anxiety Stress Scales; BDI / BDI-II = Beck Depression Inventory / Beck Depression Inventory-II; STAI / STAI-Y2 / STAI-T = State-Trait Anxiety Inventory (Form Y-2 = Trait subscale; T = Trait scale); PCL / PCL-C = PTSD Checklist (Civilian Version); CAPS = Clinician-Administered PTSD Scale; HSCL-25 = Hopkins Symptom Checklist-25, CSSA = Cambodian Somatic Symptom and Anxiety Scale; PSWQ = Penn State Worry Questionnaire; PANAS = Positive and Negative Affect Schedule; SCID-IV = Structured Clinical Interview for DSM-IV; MINI = Mini-International Neuropsychiatric Interview; ADIS-IV / ADIS-IV-L = Anxiety Disorders Interview Schedule for DSM-IV (Lifetime version); ASI = Anxiety Sensitivity Index; PSQI = Pittsburgh Sleep Quality Index; ISES = Iowa Sleep Experiences Survey; ISDI = Inventory of Depression and Anxiety Symptoms; IDAS-II = Inventory of Depression and Anxiety Symptoms-II; PLC-5 = PTSD Checklist for DSM-5; GAD= Generalized Anxiety Disorder Questionnaire-IV; MASQ = Mood and Anxiety Symptom Questionnaire; FQ = Fear Questionnaire; APPQ = Albany Panic and Phobia Questionnaire; PHQ-9 = Patient Health Questionnaire-9; PID-5 = Personality Inventory for DSM-5.

3.3.1 Sleep paralysis measures

SP's prevalence, duration, and phenomenology were assessed using various self-report and interview-based measures. All studies reported the lifetime prevalence of SP (n = 18), with half of those also examining recurrent SP episodes (n =9).

No SP measure was consistently used throughout the included studies (*Table 2*). The Waterloo Unusual Sleep Experiences Questionnaire (WUSEQ; n = 3) was the most frequently used tool. Four studies utilised structured clinical interviews (Hinton et al., 2005; Otto et al., 2006;

Ramsawh et al., 2008; Watson et al., 2015). One of these studies captured sensory experiences of SP experiences linked to hypnagogic and hypnopompic hallucinations (Hinton et al., 2005).

One study (n = 1) employed physiological measures (polysomnography, EEG, electromyography, and electro-oculography) (Szklo-Coxe et al., 2007), indicating an effort to examine self-reported SP symptoms alongside objective sleep data. Cultural perspectives were also integrated into SP research through tools such as the Cambodian Symptom and Syndrome Addendum (CSSA; n = 1) and the SP Supernatural Beliefs Scale (n = 1), which examined supernatural interpretations of SP across various populations.

3.3.2 Mental health measures

The reviewed studies employed a diverse range of mental health measures, incorporating a combination of structured clinical interviews and validated assessment tools. Four studies used depression specific measures (n = 4), six studies used measures assessing anxiety disorder symptoms (n = 6), one study (n = 1) used a measure to assess both anxiety and depression (Cheyne & Pennycook, 2013) and four studies used PTSD measures (n = 4). One study (n = 1) assessed multiple mental health symptoms using clinical interviews (Otto et al., 2006) using the structured clinical interview for DSM-IV (SCID-IV) and Mini International Neuropsychiatric Interview (MINI).

3.4 Primary findings

Table 3 presents the studies identified from the search. The studies demonstrate a consistent link between SP and symptoms of PTSD, anxiety disorders, depression and broader psychopathological presentations, namely schizotypy, dissociation, and mood dysregulation.

Table 3 Summary of included studies.

Reference	Country	Participant Characteristics	N	Design	Key Findings
Abrams et al., 2008	Canada	Sample of adults reporting childhood sexual abuse; 72.6% female; age (mean and range) 35 (18–60) years	263	Cross-sectional survey	35% of participants with SP had anxiety and/or depression vs. 12% without SP. SP was more frequent and distressing in those reporting CSA and PTSD groups; correlated with PTSD, depression, dissociation (r = .29-.40, p < .01)*
Benham, 2022	USA	College students from a Hispanic-Serving Institution in the Southwestern United States; 70% female; age (mean) 20.4 years	1,115	Cross-sectional survey	35% lifetime SP; 21% in previous year; SP significantly linked to stress (p < .01)*
Cheyne & Pennycook, 2013	Canada	Adults experiencing prior SP episodes; 76% female; age (mean and standard deviation (SD) 33.6 (12.3) years; age range 16 –69 years	293	Cross-sectional survey	Post-SP distress linked to depression, anxiety and stress (r = .31, p < .001)**
Colombo & Cellini, 2024	Italy	University students; 77% female; age (mean and SD) 22.8 (2.6) years	432	Cross-sectional survey	37.5% SP prevalence; higher anxiety scores (p = .005) but no significant depression differences compared to those without SP.
Hinton et al., 2005	USA	Cambodian refugee patients at a psychiatric clinic. 58% female, age (mean and SD) 55.3 (8.7) years. All participants lived through Pol Pot era	100	Cross-sectional survey	49% had SP; SP significantly associated with PTSD severity (r = .51, p < .001)**.
Denis et al., 2015	UK	Community sample of twins and siblings. 66% female, age (mean and SD) 5.8 (1.8) years, range 22 –32 years. 467 families included monozygotic twin pairs (n =118), dizygotic twin pairs (n =105), Sibling pairs (n = 127)	862	Cross-sectional study	Lifetime SP 29.7%; linked to anxiety (OR = 1.76), depression (OR = 1.82) and heritability (53%)
Hinton et al., 2019	Cambodia	Cambodian adults age 21 –86 from urban and rural areas. 67.5% female. Verbally surveyed due to literacy levels in the country	2,689	Cross-sectional survey	Life SP 13.3%. Higher SP mean scores (1.39, SD = 0.70) correlated with significantly higher HSCL scores than those with less distress. Somatic symptoms accounted for 51% of the variance in anxious-depressive distress (p < 0.001)**.

Jalal & Hinton, 2015	Egypt	Undergraduate students, recruited from an American-style university. SP group (*n* =43) 86% female, age (mean and SD) 19.3 (1.1) years, range 18 –24 years. No SP group (*n* = 57) age (mean and SD) 19.1 (1.4) years, range 18 –24 years	100	Cross-sectional survey	43% lifetime SP; higher PTSD symptoms and hallucinations correlated with SP.
McNally & Clancy, 2019	USA	Adults divided into four groups: repressed memory group (n=18) 94.4% female, recovered memory group (*n* = 14) 57.1% female, continuous memory group (*n* = 36) 77.8% female, and control group with no childhood sexual abuse (CSA) history (*n* = 16) 68.8% female	84	Cross-sectional survey	Lifetime prevalence of SP in CSA groups 44%. Those with SP had significantly higher BDI scores (p = .003)* compared to those without SP.
Molendijk et al., 2022	The Netherlands	Inpatients diagnosed with schizophrenia spectrum or related disorders (N = 143) 47% female, age (mean and SD) 47 (14) years. Undergraduate students (*n* = 606), 86% female, age (mean and SD) 22 (4) years	749	Cross-sectional survey	Lifetime prevalence of SP was higher in students (25%) compared inpatients (12%). Rate of SP accompanied by incubus phenomena (9%) and inpatients (12%).
Otto et al., 2006	USA	61 outpatients with anxiety disorders, including panic disorder (*n* = 24), social anxiety disorder (*n* = 18), and generalised anxiety disorder (GAD; *n* = 19). 44.3% female, age (mean) 43 years, range 30-56 years	61	Cross-sectional survey	Lifetime prevalence of SP 19.7%. Comorbid anxiety disorder was significantly linked to higher rates of ISP (p = .043)*.
Paradis et al., 2009	USA	College students from a small liberal arts college, 83%, age (mean) 22 years, age range 18 – 59 years.	208	Cross-sectional survey	25% lifetime SP; linked to anxiety and panic attacks (p = .006)*
Ramsawh et al., 2008	USA	Adults divided into two groups. Those with isolated SP [ISP+] (*n* = 36) without ISP- (*n* = 36), self-identified as African American or Afro-Caribbean. ISP+ group age (mean and SD) 24.9 (9.1) years, ISP- age (mean and SD) 27.6 (9.8) years. 73.6% female no significant differences on demographics between groups.	72	Cross-sectional, exploratory study	ISP+ associated with panic disorder (30.6%) and PTSD (27.8%)

Sharpless., 2010	USA	Outpatient participants experiencing panic attacks. 66.9% female age (mean and SD) 38.8 (12.8) years.	133	Cross-sectional study	29.3% lifetime SP; significantly associated with PTSD and BMI.
Szklo-Coxe et al., 2007	USA	Participants from the Wisconsin Sleep Cohort Study, age (mean) 54 years, range 30–60 years. 47% female.	866	Cross-sectional epidemiological study 1998-2022	SP prevalence 5.2%; linked to depression (*OR* = 5.0, *p* = .001)** and insomnia
Watson et al., 2015	USA	Adults from the greater South Bend metropolitan area; 46.3% of participants had received or were currently receiving mental health treatment. Age (mean and SD) 44.9 (13.3) years, range 18 –74 years	406	Cross-sectional	SP strongly linked to PTSD (*r* = .65), GAD, panic, depression, and schizotypy.
Wróbel-Knybel et al., 2021	Poland	Professional firefighters 3.3% female, age (mean) 36 range 18–51.	831	Cross-sectional survey (online)	8.7% SP prevalence. SP associated with significantly higher PTSD (p = .004)**, anxiety (p = .006**) and worry (p = .03)*.
Simard & Nielsen,2005	Canada	University students divided into three groups: control (n = 19), ISP (n=10), ISP+PRES (n=16). 62.2% female (n=28), age (mean and SD) 21.5 (2.3), men (n=17) age (mean and SD) 22 (2.62).	45	cross-sectional survey	ISP+PRES group had significantly higher social anxiety (p = 013)* and depression (p = <.001)*** compared to the control group.

*P<0.05, ** p<0.01, *** p<0.001.*

Note. Childhood sexual abuse = CSA, Sleep Paralysis = SP, Post-Traumatic Stress Disorder = PTSD, Generalised Anxiety Disorder = GAD, Isolated Sleep Paralysis = ISI, Isolated Sleep Paralysis with sensed presence = ISP+PRES, Beck Depression Inventory = BDI, Hopkins Symptom Checklist-25 = HSCL. Measures are the same as in Table 2.

3.4.1 Sleep paralysis and trauma

Seven studies examined the association between SP and trauma-related symptoms, particularly PTSD. Across these studies, PTSD symptoms and trauma exposure were consistently associated with increased SP prevalence and distress. However, as these studies were cross-sectional, the directionality of this relationship remains unclear. It is uncertain whether PTSD increases susceptibility to distressing SP episodes, or whether frequent, distressing SP episodes contribute to PTSD symptomatology over time.

Hinton et al. (2005) found that 65% of Cambodian refugees with PTSD experienced monthly SP episodes, a figure significantly higher than the 15% prevalence in participants without PTSD. These episodes were characterised by intense fear, a sensed presence, and chest pressure, closely resembling the hyperarousal symptoms associated with PTSD. Similarly, Sharpless et al. (2010a) reported that firefighters with PTSD were 1.86 times more likely to experience SP compared to those without PTSD, further supporting the temporal association between trauma-related hyperarousal and SP susceptibility.

In non-clinical populations (n = 15), Jalal & Hinton (2015) examined university undergraduates. They found that individuals with high anxiety sensitivity were more likely to experience distressing SP episodes, suggesting that cognitive appraisal plays a crucial role in shaping the emotional impact of SP. Three studies (n = 3) (Abrams et al., 2008; Ramsawh et al., 2008; Wróbel-Knybel et al., 2021) found that individuals with subclinical PTSD symptoms exhibited higher SP prevalence and distress. These findings support the idea that SP vulnerability exists along a continuum and that trauma-related symptoms, even without a formal PTSD diagnosis, may increase susceptibility to SP (Ramsawh et al., 2008).

3.4.2 Sleep paralysis and anxiety disorders

Eleven studies (n = 11) examined the association between SP and anxiety disorders, including generalised anxiety disorder (GAD), panic disorder, and social anxiety. Across these studies, anxiety sensitivity and perceived stress emerged as significant predictors of SP prevalence and distress.

Sharpless et al. (2010a) reported that firefighters with panic symptoms had a higher prevalence of SP (32%) compared to those without panic symptoms (15%). Similarly, Ramsawh et al. (2008) found that 30.6% of participants with isolated sleep paralysis (ISP) met the criteria for panic disorder, whereas none of the non-ISP participants met this criterion. Further, Otto et al. (2006) found that ISP was significantly more common in individuals with panic disorder compared to those with other anxiety disorders (p = .043), reinforcing the strong association between panic disorder and SP.

SP prevalence was also elevated in individuals with GAD. Denis et al. (2015) found that individuals with higher anxiety symptoms experienced more frequent and distressing SP episodes (*OR* = 1.76).

Features of SP, such as sensed presence (SP+PRES), were particularly distressing for individuals with social anxiety. Simard & Nielsen (2005) observed that participants with SP+PRES reported higher social anxiety scores compared to those without sensed presence. However, the relationship between anxiety and SP distress was often moderated by comorbid factors (Cheyne & Pennycook, 2013). For example, Denis et al. (2015) noted that anxiety sensitivity predicted SP distress, but the effect diminished when controlling for trauma and sleep quality.

3.4.3 Sleep paralysis and depression

Eight studies (n = 8) explored the link between SP and depression, generally finding that depressive symptoms heighten SP prevalence and distress. Some studies, however, did not find depression predictive of SP frequency.

Szklo-Coxe et al. (2007) reported that the prevalence of SP was significantly higher among individuals with depressive symptoms (11.9%) compared to those without (4.1%). The study found that severe depression increased the odds of SP (OR = 5.0, p = < 0.001), even after adjusting for anxiety and insomnia. McNally & Clancy (2005) noted that individuals with SP scored higher on BDI, further emphasising the link between depressive symptoms and SP. Depression was also linked to specific features of SP, such as an increased likelihood of experiencing hypnagogic and hypnopompic hallucinations (OR = 3.20, p = 0.005) (Szklo-Coxe et al., 2007). Moreover, individuals with depression reported greater emotional distress during SP

episodes (Cheyne & Pennycook, 2013), with heightened fear responses and increased frequency of sensed presence and visual distortions (Simard & Nielsen, 2005).

Not all findings were significant; Denis et al. (2015) reported that, while depression increased SP-related distress, this association weakened when accounting for concurrent anxiety. Similarly, McNally & Clancy (2005) noted that depressive symptoms were not consistently predictive of SP frequency when trauma symptoms were included in the analysis, suggesting that trauma and anxiety may have moderated the influence of depression on SP.

3.4.4 Other sleep paralysis and mental health findings

Beyond anxiety and depression, SP has been associated with broader psychopathological traits, including dissociation, schizotypy, and emotional dysregulation.

Watson et al. (2015) reported that SP correlated strongly with dissociation ($r = .53$) and moderately with schizotypy ($r = .47$). The authors proposed that SP, dissociation, and schizotypy may represent a common domain of unusual cognitions and perceptual experiences. Individuals with high dissociative tendencies may be more prone to intense and distressing SP hallucinations, particularly those involving sensed presence or external forces.

Abrams et al. (2008) found that SP distress was strongly associated with dissociation, depressive symptoms, and post-traumatic stress, even after controlling for CSA history. This supports the notion that emotional dysregulation and dissociative tendencies may amplify the distress of SP episodes, rather than SP serving as an independent predictor of psychopathology.

However, these studies were cross-sectional, making it difficult to determine whether SP contributes to increased dissociative traits or whether individuals with high dissociation are more vulnerable to distressing SP experiences. Future research should examine how dissociative tendencies influence the perception and appraisal of SP episodes over time.

3.4.5 Differences in psychological distress

Clinical samples reported more frequent and distressing SP episodes than non-clinical groups. For instance, individuals with PTSD often described symptoms such as chest tightness, a feeling of impending death, and a sensed presence, experiences that closely resemble trauma-related symptoms (Hinton et al., 2005). In contrast, non-clinical populations generally experienced SP less frequently and with lower distress. However, certain subgroups within these populations displayed increased vulnerability. For example, university students experiencing depression or anxiety reported heightened distress during SP, particularly when hallucinations involved a sensed presence (Cheyne & Pennycook, 2013). This suggests that the distinction between clinical and non-clinical groups may not be entirely clear-cut. Several studies have identified elevated SP distress in subclinical populations, indicating that susceptibility may exist along a continuum rather than within binary categories (Alderson-Day et al., 2022; João et al., 2018).

Cultural interpretations of SP also influenced distress levels. Although this review did not primarily concentrate on cultural frameworks, numerous studies have indicated that culturally specific beliefs, such as ghost attacks or spiritual oppression, can intensify fear, particularly in individuals exposed to trauma (Hinton et al., 2005, Hinton et al., 2019). For instance, those with paranormal beliefs or strong cultural scripts were more likely to feel increased fear during episodes. However, most samples in these studies were drawn from Western, educated populations, limiting cultural diversity representation. Therefore, assertions that non-clinical groups experience fewer culturally influenced interpretations should be approached with caution.

3.4.6 Mediators and moderators of sleep paralysis

Several factors influenced the intensity and distress of SP episodes in both clinical and non-clinical groups. In clinical populations, comorbid mental health issues such as depression and anxiety were significant contributors to SP distress. Szklo-Coxe et al. (2007) found that severe depression increased SP (OR = 5.0, $p = < 0.001$), even after controlling for anxiety and insomnia. This relationship was even stronger in participants without additional anxiety, highlighting the distinct interactions between depression and SP features.

In non-clinical samples, anxiety sensitivity and perceived stress were identified as significant mediators of SP vulnerability. Ramsawh et al. (2008) indicated that elevated anxiety sensitivity was associated with a higher prevalence and greater distress of SP. However, the strength of these associations weakened when factors such as PTSD symptoms, anxiety, or poor sleep quality were considered, suggesting that these elements may moderate the influence of anxiety on SP (Denis et al., 2015; McNally & Clancy, 2005).

4. Discussion

This systematic review examined whether the presence of SP is associated with mental health conditions. The findings revealed consistent associations between SP and disorders such as PTSD, anxiety, and depression, with clinical populations typically experiencing more frequent and distressing episodes than non-clinical groups. However, the distinction between these populations is not always clear-cut. Several studies included subclinical samples, such as university students experiencing elevated symptoms of anxiety or depression, who also reported considerable distress. This supports a dimensional perspective of SP vulnerability rather than a strict binary distinction between clinical and non-clinical populations.

Both clinical and non-clinical participants reported vivid hallucinations associated with SP. However, episodes among clinical populations were more likely to involve intense emotional distress and features such as a "felt presence" (Denis et al., 2015; Hinton et al., 2005; Paradis et al., 2009; Ramsawh et al., 2008; Sharpless et al., 2010b; Wróbel-Knybel et al., 2021). These findings are consistent with existing models that implicate REM intrusion, hyperarousal, and dissociative tendencies as key mechanisms underlying SP experiences.

Notably, hallucinations involving a sensed presence or intruder were often more distressing than the paralysis itself (Cheyne & Pennycook, 2013; Hinton et al., 2005). This distinction is clinically important, suggesting that individuals with heightened vulnerability to anomalous perceptual experiences or dissociative traits may be particularly affected. Moreover, comorbid mental health difficulties appear to exacerbate the frequency and emotional impact of SP episodes, especially in trauma-exposed populations.

Although this review did not specifically focus on cultural interpretations of SP, several studies indicated that such interpretations can significantly influence the level of distress experienced (Cheyne & Pennycook, 2013; Hinton et al., 2005, Hinton et al., 2019). For example, beliefs in ghostly attacks or spirit interference have been associated with increased fear, particularly among individuals exposed to trauma. While participants from more secular or Western contexts tended to report fewer culturally informed interpretations, these beliefs still shaped individual experiences to varying degrees. Future studies should continue to explore how cultural frameworks influence both the meaning and emotional intensity of SP.

Although several studies suggest that treating underlying psychological conditions may help alleviate SP symptoms (e.g., Otto et al., 2006), none of the included studies directly test this hypothesis. Given the cross-sectional design of all the studies reviewed, no firm conclusions can be drawn about the direction of the relationship between SP and mental health difficulties. It remains unclear whether SP contributes to the development of mental health conditions, arises as a symptom of them, or interacts with shared underlying vulnerabilities. Longitudinal and intervention-based research is needed to clarify this relationship.

The reviewed studies did not examine all types of mental disorders, instead focusing on confirmed diagnoses or symptom profiles related to anxiety, mood disorders, psychotic disorders, and PTSD. Additionally, sampling biases were evident, particularly with the overrepresentation of university students and trauma-exposed individuals, which limited the generalisability of the findings. While some studies included diverse cultural contexts, the majority relied on Western samples, highlighting the need for more globally representative research.

4.1 Clinical implications

The clinical implications of these findings are significant. Clinicians may benefit from assessing SP in individuals with PTSD, anxiety disorders, and depression, as early identification may enable timely interventions to alleviate distress. CBT targeting anxiety sensitivity, sleep hygiene, and post-episode distress has shown promise in reducing the frequency and severity of SP episodes (Watson et al., 2015). Integrating these therapies into standard care protocols for individuals

experiencing SP alongside other mental health conditions could enhance treatment outcomes. However, due to the lack of intervention studies, it remains unclear whether treating mental health conditions, such as PTSD or anxiety, would lead to improvements in SP symptoms. This is an interesting avenue for future research.

Cultural interpretations of SP also warrant consideration in clinical practice. For instance, individuals from cultures that associate SP with supernatural beliefs may experience heightened distress during episodes. Culturally sensitive psychoeducation can reduce fear and stigma, demystifying SP by providing insight into its physiological and psychological mechanisms (Cheyne & Pennycook, 2013). Incorporating these approaches into routine care can enhance support for diverse patient populations.

Addressing SP within a broader mental health framework is essential. SP often co-occurs with conditions such as PTSD and anxiety, where shared mechanisms, including hyperarousal and REM sleep disturbances, exacerbate symptoms (Castelnovo et al., 2018). By integrating SP management into standard care, clinicians may reduce psychological distress and improve mental health outcomes.

4.2 Strengths and limitations

This review has several strengths. It synthesised findings from a range of populations and cultural contexts, providing a comprehensive understanding of SP across varied settings. Despite methodological variability, the consistency of findings across studies reinforces the evidence linking SP to mental health conditions. Furthermore, the use of validated tools for assessing mental health symptoms in all studies improves the reliability of conclusions. However, this was not true for sleep measures and those assessing SP, which included a mix of validated measures (WUSEQ and PSQI), measures validated in some individual studies but not widely standardised (SP-EPQ and FISP), or custom tools developed for specific studies.

Nonetheless, there are notable limitations. The prevalence of cross-sectional designs limits the ability to establish causal relationships between SP and its psychological correlates. The reliance on self-reported data introduces potential biases, including recall inaccuracies and underreporting, especially in cultural contexts where SP may carry a stigma. Moreover,

inconsistency in assessment tools complicates comparisons across studies, highlighting the need for greater standardisation in future research.

Additionally, most non-clinical samples were drawn from university student populations. While convenient for recruitment, these samples may not accurately represent the broader non-clinical population, as students often experience heightened stress and disrupted sleep patterns. This overrepresentation may skew prevalence estimates and limit the generalisability of findings. In particular, associations between anxiety sensitivity, perceived stress, and SP should be interpreted cautiously, as the directionality remains unclear in the absence of longitudinal data.

4.3 Directions for future research

Future research should prioritise longitudinal and interventional studies to disentangle the directionality between SP and mental health conditions and establish causal relationships between SP and its psychological correlates. Such studies could clarify whether SP exacerbates mental health conditions or if existing vulnerabilities increase susceptibility to SP. Standardising assessment tools for SP and associated psychological factors is essential to enhance comparability across studies and facilitate robust meta-analyses.

Neurobiological and genetic research represents another critical avenue. Exploring mechanisms such as REM sleep disruptions and genetic predispositions could provide valuable insights into the aetiology of SP. These findings may inform the development of targeted pharmacological and psychological interventions and increase understanding of the aetiology of mental health conditions.

Intervention studies are also urgently needed, particularly those assessing treatments designed to address SP-related distress. Therapies such as cognitive-behavioural therapy, mindfulness-based stress reduction, and culturally informed psychoeducation should be rigorously tested in both clinical and non-clinical populations. Furthermore, exploring the influence of cultural beliefs on SP experiences would support the creation of culturally sensitive interventions, enhancing their effectiveness across diverse populations.

4.4 Conclusion

This review highlights the significant relationship between SP and mental health conditions, particularly PTSD, anxiety, and depression. SP represents an important marker of psychological vulnerability and distress, warranting greater recognition in clinical practice. Integrating SP assessment and tailored interventions into standard care will allow clinicians to address this distressing phenomenon and improve outcomes for affected individuals. Future research should prioritise longitudinal and interventional designs and standardised methodologies to advance the understanding and management of SP, addressing existing limitations and allowing more robust causal inferences. Additionally, culturally informed approaches to SP could further refine interventions, ensuring they are effective and sensitive to the diverse experiences of impacted individuals.

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Chapter 3

Bridging Chapter

Word count: 350 words

Bridging Chapter

The previous chapter presented a systematic review of the literature on sleep paralysis, with a particular focus on hypnagogic and hypnopompic hallucinations. Synthesising findings from 18 quantitative studies, the review highlighted consistent associations between sleep paralysis and psychological distress, including anxiety, post-traumatic stress disorder, depression, and dissociation. These findings suggest that sleep disturbances and emotional dysregulation increase the frequency and distress of sleep paralysis episodes. However, most of the reviewed studies focused on clinical populations or students, limiting generalisability to the broader population.

While the review supported a clear link between sleep paralysis and psychological factors, relatively few studies examined hallucinations, particularly hypnagogic and hypnopompic hallucinations, as distinct experiences. Many studies conceptualised sleep paralysis as a unitary phenomenon without adequately separating motor paralysis from accompanying hallucinations. This limits our understanding of whether these hallucinations have unique correlates or mechanisms. Given the distressing nature of these experiences, especially when involving a sensed presence or intense fear, understanding these nuances is important for informing psychological models and interventions.

Additionally, the review found a lack of longitudinal or causal evidence. Most studies employed cross-sectional designs, which preclude conclusions about the directionality of relationships between sleep paralysis, hypnagogic and hypnopompic hallucinations, and mental health symptoms. Furthermore, the emotional and functional impact of these experiences, especially in non-clinical populations, remains poorly understood.

Building on the review, the empirical study in the following chapter explores unusual sleep experiences, including hypnagogic and hypnopompic hallucinations, in a general population sample. The study expands on prior work by assessing both the frequency and associated distress of unusual sleep experiences, examining these in relation to psychological and sleep-related variables. Unlike previous studies that focused on clinical samples, this research uses a community-based sample, including individuals who experience hallucinations with and without

sleep paralysis. The aim is to clarify whether factors such as insomnia, anxiety, hallucination-proneness, and dissociation predict the occurrence and distress of unusual sleep experiences. The study intends to provide new insights into the role of sleep and mental health in unusual sleep phenomena and may inform targeted interventions to alleviate the distress associated with these experiences.

Chapter 4

Empirical Paper

This paper has been developed for submission to Sleep Medicine.

Author guidelines are outlined in Appendix C.

Word count limit: N/A

Word count: 4557 words

Sleep-Related Hallucinations and Mental Health: Investigating Psychological Correlates and Impacts in the General Population

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Abstract

Unusual sleep phenomena like hypnagogic and hypnopompic hallucinations were previously thought to be uncommon (under 10% lifetime prevalence). Recent research suggests they are more prevalent, especially among those with mental health issues like anxiety or psychosis, though the link remains under-explored. This study examined factors related to the frequency and distress of these experiences. A cross-sectional online survey recruited 84 individuals reporting unusual sleep experiences. Both lifetime and monthly unusual sleep experience frequency and distress were assessed alongside hypothesised predictors: sleep quality, insomnia, mental health (depression, anxiety, psychotic experiences), and related factors (substance use, quality of life). 35 participants reported monthly unusual sleep experiences, with 54% experiencing these without sleep paralysis. Regression analyses found that increased insomnia and stress were significantly associated with more frequent unusual sleep experiences, while anxiety and substance use were associated with distress scores. Other mental health factors like paranoia, PTSD, and depression were not significant factors. Limitations include a small, predominantly white female sample and reliance on self-report data. Findings imply sleep disturbances and psychological distress are key in unusual sleep experiences. Future studies should investigate the underlying mechanisms, longitudinal patterns, and cultural contexts of these hallucinations.

Keywords: Parasomnia, sleep-related hallucinations, hypnagogic hallucinations, hypnopompic hallucinations, mental health.

1. Introduction

Hallucinations experienced during sleep paralysis or during sleep are referred to as hypnagogic-hypnopompic hallucinations (Jones et al., 2009). Hallucinations around sleep onset (hypnagogic) or upon waking (hypnopompic) can include hearing, seeing, or feeling things that are not there. These unusual sleep experiences can understandably be very distressing and may not be shared with others due to fear of stigma or misdiagnosis when disclosing visual, auditory, or tactile hallucinations (Duarte et al., 2023). They have generally been thought to be rare outside of conditions such as narcolepsy and have received relatively little research or clinical attention, even in comparison to other sleep disorders.

Despite previous beliefs that unusual sleep experiences are relatively rare (<10% lifetime prevalence; Sharpless et al., 2010), more recent research has indicated higher prevalence in individuals with mental health conditions such as insomnia, post-traumatic stress disorder (PTSD), generalised anxiety disorder, and panic disorder (Duarte et al., 2023). A systematic review found sleep paralysis to be associated with trauma, stress, chronic pain, poor physical health, lucid dreaming, and dissociation (Denis et al., 2018). Additionally, Reeve et al. (2019) found that 15% of individuals with psychosis reported sleep paralysis in the previous year. This higher frequency may result from factors such as increased psychological stress, erratic sleep schedules, and sleep disturbances, all of which may be present during episodes of psychosis.

The exact cause of unusual sleep experiences, including hypnagogic-hypnopompic hallucinations, remains unknown. Folklore often attributes these phenomena to the paranormal (Denis et al., 2018; Rauf et al., 2023; Rauf et al., 2022), while scientific theories suggest they may result from rapid eye movement (REM) sleep intrusions during waking, mirror neuron activity (Castelnovo et al., 2018), or share features with hallucinations seen in psychosis (Waters et al., 2016). Research into the phenomenon of a "felt presence," often reported in conjunction with these hallucinations, has identified similar experiences in individuals with psychosis, bereavement, Parkinson’s disease, epilepsy, and other neurological conditions, suggesting a psychological component in addition to a shared underlying mechanism. Cultural norms have

also been found to influence both the interpretation and content of such experiences (de Jong, 2005; Duarte et al., 2023; Jalal et al., 2021).

Alderson-Day et al. (2022) suggest that sleep-related hallucinations in individuals with psychosis may arise from overlapping mechanisms involving sleep disruption and cognitive-affective factors such as stress and arousal dysregulation. Yet, these insights are often not extended to non-clinical populations, leaving key questions about prevalence and contributing factors unanswered.

Whilst there are studies demonstrating higher rates of unusual sleep experiences in those with psychosis, other mental health conditions, and a history of sleep paralysis (Duarte et al., 2023; Reeve et al., 2019), comparatively few have investigated potential causal factors in non-clinical populations. The literature has identified depersonalisation, trauma, substance use, daytime hallucinations, paranoia, anxiety, and depression as potential contributors to sleep paralysis and related experiences (Denis et al., 2018; Duarte et al., 2023; Rauf et al., 2022; Sharpless et al., 2010a). These factors tend to be more prevalent in psychiatric populations, potentially influencing the frequency and intensity of unusual sleep experiences.

However, despite growing evidence of these associations, there remains a gap in understanding the mechanisms that underpin these experiences, particularly within the general population. Few studies have examined how multiple psychological and behavioural factors interact to influence the frequency and distress of sleep-related hallucinations in those without a clinical diagnosis. Understanding these relationships is essential to identifying individuals at risk and informing early intervention strategies.

Given the emerging links between unusual sleep experiences and various psychological factors, there is a clear need for research that investigates these phenomena in non-clinical samples. This study aims to address this gap by exploring unusual sleep experiences, including hypnagogic-hypnopompic hallucinations, in the general population to understand more about their frequency and whether factors such as anxiety, low mood, substance use, paranoia, and daytime hallucinations make these experiences more likely.

Specifically, we aim to answer the following questions:

1. What factors predict increased frequency of unusual sleep experiences?
2. What factors predict increased distress associated with these experiences?

It is hoped that the results may provide researchers with a better understanding of sleep-related hallucinations, their associated factors and potential implications on mental health and well-being, which may, in turn, inform possible interventions. Throughout this study, the term *unusual sleep experiences* is used to refer to experiences including hypnagogic and hypnopompic hallucinations.

2. Methods

2.1 Participants

The study included participants aged 18 or older residing in the UK. It targeted individuals reporting unusual sleep experiences to recruit an enriched sample. Exclusion criteria were diagnoses of neurological conditions (e.g., Parkinson's, psychosis, dementia) causing unusual experiences like hallucinations.

Participants were recruited via social media advertisements. 84 individuals responded to the survey advert (*see Appendix D for the flow of participants through the study).*

Online surveys often attract automated bots, thereby compromising the integrity of the data collected. To mitigate this, the study employed strategies outlined by Brainard et al. (2022) to identify bot responses. These strategies included incorporating a theory of mind question (which had to be answered to access the survey), screening for abnormally fast responses, and being alert to unusual recruitment patterns (e.g. numerous participants commencing the survey simultaneously). No anonymous responses were detected, and all 84 responses were included.

2.2 Measures

2.2.1 Demographic and clinical background

Participants reported their age, gender, ethnicity, income, highest level of education achieved, and marital and work status.

Participants were asked if they had any mental health or sleep disorder diagnoses. When a diagnosis was reported, participants were asked to provide information on whether these difficulties were ongoing, whether treatment was being received (including prescribed medication), and whether they were under an NHS team. Participants were also asked if they had any family history of schizophrenia or psychosis.

2.2.2 Unusual sleep experiences

Unusual sleep experiences were assessed using a self-report survey designed to evaluate both recent and lifetime experiences. Participants were asked to indicate the frequency of unusual sleep experiences. Lifetime prevalence was also assessed with the question '*Have you ever had any unusual experiences (such as hearing, seeing, tasting, feeling things that are not really there, e.g. something touching you or holes in the bed or the feeling of falling) when you are going to sleep or waking up from sleep?*' If participants selected yes to the lifetime prevalence question, they were able to select from the following frequency options: 0-5 (coded as 1), 6-15 (coded as 2), 6-30 (coded as 3) or 30+ (coded as 4)., no was coded as 0.

Frequency in the past month was assessed by the item: *'In the LAST MONTH have you had any unusual sleep experiences (such as hearing, seeing, tasting, or feeling as though there is something in the room or touching you) when you are going to sleep or waking up from sleep?*' Participants who responded 'yes' then selected from the following options, one to two times a month (coded as 1). Less than once a week, about once a week, two to four times a week, more than four times a week were all coded as 2. 'No' responses were coded as 0. Participants who reported unusual experiences in the past month were also asked to report how often their experiences occurred alongside sleep paralysis (on a scale of never =1, sometimes =2, often =3, always =4).

Distress was assessed using a 0-10 Likert scale, where 0 indicated no distress and 10 indicated a lot of distress. Participants were asked to recall and rate their distress retrospectively (at the

time) for lifetime and monthly unusual sleep experiences and to rate their current distress regarding those experiences for both monthly and lifetime occurrences.

The full wording of the questions used to assess unusual sleep experiences, as well as the demographic questions (including frequency and distress items), is provided in *Appendix E*.

2.2.3 Potential factors

Insomnia symptoms were measured using the Insomnia Severity Index (ISI), a validated seven-item self-report tool. Respondents rated their symptoms over the previous month on a scale of 0 to 4 for each item, with total scores ranging from 0 to 28. Higher scores indicate more severe insomnia. A score of 15 or higher indicates clinical insomnia and scores above 8 suggest subthreshold insomnia (Bastien et al., 2001). The ISI has demonstrated high internal consistency (Cronbach's $\alpha = .90$; Bastien et al., 2001).

Depression, anxiety, and stress were measured using the Depression, Anxiety, and Stress Scale-21 (DASS-21) (Crawford & Henry, 2003). Each item scored between 0 and 3. Subscale scores (Depression, Anxiety, Stress) are calculated by summing relevant items and multiplying by two, resulting in total scores from 0 to 42 per subscale. Cut-off scores for moderate severity are ≥14 for depression, ≥10 for anxiety, and ≥19 for stress. The DASS-21 has high reliability for all subscales ($\alpha = .94$ for Depression, .87 for Anxiety, and .91 for Stress;Henry & Crawford, 2005).

The Dunn Worry Scale (Freeman et al., 2020) is a 10-item measure. Participants rated items on a scale from 0 to 4, with total scores ranging from 0 to 40. A score of 21 or higher indicated clinical levels of worry. The measure is highly reliable ($\alpha = .94$; Freeman et al., 2020).

Trauma was assessed using the Primary Care PTSD Screen for DSM-5 (PC-PTSD-5) (Prins et al., 2016). This is a five-item measure with binary (yes/no) responses that evaluate trauma exposure and symptoms such as avoidance and hypervigilance. Total scores range from 0 to 5, with a clinical threshold of 4 indicating probable PTSD. The PC-PTSD-5 has been found to reliably assess trauma symptoms ($\alpha = .86$; Bovin et al., 2021).

The Revised Green Paranoid Thoughts Scale (R-GPTS) (Freeman et al., 2021). This scale contains two subscales: Part A assesses ideas of reference (scores range from 0 to 32, with scores above

10 indicating elevated paranoia), and Part B assesses ideas of persecution (scores range from 0 to 40, with scores above 6 indicating elevated paranoia). Part A and Part B have been found to reliability assess paranoia (α = .94 for Part A and α = .96 for Part B; Freeman et al., 2021).

Hallucinations were assessed using the relevant subscale of the Specific Psychotic Experiences Questionnaire (SPEQ) (Ronald et al., 2014). The hallucinations subscale contains nine items scored from 0 (Not at all) to 5 (Daily), with scores range from 0 to 45. There is no standard clinical cut-off, but higher scores indicate a greater frequency of hallucinatory experiences. The subscale demonstrates good reliability (α = .88; Ronald et al., 2014).

The first five items (i-v) of the Felt Sense on Anomaly (ČEFSA) were used to assess dissociation (Cernis et al., 2021). Each item is scored from 0 to 4, yielding a total score between 0 and 20. While no fixed clinical cut-off is established, higher scores suggest greater dissociative experiences. The subscale has been found to reliably assess dissociative symptoms (α = .85; Cernis et al., 2021).

Quality of life, as measured by the short version of the Recovering Quality of Life (ReQoL-10) (Keetharuth et al., 2018), was included due to its ability to reliably measure this concept (α = .85–.90; (Keetharuth et al., 2018), since research suggests that unusual sleep experiences may lead to distress. The ReQol-10 includes 10 items scored from 0 to 4 (total range: 0–40). Higher scores indicate a better quality of life. Though no standard clinical cut-off is widely adopted, scores are interpreted relative to population norms.

2.2.4 Alcohol and substance use

Alcohol and substance use were assessed using the National Institute on Drug Abuse (NIDA) Quick Screen. This measure includes four items on the frequency of alcohol, cannabis, and other drug use, with response options ranging from ‘Never’ to ‘Almost daily.’ The Quick Screen is supported by strong sensitivity and specificity data (Smith et al., 2010).

The full set of self-report psychometric measures used in this study, including item-level detail and scoring instructions, is provided in *Appendix F*.

2.2.5 Ethics

The study was reviewed and received ethical permission from FMH Research Ethics Committee (reference: ETH2324-2123, *Appendix G*). All participants provided informed consent to take part in this anonymous online survey (*Appendix H*).

2.3 Statistical analysis

Jamovi version 2.6.44 (The Jamovi Project, 2025) was used to analyse the data. The survey questions were mandatory, and there were no missing data. The data was examined to ensure that participants met the eligibility criteria; there were no incidents of age falling outside the acceptable bounds (e.g., below 18) or completing the survey in an unrealistically short time (5 minutes or less).

In relation to the first research question, 'What factors predict the frequency of unusual sleep experiences in the general population?' ordinal regression was used to explore the relationship between the proposed factors and the monthly and lifetime prevalence of sleep paralysis. Monthly frequency data were coded into the following groups to minimise the size difference of groups. One to two times a month (coded as 1). Less than once a week, about once a week, two to four times a week, more than four times a week were all coded as 2. 'No' responses were coded as 0.

To address the second research question, 'What factors predict the distress linked to unusual sleep experiences?' Linear regressions were conducted were used to explore the relationship. These analyses aimed to measure how psychological and demographic variables influence distress levels associated with unusual sleep experiences.

Due to the covariance among measures, all regressions were conducted separately for each independent variable (predictor). Including all predictors in a single model could have led to artificial suppression or inflation of effects due to shared variance, as Miller & Chapman (2001) cautioned. This approach ensured that each predictor's unique contribution was assessed independently, minimising the risk of multicollinearity and inappropriate variance removal.

All hypothesis testing was two-tailed. The regression coefficient (Estimate, B), standard error (SE), Z value, and p-value are reported when appropriate. Multiple corrections were not completed due to the number of variables being investigated, as this study is exploratory.

3. Results

3.1 Demographics

The sample included 84 participants with a mean age of 35.1 years (SD = 12.8), ranging from 18 to 72 years. Most participants were white females. All participants had completed their education up to at least 16 years of age, with 78% (n = 65) achieving university-level qualifications.

Approximately 46% (n = 39) of participants reported having received a mental health diagnosis. Among those who were diagnosed, 29% reported experiencing ongoing difficulties (n = 24), whereas 17% indicated that they had no current mental health concerns (n = 14). One participant chose not to disclose this information (*Table 1*).

Table 1. Descriptive features of participants (n = 84)

Gender,	N (%)
Male	14 (17%)
Female	67(80%)
Genderqueer/ non-binary	3 (4%)
Ethnicity	
Asian (any background)	2 (2%)
Black (any background)	1 (1%)
Mixed or Multiple Ethnic Groups	7 (8%)
White (any background)	74 (88%)
Highest Level of Education, *n*	
Secondary School	3 (3%)
Sixth Form/ College or Equivalent	11 (13%)
Higher Education Diploma	5 (6%)

Undergraduate University Degree	22 (26%)
Postgraduate University Degree	29 (35%)
Doctorate Degree	14 (17%)
Diagnosed with a mental health difficulty	
Yes	39 (46%)
No	44 (52%)
Prefer not to say	1 (1%)
Mental health difficulty current	
Yes	24 (62%)
No	14 (36%)
Prefer not to say	1 (3%)

3.2 Unusual sleep experience descriptives

Of the 84 participants, 79 (94%) reported having experienced unusual sleep experiences at least once in their lifetime (Table 2). The distribution of lifetime frequency indicated that the 0–5 experiences category contained the fewest participants (n = 15, 19%). Among the 79 participants who had experienced unusual sleep experiences, 44% (n = 35) reported experiencing them in the past month, with the majority indicating unusual sleep experiences at a frequency of one to two times per month (n = 21, 60%). Just over half of those experiencing unusual sleep experiences (n = 19, 54%) reported that these did not co-occur with sleep paralysis.

Distress associated with unusual sleep experiences was assessed retrospectively (i.e., at the time of the unusual sleep experience) as well as current distress related to those experiences for both lifetime and monthly occurrences. The mean retrospective distress scores were *M* = 6.44 (*SD* = 2.49) for lifetime experiences and *M* = 6.69 (*SD* = 2.71) for monthly experiences. Current distress scores for these experiences were lower, with lifetime distress reported as *M* = 1.86 (*SD* = 2.23) and monthly distress as *M* = 2.23 (*SD* = 2.45) (*Table 2).*

Table 2. Descriptive features of lifetime and monthly unusual sleep experiences (n = 79)

Lifetime frequency of unusual sleep experiences (N = 79)	N (%)
0-5	15 (19%)
6-15	22 (28%)
16-30	20 (25%)
30+	22 (28%)
Experience of unusual sleep experiences in the last month (N = 79)	
Yes	35 (44%)
No	44 (56%)
Frequency of unusual sleep experiences in the last month (N = 35)	
One to two times a month	21(60%)
Less than once a week	4 (11%)
About once a week	6 (17%)
Two to four times a week	3 (9%)
More than four times a week	1 (3%)
Association with Sleep Paralysis in last month (N = 35)	
Never	19 (54%)
Sometimes	9 (26%)
Often	4 (11%)
Always	3 (9%)
Distress Rating (0-10)	Mean (SD)
Lifetime Retrospective (at the time of USE, N = 79)	6.44 (2.49)
Lifetime Current (N = 79)	1.86 (2.23)
Monthly Retrospective (at the time of USE, N = 35)	6.69 (2.71)
Monthly Current (N = 35)	2.23 (2.45)

3.3 Research question 1: predictors of the frequency of unusual sleep experiences

To address the first research question, multiple ordinal regression analyses were carried out to evaluate the psychological predictors of unusual sleep experiences. Separate analyses investigated predictors of both lifetime (*Table 3*) and monthly frequency (*Table 4*). The tables present each predictor's regression coefficients (Estimates), standard errors (SE), Z-values, and p-values.

3.3.1 Lifetime frequency of unusual sleep experiences

Ordinal regression analysis examining the frequency of lifetime unusual sleep experiences revealed significant associations with greater insomnia severity and stress levels. Specifically, higher scores on the Insomnia Severity Index (p = .012) and the DASS-21 Stress subscale (p = .011) were associated with an increased likelihood of reporting more frequent lifetime unusual sleep experiences. Dissociation, as measured by the Felt Sense of Anomaly scale, approached significance (p = .055), suggesting a potential positive association. Other psychological factors were not significantly associated with lifetime unusual sleep experiences frequency.

Table 3. Ordinal regression results for lifetime frequency.

Predictor	**Estimate**	**SE**	**Z**	**P**
Worry	0.03	0.02	1.16	.244
Paranoia	0.00	0.03	-0.05	.964
Insomnia	0.06	0.03	2.50	.012***
PTSD	0.06	0.10	0.56	.587
Substance Use	0.07	0.10	0.71	.479
Stress	0.03	0.01	2.55	.011**
Anxiety	0.04	0.03	1.38	.166
Depression	0.02	0.01	1.55	.121
Dissociation	0.08	0.04	1.92	.055
Hallucinations	0.03	0.02	1.24	.215
Quality of Life	-0.09	0.06	-1.66	.098

** p<0.05, ** p<0.01, *** p<0.001*

Note: Lifetime prevalence coded as none = 0, 0-5 = 1, 6-15 =2, 16-30 = 3, 30+ = 4. Worry = The Dunn Worry Scale (DWQ), paranoia =The revised Green Paranoid Throughts Scale (R-GPTS), Insomnia = Insomnia Severity Index (ISI). PTSD= *Primary Care PTSD Screen for DSM-5 (PC-PTSD-5), substance use =NIDA quick screen. Depression =DASS-21 = The Depression, Anxiety and Stress Scale, Anxiety = =DASS-21 = The Depression, Anxiety and Stress Scale, Stress =DASS-21 = The Depression, Anxiety and Stress Scale. Dissociation = Felt Sense of Anomaly (FSA), Hallucinations = Subscale of Specific Psychotic Experiences (SPEQ), Quality of life= Recovering Quality of Life ReQol***.***

3.3.2 Monthly frequency of unusual sleep experiences

Ordinal regression analysis for monthly unusual sleep experiences revealed significant factors. Higher scores on the Insomnia Severity Index (p = .008) and the DASS-21 Stress subscale (p =

.010) were associated with an increased likelihood of reporting any unusual sleep experience in the past month. Elevated scores on the hallucinations measure were also significantly related to monthly unusual sleep experience frequency (p = .042), although the association was comparatively weaker. Other psychological factors were not significantly associated with monthly unusual sleep experience frequency.

Table 4. Ordinal regression results for monthly frequency

Predictor	Estimate (B)	SE	Z	P
Worry	.01	.02	.52	0.606
Paranoia	-<.01	.03	-0.19	0.852
Insomnia	.07	.03	2.19	0.029*
Trauma	.07	.11	0.60	0.548
Substance Use	-.10	.10	-1.03	0.301
Stress	.06	.02	3.66	<.001***
Anxiety	.03	.03	1.20	0.229
Depression	.02	.01	1.32	0.186
Dissociation	.03	.04	0.84	0.400
Hallucinations	.05	.03	1.85	0.064
Quality of Life	-.10	.06	-1.75	0.081

* p<0.05, ** p<0.01, *** p<0.001

Note: Monthly prevalence coded as none = 0, One to two times a month = 1. Less than once a week, about once a week, two to four times a week and more than four times a week were all coded = 2. *Measures as in Table 3.*

3.4 Research question 2: predictors of distress associated with unusual sleep experiences

To address the second research question, separate linear regression analyses were conducted to examine predictors of distress associated with unusual sleep experiences for both lifetime and monthly frequencies (*Table 5*). Participants rated two types of distress: the level of distress experienced at the time of each unusual sleep experience (retrospective distress) and the level of distress they currently associate with those past experiences (current distress).

The following section reports results for current distress, as the factor variables explored reflect participants' current psychological states. Analyses of retrospective distress are available in *Appendix I*.

3.4.1 Lifetime distress of unusual sleep experiences

For current distress related to lifetime unusual sleep experiences, significant factors included stress ($p < .001$), anxiety ($p < .001$), and hallucinations ($p = .002$). Depression ($p = .010$) and dissociation ($p = .014$) also showed statistically significant associations, although the association with depression was comparatively weaker.

3.4.2 Monthly distress of unusual sleep experiences

For monthly experiences, no factors were significantly associated with distress associated with unusual sleep experiences (*Table 5*). However, stress ($p = .065$), anxiety ($p = .051$), and hallucinations ($p = .055$) approached significance as predictors of current distress, while none reached conventional thresholds for significance. These trends may indicate the potential relevance of these variables, warranting further investigation.

Table 5. Linear regression results for current distress associated with lifetime and monthly unusual sleep experiences.

Predictor	**Distress in relation to lifetime experiences**				**Distress in relation to monthly experiences**			
	Estimate	**SE**	**Z**	**P**	**Estimate**	**SE**	**Z**	**P**
Worry	0.06	0.03	2.13	0.036	0.05	0.04	1.13	0.265
Paranoia	0.03	0.03	1.12	0.268	0.02	0.05	0.44	0.665
Insomnia	0.07	0.04	1.78	0.080	0.07	0.06	1.19	0.242
Trauma	0.19	0.13	1.49	0.140	0.08	0.20	0.38	0.710
Substance use	0.05	0.12	0.39	0.699	0.32	0.22	1.42	0.166
Stress	0.05	0.01	3.75	<.001***	0.04	0.02	1.91	0.065
Anxiety	0.13	0.03	4.36	<.001***	0.10	0.05	2.02	0.051
Depression	0.04	0.02	2.65	0.010*	0.04	0.02	1.71	0.097
Dissociation	0.12	0.05	2.52	0.014*	0.11	0.07	1.60	0.118
Hallucinations	0.09	0.03	3.22	0.002**	0.08	0.04	1.99	0.055
Quality of Life	-0.08	0.07	-1.12	0.267	0.09	0.11	0.82	0.417

** p<0.05, ** p<0.01, *** p<0.001*

Note: Current distress was rated on a Likert scale ranging from 0 (no distress) to 10 (a lot of distress). The dependent variable reflects participants' current emotional response to past unusual sleep experiences. Measures are described in Table 3

4. Discussion

This study examined factors associated with the frequency and distress of unusual sleep experiences in the general population. Insomnia severity and stress were consistently associated with increased frequency of both lifetime and monthly unusual sleep experiences, aligning with prior research linking sleep disturbance to such phenomena. Hallucination proneness also showed a significant, though weaker, association with monthly unusual sleep experiences. These findings suggest that sleep disturbance, particularly insomnia and stress, may play a more central role in unusual sleep experience frequency than other psychological factors.

These results support models suggesting that REM intrusions or disruptions to normal sleep architecture may increase susceptibility to hypnagogic and hypnopompic hallucinations (Waters et al., 2016) and reinforce previous findings linking sleep disturbance and hyperarousal to perceptual anomalies during sleep transitions (Denis et al., 2018; Duarte et al., 2023; Rauf et al., 2022). Notably, dissociation approached significance as a factor associated with lifetime unusual sleep experiences, while hallucination proneness was associated only with monthly frequency, reinforcing the unique relevance of sleep-related and dissociative processes.

The sample context adds further insight: 94% of participants reported experiencing at least one unusual sleep experience in their lifetime, and 44% in the past month. Of those reporting monthly unusual sleep experiences, 60% experienced them one to two times per month. Importantly, 54% indicated their experiences never co-occurred with sleep paralysis, suggesting that while sleep paralysis has often been linked to distressing sleep-related phenomena, many individuals experience similar events in its absence. This broadens the conceptualisation of sleep-based hallucinations and underscores the need to consider them as part of a wider spectrum.

In terms of distress, several factors were significantly associated with higher current distress in relation to lifetime unusual sleep experiences, including stress, anxiety, hallucination proneness, depression, and dissociation. These findings suggest that emotional dysregulation and cognitive-affective vulnerabilities may influence how distressing these experiences are

perceived, particularly over the long term. In contrast to previous work focusing on PTSD or trauma-related responses (Denis et al., 2018; Rek et al., 2017), this study highlights more general indicators of emotional vulnerability as key correlates of unusual sleep experience-related distress.

For monthly unusual sleep experiences, no psychological variables reached statistical significance in predicting current distress. However, anxiety, hallucination proneness, and stress approached significance, suggesting possible trends that could emerge more clearly in larger samples. These findings raise questions about the role of time in how distress is processed and whether certain traits influence distress differently depending on whether the experience is recent or more distant.

Importantly, while distress has often been framed in the context of sleep paralysis (Sharpless & Barber, 2011), the current findings indicate that more than half of those with monthly unusual sleep experiences occurred independently of sleep paralysis. This points to the need for clinical frameworks to go beyond sleep paralysis in understanding and supporting those experiencing sleep-related hallucinations.

Finally, this study also highlights a key limitation in existing clinical assessments: sleep-related hallucinations are rarely assessed, and distinctions between lifetime and recent experiences are often overlooked. More nuanced tools capturing both frequency and distress over time may better reflect how these experiences function within broader mental health contexts.

4.1 Strengths and limitations

A key strength of this study was its targeted recruitment of individuals with lived experience of unusual sleep phenomena, including sleep paralysis. By utilising online advertisements, the study successfully recruited an enriched sample that was particularly relevant to the research focus. Although this self-selection method introduces some bias, it enabled access to a population that is often difficult to capture in traditional clinical settings research.

Another notable contribution was the investigation of sleep-related hallucinations as a distinct phenomenon, separate from but often overlapping with sleep paralysis. Previous research has

tended to place such experiences within broader categories related to sleep or psychosis; this study adds to the literature by exploring them independently. Furthermore, the analysis did not limit itself to lifetime experiences but also examined recent (monthly) occurrences and their associated distress, offering novel insights into the ongoing impact of these phenomena.

The study also explored a wide range of potential contributing factors, including those previously associated with nightmares and sleep paralysis (e.g., insomnia, stress, dissociation), contributing to a broader understanding of the related psychological processes (Rek et al., 2017). The use of validated psychometric instruments improved the reliability of the psychological assessments.

However, it should be noted that the primary measure of sleep-related hallucinations was developed specifically for this study and lacks formal validation. This limits direct comparison with existing literature and may have influenced findings.

The cross-sectional design limits causal interpretation: it is unclear whether psychological factors, such as insomnia and stress, contribute to unusual sleep experiences or whether these experiences exacerbate psychological distress. Longitudinal or interventional studies are needed to establish directionality.

Several limitations should also be noted. Although the study aimed to reach a broad sample, the final group lacked substantial demographic diversity, with most participants identifying as White and female. This limits the generalisability of the findings, particularly given cultural variability in the interpretation and reporting of sleep-related hallucinations (Jalal et al., 2021). Additionally, the sample size fell short of initial recruitment targets, which may have reduced statistical power. Some variables showed associations nearing significance, and it is possible that a larger sample may have yielded more robust results.

It is also important to note that no corrections for multiple comparisons were applied in the regression analyses. This decision was based on the exploratory nature of the study and the limited power to detect effects after correction. However, this must be acknowledged as a limitation: applying strict correction procedures would likely have reduced the number of

significant associations observed. Future confirmatory studies with larger samples are needed to validate the identified patterns here.

4.2 Clinical and research implications

These findings suggest that individuals presenting with mental health difficulties may also experience sleep-related hallucinations and that these experiences may interact with or contribute to broader psychological distress. Although there are currently no standardised clinical assessments specifically targeting sleep-related hallucinations, it may be helpful for clinicians to be aware of their possible presence, particularly in populations experiencing stress, insomnia, or dissociative symptoms.

In addition to improved assessment, providing high-quality psychoeducational materials may help de-catastrophise sleep-related hallucinations and reduce the associated stress or worry. This approach may be particularly beneficial for individuals experiencing high levels of stress and sleep disturbances, even if they do not report unusual experiences spontaneously. Normalising these phenomena as relatively common and often non-pathological may help prevent the exacerbation of insomnia or emotional distress. Furthermore, these experiences may not be static but can fluctuate in response to situational and relational factors, such as acute stress or sleep disruption. Recognising this dynamic nature could also promote more flexible and compassionate clinical approaches.

While this study does not provide direct evidence to support specific interventions, the observed associations raise the possibility that improving sleep quality could reduce the frequency or distress of these experiences. Interventions such as cognitive-behavioural therapy for insomnia (CBT-I) have been shown to reduce insomnia and psychological symptoms more broadly (Alimoradi et al., 2022; Freeman et al., 2021), and future research could explore whether such approaches have a secondary benefit for individuals reporting sleep-related hallucinations.

Further research is needed to investigate whether interventions for sleep disturbance or emotional dysregulation impact the occurrence or impact of sleep-related hallucinations. Longitudinal and experimental studies will also be important for clarifying the direction of these

associations. Additionally, given that interpretations of these experiences may vary culturally, exploring sociocultural frameworks could provide further insight into their emotional and clinical significance.

4.3 Conclusion

This study contributes to the growing literature on sleep-related hallucinations by identifying stress and insomnia severity as key factors associated with their frequency, with hallucination proneness demonstrating a weaker association with more recent occurrences. Emotional vulnerability markers, such as stress, anxiety, dissociation, and depression, were significantly associated with distress linked to lifetime unusual sleep experiences, although no variables reached significance for monthly experiences. By examining sleep-related hallucinations as distinct from sleep paralysis or psychosis, this study offers novel insights into their psychological correlates and variability over time. These findings support the view that sleep-related hallucinations are not fixed traits but may fluctuate depending on relational and situational factors such as stress or sleep quality. Although causal conclusions cannot be drawn from this cross-sectional design, the findings suggest that common mental health factors may influence both the occurrence and emotional impact of these experiences. Future research should address current methodological limitations, including limited demographic diversity, and employ longitudinal or experimental designs to explore causal pathways, the effects of mental health treatments, and cultural influences on interpretation. While no specific clinical interventions are recommended at this stage, raising awareness of sleep-related hallucinations within mental health contexts may support more holistic understanding and care.

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Chapter 5

Discussion and Critical Evaluation

Word count: 3162 words

Discussion and Critical Evaluation

This chapter critically evaluates the unique and combined contributions of the systematic review (SR) and empirical paper (EP). Both focused on sleep paralysis and related hypnagogic and hypnopompic hallucinations, collectively referred to as unusual sleep experiences and their psychological correlates.

Researcher reflections

Before I began this portfolio, my motivation for researching unusual sleep experiences came from my personal encounters with hypnopompic hallucinations. These vivid and often unsettling experiences sparked my curiosity, especially since informal conversations with friends showed that more than half had experienced something similar. Investigating hypnopompic and hypnagogic hallucinations, with and without sleep paralysis, was a compelling area of interest, and this enthusiasm for the topic remained throughout the thesis process. I am thankful that the topics were so captivating, as the journey was challenging at times, particularly regarding recruiting the enriched sample. The process for the empirical study was especially demanding, requiring considerable flexibility due to challenges in the recruitment timeline and strategy, as target ads failed to yield the expected numbers. Despite these obstacles, the experience has been rewarding because I have been able to explore these topics in new ways and contribute valuable clinical findings to the field of clinical psychology. Overall, the journey has proven highly fulfilling, allowing me to refine my research skills, enhance my critical thinking, and underscore the clinical significance of routinely assessing sleep within psychological practice.

The process of conducting both a systematic review and an empirical study also led me to reflect on my own position as a researcher. Inspired by Jamieson et al. (2023) advocacy for reflexivity in quantitative research, I became more critically aware of how my assumptions and lived experiences shaped the framing of research questions, the choice of measures, and the interpretation of findings. Their work reinforced the value of integrating reflexive practice even within quantitative paradigms, prompting me to document my decision-making processes and consider ethical implications beyond formal approvals. This experience has shaped not only the research outcomes but also my identity as a reflective practitioner.

Summary of findings

The SR investigated the association between sleep paralysis and mental health conditions. Across 18 studies, there was consistent evidence that sleep paralysis is significantly more prevalent and distressing among clinical populations compared to non-clinical groups, particularly those with post-traumatic stress disorder (PTSD), anxiety disorders, and depression. Hallucinatory phenomena, especially sensed presence and intruder-type hallucinations, were prominent features of sleep paralysis episodes and strongly associated with psychological distress. Trauma exposure and PTSD symptoms were consistent predictors of both sleep paralysis occurrence and severity, with some studies suggesting that trauma-related hyperarousal may trigger sleep paralysis episodes or amplify their emotional impact (Hinton et al., 2005; Sharpless & Barber, 2011). Anxiety sensitivity and perceived stress were consistently associated with sleep paralysis, whereas findings for depressive symptoms were more mixed; some studies found that depression increased distress during sleep paralysis episodes but did not reliably predict how often they occurred. The mechanisms responsible for sleep paralysis remain unknown. However, REM sleep intrusion, hyperarousal, dissociation, and maladaptive cognitive appraisals emerged as shared explanatory pathways (Denis et al., 2018; Rauf et al., 2022). Notably, even subclinical populations demonstrated increased sleep paralysis vulnerability when elevated stress, trauma histories, or dissociative traits were present, suggesting that susceptibility exists along a continuum rather than within discrete diagnostic boundaries.

The EP extended these insights by focusing on unusual sleep experiences in the general population, including hypnagogic or hypnopompic hallucinations that may accompany sleep paralysis or occur independently. Within a non-clinical sample (N = 84), 94% reported experiencing at least one unusual sleep experience in their lifetime, and 44% reported occurrences in the past month. Interestingly, more than half of those with monthly unusual sleep experiences reported no co-occurring sleep paralysis, suggesting that hallucination-like phenomena during sleep transitions occur outside traditional sleep paralysis frameworks. Insomnia and stress were significant factors for both lifetime and monthly unusual sleep experience frequency. Distress associated with lifetime unusual sleep experiences was

significantly associated with stress, anxiety, hallucination proneness, dissociation, and depression, which mirrors previous findings (Cernis et al., 2021; Duarte et al., 2023). Hallucination proneness was also associated with monthly unusual sleep experiences frequency, though to a lesser extent. These findings suggest that emotional vulnerability and perceptual sensitivity are important in shaping the psychological impact of sleep-related hallucinations. Interestingly, while these associations held for lifetime distress, predictors of current distress related to recent experiences (monthly) were weaker, suggesting that distress may diminish over time or depend on contextual appraisals (Alderson-Day et al., 2022; Cheyne & Pennycook, 2013).

Together, the SR and EP underscore overlapping patterns between sleep-related hallucinations and mental health vulnerabilities. Both highlight that sleep disturbances such as sleep paralysis and other unusual sleep experiences are linked not only to clinical conditions but also to broader psychological and emotional states, including insomnia, stress, and dissociation. This integrated evidence supports a transdiagnostic and dimensional view of sleep-related hallucinations, wherein these experiences reflect an interplay of physiological and psychological processes, influenced by both trait-like vulnerabilities and situational stressors.

Combined discussion

Despite their different focuses, both the SR and EP found that emotional dysregulation (e.g., anxiety, stress, dissociation) is closely linked to the distress associated with sleep-related hallucinations. Both studies emphasised the psychological significance of unusual sleep experiences, whether they occurred alongside sleep paralysis or independently. These experiences were consistently associated with hyperarousal and cognitive-affective dysregulation, aligning with sleep-state dissociation models, which propose that boundary disruptions between wakefulness and dreaming underlie perceptual anomalies during sleep transitions (Alderson-Day et al., 2022; Waters et al., 2016). Collectively, the findings support the view that such phenomena exist along a continuum of severity, shaped by psychological vulnerability and contextual interpretation (Cheyne & Pennycook, 2013; Sharpless & Barber, 2011).

The SR revealed that sleep paralysis is disproportionately prevalent and distressing among trauma-exposed and clinical populations. Hallucinatory content, particularly involving sensed presence or perceived threat, was associated with greater distress, especially when interpreted through cultural or supernatural lenses (Hinton et al., 2005; Jalal & Hinton, 2015). These findings are consistent with REM intrusion theory, which hypothesises that the intrusion of REM-like activity into wakefulness gives rise to vivid hallucinations and paralysis (Cheyne & Pennycook, 2013). They are also aligned with hyperarousal models, which link trauma and heightened sympathetic activation to sleep fragmentation and vulnerability to sleep paralysis (Denis et al., 2018; Rauf et al., 2022).

The EP extended this by examining unusual sleep experiences beyond sleep paralysis, including hypnagogic and hypnopompic hallucinations, within a non-clinical sample. As previously noted, unusual sleep experiences were highly prevalent in the non-clinical sample, and many occurred without co-occurring sleep paralysis. Importantly, over half of those with monthly unusual sleep experiences did not report co-occurring sleep paralysis, demonstrating that sleep-related hallucinations frequently occur independently of classic sleep paralysis episodes. This suggests that while sleep-related hallucinations may occur alongside sleep paralysis and involve distinct physiological features such as muscle atonia, similar hallucinatory experiences can also arise independently. These may be driven by shared vulnerability factors such as insomnia, stress, and increased perceptual sensitivity, even in the absence of the specific neurophysiological characteristic of sleep paralysis.

The results also call into question the traditional pathologisation of sleep-related hallucinations. While sleep paralysis is often framed within clinical or neurological contexts, the EP demonstrated that hallucinations during sleep transitions are widespread and not inherently pathological. Instead, contextual factors such as meaning attribution, emotional state, and cultural beliefs likely mediate the degree of distress, an idea supported by both studies and the broader literature (Alderson-Day et al., 2022; Jalal et al., 2021).

Clinically, the overlap between hallucination-proneness, insomnia, and emotional distress indicates that targeted interventions such as cognitive behavioural therapy for insomnia (CBT-I)

may provide transdiagnostic benefit, reducing not only sleep disturbance but also distress related to perceptual anomalies. However, the reliance on cross-sectional data across both studies limits causal inference. Longitudinal studies are essential to clarify directionality and assess whether therapeutic interventions targeting sleep can alleviate both unusual sleep experiences frequency and associated distress (Alimoradi et al., 2022; Freeman et al., 2021).

Having outlined the combined findings, the following sections critically appraise the strengths and limitations of each component study.

Systematic review: critical review

A notable strength of the SR was its inclusion of varied participant groups, such as trauma-exposed individuals, refugees, university students, and psychiatric inpatients, which provided valuable insights into the psychological correlates of sleep paralysis across different contexts. However, while this diversity added depth, the cross-cultural scope was somewhat limited, as most studies were conducted in Western countries, which constrains the broader generalisability of findings. Several studies showed that cultural beliefs shaped both how sleep paralysis is interpreted and the distress associated with these experiences (Jalal & Hinton, 2015), highlighting the importance of culturally sensitive frameworks in both research design and clinical assessment. Despite methodological variation across studies, the consistent association between sleep paralysis and psychological distress lends robustness to the overall findings.

However, several methodological limitations restrict the interpretability and comparability of the findings. Most critically, the exclusive use of cross-sectional designs prevents any causal inferences about whether psychological vulnerabilities (e.g., trauma, anxiety, dissociation) contribute to sleep paralysis or arise as a consequence. Additionally, there was substantial variability in sleep paralysis assessment tools, including the use of self-report questionnaires (e.g., WUSEQ, SPQ), semi-structured interviews, and in one case, polysomnography. This lack of standardisation undermines the comparability of prevalence rates and limits meta-analytic potential. Moreover, only a minority of studies employed objective sleep measures, meaning

most data relied on retrospective self-report, which may be affected by memory biases or misinterpretation of experiences.

The criteria for including or excluding participants varied between studies, leading to inconsistencies. While all studies excluded individuals with comorbid neurological disorders (such as narcolepsy or epilepsy), only a few adequately considered other factors like substance use, sleep hygiene, or different parasomnias that could affect both the frequency of sleep paralysis and its psychological consequences. This raises issues regarding omitted variable bias, restricting our ability to draw clear conclusions about specific psychological correlates. Moreover, while some studies examined trauma-exposed groups, very few directly evaluated sociocultural aspects, including religious beliefs or distress explanatory models, both of which likely influence how individuals experience and report sleep paralysis.

It is also worth noting that the database searches for the review were conducted in September 2024, and therefore, relevant studies published since may not have been captured. This means the findings reflect the literature available at that time and may not represent the most current developments in the field.

A further gap is the lack of intervention-based research. None of the studies examined whether targeting modifiable factors (such as insomnia, anxiety, and maladaptive appraisals) could effectively reduce the occurrence of sleep paralysis or the associated distress. This limits the clinical applicability of current findings and underscores the need for longitudinal and experimental studies. Future research should include standardised, validated assessment tools, control for major confounding factors, and more explicitly investigate cultural interpretations to enhance the provision of person-centred and culturally competent care (Page et al., 2021).

Empirical paper: critical review

The EP delivered important insights by examining unusual sleep experiences within a general population sample, thus broadening the research focus beyond traditional sleep paralysis. A significant strength was its incorporation of both frequency and distress metrics, facilitating a deeper understanding of how sleep-related hallucinations are perceived and evaluated. The intentional distinction between lifetime and recent experiences, alongside a targeted focus on

hallucinations that occurred without sleep paralysis, brought conceptual clarity and separated unusual sleep experiences from more clinically defined parasomnias. This design choice enhances the growing body of literature that examines sleep-related hallucinations as transdiagnostic phenomena (Alderson-Day et al., 2022).

However, several important limitations must be acknowledged. Although psychometrically robust instruments were used to assess psychological variables, the primary measure of unusual sleep experiences was developed specifically for this study and lacked formal validation, which may affect the reliability and generalisability of the findings. The sample was predominantly white, female, and university-educated, and participants self-selected, introducing the possibility of limiting demographic representativeness. Furthermore, the cross-sectional design precludes any inference of causality or directionality between emotional vulnerability and unusual sleep experiences. The absence of adjustments for multiple comparisons also raises the risk of type I errors (false positives), especially considering the number of psychological variables examined.

Moreover, although the study's use of a general population sample is a significant advantage over clinically oriented sleep paralysis research, it has its limitations. When compared to previous clinical samples (e.g., Hinton et al., 2005; Watson et al., 2015), symptom severity in this study was probably lower, which might have lessened the visibility of more pronounced associations. Nonetheless, the replication of established patterns, such as the role of insomnia and hallucination proneness in predicting the frequency and distress of unusual sleep experiences, suggests that these factors are robust and not merely artefacts of clinical comorbidity.

In summary, the empirical study contributes novel and clinically relevant data on the prevalence, correlates, and distress associated with unusual sleep experiences. While methodological constraints such as sampling limitations and an unvalidated primary measure warrant caution, the findings provide important foundations for future research. Longitudinal, cross-cultural studies using validated tools are necessary to explore causality and develop early intervention strategies. Moreover, the observed associations between unusual sleep

experiences and emotional vulnerability emphasise the potential value of integrating psychoeducation and sleep-focused interventions, such as CBT-I, into broader mental health support frameworks.

Clinical implications

The findings from both studies underscore the under-recognised clinical relevance of unusual sleep experiences and sleep paralysis-related distress, particularly in individuals with heightened emotional vulnerability. Clinicians working with cases of anxiety, dissociation, trauma, or stress should consider routinely screening for sleep-related hallucinations and parasomnias, as these phenomena may exacerbate psychological symptoms or be mistakenly interpreted as signs of psychosis. Accurate differentiation between transient perceptual anomalies during sleep transitions and enduring psychotic symptoms is essential for preventing misdiagnosis, avoiding unnecessary pharmacological treatment, and delivering appropriate psychoeducational and psychological support.

Incorporating structured sleep assessments (e.g., ISI, PSQI) into routine psychological evaluations can enhance the identification of at-risk individuals, particularly in primary care, general mental health, and trauma-focused services. In trauma-exposed populations, for instance, sleep paralysis may act as a secondary manifestation of hyperarousal and disturbed REM patterns. Here, trauma-focused CBT could be beneficial not only for core PTSD symptoms but also for alleviating distress linked to sleep-related intrusions. Similarly, for individuals reporting chronic insomnia alongside unusual sleep phenomena, CBT for Insomnia (CBT-I) may be a useful transdiagnostic tool, addressing sleep disruption, reducing vulnerability to hallucination-like experiences, and improving overall affect regulation (Alimoradi et al., 2022; Freeman et al., 2021).

Beyond treatment, psychoeducation should be integrated into the early stages of intervention, especially in settings where cultural beliefs may frame sleep paralysis or hallucinations in supernatural or spiritual terms. Providing culturally sensitive explanations of the physiological and psychological mechanisms underlying these experiences may help reduce fear, shame, and stigma. This is particularly important in ethnically diverse populations, where distress may be

amplified by culturally reinforced interpretations of danger or possession (Jalal et al., 2021). To be effective, psychoeducational materials should be tailored for community health, school-based, and trauma-informed care contexts, where service users may not actively disclose these experiences unless prompted.

Importantly, psychoeducation should also extend to clinicians, including general practitioners (GPs), psychologists, and frontline mental health staff, who may encounter individuals reporting these experiences. Enhancing professionals' understanding of the non-pathological nature of many unusual sleep experiences, their links to emotional vulnerability, and their cultural framing can improve diagnostic accuracy, reduce inappropriate referrals or medication use, and support more empathetic, normalising responses during clinical interactions.

There is potential to create targeted psychological interventions that address the interplay between perceptual anomalies, insomnia, and emotional dysregulation. For instance, adaptations of metacognitive therapy, imagery rescripting, or compassion-focused therapy could be investigated for those who experience high levels of hallucination-proneness, dissociation, and distress. In more severe instances, incorporating sleep-focused modules into treatment plans for individuals with psychosis-spectrum presentations might provide a pathway for early intervention.

These findings highlight the necessity for greater awareness, training, and development of services in primary care, psychological therapies, and trauma services. Implementing a stepped-care approach that encompasses psychoeducation, sleep hygiene, validated screening, and focused psychological therapies could provide the most extensive support for individuals suffering from distressing sleep-related hallucinations, irrespective of diagnosis status.

Directions for future research

Future research should prioritise longitudinal and interventional designs to clarify causal relationships between sleep-related hallucinations and psychological vulnerability. Tracking individuals over time would help determine whether factors such as insomnia, stress, and dissociation predict the onset or intensification of unusual sleep experiences, or if these experiences themselves contribute to psychological distress. Additionally, randomised

controlled trials are needed to assess the effectiveness of treatments such as cognitive behavioural therapy for insomnia, mindfulness-based stress reduction, or trauma-focused therapies in reducing both the frequency and distress associated with sleep paralysis and other unusual sleep-related hallucinations.

There is an urgent need to create and validate psychometric tools that can effectively assess the phenomenology of these experiences. Existing measures differ significantly in both content and structure, which hinders comparability between studies. Future tools must clearly differentiate between sleep paralysis, hypnagogic and hypnopompic hallucinations, as well as other parasomnias. They should also measure aspects of distress, frequency, and cultural interpretation. Psychometric development needs to focus on cross-cultural adaptability, ensuring that these tools are attuned to the various interpretations and expressions of these phenomena across different cultures groups.

Additionally, qualitative research can provide in-depth insights into the subjective meaning-making processes related to these experiences. Exploring how individuals from diverse backgrounds understand, explain, and cope with sleep paralysis and sleep-related hallucinations can guide the development of person-centred interventions that are both clinically effective and culturally respectful. Combining qualitative approaches with quantitative data may enhance the creation of mixed-methods models that better reflect the complexity of these experiences.

Finally, expanding sample diversity is essential. Many current studies rely on predominantly white, Western, student samples, which limits generalisability. Future research should actively include ethnic minorities, underrepresented gender identities, individuals from low-income or marginalised communities, and non-Western cultural groups. This will improve the external validity of findings and promote a more inclusive and globally relevant psychological practices.

Conclusion

This chapter has critically examined the contributions of the SR and EP in exploring unusual sleep-related experiences, including hallucinations and sleep paralysis. Together, these projects demonstrate that such phenomena are highly prevalent, psychologically significant, and often under-recognised in both research and clinical settings. The EP identified key predictors of frequency and distress, such as insomnia, anxiety, and dissociation, while the SR, although not primarily focused on cultural factors, found that cultural interpretations meaningfully shaped how these experiences were perceived and the level of distress they provoked. These findings underscore the need for sleep-informed, culturally aware, and psychologically integrative approaches to assessment and intervention. They also highlight opportunities to improve awareness in clinical settings, refine measurement tools, and better incorporate sleep-related phenomena into mental health care. Moving forward, this work calls for a more holistic and person-centred understanding of sleep-related hallucinations, bridging the divide between sleep science and psychological practice.

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Appendices

Appendix

Systematic Review Author Guidelines (Psychiatry Research)

Rapid publication is a priority; hence, authors are requested to pay close attention to the following instructions for the submission of manuscripts to the journal *Psychiatry Research*.

Preparation of manuscripts

Title page. The Title page should include the author byline, with names of authors on the same line(s). Superscript letters (a, b, c), not numerals, should be used to key institutional affiliation (if all authors are in the same department, the superscript letter should be omitted); an asterisk should be entered to designate the corresponding author. Underneath the byline, institutional affiliations should be listed (department, institution, city, state or province (if applicable) and country. Funding information should not be included on the title page but should instead be given following the Discussion section.In an asterisked Corresponding Author footnote at the bottom of the title page, telephone/fax numbers and e-mail address of the corresponding author should be provided; e-mail addresses, if desired, may also be provided for the co-authors (or co-corresponding author, if applicable).

Abstract. The Abstract should be 150-200 words for full-length articles and 100 words for short communications (formally known as Brief Communications), summarizing the aims of the study, the112 methods used, the results and the major conclusions. Do not include a summary at the end of the article. Note that *Psychiatry Research* does not use the structured abstract style; do not include bold-faced headings within the abstract. The Abstract should be a single paragraph. Do not include detailed statistics or p-values in the abstract; simply say “significant “or “non-significant”. The abstract should be followed by up to seven key words which accord with the indexing conventions of Index Medicus. Note that the keywords should not duplicate words used in the title of the article, which will be automatically indexed.

Text. Although exceptions will be considered, manuscripts should not exceed 5000 words, and shorter manuscripts (e.g., 3000 words) are preferred. Each article should contain the following major headings: Introduction (preceded by arabic number 1.), Methods (preceded by number 2.), Results (preceded by number 3.), Discussion (preceded by number 4.), Acknowledgment (optional section following the discussion, which should not be preceded by a numeral), and

References (should not be preceded by a numeral). Subheadings should follow the numbering system used in the major heading; for example, the subheading "Subjects" within the Methods section should be flush left on a separate line and designated 2.1., the subheading "Procedures" should be designated 2.2., etc. Lower level headings, if required, should also be numbered (e.g., "2.1.1. Patients." as a lower order heading under "2.1. Subjects."). Only the first letter of the first word of each heading should be capitalized. The use of abbreviations within the text should be minimized, and each abbreviation, when introduced, must be defined and used consistently thereafter. Systeme International measurements should be used. For products or instruments (do not abbreviate) used in the research reported, provide the name, city and country of the supplier in parentheses. All tables and figures must be referred to in the text.

Manuscript categories

Research Articles. Although exceptions will be considered, manuscripts should not exceed 5000 words, and shorter manuscripts (e.g., 3000 words) are preferred. Each article should contain the following major headings: Introduction (preceded by arabic number 1.), Methods (preceded by number 2.), Results (preceded by number 3.), Discussion (preceded by number 4.), Acknowledgment (optional section following the discussion, which should not be preceded by a numeral), and References (should not be preceded by a numeral). Subheadings should follow the numbering system used in the major heading; for example, the subheading "Subjects" within the Methods section should be flush left on a separate line and designated 2.1., the subheading "Procedures" should be designated 2.2., etc. Lower level headings, if required, should also be numbered (e.g., "2.1.1. Patients." as a114 lower order heading under "2.1. Subjects."). Only the first letter of the first word of each heading should be capitalized.

Short communications. Short communications (formally called Brief reports) should not exceed 1500 words, including a 100-word abstract, 3 keywords, text, and references plus 1 table or 1 figure.

Case reports. Case reports will only be considered as Correspondence (see following instructions.)

Correspondence. Correspondence items (formally Letters to the Editor) should be 750-1000 words or less. It should not include a title page, abstract or key words. Authors' names and

affiliations should be listed at the end of the letter, along with the corresponding author's email address. There should be no more than 5 references, and no tables or figures.

Manuscript categories

Conflict of interest. All authors are requested to disclose any actual or potential conflict of interest including any financial, personal or other relationships with other people or organizations within three (3) years of beginning the work submitted that could inappropriately influence, or be perceived to influence, their work. Examples of potential conflicts of interest that should be disclosed include employment, consultancies, stock ownership (except for personal investment purposes equal to the lesser of one percent (1%) or USD 5000), honoraria, paid expert testimony, patent applications, registrations, and grants. If there are no conflicts of interest, authors should state that there are none.

Abbreviations. Define abbreviations at their first occurrence in the article. Abbreviations should be defined when they first occur in the abstract, in the text, and also in tables and figure legends. Once an abbreviation has been introduced in the main body of the text, it should be used throughout.

Statistical reporting. Statistical reporting should be complete, including at a minimum name of statistical test, test value, degrees of freedom where appropriate, and *p*-value. Italic font should be used for *n* (sample size) and statistical terms, e.g., *t, r, F, U, p*.

Submission of manuscripts

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• A competing interests statement is provided, even if the authors have no competing interests to declare

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Reporting sex- and gender-based analyses

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These offer systematic approaches to the use and editorial review of sex and gender information in study design, data analysis, outcome reporting and research interpretation - however, please note there is no single, universally agreed-upon set of guidelines for defining sex and gender.

Definitions

Sex generally refers to a set of biological attributes that are associated with physical and physiological features (e.g., chromosomal genotype, hormonal levels, internal and external anatomy). A binary sex categorization (male/female) is usually designated at birth (""sex assigned at birth""), most often based solely on the visible external anatomy of a newborn. Gender generally refers to socially constructed roles, behaviors, and identities of women, men and gender-diverse people that occur in a historical and cultural context and may vary across societies and over time. Gender influences how people view themselves and each other, how they behave and interact and how power is distributed in society. Sex and gender are often incorrectly portrayed as binary (female/male or woman/man) and unchanging whereas these constructs actually exist along a spectrum and include additional sex categorizations and gender identities such as people who are intersex/have differences of sex development (DSD) or identify as non-binary. Moreover, the terms "sex" and "gender" can be ambiguous—thus it is

important for authors to define the manner in which they are used. In addition to this definition guidance and the SAGER guidelines, the resources on this page offer further insight around sex and gender in research studies.

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A concise and factual abstract is required. The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separately from the article, so it must be able to stand alone. For this reason, References should be avoided, but if essential, then cite the author(s) and year(s). Also, non-standard or uncommon abbreviations should be avoided, but if essential they must be defined at their first mention in the abstract itself.

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Acknowledgements

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Reference to a book:

Strunk Jr., W., White, E.B., 2000. The Elements of Style, fourth ed. Longman, New York.

Reference to a chapter in an edited book: Mettam, G.R., Adams, L.B., 2009. How to prepare an electronic version of your article, in: Jones, B.S., Smith , R.Z. (Eds.), Introduction to the Electronic Age. E-Publishing Inc., New York, pp. 281–304.

Reference to a website:142

Cancer Research UK, 1975. Cancer statistics reports for the UK. http://www.cancerresearchuk.org/aboutcancer/statistics/cancerstats report/ (accessed 13 March 2003).

Reference to a dataset:

[dataset] Oguro, M., Imahiro, S., Saito, S., Nakashizuka, T., 2015. Mortality data for Japanese oak wilt disease and surrounding forest compositions. Mendeley Data, v1. https://doi-org.uea.idm.oclc.org/10.17632/xwj98nb39r.1.

Reference to software:

Coon, E., Berndt, M., Jan, A., Svyatsky, D., Atchley, A., Kikinzon, E., Harp, D., Manzini, G., Shelef, E., Lipnikov, K., Garimella, R., Xu, C., Moulton, D., Karra, S., Painter, S., Jafarov, E., & Molins, S., 2020. Advanced Terrestrial Simulator (ATS) v0.88 (Version 0.88). Zenodo. https://doi-org.uea.idm.oclc.org/10.5281/zenodo.3727209.

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Appendix B

PRISMA Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	
Effect	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of	

Section and Topic	Item #	Checklist item	Location where item is reported
measures		results.	
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	
Study characteristics	17	Cite each included study and present its characteristics.	
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	

Section and Topic	Item #	Checklist item	Location where item is reported
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	
	23b	Discuss any limitations of the evidence included in the review.	
	23c	Discuss any limitations of the review processes used.	
	23d	Discuss implications of the results for practice, policy, and future research.	
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	
Competing interests	26	Declare any competing interests of review authors.	
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	

Appendix C

Original Article Author Guidelines (Sleep Medicine)

Author guidelines

Your Paper Your Way

We now differentiate between the requirements for new and revised submissions. You may choose to submit your manuscript as a single Word or PDF file to be used in the refereeing process. Only when your paper is at the revision stage, will you be requested to put your paper in to a 'correct format' for acceptance and provide the items required for the publication of your article.

To find out more, please visit the Preparation section below.

Introduction

Sleep Medicine has an open access companion journal, Sleep Medicine: X. Sleep Medicine is published monthly and all manuscripts are peer-reviewed except proceedings of scientific meetings.

Purpose and Procedure

Articles submitted for review should meet the following criteria:

•Studies of prevention or treatment must meet these criteria: random allocation of participants to comparison groups; follow-up of at least 80% of those entering the investigation; outcome measure of known or probably clinical importance.

•Studies of prognosis must meet these additional criteria: inception cohort of individuals, all initially free of the outcome of interest; follow-up of at least 80% of participants until the occurrence of a major study end point or to the end of the study.

•Studies of causation must meet these additional criteria: clearly identified comparison group for those at risk for, or having, the outcome of interest (e.g. randomized controlled trial, quasi-randomized controlled trial, nonrandomized controlled trial, cohort analytic study with case-by-case matching or statistical adjustment to create comparable groups, case-control study); blinding of observers of outcome to exposure (criterion assumed to be met if outcome is objective, e.g. all-cause mortality, objective test); blinding of observers of exposure to outcomes for case-control studies OR blinding of subjects to exposure for all to be compared

on the basis of both the outcomes produced (effectiveness) and resources consumed (costs); evidence of effectiveness must be from a study (or studies) that meets the above-noted criteria for diagnosis, treatment, quality assurance, or a review article; results should be presented in

terms of the incremental or additional costs and outcomes of one intervention over another; where there is uncertainty in the estimates or imprecision in the measurement, a sensitivity analysis should be done.

Article Types

The primary emphasis of the journal will be clinical and to this end, a number of different types of articles will be published. Each type will be aimed to provide clinically important information needed to keep up to date with the practice of sleep medicine, written in a way to foster interdisciplinary understanding and make clinical information accessible to all practitioners.

Sleep Medicine publishes the following types of articles:

• **Original Articles** dealing with diagnosis, clinical features, pathophysiology, etiology, treatment (by all relevant modalities, including pharmacological, instrumental, surgical, behavioral, nutritional), genetics, epidemiology, natural history and prognosis of human sleep disorders will be considered for publication, provided these have not been previously published except in abstract form or have not been submitted simultaneously elsewhere. Reports may also include technical aspects of sleep medicine, which are relevant for diagnosis, pathophysiology, etiology, treatment and natural history. Basic research articles will also be published where they have a direct impact on or shed considerable light on clinical aspects of sleep. Submission of original articles based on animal or human experimental studies are encouraged, and these articles should include a comment in the abstract and discussion about the potential clinical relevance of the study.

• **Review articles** on all aspects of clinical sleep medicine and related basic science that contribute to understanding clinical sleep medicine will be published. Reviews will be timely, emphasize areas undergoing new development, and include both state of the art reviews and multi-author discussion of controversial areas.

• **Editorials** on manuscripts published elsewhere in the journal or on a timely and controversial topic will be published occasionally. Editorials may contain up to 1000 words and 20 references.

• **Brief Communications** are preliminary or limited results of investigations (up to 1500 words containing 20 or fewer references, one table and one figure).

• **Letters to the Editor** addressing articles appearing in the journal or on other current topics will be published (up to 300 words and five references).

• **Historical Issues in Sleep Medicine** submissions dealing with sleep-related historical figures, whether leaders from the past or characters from literature or mythology, will be considered for publication.

•**Book Reviews** are also published. Upon reception of a book from the publisher, it is sent to the book review editor.

• **Images in Sleep Medicine** submissions should derive from a specific sleep-related clinical situation. Each submission *must* consist of high-resolution images (e.g. polysomnographic tracing, actigraphic recording, neuroimaging, etc.) and should be accompanied by a very brief clinical impression, significance of the findings and figure legend. Readers will be encouraged to foster discussion of any controversial images.

Submissions may contain up to 500 words and five references, and content must be organized by the following headings: 1.Introduction to the case, 2. Image analysis, 3. Discussion, and 4.References. Submissions not adhering to these guidelines may be rejected without further consideration.

• **Video-Clinical Corners** will deal with interesting and challenging clinical cases and significant original phenomena. Every video submission must consist of high-resolution images and a consent form for publication for educational purposes signed by the patient see form, please see the **Patient Details** section below. The Editors reserve the right to ask for additional video/s or video modifications.

Submissions may contain up to 750 words, 10 references and 2 figures, and content must be organized as follows:

1) **Introduction** of the case stating the purpose and unusual and interesting aspects of the video

2) **Case description** including chief complaint, past and present medications and history and physical findings

3) **Video analysis** of data including representative examples from the patient's polysomnogram;

4) **Brief discussion** of the differential diagnosis and therapeutic challenge. For tips on preparing your video for submission, see here.

The journal will publish **special issues** or **supplements** dealing with proceedings of meetings, workshops or special topics.

Submission checklist

You can use this list to carry out a final check of your submission before you send it to the journal for review. Please check the relevant section in this Guide for Authors for more details.

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Supplemental files (where applicable)

Further considerations

• Manuscript has been 'spell checked' and 'grammar checked'

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If applicable, a statement must appear in the Methods section that the study was approved by the relevant institutional review boards, ethics committees, or similarly authorized bodies overseeing the research proposals.

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Reporting guidance

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Definitions

Sex generally refers to a set of biological attributes that are associated with physical and physiological features (e.g., chromosomal genotype, hormonal levels, internal and external anatomy). A binary sex categorization (male/female) is usually designated at birth (""sex assigned at birth""), most often based solely on the visible external anatomy of a newborn. Gender generally refers to socially constructed roles, behaviors, and identities of women, men and gender-diverse people that occur in a historical and cultural context and may vary across

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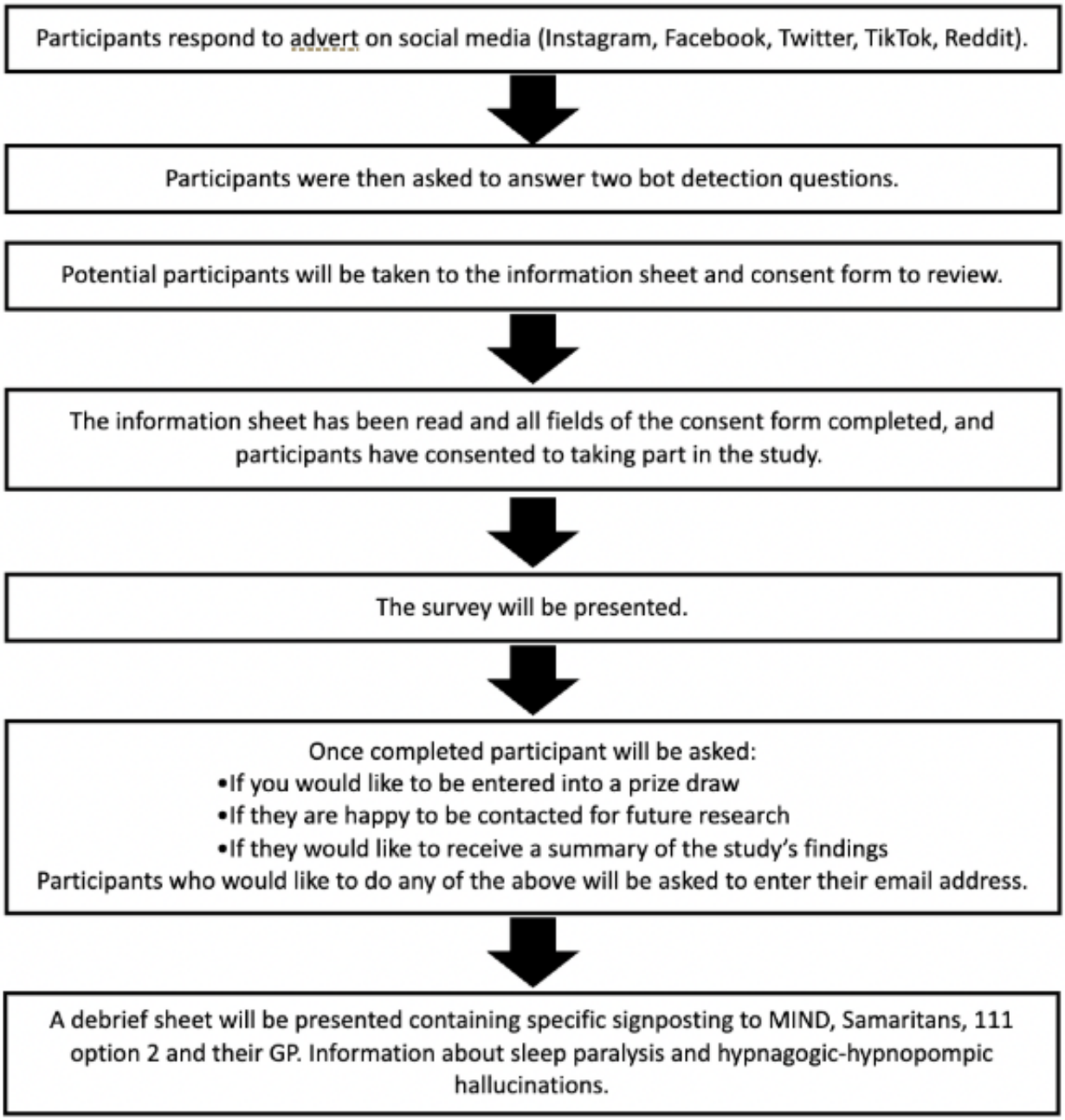
Appendix D

Flow of participants through Empirical Study



Appendix E

Full Wording of Items for Unusual Sleep Experiences and Demographic Questions

Please complete the following demographic questions about yourself to help us understand more about the people completing this internet survey.

15. 1. Which of the below best describes you? *

- ◯ Male
- ◯ Female
- ◯ Genderqueer/Non-binary
- ◯ Other
- ◯ Prefer not to say

16. What is your age? *

17. What race or ethnicity best describes you? *

- ◯ Asian (any background
- ◯ Black (any background)
- ◯ Mixed or Multiple ethnic groups
- ◯ White (any background)
- ◯ Other
- ◯ Prefer not to say

18. If other please specify *

19. 4. Which of the following best describes your personal income last year before tax? *

- ◯ £0
- ◯ £1 to £9,999
- ◯ £10,000 to £24,999

- ◯ £25,000 to £49,999
- ◯ £50,000 to £74,999
- ◯ £75,000 to £99,999
- ◯ £100,000 or more
- ◯ Prefer not to say.

20. Please select your highest level of education completed: *

- ◯ Primary School
- ◯ High / Secondary School or equivalent [e.g. GCSE, NVQ]
- ◯ Sixth Form / College or equivalent [e.g. A-Level; Bac; BTEC]
- ◯ Higher Education Diploma [e.g. Certificate of Higher Education; Level 4 Diploma]
- ◯ Undergraduate university degree [e.g. BA; BSc]
- ◯ Postgraduate university degree [e.g. MA; MSc; PGCE]
- ◯ Doctorate degree [e.g. PhD]

25. Do you have any of these specific sleep diagnoses? *

- [ ] Insomnia
- [ ] Narcolepsy
- [ ] Nightmare Disorder
- [ ] REM sleep behaviour disorder (RBD)
- [ ] Sleep Paralysis
- [ ] Sleep-related Eating Disorder
- [ ] Night Terrors / Sleep Terrors
- [ ] Sleepwalking
- [ ] None

26. Are these difficulties still ongoing?

- ◯ Yes
- ◯ No
- ◯ Prefer not to say

27. Are you currently receiving treatment for these difficulties (inc. taking prescribed medication)? *

- ◯ Yes
- ◯ No
- ◯ Prefer not to say

28. Have you ever had any unusual experiences (such as hearing, seeing, tasting, feeling things that are not really there e.g. something touching you or holes in the bed or the feeling of falling) When you are going to sleep or waking up from sleep? *

- ◯ Yes
- ◯ No

29. Please tick that fits with the number you have experiences you have had in your life. Click and check boxes will appear *

- ◯ 0-5
- ◯ 6-15
- ◯ 16-30
- ◯ 30+

30. Please rate the distress caused by these experiences AT THE TIME using the below. *

- ◯ 0 No Distress
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7
- ◯ 8
- ◯ 9
- ◯ 10- A lot of distress

31. Please rate the distress caused by these experiences NOW using the below. *

- ◯ 0 No Distress
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7

- ◯ 8
- ◯ 9
- ◯ 10- A lot of ditress

32. Have you spoken to a health professional or received any treatment for these experiences? *

- ◯ Yes
- ◯ No

33. If you would like to provide details, please do so in the box below.

34. THIS QUESTION IS OPTIONAL. Please describe what you heard, saw, or felt during these experiences

35. In the LAST MONTH have you had any unusual sleep experiences (such as hearing, seeing, tasting, or feeling as though there is something in the room or touching you). When you are going to sleep or waking up from sleep? *

- ◯ Yes
- ◯ No

36. How often were these experiences accompanied by sleep paralysis (being unable to move)? *

- ◯ Never
- ◯ Sometimes
- ◯ Often
- ◯ Always

37. In a typical month over the past year how often do you have these experience please select which fits best Check boxes will appear. *

- ◯ One to two times a month
- ◯ Less than once a week
- ◯ About once a week
- ◯ Two to four times a week
- ◯ More than four times a week

38. Please rate the distress caused by these experiences AT THE TIME using the below. *

- ◯ 0- No Distress
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7
- ◯ 8
- ◯ 9
- ◯ 10- A lot of distress

39. Please rate the distress caused by these experiences now using the below.

- ◯ 0 - No Distress
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7
- ◯ 8
- ◯ 9

40. THIS QUESTION IS OPTIONAL. Please describe what you heard, saw, or felt during these experiences

41. Please describe any actions or behaviours you carried out as a result of these unusual experiences, if relevant (e.g. turning lights on, focusing on breathing, leaving the room).

Appendix F

Self-report psychometric measures used in this study

The Dunn Worry Questionnaire (DWQ)(Freeman et al., 2020)

The Dunn Worry Questionnaire (DWQ)

Name: _____

Date: _____

Please circle the numbers that best describe your experience in the *past month*.

	None of the time	Rarely	Some of the time	Often	All of the time
1. I've been worrying a lot	0	1	2	3	4
2. In my mind I have been going over problems again and again	0	1	2	3	4
3. There was little I could do to stop worrying	0	1	2	3	4
4. I have been worrying even though I didn't want to.	0	1	2	3	4
5. Worry has stopped me focussing on important things in my day	0	1	2	3	4
6. Worry has stopped me sleeping	0	1	2	3	4
7. Worry has caused me to feel upset	0	1	2	3	4
8. Worry has made me feel stressed.	0	1	2	3	4
9. Worry has made me feel anxious	0	1	2	3	4
10. Worry has made me feel hopeless	0	1	2	3	4

Scoring

A total worry score is obtained by adding together all 10 items. A score of 21 or above indicates clinically high levels of worry.

Freeman D, Bird JC, Loe BS, Kingdon D, Startup H, Clark DM, Ehlers A, Černis E, Wingham G, Evans N, Lister R, Pugh K, Cordwell J, Dunn G. (2020). The Dunn Worry Questionnaire and the Paranoia Worries Questionnaire: new assessments of worry. Psychological Medicine, 50(5), 771-780. https://doi.org/10.1017/S0033291719000588

Revised Green et al Paranoia Thoughts Scale (Freeman et al., 2021) **Part A**

R-GPTS

Part A

Name: _____

Date: _____

Please read each of the statements carefully. They refer to thoughts and feelings you may have had about others over the last month.

Think about the last month and indicate the extent of these feelings from 0 (Not at all) to 4 (Totally).

(Please do not rate items according to any experiences you may have had under the influence of drugs.)

		Not at all				Totally
1.	I spent time thinking about friends gossiping about me.	0	1	2	3	4
2.	I often heard people referring to me.	0	1	2	3	4
3.	I have been upset by friends and colleagues judging me critically.	0	1	2	3	4
4.	People definitely laughed at me behind my back.	0	1	2	3	4
5.	I have been thinking a lot about people avoiding me.	0	1	2	3	4
6.	People have been dropping hints for me.	0	1	2	3	4
7.	I believed that certain people were not what they seemed.	0	1	2	3	4
8.	People talking about me behind my back upset me.	0	1	2	3	4

Revised Green et al Paranoia Thoughts Scale Part B (Freeman et al., 2021)

R-GPTS

Part B

Name: _____

Date: _____

Please read each of the statements carefully. They refer to thoughts and feelings you may have had about others over the last month.

Think about the last month and indicate the extent of these feelings from 0 (Not at all) to 4 (Totally).

(Please do not rate items according to any experiences you may have had under the influence of drugs.)

		Not at all				Totally
1.	Certain individuals have had it in for me.	0	1	2	3	4
2.	People wanted me to feel threatened, so they stared at me.	0	1	2	3	4
3.	I was certain people did things in order to annoy me.	0	1	2	3	4
4.	I was convinced there was a conspiracy against me.	0	1	2	3	4
5.	I was sure someone wanted to hurt me.	0	1	2	3	4
6.	I couldn't stop thinking about people wanting to confuse me.	0	1	2	3	4
7.	I was distressed by being persecuted.	0	1	2	3	4
8.	It was difficult to stop thinking about people wanting to make me feel bad.	0	1	2	3	4
9.	People have been hostile towards me on purpose.	0	1	2	3	4
10.	I was angry that someone wanted to hurt me.	0	1	2	3	4

Hallucinations Subscale of Specific Psychotic Experiences (SPEQ) (Ronald et al., 2014)

Please read each statement and click the number that best indicates how frequently you have each of these experiences. There are no right or wrong answers. Try not to spend too much time on any statement.					
Not at all	***Rarely***	***Once a month***	***Once a week***	***Several times a week***	***Daily***
0	*1*	*2*	*3*	*4*	*5*
1. Hear sounds or music that people near you don't hear?					
0	*1*	*2*	*3*	*4*	*5*
2. See things that other people cannot?					
0	*1*	*2*	*3*	*4*	*5*
3. Feel that someone is touching you, but when you look nobody is there?					
0	*1*	*2*	*3*	*4*	*5*
4. Hear noises or sounds when there is nothing around to explain them?					
0	*1*	*2*	*3*	*4*	*5*
5. Detect smells which don't seem to come from your surroundings?					
0	*1*	*2*	*3*	*4*	*5*
6. See shapes, lights, or colours even though there is nothing really there?					
0	*1*	*2*	*3*	*4*	*5*
7. Notice smells or odours that people next to you seem unaware of?					
0	*1*	*2*	*3*	*4*	*5*
8. Experience unusual burning sensations or other strange feelings in or on your body that can't be explained?					
0	*1*	*2*	*3*	*4*	*5*
9. Hear voices commenting on what you're thinking or doing?					
0	*1*	*2*	*3*	*4*	*5*
Overall, how distressed are you by these experiences?					

0 (not distressed)	*1 (a bit distressed)*	*2 (quite distressed)*	*3 (very distressed)*

Insomnia Severity Index (ISI)(Bastien et al., 2001)

Insomnia Severity Index

Patient's Name _____ Date _____

For each question, make a single selection to check a box. Click the button to clear the form if needed.

Clear

1. Please rate the current (last 2 weeks) SEVERITY of your insomnia problem(s).

	None 0	*Mild* 1	*Moderate* 2	*Severe* 3	*Very* 4	Score
Difficulty falling asleep	☐	☐	☐	☐	☐	0
Difficulty staying asleep	☐	☐	☐	☐	☐	0
Problem waking up too early	☐	☐	☐	☐	☐	0

2. How SATISFIED/dissatisfied are you with your current sleep pattern?

Very Satisfied 0	*Satisfied* 1	*Somewhat Satisfied* 2	*Dissatisfied* 3	*Very Dissatisfied* 4	
☐	☐	☐	☐	☐	0

3. To what extent do you consider your sleep problem to INTERFERE with your daily functioning (e.g. daytime fatigue, ability to function at work/daily chores, concentration, memory, mood, etc.)

Not at all Interfering 0	*A Little Interfering* 1	*Somewhat Interfering* 2	*Much Interfering* 3	*Very Much Interfering* 4	
☐	☐	☐	☐	☐	0

4. How NOTICEABLE to others do you think your sleep problem is in terms of impairing the quality of your life?

Not at all Noticeable 0	*A Little Noticeable* 1	*Somewhat Noticeable* 2	*Much Noticeable* 3	*Very Much Noticeable* 4	
☐	☐	☐	☐	☐	0

5. How WORRIED/distressed are you about your current sleep problem?

Not at all Worried 0	*A Little Worried* 1	*Somewhat Worried* 2	*Much Worried* 3	*Very Much Worried* 4	
☐	☐	☐	☐	☐	0

Guidelines for Scoring/Interpretation:

The total score is the sum of all seven items. Total score ranges from 0-28.

0 - 7	No clinically significant insomnia
8 - 14	Subthreshold insomnia
15 - 21	Clinical insomnia (moderate severity)
22 - 28	Clinical insomnia (severe)

TOTAL Score: 0

Insomnia Severity Index (Copyright, Charles M. Morin, 1993)

Primary Care PTSD Screen for *DSM-5* (PC-PTSD-5)

PC-PTSD-5

Sometimes things happen to people that are unusually or especially frightening, horrible, or traumatic. For example:

- a serious accident or fire
- a physical or sexual assault or abuse
- an earthquake or flood
- a war
- seeing someone be killed or seriously injured
- having a loved one die through homicide or suicide.

Have you ever experienced this kind of event?

YES NO

If no, screen total = 0. Please stop here.

If yes, please answer the questions below.

In the past month, have you…

1. had nightmares about the event(s) or thought about the event(s) when you did not want to?

   YES NO

2. tried hard not to think about the event(s) or went out of your way to avoid situations that reminded you of the event(s)?

   YES NO

3. been constantly on guard, watchful, or easily startled?

   YES NO

4. felt numb or detached from people, activities, or your surroundings?

   YES NO

5. felt guilty or unable to stop blaming yourself or others for the event(s) or any problems the event(s) may have caused?

   YES NO

NIDA Quick Screen

NIDA *Quick Screen* Question: In the past year, how often have you used the following?	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
Alcohol • For men, 5 or more drinks a day • For women, 4 or more drinks a day					
Tobacco Products					
Prescription Drugs for Non-Medical Reasons					
Illegal Drugs					

Felt Sense on Anomaly (Cernis et al., 2021)

Černis Felt Sense of Anomaly (ČEFSA) Scale

Please read the following items and rate how often you have experienced these over the past **TWO WEEKS** using the following rating:

0	1	2	3	4
Never	Rarely	Sometimes	Often	Always

Please note that this should NOT be whilst under the influence of drugs, alcohol or legal highs.

		Never	Rarely	Sometimes	Often	Always
i	Things seem strange.	0	1	2	3	4
ii	I feel odd.	0	1	2	3	4
iii	Things seem weird.	0	1	2	3	4
iv	I feel surreal.	0	1	2	3	4
v	My experiences seem peculiar.	0	1	2	3	4

The Depression, Anxiety and Stress Scale (DASS 21) (Crawford & Henry, 2003)

DASS21

Name: Date:

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you **over the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree or a good part of time
3 Applied to me very much or most of the time

1 (s)	I found it hard to wind down	0	1	2	3
2 (a)	I was aware of dryness of my mouth	0	1	2	3
3 (d)	I couldn't seem to experience any positive feeling at all	0	1	2	3
4 (a)	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5 (d)	I found it difficult to work up the initiative to do things	0	1	2	3
6 (s)	I tended to over-react to situations	0	1	2	3
7 (a)	I experienced trembling (e.g. in the hands)	0	1	2	3
8 (s)	I felt that I was using a lot of nervous energy	0	1	2	3
9 (a)	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10 (d)	I felt that I had nothing to look forward to	0	1	2	3
11 (s)	I found myself getting agitated	0	1	2	3
12 (s)	I found it difficult to relax	0	1	2	3
13 (d)	I felt down-hearted and blue	0	1	2	3
14 (s)	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15 (a)	I felt I was close to panic	0	1	2	3
16 (d)	I was unable to become enthusiastic about anything	0	1	2	3
17 (d)	I felt I wasn't worth much as a person	0	1	2	3
18 (s)	I felt that I was rather touchy	0	1	2	3
19 (a)	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
20 (a)	I felt scared without any good reason	0	1	2	3
21 (d)	I felt that life was meaningless	0	1	2	3

Recovering Quality of Life (ReQoL) (Keetharuth et al., 2018)

ReQoL™

Recovering Quality of Life

For each of the following statements, please tick one box that best describes your thoughts, feelings and activities over the last week.

Last week	None of the time	Only occasionally	Sometimes	Often	Most or all of the time
1. I found it difficult to get started with everyday tasks	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0
2. I felt able to trust others	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
3. I felt unable to cope	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0
4. I could do the things I wanted to do	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
5. I felt happy	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
6. I thought my life was not worth living	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0
7. I enjoyed what I did	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
8. I felt hopeful about my future	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
9. I felt lonely	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0
10. I felt confident in myself	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
	No problems	Slight problems	Moderate problems	Severe problems	Very severe problems
Please describe your **physical health** (problems with pain, mobility, difficulties caring for yourself or feeling physically unwell) over the last week.	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0

*There is a longer version ReQoL-20 which contains 20 mental health questions and the same physical health question. The initial 10 questions of the ReQoL-20 are exactly the same as the ones in the ReQoL-10.

Appendix G

FMH Research Ethics Committee Approval Letter

University of East Anglia
Norwich Research Park
Norwich. NR4 7TJ

Email: ethicsmonitor@uea.ac.uk
Web: www.uea.ac.uk

Study title: Unusual sleep experiences and sleep-related hallucinations in the general population.

Application ID: ETH2324-0024

Dear Alisia,

Your application was considered on 5th February 2024 by the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee).

The decision is: **approved**.

You are therefore able to start your project subject to any other necessary approvals being given.

If your study involves NHS staff and facilities, you will require Health Research Authority (HRA) governance approval before you can start this project (even though you did not require NHS-REC ethics approval). Please consult the HRA webpage about the application required, which is submitted through the IRAS system.

This approval will expire on **24th March 2025**.

Please note that your project is granted ethics approval only for the length of time identified above. Any extension to a project must obtain ethics approval by the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee) before continuing.

It is a requirement of this ethics approval that you should report any adverse events which occur during your project to the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee) as soon as possible. An adverse event is one which was not anticipated in the research design, and which could potentially cause risk or harm to the participants or the researcher, or which reveals potential risks in the treatment under evaluation. For research involving animals, it may be the unintended death of an animal after trapping or carrying out a procedure.

Any amendments to your submitted project in terms of design, sample, data collection, focus etc. should be notified to the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee) in advance to ensure ethical compliance. If the amendments are substantial a new application may be required.

Approval by the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee) should not be taken as evidence that your study is compliant with the UK General Data Protection Regulation (UK GDPR) and the Data Protection Act 2018. If you need guidance on how to make your study UK GDPR compliant, please contact the UEA Data Protection Officer (dataprotection@uea.ac.uk).

Please can you send your report once your project is completed to the FMH S-REC (fmh.ethics@uea.ac.uk).

I would like to wish you every success with your project.

On behalf of the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee)

Yours sincerely,

Dr Paul Linsley

Appendix H

Participant Information Sheet and Consent Form

Electronic Participant Information Sheet

University of East Anglia

Faculty of Medicine & Health Sciences
Norwich Medical School
University of East Anglia
Norwich Research Park
Norwich, NR4 7TJ
United Kingdom

Unusual sleep experiences in the general population

Thank you for taking the time to consider taking part in this study. Before you decide to complete the study, it is important for you to understand why the research is being conducted and what participation will involve. Please take some time to read the following information carefully and raise any questions you may have with our researchers (Alisia Green alisia.green@uea.ac.uk or Dr Sarah Reeve sarah.reeve@uea.ac.uk).

What is this study about?
Unusual sleep experiences include seeing, hearing, or feeling things that are not really there when going to sleep or when waking up (they are sometimes referred to as 'hypnogogic and hypnopompic hallucinations). They often occur alongside sleep paralysis – where people are unable to move – but can also occur separately. This study wants to understand more about these experiences and what factors might contribute to them, such as worry or low mood.

Why have I been invited?
Anyone aged 18+ in the UK is invited, with exclusions for below conditions:

- Parkinson's disease
- Charles Bonnet syndrome
- Dementia
- Any other neurological conditions as these are known to cause unusual experiences including hallucinations.

Taking part is voluntary, you can choose to withdraw at any point with no consequences by navigating away from this page in your browser.

Participant Declaration
I confirm that I don't have a confirmed or expected diagnosis of Dementia, Charles Bonnet Syndrome, Parkinson's, or any other neurological conditions as these are known to cause unusual experiences including hallucinations.

What will the study involve for me?
If you do choose to participate, you will be asked to complete a survey. The study will take roughly 20-30 minutes to complete, and we have aimed to make this as concise and short as possible for your convenience.
You can withdraw from the survey at any time, by simply exiting the survey and your data will not be recorded or included in the study. At the end of the survey, you will be asked if you are happy to be

contacted about future research and if you would like to receive a summary of the study once it has been completed. If you would like to be contacted, you will be asked to input your email. If you have provided your email once you have completed the survey you will automatically be entered into a prize draw with the opportunity to win 1 of 5 £20 vouchers.
Once you have completed the survey in full and closed the window you will be unable to request your data be deleted as your data will have been stored anonymously therefore it would not be possible to identify to withdraw. However, if you wish for your email to be deleted this request can be made by emailing the research team as this will be stored separately to survey response.

Are there any risks and/or disadvantages with participating in this study?
We acknowledge that completing surveys about mental health can be an emotive and difficult topic for people. However, within the study you will not be asked or expected to discuss any specific cases or personal experiences of this, and you are free to withdraw at any time without needing to provide a reason. Information regarding further support services and resources about sleep paralysis will be provided at the end of the survey should you feel that you require any additional support.

Are there any benefits associated with being in the study?
This study hopes to give you a chance to share your unusual sleep experiences and how this affects you. Taking part in this research will allow greater understanding and may help inform future treatments. After completing the study, you will be provided with information and documents on sleep paralysis and hypnagogic-hypnopompic hallucinations that you may wish to read.

What will happen to information about me that is collected during the study?
You will be assigned a participant ID, so you will be completely anonymous throughout. The information collected will be kept strictly confidential. Data will be stored securely for up to 10 years according to the General Data Protection Regulation Act (2018) and the University of East Anglia Research Data Management Policy (2019).

Will I be told the results of the study?
The results of the study will be written up into a doctoral thesis in 2025, a summary will be on the SINEA website (sinea.uea.ac.uk) and submitted to a relevant journal.

What if I would like further information, a complaint, or concerns about the study?
Should you need more information about the research study, please do not hesitate to contact me at alisia.green@uea.ac.uk and raise any questions you may have.
If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the University administration team by email (med.reception@uea.ac.uk) and they will direct your concerns to a senior faculty member.

Who is running the study?
This research is being conducted by Alisia Green, Postgraduate Researcher in the Doctorate in Clinical Psychology Programme (ClinPsyD) at Norwich Medical School, UEA. The research is carried out under the supervision of Dr Sarah Reeve and Dr. Eleanor Chatburn. The research is funded by the University of East Anglia (UEA) and has been reviewed by the UEA Faculty of Medicine and Health Sciences Research Ethics Committee.

Consent Form

Now you have read the information sheet on the previous page please read the below statements

3. I confirm that I have read and understand the Participant Information Sheet and have had the opportunity to ask any questions that I have about the study and am happy with the answers. *

- ◯ Yes
- ◯ No

4. I understand the purpose, procedure and any benefits or risks involved with the study. *

- ◯ Yes
- ◯ No

5. I confirm I am aged 18+ and living in the UK and do not have a confirmed or expected diagnosis of Dementia, Charles Bonnet Syndrome, Parkinson's, or any other neurological conditions as these are known to cause unusual experiences including hallucinations. *

- ◯ Yes
- ◯ No

6. I understand that no personal information or identifiable data will be collected during this research. My data gathered in this study will be stored anonymously and securely. *

- ◯ Yes
- ◯ No

7. If I choose to enter my email, I understand that no other personal information or identifiable data will be collected during this research. *

- ◯ Yes

◯ No

8. If I choose to enter my email I understand that my data gathered in this study will be stored anonymously and securely with my email stored securely and separately from other data gathered in the survey.

◯ Yes
◯ No

9. If I choose to enter my email I understand that researchers linked with UEA may contact me via email regarding future research.

◯ Yes
◯ No

10. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason. *

◯ Yes
◯ No

11. I understand that this research can be audited by the University of East Anglia or the regulatory authorities. I therefore give permission for these organisations to access my anonymous data. *

◯ Yes
◯ No

12. I agree to take part in this study. *

◯ Yes
◯ No

Participant Declaration

I confirm I don't have a confirmed or expected diagnosis of Dementia, Charles Bonnet Syndrome, Parkinson's, or any other neurological conditions as these are known to cause unusual experiences including hallucinations.

13. I confirm that I have read and understood the information provided in the participant information form. *

- ◯ Yes
- ◯ No

14. I confirm I DO NOT HAVE a confirmed or expected diagnosis of Dementia, Charles Bonnet Syndrome, Parkinson's, or any other neurological conditions as these are known to cause unusual experiences including hallucinations. *

- ◯ I confirm I have none of the above diagnoses
- ◯ I do have one of the above conditions

Appendix I

Retrospective Distress Analysis and Distress Score Spread for Lifetime and Monthly Unusual Sleep Experiences

Predictor	Lifetime Distress AT THE TIME				Monthly Distress AT THE TIME			
	Estimate	SE	Z	P	Estimate	SE	Z	P
Worry	0.07	0.03	2.24	.028**	0.09	0.04	2.08	0.046*
Paranoia	<-0.01	0.04	-0.16	.876	0.05	0.05	1.01	0.322
Insomnia	0.07	0.05	1.66	.101	0.12	0.06	1.97	0.058
PTSD	0.16	0.15	1.06	.292	0.15	0.22	0.67	0.511
Substance Use	0.03	0.13	0.23	.819	0.50	0.24	2.08	0.046*
Stress	0.07	0.02	4.33	<.001***	0.09	0.02	4.33	<.001***
Anxiety	0.05	0.04	1.29	.200	0.11	0.05	2.17	0.038*
Depression	<-0.01	0.02	0.27	.791	0.04	0.03	1.57	0.126
Dissociation	<-0.01	0.06	-0.03	.979	0.12	0.08	1.50	0.142
Hallucinations	0.002	0.04	0.05	.963	<-0.01	0.05	0.09	0.931
Quality of Life	<-0.01	0.08	0.10	.921	0.13	0.12	1.14	0.262

	Lifetime experience of unusual sleep experiences (N = 79)	Monthly experiences of unusual sleep experiences (N = 35)
Distress Rating	At the time N (%)	At the time N (%)
0- no distress	3 (4)	2 (6)
1	2 (3)	1 (3)
2	1 (1)	0 (0)
3	5 (6)	2 (6)
4	4 (5)	2 (6)
5	8 (10)	2 (6)
6	9 (11)	1 (3)
7	16 (20)	9 (26)
8	19 (24)	8 (23)
9	4 (5)	4 (11)
10- a lot of distress	8 (10)	4 (11)