A scientific investigation of the associations between sleep, the paranormal, and religion

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December 2023

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A thesis submitted to Goldsmiths University for the degree of Doctor of Philosophy

Abstract

Night-time can be an interesting and sometimes frightening experience for certain people who report ostensibly paranormal experiences and paranormal beliefs. The associations between sleep and paranormal variables remain highly under-researched. The broad aim of this thesis is to generate a better understanding of the associations between various aspects of sleep and paranormal beliefs as well as religion. Previous literature has been conducted on a small scale or has been limited in scope (e.g., assessing a limited range of sleep variables), thus, more research in this area is required in order to move this field forward. An initial scoping review (Chapter 2) was conducted to synthesise existing literature on sleep and the paranormal. Generally, the studies included indicated an association between reports of paranormal beliefs and encounters and sleep disturbances, although some results were mixed or non-significant. The first empirical study, presented in Chapter 4, utilised data from the BBC Focus study and explored clinical features, demographic differences, as well as related prevention and disruption techniques regarding isolated sleep paralysis (ISP) – a phenomenon where individuals are conscious but unable to move as they are falling asleep or waking up (Sharpless, 2016). Distinguished from sleep paralysis (SP), ISP occurs independently of other sleep or neurological disorders, while SP encompasses all occurrences of this condition (Hurd, 2010; Sharpless & Kliková, 2019). Results indicate that reports of ISP were associated with poorer sleep outcomes and were more prevalent among female and younger participants. Moreover, various techniques aimed at either preventing or disrupting ISP episodes were documented along with their perceived effectiveness. The following studies, detailed in Chapters 5 and 6, (with Chapter 6 representing an attempted replication study), provided an empirical investigation into the associations between a range of sleep variables and paranormal beliefs. Findings from Chapter 5 showed that greater endorsement in paranormal beliefs was associated with poorer subjective sleep quality as well as occurrences of ISP and exploding head

syndrome (EHS). The replication study showed mostly non-significant results, but largely mirrored the patterns observed in Chapter 5. The two last empirical investigations (presented in Chapters 7 and 8) examined the role of religion in relation to ISP, with Chapter 7 representing a pilot study. Paranormal and religious beliefs can be considered as belonging to a shared category (see Chapter 1 for more details) if the idea is to look at beliefs and phenomena that fall outside of the realm of conventional science (Staddon, 2013). Hence, in this thesis, both religious and paranormal beliefs were considered from this shared perspective. The pilot study showed that reports of SP were associated with greater religious faith, whereas the main study indicated an inverse association, suggesting lower levels of religious faith among those reporting ISP. These divergent findings may be influenced by factors such as variation in the sample composition across the studies. Additionally, results from the main study suggested that ISP occurrences were more prevalent among individuals identifying as agnostic or atheist compared to religious participants. Collectively, the insights and findings derived from the studies presented throughout the thesis underscore a compelling association between various sleep variables, particularly ISP, and both paranormal and religious beliefs. The findings suggest the importance of evaluating sleep disturbances in individuals who report paranormal and/or religious beliefs or experiences. If replicated and developed, these findings could eventually inform the development and refinement of behavioural interventions aimed at addressing sleep-related issues within these populations, thereby enhancing overall well-being and understanding of these phenomena.

Declaration of authorship

I, Betul Rauf, confirm that the work presented in this thesis is entirely original and created by myself. Where others have helped, their roles are noted below (in the section on 'Contributions'). Where information has been derived from other sources, proper acknowledgement has been provided within the thesis.

Contributions

The subsections within Chapter 1 draw upon, and in some cases, have been altered and expanded from the introductory sections of the chapters presented throughout my PhD thesis.

In Chapter 2, I conducted the scoping review and led the writing of the manuscript. Alice Gregory and Rotem Perach supervised this review. They, along with the wider research team (Christopher French, Juan Jose Madrid-Valero, Brian Sharpless, and Dan Denis) assisted with chapter editing.

In Chapter 4, I conducted the statistical analyses (data from the BBC Focus dataset) and led the writing of the manuscript. Alice Gregory, along with the wider research team, helped design the study and assisted with writing and editing.

In Chapter 5, I conducted statistical analyses on the secondary data (the BBC Focus dataset) obtained by the wider research group. I led the writing of the manuscript. The design of the analyses was developed with Alice Gregory who supervised the analyses and assisted with the manuscript editing. The wider research team (defined above) also assisted with chapter writing and editing.

In Chapters 7 and 8, I developed the research ideas, designed the studies, collected all the data, conducted the analyses, and crafted the manuscripts. Alice Gregory assisted with co-designing the study as well as the editing of the manuscript. The wider research team also assisted with editing and feedback.

Chapters 2, 4, and 5 overlap substantially with the published reports, however, they have been modified to align with the structure and narrative of the thesis.

Publications and papers resulting from work in this thesis

Rauf, B., Sharpless, B. A., Denis, D., Perach, R., Madrid-Valero, J. J., French, C. C., & Gregory, A. M. (2023). Isolated sleep paralysis: Clinical features, perception of aetiology, prevention and disruption strategies in a large international sample. *Sleep Medicine*, 104, 105-112. https://doi.org/10.1016/j.sleep.2023.02.023

Rauf, B., Perach, R., Madrid-Valero, J. J., Denis, D., Sharpless, B. A., Poerio, G. L., ... & Gregory, A. M. (2023). The associations between paranormal beliefs and sleep variables. *Journal of Sleep Research*, e13810. https://doi.org/10.1111/jsr.13810

Rauf, B., Perach, R., Madrid-Valero, J. J., Denis, D., Sharpless, B. A., Farron, H., ... & Gregory, A. M. (2023). Associations between sleep variables and ostensibly paranormal experiences and paranormal beliefs: A scoping review. *British Journal of Psychology*. https://doi.org/10.1111/bjop.12655

Rauf, B., Perach, R., Madrid-Valero, J. J., Sharpless, B. A., Denis, D., French, C. C., & Gregory, A. M. (under review). The associations between isolated sleep paralysis and religion. *Manuscript under review for publication.*

Poster and oral presentations

Rauf, B., Sharpless, B. A., Denis, D., Perach, R., Madrid-Valero, J. J., French, C. C., & Gregory, A. M. (2023). Isolated sleep paralysis: Clinical features, perception of aetiology, prevention and disruption strategies in a large international sample. Poster presented at the São Paulo School of Advanced Science on Ecology of Human Sleep and Biological Rhythms, São Paulo, Brazil.

Rauf, B., Perach, R., Madrid-Valero, J. J., Sharpless, B. A., Denis, D., French, C. C., & Gregory, A. M. (2023). The associations between isolated sleep paralysis and religion. Presentation given as well as poster presented at the European Sleep Research Society, Fréjus, France.

Acknowledgements

Firstly, I would like to express my immense gratitude to my primary supervisor Prof. Alice Gregory, for her unwavering support and encouragement. Alice has been a constant source of guidance and inspiration, making the impossible seem possible and being my rock during these three years. Thank you for your time and commitment.

I also extend my thanks to my second supervisor, Dr. Rotem Perach, for his superb supervision, support, and endless encouragement throughout my journey. He took me under his wing and provided clarity and guidance during these three years.

Thank you to Prof. Christopher French for your expert advice and support. To the rest of our outstanding research team – thank you to JuanJo, Brian, and Dan for your consistent support, expert advice, and vast knowledge. None of this would have been possible without you!

A final, heartfelt thank you to my wonderful family for their invaluable support, love, and encouragement. I am especially grateful to my beloved parents, Namir (papsi) and Melisa (mamsi), who have always believed in me, offered their outmost support, and kept me in their prayers. Their contribution was indispensable for making this possible. I love and adore you. To my exceptional husband, Asad, I love you. Thank you for making my PhD journey a pleasant and enjoyable one whilst taking on the role of a provider, supporter, best friend, confidant and so much more. To Zejneb and Patricia – thank you for rooting for me and for allowing me to look back at these three years with such happiness and joy. I truly appreciate and love you. PZB forever!

Oh, I almost forgot! Kave café – thank you for providing such an excellent working environment. The cappuccinos and pain au chocolates served as a wonderful incentive for me to get out of bed and conclude this thesis.

Table of Contents

List of Abbreviations

CBT	Cognitive Behavioural Therapy
EHS	Exploding Head Syndrome
ESP	Extrasensory Perception
ICSD-3	The International Classification of Sleep Disorders, Third Edition,
ICSD -3-TR	The International Classification of Sleep Disorders, Third Edition, Text Revision
ISP	Isolated Sleep Paralysis
NDE	Near-death Experience
NREM	Non-rapid Eye Movement
OBE	Out-of-body Experience
OPEPB	Ostensibly Paranormal Experiences and Paranormal Beliefs
REM	Rapid Eye Movement
RFISP	Recurrent Fearful Isolated Sleep Paralysis
RISP	Recurrent Isolated Sleep Paralysis
SP	Sleep Paralysis
UFO	Unidentified Flying Object

List of Figures

List of Tables

Chapter 1: General Introduction

1.1 Chapter overview

The following chapter will embark on an exploration of sleep, unveiling its intricate stages and multifaceted functions. The chapter will then proceed to describe parasomnias, what they are, and the specific stages of sleep where they typically manifest. Moreover, other key sleep variables and risk factors that are shown to be associated with certain parasomnias will be explored. The chapter delves into the territory of paranormal beliefs and experiences, illuminating how various sleep variables, particularly the vivid ones, can be interpreted within a paranormal framework and how such interpretations may impact individuals negatively. The chapter will also review the prevalence of paranormal beliefs, identifying the population most inclined to embrace them. Finally, the chapter will explore the differences and similarities between paranormal and religious beliefs, and the associations between religion and sleep variables will be discussed. Please note that throughout the thesis, references will be made to both SP and ISP. The term "SP" is used when discussing studies that have focused on SP, while "ISP" is used when referring to studies that have examined ISP.

1.2 What is sleep?

Sleep is a fundamental aspect of human existence, making up approximately one-third of a human life (Patel et al., 2022). It is marked by a remarkable shift in consciousness and is characterised by a loss of attention to the external world (Hobson & Pace-Schott, 2002). During sleep, the brain is not entirely disconnected, but rather remains active, performing essential functions such as memory consolidation, emotional processing, hormonal regulation, among other important tasks (Tempesta et al., 2018). Sleep-related activity is different from complete unconsciousness due to the unique patterns exhibited by the different sleep stages which can be revealed by brain imaging and polysomnography (Hobson & Pace-Schott, 2002). Polysomnography refers to a systematic process employed to gather various physiological data during sleep. This approach involves the simultaneous monitoring and recording of multiple physiological parameters to gain objective insight into sleep patterns, disturbances, and related functions such as brain activity, heart rate, eye movements, and muscle tone (Rundo & Downey, 2019). According to the National Sleep Foundation (NSF), the average adult requires between 7 to 9 hours of sleep per night to maintain optimal health (Hirshkowitz et al., 2015). However, as noted by Chaput et al. (2018), inter-individual variability in sleep needs should also be accounted for. For example, infants, school-age children, and teenagers require more sleep than adults (Matricciani et al., 2013; Paruthi et al., 2016), whereas older individuals tend to sleep shorter and experience more sleep fragmentation (Bonnet, 1989). In addition, one study suggested that women may express a slightly greater need for sleep compared to men (Anderson & Horne, 2008), however, this distinction is not acknowledged in the official guidelines for sleep (Hirshkowitz et al., 2015).

1.3 Stages of sleep

Sleep is not a single state. Instead, it constitutes four distinct stages, namely, N1, N2, N3 and rapid eye movement (REM) sleep (Sharma et al., 2023). Stages N1 to N3 belong to a sleep category often referred to as non-REM sleep, or NREM, each with its unique characteristics and functions. NREM makes up majority of our sleep and is generally defined by a decrease in brain and neuronal activity. During this stage, heart rate, blood pressure, and breathing rates are all decelerated (Busek et al., 2005). Stage N1 – the lightest stage of sleep, typically occurs when an individual starts to experience drowsiness, marking the transition from a state of wakefulness to the early stages of sleep. During this stage, there is a gradual decrease in heartbeat, eye movements, brain waves, and breathing activity. This period is considered to last approximately 1 to 5 minutes, making up 5% of total sleep time (Patel et al., 2022). N1 is associated with two types of brainwaves, namely, alpha and theta waves. These brainwaves can be identified and recorded using an electroencephalogram (EEG). In the early part of N1 sleep, alpha waves dominate, characterised by low frequency and high amplitude, resembling relaxed yet wakeful brainwave patterns. As N1 progresses, theta wave activity increases, featuring lower frequency and higher amplitude, which indicates deeper sleep compared to the initial alpha wave-dominant phase (Kryger et al., 2022). Stage N2 is typically entered shortly after N1 and is considered the main stage of NREM, typically comprising 45% of a night's sleep. During this stage, brain activity and heart rate continue to decrease along with a drop in body temperature (Busek et al., 2005). Stage N2 is considered integral to memory consolidation and processing of information (Frazer et al., 2021). It is marked by the predominance of theta waves in brain activity. However, this predominant theta wave pattern is interrupted by brief bursts of higher-frequency brain waves, known as sleep spindles. Furthermore, the presence of K-complexes, characterised by their high-amplitude brain activity patterns elicited in response to environmental stimuli, is often associated with stage N2 sleep (Kryger et al., 2022). Stage N3, also recognised as slow-wave sleep, represents the deepest stage of sleep and accounts for approximately 25% of the entire sleep duration. Stage N3 is characterised by low frequency, high amplitude delta waves, and while awakening from this stage is possible, it proves to be the most resistant to disruption, even in the presence of loud external stimuli (Kryger et al., 2022). This sleep phase is imperative for body repairment and tissue growth, as well as for the immune system (Patel et al., 2022).

After a period of NREM sleep, the body transitions into REM sleep which is the phase in which most of our vivid dreaming occurs (Levitan & DeGracia, 1999). REM sleep is characterised by an increased brain activity in which voluntary muscles are inhibited and rapid eye movements and dreams occur (Hinton, Pich, Chhean, Pollack & McNally, 2005; Kryger et al., 2022). While the body is typically paralysed during REM to prevent physical movements, the brain is highly active, processing and consolidating memories and emotions (Simor et al., 2020). The various stages of sleep cycle over the course of a night, with each cycle normally lasting between 90 to 110 minutes. REM sleep becomes more prominent as the night progresses and is typically more prevalent during the latter part of the night (Patel et al., 2022). It is important to note that individual sleep cycles can vary based on factors such as age, sex (Ohayon et al., 2004) and body mass index (Rusu et al., 2019), as well as conditions like depression (Ellis et al., 2014) and anxiety (Oh et al., 2019).

1.4 Additional functions of sleep

The exact functions of sleep still lack a clear consensus, despite decades of research on the topic (Diekelmann & Born, 2010; Meddis, 1975; Rechtschaffen, 1998). While it is clear that sleep is imperative for the restoration and repair of the body and brain (Patel et al., 2022), the exact mechanisms behind these processes are yet to be fully understood. Some theories argue that sleep is conducive to memory consolidation, mood regulation, and good immunity (Benedict et al., 2009). Sleep is also suggested to contribute to the removal of toxins from the brain (Eugene & Masiak, 2015). Evolutionary accounts suggest that the temporary state of vulnerability during sleep may have conferred an advantage to prehistoric humans by enabling them to conserve energy while remaining hidden from predators and other dangers (Spörrle & Stich, 2010). The optimal energy allocation theory instead claims that sleep evolved as an adaptive strategy to optimise the use of energy resources, with the aim of maximising lifetime reproductive success (Schmidt, 2014). In summary, despite the evident benefits of sleep, such as body restoration and memory consolidation, and the many theories that have been put forth, the fundamental nature of sleep remains a significant enigma to scientists.

1.5 The International Classification of Sleep Disorders

The International Classification of Sleep Disorders Third Edition, Text Revision (ICSD-3-TR) is a manual published by the American Academy of Sleep Medicine (AASM, 2023) that provides a comprehensive classification system and diagnostic criteria for various sleep-related disorders. It is used by healthcare professionals and researchers in the field of sleep medicine to diagnose and classify sleep disorders. The disorders mentioned in the ICSD-3-TR are grouped into seven primary categories which are insomnia, sleep-related breathing disorders, central disorders of hypersomnolence, circadian rhythm sleep-wake disorders, parasomnias, sleep related movement disorders, and other sleep disorders. Each category contains specific diagnostic criteria, allowing healthcare providers to make precise assessments and recommendations for treatment (AASM, 2023). The ICSD-3-TR ensures consistency and precision in the diagnosis and classification of sleep disorders, serving as the foundation for ongoing research and progress in understanding and managing these conditions (Gauld et al., 2021).

1.6 Parasomnias

Parasomnias are, according to the ICSD-3-TR, “undesirable physical events or experiences that occur during entry into sleep, within sleep, or during arousal from sleep” (AASM, 2023). These often-unpleasant occurrences may happen during different stages of sleep, including NREM, REM, or when the brain transitions in and out of sleep (Singh et al., 2018). Although dreaming can take place during both NREM and REM sleep, dreams that occur during REM sleep tend to be more vivid and bizarre (Schwartz & Maquet, 2002). The muscles during this stage are paralysed to ensure we do not enact our lifelike dreams. Muscle paralysis is a natural characteristic of dreaming sleep, however, in some cases, the paralysis that occurs during REM sleep can extend into wakefulness which can result in a sleep phenomenon known as sleep paralysis (SP; Hurd, 2010). SP – a parasomnia characterised by a temporary immobility occurring as one is falling asleep or waking up, is a REM-sleep related phenomenon that is believed to emerge when REM sleep is most abundant (Sharpless & Kliková, 2019). During this period, individuals are usually conscious and aware of their surroundings but are unable to move or speak during the paralysis. It is sometimes possible to open one's eyes during an episode, however, some people report being unable or unwilling to do so (Cheyne, Newby-Clark & Rueffer, 1999). SP is a common symptom of narcolepsy which is a chronic neurological disorder characterised by impaired regulation of sleep-wake cycles (Sharpless, 2016). Studies have shown that approximately 57% to 59% of individuals diagnosed with narcolepsy have reported experiencing SP episodes (Dodet et al., 2015; Hishikawa, 1976). If SP occurs in the absence of narcolepsy, it is referred to as ISP (Sharpless, 2016). The prevalence of SP can vary greatly, with higher rates reported in individuals with psychiatric disorders, particularly anxiety disorders (Wróbel-Knybel et al., 2020) such as post-traumatic stress disorder (Hinton, Pich, Chhean, Pollack & McNally, 2005), panic disorder (Paradis et al., 1997), generalised anxiety disorder, and social anxiety (Otto et al., 2006). Higher SP rates are also reported in those residing in rural (vs. urban) areas (Olunu et al., 2018), among students (Lišková et al., 2016), and those of younger age (Ohayon & Pakpour, 2022). However, a systematic review that included 36,533 participants found that 7.6% of the general population reported experiencing at least one episode of SP, despite the varying rates (Sharpless & Barber, 2011).

SP can be accompanied by sleep-related hallucinations with can involve visual, auditory, tactile, olfactory, or kinetic perceptions (Olunu et al., 2018). These hallucinations can sometimes be confused with symptoms of psychiatric disorders that have psychotic features, but they are not the same. Sleep-related hallucinations are limited to the context of sleep, whereas symptoms of psychiatric disorders with psychotic features are not confined to a specific time period (Cheyne & Pennycook, 2013). Hallucinations occurring at sleep onset are referred to as hypnagogic hallucinations, while hallucinations that occur upon waking are known as hypnopompic hallucinations (Bless et al., 2021). Although the specifics of these hallucinations can vary, some common experiences have been reported which are usually divided into three main groups: the intruder, the incubus, and vestibular-motor (V-M) hallucinations (Denis, 2018). Intruder hallucinations are characterised as the perception or sensation of an evil presence or a threatening intruder in the room (Denis & Poerio, 2017; Jalal & Ramachandran, 2014). Intruder hallucinations are often frightening and have been proposed to occur as a result of heightened activity of the amygdala (Cheyne, Rueffer & Newby-Clark, 1999; Jalal, 2018) – a part of the brain that processes emotions, including fear (Jalal, 2018). On the other hand, incubus hallucinations produce a sense of heaviness or pressure on the chest. These chest pressure hallucinations can evoke feelings of choking and suffocation which can be uncomfortable (Jalal & Ramachandran, 2014) and even painful in some cases. Incubus hallucinations are believed to be caused by the effects of reduced respiratory muscle activity during REM sleep, resulting from inhibition of motor neurons (Cheyne, Rueffer & Newby-Clark, 1999). Intruder and incubus hallucinations tend to co-occur and are associated with fear (Denis, 2018). The third category of hallucinations, known as V-M experiences, are distinct from the previous types in that they involve feelings of movement (such as a sensation of flying) and out-of-body experiences, wherein an individual senses their conscious self existing outside their physical form (Cheyne, 2003). Unlike the intruder and incubus hallucinations which tend to produce feelings of fright and dread, V-M hallucinations have the potential to elicit more positive emotions. In particular, some people report experiencing feelings of bliss (Denis & Poerio, 2017).

Although generally considered a harmless condition (McNally & Clancy, 2005), SP can induce great emotional distress in some individuals, primarily due to the frightening visual and auditory hallucinations that often accompany the episodes (Cheyne & Pennycook, 2013). This heightened fear can increase the frequency of SP episodes, further exacerbating anxiety and perpetuating a positive feedback loop (Hinton, Pich, Chhean, Pollack & McNally, 2005). There is currently no known direct SP treatment during an active episode, but there are various methods to manage the symptoms. Prescription medications, such as stimulants and selective serotonin reuptake inhibitors, have been used as treatments for SP (Sharpless, 2016). While these medications may not directly address the underlying causes of SP, they can effectively alleviate symptoms and improve overall sleep quality (Denis, French, & Gregory, 2018). Furthermore, Sharpless (2016) recommends that clinicians offer psychoeducation and reassurance for individuals reporting experiencing recurrent ISP (RISP). Oftentimes, individuals report feelings of shame and may fear that they are going "crazy". Normalising and modifying catastrophic cognitions about SP can have a significant positive impact on the patients. In addition, although lacking empirical validation, cognitive behavioural therapy (CBT) for RISP has been proposed. This short-term treatment includes SP-specific sleep hygiene advice, relaxation and disruption techniques for use during an episode, and strategies for managing frightening imagery and catastrophic thoughts (Sharpless & Doghramji, 2015). Several ISP-related prevention and disruption techniques along with their perceived effectiveness have been empirically investigated (Sharpless & Grom, 2016) but a comprehensive study on a larger scale is required to confirm the efficacy of these strategies as well as provide insight into any new prevention and disruption techniques that may have emerged since the last investigation.

Another parasomnia – exploding head syndrome (EHS), alternatively termed episodic cranial sensory shock, is an under-recognised sensory phenomenon which according to ICSD-3-TR is characterised by a "sudden, loud imagined noise or sense of a violent explosion in the head occurring as the patient is falling asleep or waking during the night" and is estimated to affect 10% to 37% of people during their lifetime. During these episodes, an abrupt arousal occurs, however, it is not accompanied by any significant pain (Sharpless et al., 2020). EHS can also occur in people who have a predisposition to headaches (Ceriani & Nahas, 2018). One study investigating the largest EHS sample to date found that EHS was associated with poorer sleep quality (Sharpless et al., 2020). In addition, the authors found that EHS was associated with negative clinical impacts. Specifically, 44% of those studied reported fear during EHS episodes, 26% reported distress, and 10% reported impairment, all at moderate or higher levels.

The underlying cause of EHS is not well understood and various theories have been proposed to account for its origin. These theories encompass middle ear dysfunctions (Armstrong-Jones, 1920; Ganguly et al., 2013) and drug withdrawal-related side effects (e.g., Ganguly et al., 2013). Nevertheless, one prominent theory postulates that EHS could be a result of alterations in the neurological structures that regulate sleep and wakefulness, such as the reticular activating system (Moller, 2011; Sharpless, 2014). During the initiation of sleep, there is typically a decrement in neuronal activity within the reticular formation in the brainstem. This diminished activity results in an inactivity of various cerebral functions, such as motor, sensory, visual, and sensory areas less active, thus facilitating the transition into a sleep state (Sharpless, 2014). In the context of EHS, it is postulated that a delay in the attenuation of neuronal activity within these aforementioned areas occurs, consequently prolonging the process of transitioning into a sleep state. This delay can give rise to sudden and intense experiences, including muscle twitches, loud noises, or flashes of light (AASM, 2023). To date, there are no established treatment protocols for EHS, but prescription medications, including antiseizure and antidepressant drugs have shown efficacy in managing the symptoms (Sharpless, 2014). Reassurance alone has also led to improvements in some cases (Ceriani & Nahas, 2018). It is worth mentioning that SP and EHS are extensively covered in this context due to their significant relevance to the thesis.

1.7 Other sleep variables

It is noteworthy that while certain parasomnias such as SP and EHS are associated with various types of hallucinations, other less vivid sleep-related variables have also been associated with hallucinations. For example, hypnagogic and hypnopompic hallucinations have also been reported by people reporting various other sleep disturbances. One study investigated sleep-related hallucinations in a representative UK sample of nearly 5,000 participants, aged between 15 and 100 years (Ohayon et al., 1996). They found that both hypnagogic and hypnopompic hallucinations were more common in respondents who reported insomnia and excessive daytime sleepiness compared to those who did not report these symptoms. Similarly, another cross-sectional study examined 4,065 participants, aged between 15 and 96 and found that hypnagogic hallucinations occurred more often in participants who had difficulty initiating sleep compared to those who did not (Ohayon & Sagales, 2010). Altogether, these findings indicate that vivid imagery is associated with different types of sleep disturbances that are not necessarily explicit or graphic.

Furthermore, sleep disturbances, such as insomnia, poor sleep quality, and sleep disruption have been associated with various parasomnias, including SP (Denis, 2018), EHS (Denis et al., 2019), sleepwalking (Lawson et al., 2019), and sleep terrors (i.e., episodes of extreme terror and panic occurring during sleep; Leung et al., 2020) . A review by Denis (2018) reported that several studies had established an association between worse sleep quality and greater likelihood of experiencing SP. In the same review, insomnia symptoms were also found to be predictive of SP. A similar trend was observed in a cross-sectional study by Sharpless et al. (2020) who found that those reporting EHS (N = 3,286) also reported shorter sleep durations, longer sleep latencies, poorer sleep quality, and less sleep efficiency as compared to those who did not report EHS. Likewise, Lawson et al. (2019) assessed sleep quality over a one-month period in 153 Ghanian medical students and found a correlation between poor sleep quality and high frequency of sleepwalking. While the causal relationships between these factors have yet to be established, these findings suggest that effectively managing and treating certain sleep disturbances (e.g., sleep quality and insomnia) may have the potential to prevent the occurrence of other sleep-related issues, including SP and EHS. Of note, participants in this study were asked to recall their experiences over the past month. While this approach offers advantages in terms of enhancing recall accuracy (Hope et al., 2013), it introduces limitations. For example, certain events or experiences related to sleep disturbances may occur infrequently or exhibit seasonal variations. Consequently, participants who had encountered sleep-related problems more than a month ago might not have had the opportunity to share valuable information. Hence, it is important to consider the potential impact of the chosen timeframe on the comprehensiveness of data collection.

1.8 Other risk factors associated with parasomnias

In addition to various sleep disturbances (Denis, 2018; Denis et al., 2019), parasomnias have also been found to be associated with other risk factors. For example, a study by Lišková et al. (2016) found a correlation between individuals with 'thin boundaries' and experiencing pleasant SP. Thin boundaries were measured using the 18-item Boundary Questionnaire, with higher scores indicating thinner boundaries. Thin boundaries were characterised by a blurred distinction between various aspects of individuals' lives and greater openness in many ways. Additionally, the authors found that higher levels of absorption (defined as the "disposition for having episodes of 'total' attention that fully engage someone's representational resources") in individuals (vs. individuals reporting lower levels of absorption) were correlated with a greater propensity to experience SP with hallucinations. While informative, the study did not include people who did not report experiences of SP, which means that it is not possible to conclusively determine whether the correlations observed are exclusive to individuals who report SP.

Moreover, a systematic review of 42 studies conducted by Denis et al. (2018) found mixed associations between sex and SP. While some studies reported higher prevalence of SP in females, the majority reported no significant differences between the sexes. Furthermore, age was not identified as a significant predictor of SP. SP was found to be associated with different threatening or traumatic experiences, including childhood sexual abuse, war, and self-reported life stress. SP appears to be influenced by genes and may run in families, as indicated by its familial association. However, some studies found no association between SP and hereditary factors. The findings appear rather inconsistent and require further confirmation through replication.

Other parasomnias, such as EHS, have been associated with different demographic variables. For example, in one study, females (53.5%) were marginally more likely to report episodes of EHS than males (50.7%), and participants endorsing EHS were slightly younger than those who did not report any such episodes (Sharpless et al., 2020). However, no ethnic differences were observed regarding the prevalence of EHS when using data from the BBC Focus sample (i.e., the same sample referred to within this thesis). A separate study found that those reporting EHS experienced greater life-stress in comparison to those who did not report experiencing EHS (Denis et al., 2019).

1.9 Paranormal beliefs and experiences

Defining the paranormal is an intricate and multifaceted matter, exemplified by the definition presented by Lindeman and Aarnio (2006) who define the concept as encompassing superstition, the supernatural, and magic. Broad (1949) characterised paranormal phenomena as that which violates the fundamental principles of science. Similarly, French and Stone (2014) defined the paranormal as any phenomenon that surpasses the limits of what is considered physically possible based on existing scientific assumptions.

Research shows that a substantial proportion of people in modern Western societies hold strong beliefs in the existence of paranormal phenomena. For example, statistics published by Statista Research Department in 2017 revealed that 39% of respondents aged 18 to 34 believed in ghosts, ghouls, spirits, or other types of paranormal activity (Varrella, 2017). The corresponding figures for those aged 35 to 54 and those 55 or above were 35% and 26%, respectively. Likewise, a survey of 1,005 British adults in 2007 found that 62% of respondents strongly endorsed the concepts of fate and souls (MORI, 2007). A 2005 survey in America reported comparable findings (Moore, 2005). The survey involved 1,002 telephone interviews with American adults and revealed that 73% of respondents expressed belief in paranormal occurrences. More specifically, the survey found that many individuals reported believing in extrasensory perception (41%), haunted houses (37%), ghosts (32%), and telepathy (i.e., ‘communication between minds without using traditional senses; 31%). These findings are consistent with earlier research, including a 1987 survey of 1400 American adults (Greeley, 1987). The survey found that 67% of the respondents reported experiences of extrasensory perception. A separate study found that 34% of biology teachers believed that psychic abilities could be utilised to read other people’s minds and 22% believed that ghosts exist (Eve & Dunn, 1989). It appears that paranormal convictions are widespread among individuals, even in those with scientific backgrounds.

Previous research shows that personal encounters with seemingly paranormal events are the primary reason for belief in the paranormal among individuals (Blanco et al., 2015). However, many people believe in the paranormal not only based on direct personal experience, but also based on accounts of reliable sources or the information disseminated through the media (French & Stone, 2014). According to Persinger and Makarec (1987), there is a significant moderate to strong positive correlation between the number of paranormal incidents that individuals report and their level of belief in paranormal phenomena. Similarly, Dagnall et al.

(2016) conducted a cross-sectional study exploring the correlation between subjective paranormal experiences (SPEs) and paranormal belief in 1,215 participants aged 16 to 70. They used an 18-item measure to assess SPEs and two established measures to assess paranormal beliefs. The findings revealed a positive correlation between SPEs and beliefs in the paranormal. Together, these studies demonstrate that there is a coexistence between paranormal experiences and paranormal beliefs.

1.10 Supernatural explanations attributed to sleep phenomena

Culture – the unique attributes and knowledge of a particular group of people (White, 1959), shapes the way members perceive and make sense of the world around them. Culture can have a profound influence on our perception (Amershi, 2020) and its impact can be so significant that it can even affect our interpretation and understanding of scientifically explainable phenomena (Jalal et al., 2015; Jalal & Hinton, 2013). Throughout history, explanations for various sleep-related phenomena have been multifactorial and primarily influenced by cultural factors. For example, despite being a neurobiological phenomenon and having a relatively high prevalence, various supernatural descriptions of SP have been proposed across diverse cultures, each culture and folk group exhibiting a unique approach towards this condition (Fukuda et al., 1987; Jalal et al., 2014; Ramsawh et al., 2008). A cross-sectional study involving 635 college students investigated a phenomenon called “Kanashibari” which is considered synonymous to ISP in Japan (Fukuda et al., 1987). The authors discovered that 46.0% of men and 70.8% of women believed that there was a relationship between Kanashibari (ISP) and spirits. Similarly, a small proportion (5.6%; four out of 72 participants) of African-Americans were found to attribute SP to a number of factors, including ghost visitation or evil spirits (Ramsawh et al., 2008). Likewise, in a cross-sectional study investigating explanations of SP in Egyptian and Danish populations, it was discovered that 48% of participants from the general population in Egypt believed SP to be caused by the Jinn – a spirit-like creature originating from Islamic tradition (Jalal et al., 2014). In contrast, Danish participants were more inclined than Egyptian participants to assign physiological factors to the phenomenon, suggesting that Westerners (vs. non-Westerners) may be more likely to view SP within a scientific framework. Nevertheless, the majority of participants identified as females, posing challenges in generalising the findings to males. The inclusion of more males in future studies might reveal divergent results. Indeed, one study with equal numbers of men and women indicated that women, compared to men, reported more distressing experiences of SP (Mayer & Fuhrmann, 2021), implying that different interpretations of the phenomenon may exist between genders.

SP has also been associated with reports of alien abduction. In a study conducted by McNally and Clancy (2005), ten individuals who claimed to have been abducted by extra-terrestrial beings ('abductees') were interviewed. The authors found that the reports of alien abduction were linked to episodes of SP, during which the accompanied hallucinations were interpreted as aliens. Likewise, French et al. (2008) examined 19 UK-based participants reporting alien contact (also known as 'experiencers') and an age and gender matched control group. The findings showed that experiencers (vs. controls) were more likely to report episodes of SP.

Similar paranormal attributions have been applied to other sleep-related phenomena. Sharpless et al. (2020) found that 2.8% (N = 92) of their respondents endorsed the belief that EHS was caused by "something supernatural". Furthermore, another study reported that 80% of their participants believed that the nightmares resulted in soul dislocation, where the soul is separated from the body (Hinton et al., 2009). Sleepwalking, or somnambulism, has also been conceptualised as a manifestation of supernatural agency in certain cultural and religious contexts (Handley, 2012).

1.11 Consequences of supernatural attributions to sleep-related phenomena

The existing literature suggests that many sleep-related occurrences can be interpreted within a supernatural sphere (Jalal et al., 2014; McNally & Clancy, 2005; Sharpless et al., 2020). These interpretations can cause anxiety, especially when the experiences involve frightening creatures or objects. Indeed, Jalal et al. (2014) found that individuals in Egypt who interpreted their SP episodes as the result of supernatural attacks reported experiencing great fear during these events (Jalal et al., 2014). Moreover, a notably higher number of individuals from Egypt expressed fear of dying from SP compared to their counterparts in Denmark. The latter group tended to attribute SP to physiological causes. Other studies have found that supernatural attributions of SP were positively correlated with fear, death anxiety (Arikawa et al., 1999), and increased intensity of both fear and threat/assault experiences as well as post episode distress (Cheyne & Pennycook, 2013). It is evident from these studies that assigning supernatural causes to SP can have negative consequences. Therefore, more research is necessary in the area of sleep and the paranormal to potentially mitigate some of the fear and anxiety associated with these experiences.

1.12 Who is most likely to endorse paranormal beliefs?

There are several reasons why individuals believe in the paranormal, one of which is attributed to their personal experiences (Holt et al., 2017). Indeed, Clarke (1995) found this to be true by investigating 385 university students aged 18 to 68. The participants completed questionnaires concerning experiences and beliefs around paranormal phenomena. The findings of the study suggest that personal experiences were the primary reason for belief in the paranormal. Furthermore, the author discovered that other factors, such as the experience of others and the influence of the media, also played a significant role in shaping paranormal beliefs. This was further confirmed by two other studies both of which found that being exposed to certain programs frequently featuring reportedly paranormal activity was associated with a greater inclination to endorse beliefs in the paranormal (Sparks et al., 1997; Sparks &

Miller, 2001). In addition to personal experience and media, a study investigating supernatural explanations across numerous societies argued that supernatural explanations were more commonly adopted by societies and individuals who encounter natural events (e.g., diseases, natural hazard), which lack a clear causal agent (Jackson et al., 2021). Consequently, people tend to infer supernatural involvement in such cases.

Other factors that appear to be associated with endorsement in paranormal beliefs include socioeconomic status (Betsch et al., 2020), religiosity (Weeks et al., 2008), gender (Silva & Woody, 2022; Ward & King, 2020), and age (Dean et al., 2021). Research suggests that the reason females have a greater tendency than males to believe in the paranormal can be attributed to intuition. As an example, Ward and King (2020) conducted various studies with different methodological approaches and measures of magical beliefs. Their studies collectively showed that women reported higher magical beliefs compared to men, and that intuition helped account for gender differences in magical beliefs. Likewise, a recent nationally representative survey involving over 1,000 Americans found that women were more likely than men to believe in spiritual and supernatural phenomena (Silva & Woody, 2022). However, gender differences in paranormal beliefs vary depending on the specific aspect of the paranormal being considered. For example, women tend to endorse astrology (Chico & Lorenzo-Seva, 2006), precognition (i.e., foreknowledge of an event; Aarnio & Lindeman, 2005; Darwin et al., 2011), and traditional religious concepts (Aarnio & Lindeman, 2005) more strongly than do men. Please note that religion will be explored more extensively in section 1.13 of this chapter. In contrast, men often report strong belief in extraordinary life forms and UFOs compared to women (Aarnio & Lindeman, 2005). Nevertheless, other studies have not shown any gender-related differences in relation to paranormal beliefs (Fox & Williams, 2000).

Demographic differences also extend to the specific types of paranormal phenomena people believe in. A study involving 1,200 random-dialled telephone interviews with adults across the

United States found that individuals having obtained higher education (vs. less educated individuals) were more likely to endorse beliefs in ESP, psychic healing, and déjà vu (Rice, 2003). Conversely, they were less likely to subscribe to superstition and astrology. Similar patterns were found regarding income. Higher income was associated with greater beliefs in psychic healing and life after death, and lower belief in astrology and superstition (Rice, 2003). These discoveries challenge the expectation that these paranormal beliefs would align uniformly, although replication of findings is needed before drawing firm conclusions. One potential explanation for these findings could be that individuals with higher incomes often have better access to education and exposure to various belief systems, potentially making them more open and receptive to certain paranormal beliefs. Additionally, it could be related to a desire for alternative or complementary forms of healing (e.g., psychic healing) that are often associated with well-being (Lyvers et al., 2006), whereas superstition may not be perceived as offering similar benefits. However, it is important to mention that, despite the informative nature of the study's findings, the response options provided were limited to three categories ("Believe", "Don't Believe", and "Not Sure/No Answer"). This limitation may have oversimplified some respondents' nuanced perspectives, as they attempted to fit their views into categories that might not accurately reflect the complexity of their opinions. Another study found that unemployment was associated with paranormal beliefs (Emmons & Sobal, 1981).

Furthermore, it has been found that younger individuals exhibit greater endorsement in paranormal beliefs (e.g., belief in angels, devils, witches, astrology) than older adults do (Emmons & Sobal, 1981). Additionally, studies have shown that paranormal belief tends to decrease with age (Preece & Baxter, 2000). However, it is essential to consider the specific kinds of paranormal beliefs being examined, as these may differ with age. For example, older participants may be more likely than younger participants to hold paranormal beliefs that are more relevant to their age group (e.g., communication with deceased loved ones). Indeed, some data suggests that while certain facets of paranormal belief (e.g., spiritualism, astrology, ghosts) are common in younger individuals (Torgler, 2007), traditional religious beliefs tend to rise with age (Bengtson et al., 2015). Nevertheless, a study with a substantial sample size (N = 3,141) reported no age-related differences in different types of paranormal beliefs (Aarnio & Lindeman, 2005). Overall, these findings generally suggest that there are notable differences in paranormal beliefs based on several demographic factors in some studies, although findings overall are mixed.

In addition to demographic correlates, research has shown that certain personality traits are associated with paranormal beliefs (Darolia & Chugh, 2022; Smith et al., 2009). One study in 2009 found that certain personality constructs, such as openness to experience and sensation seeking partially predicted belief in the paranormal (Smith et al., 2009). A more recent study found that paranormal beliefs positively correlated with the personality traits openness and extraversion (Darolia & Chugh, 2022). These associations could potentially be attributed to the inclination of open individuals to possess a vivid imagination and a willingness to explore unconventional ideas and viewpoints. These qualities might render such people to be more inclined to consider and engage with paranormal concepts, fostering a greater openness to such notions. Whilst these findings point to an association between several personality constructs and the endorsement of paranormal beliefs, other research has found no such relationships (Robbins et al., 2010; Willging & Lester, 1997). Moreover, fantasy-proneness, a personality trait involving having vivid daydreams, and a strong imagination that absorbs the individual, making them feel as if the daydreams are real (French & Stone, 2014), has been associated with paranormal belief (Berkowski & MacDonald, 2014; Irwin, 1990; Merckelbach et al., 2022) and perceived paranormal abilities (Parra & Argibay, 2012). Similarly, another personality trait closely associated with paranormal beliefs is locus of control. Locus of control refers to an individual’s belief about whether control over their life resides within themselves (i.e., internal locus of control), or externally with other people, events, or situations (i.e., external locus of control; Lefcourt, 1991). Evidence suggests that a higher external locus of control has been associated with greater paranormal belief (Newby & Davis, 2004; Tobacyk et al., 1988), as well as different elements of paranormal belief, including, precognition, spiritualism, and witchcraft (Groth-Marnat & Pegden, 1998). It is important to note, however, that other studies have not found any significant association between locus of control and paranormal belief (Billows & Storm, 2015; Stanke & Taylor, 2004). The differences in the findings can be attributed to the specific aspects of paranormal beliefs being studied, the multidimensional operationalisations of locus of control, and the particular measures and samples used in each study. While this thesis primarily focuses on exploring the associations between sleep variables and paranormal beliefs, it is important to acknowledge the role of personality traits in the broader literature. Understanding how personality can influence or interact with paranormal beliefs is a crucial facet in comprehending the complex landscape of the paranormal and its associations with sleep.

Research has also examined paranormal beliefs from a cognitive perspective. For example, Lindeman et al. (2013) argue that those who hold paranormal beliefs may have weaker cognitive inhibition which refers to the mind's ability to disregard irrelevant stimuli. In their study, they examined the brain activity of 12 believers in the supernatural and 11 sceptics using functional magnetic resonance imaging. The participants were instructed to imagine themselves in critical life situations, followed by viewing emotionally charged images of lifeless objects and scenery. The authors found that those who believed in the supernatural (vs. sceptics) were more likely to see signs of future outcomes in the pictures. Results showed that the right inferior frontal gyrus, an area of the brain associated with cognitive inhibition, exhibited stronger activation in sceptics than believers. Overall, while the evidence on the topic is not entirely consistent, it appears that specific personality and cognitive factors may indeed be associated with paranormal beliefs.

In addition, there have been numerous associations established between paranormal beliefs and experiences and various mental illnesses, including schizophrenia (Thalbourne, 1994), dissociative identity disorder (Sar et al., 2014), and major depressive disorder (Thalbourne & French, 1995). However, it is worth noting that many symptoms associated with these serious psychological conditions are prevalent among a significant portion of the general population (Nuevo et al., 2012). A factor which has been of interest regarding paranormal beliefs is schizotypy – a prevalent phenomenon in the general population, suggesting a bridge between typical mental functioning and the psychosis observed in individuals diagnosed with schizophrenia (Lustenberger et al., 2015). A study investigating schizotypy and paranormal beliefs in 220 students found that schizotypy scores were positively correlated with paranormal belief scores (Raine & Benishay, 1995).

Dissociation – which can be defined as "a structured separation of mental processes that are ordinarily integrated" (Wolfradt, 1997) is another factor that has been associated with paranormal beliefs. In a study conducted by Irwin (1994), the relationship between scores on paranormal belief and proneness to dissociation scales was examined among a group of 100 psychology students. The results showed a positive correlation between scores on dissociation and global paranormal beliefs.

Given the findings from these studies, it is not surprising that individuals endorsing paranormal beliefs are sometimes pathologized (Kate et al., 2012). However, by taking this approach, we may overlook other explanations related to these beliefs. Therefore, by examining associations between paranormal beliefs and sleep variables, we may be able to offer alternative explanations rather than hastily attributing them to pathology.

1.13 The role of religion and religiosity

Similar to paranormal beliefs, religion and some of its accompanying beliefs are also sometimes considered to lack empirical support (Staddon, 2013). Specifically, here, we define religion and religious beliefs as “a level of reality beyond the observable world known to science” (Schilbrack, 2013, p. 311). Throughout history, religious faith has (for some) been successful in eliminating fear and providing comfort to those who are suffering (Molteni et al., 2021). The belief in a higher power or divine plan can provide some people with a sense of meaning and purpose in difficult times, helping individuals manage their difficulties more effectively (Schieman et al., 2017) and rationalise inexplicable events (Jackson et al., 2021). Research has found that certain religious rituals can serve as an anti-stress mechanism in some cases. Specifically, previous literature has found associations between religious service attendance and lower blood pressure (Gillum & Ingram, 2006; Seeman et al., 2003). Nonetheless, the study measured religious faith based on attendance at religious services, which may not comprehensively capture the depth of one’s religious convictions. Attendance as church gatherings might stem from motivations beyond solely religious devotion, such as social interaction and a sense of community (Dunbar, 2021). Furthermore, a study in Iran involving haemodialysis patients who willingly listened to Quran recitation revealed a significant reduction in anxiety levels compared to a control group (i.e., those who did not listen to Quran recitation; Babamohamadi et al., 2015). However, studies have shown that listening to music can decrease anxiety (Ventura et al., 2012; Voss et al., 2004), therefore, the precise source of anxiety reduction from the Quranic recitation is uncertain. The calming effect could either be attributable to the religious content itself or the melodious quality of the recitation.

Additional studies have further supported the association between religious faith and better well-being. One study involving 348 participants diagnosed with either depression or adjustment disorder found that church attendance played a significant role in moderating the severity of depression, particularly in response to stressful life events (Lorenz et al., 2019). Similarly, a study conducted on approximately 48,000 female nurses in the US using a longitudinal design revealed that frequent religious attendance was associated with a lower risk of depression compared to those who never attended religious services (Li et al., 2016). While the study had significant methodological strengths, including a large sample size and the use of longitudinal data, it may have missed out on crucial findings by excluding males. Men and women may hold different views regarding which religious practices are more successful in reducing feelings of depression. Nevertheless, these studies highlight the positive association between religiosity and various well-being outcomes.

While beneficial and comforting to some (Babamohamadi et al., 2015; Hill et al., 2018; Lorenz et al., 2019), research has also found that religion may also be associated with less favourable outcomes (Exline et al., 2000; Rakesh et al., 2021). One study examining the role of religiosity in guilt and obsessive-compulsive disorder found an association between religiosity and guilt related to obsessive-compulsive disorder, especially among Sikhs and Hindus (Rakesh et al., 2021). Other negative mental health outcomes have been reported in relation to religion. For example, a cross-sectional study involving 200 nonclinical participants found that experiencing religious strain, such as feeling alienated from God, was associated with higher levels of depression and suicidality irrespective of religiosity levels or the degree of solace derived from religion (Exline et al., 2000). Of note, the religious strain instrument used in the study did not include other potentially important strain-related aspects (e.g., frustration/anger with God, difficulty adhering to religious standards) which might have yielded additional valuable insights. Another study involving 176 students showed that the more the students felt disconnected from God, the more shame and guilt they experienced

(Murray et al., 2007). Similar findings have appeared in a newer study (Malinakova et al., 2020).

Religion has also been examined in relation to death anxiety. A systematic review and meta-analysis included 100 studies that reported a total of 202 linear correlations between death anxiety and religiosity from 113 independent samples (Jong et al., 2018). Among the correlations, the most prevalent outcome was non-significance (n = 106), indicating no correlation between death anxiety and religion. Subsequently, a weak negative correlation (n = 60) was observed, followed by a positive correlation (n = 36). Overall, the literature regarding religiosity and various psychological and physiological factors appears to be remarkably inconsistent, although it generally leans towards a lack of significant associations between religion and death anxiety.

1.14 Individual differences in religiosity

Several social and cultural factors have been shown to be associated with religiosity, including gender (Maselko & Kubzansky, 2006), age (Dillon & Wink, 2007; Krause, 2008), and educational level (Mocan & Pogorelova, 2017). Women have repeatedly been shown to be more religious than men (Francis, 1997; Gallup, 1999; Rababa et al., 2021; Rassoulian et al., 2021). For example, research based on the U.S. General Social Survey indicated that around 61% of women reported engaging in daily religious activities, such as reading the Bible, private prayer, or meditation (Maselko & Kubzansky, 2006). In contrast, approximately 43% of men reported participating in the same practices.

With respect to age, religiosity tends to solidify in older age (Krause, 2008). Specifically, a longitudinal study examining age patterns and religiosity across seven decades (Dillon & Wink, 2007) found that religiosity declined through youth and middle adulthood but increased during the majority of late adulthood. This observation could potentially be explained by the notion that embracing religious faith in later stages of life, when health issues and loneliness are more prevalent, may assist individuals in better coping with the associated challenges (Idler, 2006). In terms of education, one study found a correlation between increased time in education and decreased religiosity (Mocan & Pogorelova, 2017).

In addition to demographic correlates, certain personality traits have been shown to be associated with religiosity. According to a meta-analytic review, agreeableness and conscientiousness were identified as traits most strongly associated with religiosity, although the effect sizes were small (Saroglou, 2002).

1.15 Paranormal beliefs and religious beliefs

For decades, researchers have endeavoured to understand the relationship between paranormal and religious beliefs, and whether they represent similar or distinctive concepts (Jackson et al., 2021; Rice, 2003). Both paranormal (Barber, 2014) and religious beliefs are rooted in the human inclination to explain and understand the world (Galek et al., 2015), and they may even share common psychological and social implications (Lindeman & Svedholm-Häkkinen, 2016). For example, Tobacyk and Milford (1983) administered a 25-item self-report questionnaire assessing belief in the paranormal to 391 undergraduate students. The results demonstrated a moderate to strong positive correlation between paranormal and religious beliefs, suggesting that those who held firm religious beliefs were also more likely to have paranormal convictions. In addition, religious beliefs and practices can be perceived as superstitious by some (Mocan & Pogorelova, 2017). One study found that people belonging to a religious denomination also tend to report higher beliefs in superstition compared to those not having a religious denomination (Torgler, 2003). Other researchers argue that paranormal beliefs and religious beliefs are fundamentally different. For example, Orenstein (2002) showed that greater church attendance was strongly associated with lowered paranormal beliefs. Similarly, Rice (2003) showed that the correlations between religious beliefs and paranormal beliefs were largely non-significant. These studies taken together indicate that there is generally an unclear association between religion and paranormal beliefs which is complex and seemingly contradictory. Despite the uncertainty of whether religious beliefs and paranormal beliefs are similar or distinct, this thesis posits that these two belief systems are conceptually unified due to their shared characteristics of lacking empirical evidence and their shared presumption that these beliefs are yet to be validated by scientific inquiry (French & Stone, 2014; Schilbrack, 2013).

Some research argues that the association between paranormal beliefs and religious beliefs is influenced by the particular category of paranormal belief, the nature of religion in question, and the way in which religion is measured (Krull & McKibben, 2006). For instance, while Sparks (2001) found that generally, religious and non-religious respondents held similar beliefs and disbeliefs in the paranormal (such as astrology, haunted houses, flying saucers), there were variations between the two groups on specific paranormal items. Specifically, respondents with high levels of religious beliefs were more likely than those with low levels of religious beliefs to support claims related to healing, prophetic dreaming, and bending metal just by thinking. Similarly, another study showed that religiosity was positively associated with belief in psychic healing and negatively associated with UFO belief (Clarke, 1995). These findings support the notion that the association between paranormal and religious beliefs possibly depends on the extent to which the particular paranormal belief is congruent with and central to religious doctrine.

1.16 Religious faith and sleep paralysis

A couple of studies have investigated religiosity in relation to SP (Jacobson, 2009; Jalal, Sevde Eskici, et al., 2021; Jalal & Hinton, 2013). In their study, Jalal and Hinton (2013) compared lifetime occurrence of SP among 693 individuals from the general population of Denmark and Egypt. Level of religiosity was measured as "How important is religion to you?" and ranged from 1 to 7, with higher scores indicating greater religiosity. They found that for both participants in Denmark and Egypt, ascribing supernatural causes to SP was associated with higher levels of religiosity. Although highly informative, it is noteworthy that a single item was used to examine religiosity – and future research should employ more extensive measurements to account for the multifaceted nature of religiosity (Djupe & Hunt, 2009). Another study examining explanations of SP in Turkey revealed a similar pattern of results (Jalal, Sevde Eskici, et al., 2021). The study involved 59 predominately Muslim college students who were orally administered the Sleep Paralysis Experiences and Phenomenology Questionnaire. The researchers found that 17% of the participants believed that their SP might have been caused by the "Karabasan" – a spirit-like creature rooted in Turkish folk tradition. This is in accordance with the study conducted by Jalal and Hinton (2013) and proposes that people who identify with a religion, and in this study especially Islam, assign supernatural explanations to SP. However, since the participants were all from the same country, it is possible that the "Karabasan" explanation is culture-specific rather than reflecting religious beliefs. Therefore, it is of interest to look at a more diverse Muslim population that is not limited to only one or two countries. In addition, given the small number of people from other religious groups, no analyses could be made comparing the religious groups. Research on whether SP interpretations differ across different religions as well as non-religious groups is needed. Overall, it is possible that higher levels of religiosity may perpetuate the fear of SP because believers are more likely to assign paranormal explanations to the experiences. However, one study of a North American sample found that SP sufferers experienced an increase in their Christian faith following SP, indicating that SP may appear as a spiritual experience to some (Hufford, 2005).

Regarding SP frequency, a recent study investigating SP and associated demographic variables in 168 participants found that religious identification (mainly Christianity) positively predicted SP frequency (as compared to the atheist/agnostic grouping) in the past month (Blood & Cacciatore, 2022). Although this study provides an interesting finding between religious and non-religious groups, it is important to distinguish between atheism and agnosticism due to their unique characteristics. For example, whilst those identifying as atheists typically hold the idea that God does not exist, agnostics adopt a more uncertain and impartial approach, considering all arguments (Bradley et al., 2018). Therefore, grouping these two categories separately (as opposed to viewing them as equivalent) may yield discordant findings. Future research is necessary to validate this assertion.

1.17 Religious faith and other sleep variables

In addition to SP, other aspects of sleep have been associated with religious faith (Cho & Kim, 2023; Fergason & Scullin, 2020; Hill et al., 2018; Nguyen et al., 2022; Zarhin, 2022). Hill et al. (2018) conducted a comprehensive review that involved seven large population-based studies that examined the association between religious involvement and sleep outcomes. Based on the studies, the authors concluded that among adult populations, religious involvement (e.g., religious attendance, frequency of prayer, God-mediated control) was associated with healthier sleep outcomes, such as longer sleep duration and better overall sleep quality. In contrast, among younger populations, increased engagement in religious activities was associated with diminished total sleep time both weekdays and weekends. Similarly, a qualitative study conducted on Muslim and Jewish individuals residing in Israel examined the associations between religion and sleep (Zarhin, 2022). The study discovered that the participants reported that their strong faith in God and practice of praying helped reduce stress and improve sleep quality. However, the study also revealed that among Muslims, missing prayers could elicit feelings of guilt and discomfort, which in turn could negatively impact their sleep quality. This highlights the positive and negative aspects of religious beliefs in relation to sleep quality. Furthermore, BaHammam et al. (2013) observed that fasting Muslims exhibited a delayed bedtime and time of rising during Ramadan, the month of fasting for Muslims, compared to non-Muslims. This was measured objectively using an armband. Another study revealed that non-believers showed better sleep outcomes. Fergason and Scullin (2020) found that atheists/agnostics reported better sleep duration and less difficulty falling asleep than Catholics and Baptists. Based on these studies, the evidence pertaining to the associations between sleep and religion appears to be inconclusive. More research is needed to further understand some of these relationships.

1.18 Religion-specific techniques and sleep

Previous research has also investigated religion-specific thoughts and behaviours in relation to sleep difficulties (Cheyne & Pennycook, 2013; Jalal, Sevde Eskici et al., 2021; Ramsawh et al., 2008). For example, a positive association between private prayer and overall self-rated sleep quality has been observed (Ellison et al., 2011). Similarly, a small study involving 40 Christian participants found that increased frequency of prayer was significantly associated with lower sleep disturbances (Britt et al., 2022). Another cross-sectional study involving 1,410 respondents explored moderating factors in the association between sleep quality and stress, and found that religious cognitions (e.g., attachment to God) but not religious attendance or private religiousness, weakened the association (Ellison et al., 2019). These studies generally indicate that certain religion-specific practices and beliefs are associated with better sleep outcomes.

Research has also reported on the specific prevention and disruption techniques employed to cope with SP episodes. For example, Jalal, Sevde Eskici, et al. (2021) found that 37% of their participants (Turkish undergraduate students) applied religious methods to prevent future

SP episodes, including dua (a prayer of invocation), reciting the Quran, and wearing a good luck talisman inscribed with Quranic verses called musqa. Similarly, in a predominately Christian African-American sample consisting of 36 individuals who reported SP, it was found that the most common precautionary measure taken to prevent future episodes of SP was religious coping (13.9%), such as reading the Bible and praying (Ramsawh et al., 2008). Another study by Ohaeri et al. (2004) examined 110 participants residing in Nigeria, where 49 (44.5%) reported relying on Christian prayer to prevent further ISP episodes. These findings indicate that religious communities commonly employ SP-related coping techniques rooted in their faith. However, the effectiveness of these methods remains untested, necessitating further research to validate the strategies employed and evaluate their perceived effectiveness, thereby guiding potential interventions.

1.19 Structure of the thesis

The broad aim of this thesis is to generate a better understanding of the associations between different aspects of sleep and paranormal as well as religious beliefs. The specific aims of this thesis are as follows: 1) to examine the current state of the literature on the associations between sleep variables and ostensibly paranormal experiences and paranormal beliefs (OPEPB), 2) to hone in on ISP (a sleep phenomenon often interpreted through a paranormal lens) by investigating its clinical features, demographic differences, perceptions of aetiology, and prevention as well as disruption techniques, 3) to further explore associations between sleep variables and paranormal beliefs empirically by including a wider range of sleep variables and paranormal beliefs than previously examined in research, 4) to explore the associations between religious belief (because like paranormal beliefs, many religious beliefs are without empirical support) and ISP.

As described throughout this introductory chapter, sleep disturbances can be reported in conjunction with various paranormal beliefs and experiences. Nonetheless, the literature on these associations to date has been conducted on a small scale and/or been limited in the range of sleep and paranormal variables investigated. What is more, preliminary data suggests that further sleep variables are likely to be linked to paranormal variables, supporting further systematic investigation. Further research is needed to replicate and expand upon the current associations, and to identify other potential links between sleep and the paranormal to enhance our understanding in this field. Chapter 2 provides a scoping review which collates all the existing evidence on these associations, helping to identify gaps in the current literature as well as suggesting ways to advance research in this area. Additionally, the chapter provides a helpful starting point for sleep practitioners and other clinicians on how to best support patients who report experiencing both sleep disturbances and paranormal phenomena. The scoping review also lays the foundation for discussion and future investigation, ideally playing a pivotal role in the gradual and replicable process of implementing changes in clinical settings. Chapter 3 outlines the shared measurements and methodologies employed across the empirical studies within the thesis,

Chapter 4 provides a comprehensive overview of ISP, which emerged as a commonly explored variable according to the findings of the scoping review. The chapter delves into various clinical features, demographic differences, as well as strategies employed to manage the condition. While previous research has identified certain features of ISP (e.g., Olunu et al., 2018; Sharpless & Kliková, 2019; Wróbel-Knybel et al., 2020), the evidence has been inconsistent, underscoring the need to confirm specific findings and further enhance our understanding of this condition through empirical work before moving forward.

Chapters 5 and 6 focus on furthering our understanding of the associations between sleep and the paranormal by investigating associations across a wider range of variables. Chapter 6 specifically endeavours to replicate, using the Anomalous Sleep Experience (ASE) dataset, the empirical investigation presented in Chapter 5, which aligns with efforts to address the ongoing replication crisis in scientific research (Anvari & Lakens, 2018; Shrout & Rodgers, 2018). Some people who report night-time related occurrences can often face feelings of isolation and shame (Jalal et al., 2015), as these experiences are frequently accompanied by societal stigmatisation (Hufford, 2005; Sacks, 2012). These chapters can play a vital role in diminishing the stigma associated with these experiences. In addition, people reporting ostensibly paranormal experiences in relation to night-time can sometimes be misdiagnosed with other disorders (Gangdev et al., 2015) and therefore receive inappropriate treatment. These chapters help shed light on the unique nature of night-time related experiences, potentially assisting healthcare practitioners in distinguishing between reports primarily manifest during night-time and those that extend beyond night-time.

As there are shared characteristics between paranormal and religious beliefs (Tobacyk & Milford, 1983), Chapters 7 and 8 (with Chapter 7 serving as a pilot study) seek to examine the associations between SP/ISP and religious faith as well as religious belief systems. While previous studies have examined the associations between SP and religion, there remains a necessity for additional investigation in this field to provide more clarity on the associations between these variables. Such research can, if appropriate, acknowledge the role of one's religious beliefs in future considerations and treatments for the condition, fostering cultural sensitivity and enabling personalised, holistic therapeutic strategies.

Finally, Chapter 9 encompasses a general discussion, uniting the findings of the thesis. This section discusses both the similarities and discrepancies among the research outcomes, highlighting shared strengths, limitations, implications, and potential avenues for future research.

Chapter 2: Associations between Sleep Variables and Ostensibly Paranormal Experiences and Paranormal Beliefs: A Scoping Review

A paper based on this chapter has been published in the British Journal of Psychology:

Rauf, B., Perach, R., Madrid-Valero, J. J., Denis, D., Sharpless, B. A., Farron, H., ... & Gregory, A. M. (2023). Associations between sleep variables and ostensibly paranormal experiences and paranormal beliefs: A scoping review. *British Journal of Psychology*.

2.1 Abstract

Chapter 1 provided a broad context for our research domain and identified some associations between sleep variables, including parasomnias, and OPEPB. However, it became evident from Chapter 1 that our comprehension of these associations remains limited and that there is room for a deeper understanding of the associations. Therefore, in this chapter, the primary objective is to enhance our understanding of the associations between sleep variables and OPEPB, while simultaneously unifying a currently fragmented literature-base into a structured, practical review. In this pre-registered scoping review, we searched for relevant studies in MEDLINE (PubMed), PsycINFO (EBSCO), Web of Science and EMBASE using terms related to sleep and OPEPB.

Forty-four studies met all inclusion criteria. All were cross-sectional and most investigated SP and/or lucid dreaming in relation to OPEPB. Overall, there were positive associations between many sleep variables (including sleep paralysis, lucid dreams, nightmares, and hypnagogic hallucinations) and OPEPB (including those of ghosts, spirits, and near-death experiences). The findings of this review have potential clinical implications such as reducing misdiagnosis and providing information relevant for treatment development and foundations for further

research. Our findings also highlight the importance of understanding why so many people report ‘things that go bump in the night’.

2.2 Introduction

Explanations for many sleep-related phenomena, including SP and EHS, have been multifactorial. For example, references to SP are scattered throughout history, and this sometimes vivid and terrifying experience has often been attributed to paranormal factors (French et al., 2002), including Kanashibari – being bound in metal shackles, the Old Hag – a witch riding on the chest of the victim (Sharpless & Doghramji, 2015), jinn – a supernatural being that victimizes and intimidates its victims (Jalal & Hinton, 2013), and Pandafeche, which is an evil witch or terrifying humanoid cat (Jalal et al., 2015). Others believe that SP is caused by physiological risk factors such as stress and anxiety (Jalal & Hinton, 2013). Similar paranormal attributions have been applied to EHS which some experiencers believe is due to the result of 'something supernatural' (Sharpless et al., 2020; see Chapter 1). These findings suggest that attributing anomalous experiences to scientifically proven phenomena is relatively prevalent in society today. Other sleep variables such as nightmares, sleep terrors, and hallucinations caused by missing out of sleep could also be interpreted within the framework of the paranormal (Drinkwater et al., 2020; Ohayon et al., 1996).

Many healthcare professionals do not counsel their patients on sleep (Grandner & Malhotra, 2015) and may therefore underestimate the potential impact that these night-time events have on their patients. It is therefore imperative to describe and synthesize the evidence concerning sleep and paranormal variables in order to gain a global understanding of the associations. This, in turn, may stimulate further research and eventually result in clinicians being better equipped to care for and counsel patients reporting such events. Physician-patient communication has been linked to various positive outcomes (Rocque & Leanza, 2015), such as increased patient satisfaction and adherence to treatment plans (Johnson, 2019). This scoping review aims to better our current understanding of 'things that go bump in the night', expose knowledge gaps, stimulate research to fill in the gaps (Munn et al., 2018) and make this knowledge easily accessible to other researchers, educators, sleep professionals and healthcare providers. Our objective is to enable an improved, comprehensive understanding of the associations between different sleep variables (not only limited to parasomnias) and OPEPB while unifying a currently fragmented literature-base into a structured, practical review.

2.3 Methods

This pre-registered scoping review (https://osf.io/4zuhn/?view_only=cf0da6c9a4824471b0576d56a824abf3) was conducted in accordance with published guidelines (Levac et al., 2010; Peters et al., 2020). We followed these steps:

Stage 1: Identifying the research question

Our research question is: What are the associations between sleep variables and OPEPB?

Stage 2: Identifying relevant studies

We conducted a comprehensive search of the literature using the following databases: MEDLINE (PubMed), PsycINFO (EBSCO), Web of Science and EMBASE. The choice of these databases is strategically grounded in their comprehensive coverage of psychology-related research, allowing us to access a wide array of studies relevant to our exploration of the associations between sleep variables and OPEPB. Search terms and strings were developed by the research team in consultation with a subject librarian and tailored for each database (see Appendix A for search strategies for all databases).

Stage 3: Study selection

Citations retrieved through the electronic database searches were imported into Zotero (5.0.96.3) and duplicates were identified and removed. The first author (BR) and two psychology undergraduate students (EW and NA) independently screened studies based on titles and abstract to determine if they met the inclusion criteria for full-text screening. An additional author (JJM-V) reviewed screening decisions to resolve disagreements via consensus. Studies that were retrieved for full text were further reviewed by two authors (BR and HF) and any disagreements were resolved by a third author (JJM-V) via consensus. Authors were contacted twice via email if their papers were inaccessible online. The inclusion criteria were (1) a peer-reviewed article published in English and (2) an article reporting on a quantitative association between sleep (subjective and/or objective) and OPEPB in humans.

We defined sleep as any sleep-related phenomena including (but not limited to) sleep restriction or deprivation, sleep quality, insomnia, nightmares, sleep terrors, SP, and EHS (AASM, 2014). Ostensibly paranormal experiences were defined as experiences that appear to be, in the view of the individual having the experience and/or a substantial proportion of the wider population, beyond explanation in terms of currently accepted scientific concepts. Paranormal beliefs are here defined as endorsement of the paranormal nature of such experiences (Betsch et al., 2020).

Stage 4: Data charting process

Two authors (BR and HF) independently extracted the following data items: general data (author(s) and date, journal, study location); methodological data (study aims/objectives, study design, type of evidence, sample characteristics); study data (sleep variable(s), measure(s) of sleep variable(s), ostensibly paranormal experiences/beliefs, measure(s) of paranormal variable(s), results).

Stage 5: Summarizing results

The results were organized under the following categories: studies, population, concept, context, SP and OPEPB, lucid dreams and OPEPB, nightmares and OPEPB, hypnagogic hallucinations and OPEPB, sleep quality and OPEPB, dreams and OPEPB, EHS and OPEPB, other sleep variables and OPEPB. We reported the review in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines – extension for scoping review (Tricco et al., 2018).

2.3.1 Deviation from pre-registered protocol

To maintain the feasibility of the review, we decided to exclude studies concerning precognition. This is because although precognition – the ability to see into the future (French & Stone, 2014) is usually classified as a paranormal experience, it is often treated as an independent topic (Rattet & Bursik, 2001). Precognition is an umbrella term that includes several subcategories, including premonition (i.e., warning in advance) and presentiment (i.e., feeling in advance; Mossbridge & Radin, 2018), and is therefore broad enough to be investigated on its own.

2.3.2 Quality assessment

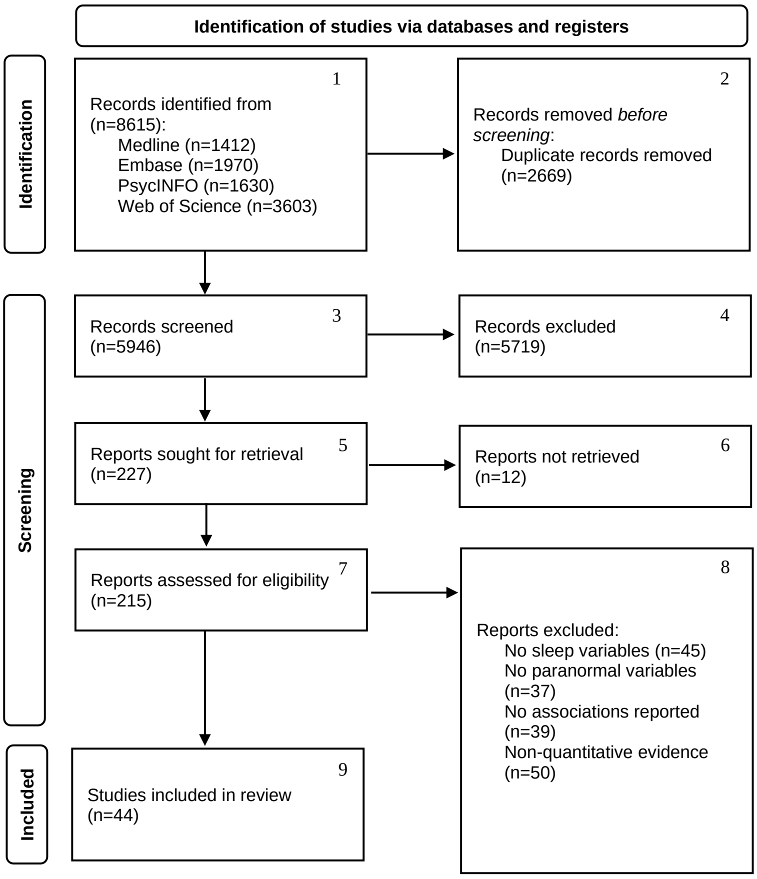
In line with scoping review guidelines (Levac et al., 2010), we exclude quality assessment of individual studies. Methodological characteristics and heterogeneity of the overall evidence are considered in the discussion.

2.4 Results

Forty-four studies (reported in 44 articles) met our inclusion criteria (Figure 1). Where correlations are reported, we interpret them as negligible (0.00 – 0.10), weak (0.10 – 0.39), moderate (0.40 – 0.69), strong (0.70 – 0.89), and very strong (0.90 – 1.00; Schober et al., 2018).

Figure 1

Preferred reporting items for systematic reviews and meta-analyses flow diagram of the study



Note. The numbers in the right-hand corner clarify the sequence of steps undertaken in the process. Exclusion of n = 5719 records was primarily due to their divergence from the scope of our research question, as determined during title and abstract screening. These records included books, commentaries, qualitative studies, and case reports, which did not align with the criteria of our investigation.

2.4.1 Included studies

Study characteristics are presented in Table 1. These included studies were all cross-sectional and published between 1982 and 2021. The studies were conducted by diverse research groups, providing an international and cross-cultural sample.

Table 1

Overview of characteristics of included studies (N = 44)

Study	Population	N (% female)	Mean(sd; age range)	Sleep variable (measure type/name of number of items)	Paranormal variable (measure type/ name or number of items)	Location
Alvarado (1998)	Graduate psychology students	nr	nr	Sleepwalking (1 item)	Parapsychological experiences (5 items)	Puerto Rico

Alvarado & Zingrone (2007)	Ibero-American readers (majority Spanish) of a popular publication on paranormal topics	492(68.0)	nr	LD (2 items)	OBEs (7 items)	US
Bastos Jr et al. 2020)	Medium group vs control group	32(100.0)	53.3	Subjective sleep quality, Sleep latency, Sleep duration, Sleep efficiency, Sleep disturbance (PSQI)	Psychophonic mediumship i.e., speaking under the influence of spirits (questionnaire)	Brazil
Blackmore (1982)	Students undertaking a parapsychology course	157(nr)	nr	LD (questionnaire)	OBEs (questionnaire)	UK
Blackmore (1983)	Most were members of psychology & parapsychology	234(68.0)	35.3	LD (7 items)	OBEs (2 items)	UK

	adult education classes					
Blackmore (1984)	Randomly selected people from the Bristol Electoral Register	321(52.9)	44.6(18-87)	LD (questionnaire)	OBEs (questionnaire)	UK
Blackmore (1986)	People who attended parapsychology conferences	97(35.1)	46.7(17.1)	LD (questionnaire)	OBEs (questionnaire)	UK
Britton & Bootzin (2004)	Individuals reporting experiencing NDEs during life-threatening events vs controls	43(69.8)	53.0(25-71)	Sleep duration, REM sleep latency (Polysomnography)	NDEs (DES)	US

Cheyne & Girard (2009)	World-wide population (majority in US)	11385(37.0)	29.2(10.1)	SP (WUSEQ)	OBEs	International
De Foe et al. (2013)	Participants recruited via university social media & online psychology newsletters	370(57.0)	37(18-65)	Sleep onset (nr)	OBEs (multiple questions about OBEs)	Australia
Denis & Poerio (2017)	Participants were invited to take part through university mailing listing, and on SP and LD websites/forums	1928(53.0)	34.2(13.6; 18-82)	SP (WQ), LD (1 item), Sleep quality (SCI)	Paranormal beliefs (PBS)	UK

Drinkwater et al. (2020)	UK-based online sample	455(75.8)	34.5(15.7)	Nightmares, SP, Lucid dreams (2 items for nightmares, 1 item for SP, 4 items for LD)	Paranormal beliefs & Paranormal experiences (MMU-N & a series of items)	UK
French et al. (2008)	People who had claimed to have had extra-terrestrial contact vs control group	19(58.0)	45(13.7; 23-72)	SP (NEC)	Contact with Aliens (AEI)	UK
Fukuda et al. (1987)	College students	635(39.0)	19.6(18-26)	SP (questionnaire) referred to as Kanashibari	Spirits (questionnaire)	Japan
Glicksohn & Barrett (2003)	Mainly undergraduates	656(64.0)	Median=23(13-78)	LD (SEQ)	OBEs (SEQ)	Israel
Glicksohn (1990)	Students undertaking introductory psychology	72(40.0)	nr(20-47)	LD & Hypnagogic imagery (10-item questionnaire)	Subjective paranormal experience(10 items)	Israel

	course at a University					
Hinton et al. (2005)	Psychiatric population of Cambodian refugees	42(68.0)	49.1(5.3)	SP (SP frequency questionnaire)	Soul scared from body, fatal spirit attack (SP-CCQ)	US
Hinton et al. (2009)	Cambodian refugees attending a psychiatric clinic	100(60.0)	47.2(6.2)	Nightmares (1 item from SCID)	Soul dislocation	US
Hinton et al. (2013)	Treatment-seeking Cambodian refugees	100(65.0)	54.2(7.5)	Dreams (The Dream Frequency Scales)	Visitations	US
Hinton et al. (2019)	Cambodian refugees	70 (60.0)	nr	Dreams (nr)	Ghost (1 item)	US
Jalal et al. (2013)	(1)Egyptian nationals	(1)89 (34.0)	(1)28.2(8.6; 18-67)	SP (questionnaire)	(1)Jinn/Shaitan assault (2)Jinn assault	Egypt

	(2)Egyptian students in American Uni of Cairo	(2)44 (68.0)	(2)29 (1.5; 18-24)			
Jalal et al. (2015)	Italian nationals	68 (49.0)	41(17.9; 20-81)	SP (SP-EPQ)	Pandafeche	Italy
Jalal, Romanelli, et al. (2021)	General population in Italy	67(49.0)	41.2(17.9; 20-81)	SP (SP-EPQ)	Pandafeche	Italy
Jalal, Sevde Eskici, et al. (2021)	Turkish undergraduate students with at least one SP episode	59(75.0)	23.2(2.9; 20-37)	SP (SP-EPQ)	Karabasan attack	Turkey
Kondziella et al. (2019)	Lay people from 35 different countries	1034(59.0)	32.7(11.3)	REM sleep intrusion (4 items)	NDEs (Greyson NDE scale)	Internation al

Kunzendorf et al. (2007)	Students taking General Psychology	160(44.4)	18.8(1.5; 18-28)	Dreams	Visitations by the deceased (Dream visitation survey)	US
Levitan et al. (1999)	Undergraduate students in an introductory psychology course & readers of the NightLight	604(45.0)	30	LD (questionnaire with 12 different frequency levels for LD)	OBEs (questionnaire with 12 different frequency levels for OBEs)	US
McNally & Clancy (2005)	1. People with continuous memories of childhood sexual abuse vs control group	36(77.8)	39.7(10.2)	SP (Sleep Experiences Questionnaire)	Ghost (The Absorption Scale)	US
	2. People reporting alien abduction	10 (60.0)	nr	SP (Sleep Experiences Questionnaire)	Aliens	
						US

Nelson et al. (2006)	North American volunteers with NDEs vs control	110(65.0)	54.2(31-76)	Rem intrusion	NDEs (Greyson criteria)	US
Ohaeri et al. (2004)	Members of the general population of a university town	110(55.5)	30.9(10.5; 18-62)	SP (24-item SP questionnaire)	Supernatural (witches/spiritual attack/evil spirit)	Nigeria
Oluwole (2010)	Participants were recruited from a Hall of Residence in a large University	276(41.7)	25(3; 19-35)	Sleep (a 29-item background questionnaire)	Aliens (incidence questionnaire)	Nigeria
Raduga et al. (2020)	People on the streets of Moscow	974(54.0)	29(15; 10-87)	SP (Live survey)	OBEs	Russia
Ramsawh et al. (2008)	African American/Afro-	36(73.6)	24.9(9.1)	ISP (The ISP questionnaire)	Ghost/evil spirit (nr)	US

	Caribbean individuals					
Schaffler et al. (2016)	Vodou practitioners with and or without spirit possession	85(55.0)	35.9(11.6)	Sleep quality (1 item from SDQ-5)	Spirit possession (SPQ-DR)	Dominican Republic
Sharpless & Kliková (2019)	People with at least one SP episode	513 (67.6)	19.7	ISP (expanded FISPI)	Ghost, Spirit (expanded FISPI)	US
Sharpless et al. (2020)	People reporting at least one EHS episode	3286(66.0)	47(15.3; 18-89)	EHS (EHSI)	"Something supernatural"	International (mainly UK)
Sherwood (1999)	Users of the WWW computer network	108(64.0)	30.3(11.4; 18-71)	EHS, LD, Sleep terrors, Nighmares, REM sleep behaviour disorder, Hypnagogic &	Anomalous experiences (questionnaire)	International

				Hypnopompic imagery (questionnaire)		
Spanos et al. (1993)	UFO reporters	49(28.6)	37.2(11.7)	Sleep-related (nr)	UFO (semi-structured interview)	Canada
Spanos et al. (1995)	Psychology students with SP vs control group	190(61.0)	nr	SP (questionnaire)	OBEs (4-point likert-type scale)	Canada
Terhune (2009)	Participants were recruited through postings on public pages of WWW sites for a study on “unusual experiences”	420(81.0)	32.1(11.5; 18-76)	Hypnagogia (ISES)	OBEs (1 item)	International (most residing in the US)

Thaibourne & Delin (1999)	Predominately university students	116(62.9)	25.5(10.6)	Nightmares (1 item)	Paranormal beliefs (MEQ)	Australia
Wing et al. (1994)	Chinese students in Hong Kong	603(42.0)	20.6(1.2; 17-32)	SP (16 items – SP and Ghost oppression used interchangeably)	Ghost oppression (16 items)	China
Wing et al. (1999)	Chinese elderly	158(58.0)	80.3(6.5; 70-98)	SP (questionnaire – SP and Ghost oppression used interchangeably)	Ghost oppression (questionnaire)	China
Young et al. (2013)	Hmong immigrants	747(38.0)	40(13; 18-86)	SP, hypnagogic hallucinations, nightmares, difficulty getting to sleep, restless sleep, weak knees, sleep apnoea (a semi-qualitative scale; polysomnogram for sleep aponea)	Dab tsog (multiple questions)	US

Note. All included studies were cross-sectional. Age indices (e.g., means, standard deviation, and/or age range) were not reported in 9 studies. sd = standard deviation; uni = university; nr = not reported; ISP = isolated sleep paralysis; FISPI = fearful isolated sleep paralysis interview; SP = sleep paralysis; OBEs = out-of-body experiences; EHS = exploding head syndrome; LD = lucid dream; SCID = structured clinical interview for DSM disorders; SP-CCQ = sleep paralysis catastrophic cognitions questionnaire; NEC = nocturnal experiences questionnaire; AEI = anomalous experiences inventory; DES = dissociative experiences scale; EHSI = exploding head syndrome interview; SP-EPQ = sleep paralysis experiences and phenomenology; NDEs = near-death experiences; MEQ = the mystical experience questionnaire; MMU-N = Manchester metropolitan university new; SEQ = the subjective experience questionnaire; SDQ-5 = somatoform dissociation questionnaire; SPQ-DR = spirit possession questionnaire – Dominican republic; WUSEQ = waterloo unusual sleep experiences questionnaire; WQ = waterloo usual sleep experiences questionnaire-VIIa; SCI = sleep condition indicator; PBS = paranormal belief scale; PSQI = Pittsburgh sleep quality index; ISES = Iowa sleep experiences survey. Information about the sleep and paranormal questionnaires is presented where available.

2.4.2 Population

Based on the studies reporting associations between sleep and paranormal variables, data from a total of 27,130 people were reported in this review (50% male, 48% female, mean age = 33.7; range 10 – 98). However, it is worth noting that the study by Alvarado (1998) did not provide details regarding the number of participants, gender distribution, or age demographics.

2.4.3 Concept

Numerous sleep variables were investigated across the 44 included studies. SP was the most investigated sleep variable (18/44, 41%), followed by lucid dreams (11/44, 25%), nightmares (5/44, 11%), hypnagogic hallucinations (4/44, 9%), sleep quality (3/44, 8%), and dreams (3/44, 6%). Several studies investigated more than one sleep variable (Bastos et al., 2020; Britton & Bootzin, 2004; Cheyne, Rueffer, & Newby-Clark, 1999; Drinkwater et al., 2020; Glicksohn, 1990; Sherwood, 1999; Young et al., 2013). Sleep variables and their OPEPB associations are listed in Table 2.

A wide range of OPEPB was reported (Table 1). Evil spirits, ghosts and/or creatures (14/44, 32%) were most common, followed by out-of-body experiences (OBEs; 12/44, 27%). Of the studies that reported evil spirits, ghosts, and creatures, five included other definitions of what would be translated to evil spirits/creatures in the English language such as attacks by the Pandafeche (an evil witch or terrifying humanoid cat), Jinn (supernatural being intimidating its victims), Dab tsog (frightening night-spirit), and Karabasan (spirit-like creature).

Sleep measures ranged from single items to well-validated and reliable survey scales to polysomnograms. Most studies used validated and reliable measures of paranormal experiences/beliefs. Self-designed questionnaires were also used.

2.4.4 Context

The studies took place in various contextual settings, including at universities (12/44, 27%), online (5/44, 11%), at psychiatric/mental health clinics (4/44, 9%), and at conferences (1/44, 2%).

2.4.5 SP and OPEPB

The associations between SP and OPEPB (n = 19/44) are shown in Table 2.

SP, ghosts, spirits, witches, souls, and visitations

In total, 13 studies reported on the associations between SP and different creatures, visitations, and soul-related phenomena. Grouping these OPEPB (ghosts, spirits, witches, souls, and visitations) together is justified by the fact that although they represent distinct concepts, they often coincide in individuals with paranormal beliefs (Varrella, 2017). Moreover, experiences involving one type of entity (e.g., spirits) may sometimes be interpreted or labeled differently (e.g., visitations) based on cultural and contextual factors (McClenon, 1995).

Ten studies reported solely frequencies (Fukuda et al., 1987; Hinton, Pich, Chhean & Pollack, 2005; Jalal et al., 2014, 2015; Jalal, Romanelli, et al., 2021; Jalal, Sevde Eskici, et al., 2021; McNally & Clancy, 2005; Ohaeri et al., 2004; Ramsawh et al., 2008; Sharpless & Kliková, 2019), ranging from 6 to 93% with the lowest frequencies reported in the general population in Italy (Jalal, Romanelli, et al., 2021) and highest reported in a psychiatric refugee population (Hinton, Pich, Chhean & Pollack, 2005).

The remaining three studies (Wing et al., 1999; Wing et al., 1994; Young et al., 2013) were comparative. Two of these three studies yielded mixed results regarding SP and ghost oppression (i.e., the belief that one is being oppressed by a ghost at night and paralysed) in an SP and non-SP group. One found that those reporting having experienced SP (vs. those who did not) were significantly more likely to believe that SP represented ghost oppression (Wing et al., 1994). The results of the other study suggested that those reporting SP (vs. those who did not) were significantly less likely to believe episodes were due to ghost oppression (Wing et al., 1999). The third study found that people reporting experiencing the nocturnal pressing spirit dab tsog (vs. those who did not) were significantly more likely to experience SP (Young et al., 2013).

SP and out-of-body experiences (OBEs)

OBEs in relation to SP were reported in three studies. One study found that 39% of the participants who reported SP also reported having experienced OBEs (Cheyne & Girard, 2009). The other two studies used comparative analysis in which both revealed that OBEs were significantly more common in the SP group compared to a non-SP group (Raduga et al., 2020; Spanos et al., 1995). Together, these three studies suggest that there is a positive association between SP and OBEs.

SP and aliens

Two studies reported an association between SP and contact with aliens. One study that investigated 10 individuals, specifically selected for reporting encounters with space aliens, found that every participant also reported episodes of SP (McNally & Clancy, 2005). Similarly, in a comparative analysis, SP was reported significantly more frequently in people reporting contact with aliens in comparison to an age- and gender-matched control group (French et al., 2008). Based on these two studies, there seems to be an association between experiencing SP and reporting alien contact.

SP, paranormal beliefs, and experiences

Associations between SP and unspecified paranormal beliefs and experiences were identified in two studies. The studies found that the frequency of SP episodes had significantly weak positive correlations with belief in the paranormal (Denis & Poerio, 2017; Drinkwater et al., 2020) and paranormal experiences (Drinkwater et al., 2020). These studies together show that [unspecified] paranormal beliefs and experiences are weakly positively associated with SP.

2.4.6 Lucid dreams and OPEPB

Lucid dreams and OBEs

Associations between lucid dreams and OPEPB are shown in Table 2. Significant positive correlations between lucid dreams and OBEs were found in all seven studies that reported on these associations. Five of seven studies were of comparative nature and found that those who reported (vs. not reported) OBEs were more likely to also report lucid dreams (Blackmore, 1982, 1983, 1984, 1986; Glicksohn & Barrett, 2003). These five studies primarily included students as their participants, and together suggest an association between OBEs and lucid dreams. Two additional studies also found weak significant positive correlations between lucid dreams and OBEs (Alvarado & Zingrone, 2007; Levitan & DeGracia, 1999).

Lucid dreams, paranormal beliefs, and experiences

Three correlational studies investigated lucid dreams and unspecified paranormal experiences and found positive weak significant correlations (Drinkwater et al., 2020; Glicksohn, 1990; Sherwood, 1999). Another study found a weak significant positive correlation between lucid dreams and paranormal beliefs, although the correlation was not significant in a multiple regression when several psychological and physiological factors were added (Denis & Poerio, 2017). Overall, there seems to be a weak positive association between experiencing lucid dreams and endorsing paranormal beliefs and experiences.

2.4.7 Nightmares and OPEPB

Nightmares and soul-related beliefs, dab tsog, and paranormal beliefs and experiences

Five studies reported on the associations between nightmares and OPEPB. A comparative study found that those reporting dab tsog reported significantly increased odds of nightmares compared to those who did not report dag tsog (Young et al., 2013). Another study found that 82 of 100 participants believed that their nightmares were causing soul dislocation (i.e., the soul being displaced from the body; Hinton et al., 2009). Three correlational studies found statistically significant positive weak correlations between nightmares and unspecified paranormal beliefs (Drinkwater et al., 2020; Thaibourne & Delin, 1999), and paranormal experiences (Drinkwater et al., 2020; Sherwood, 1999). Together the studies show that nightmares and OPEPB (e.g., evil spirits, soul dislocation) are positively associated.

2.4.8 Hypnagogic hallucinations and OPEPB

Four studies reported on the associations between hypnagogic hallucinations and OPEPB. Two comparative studies found that hypnagogic hallucinations were significantly more common in the dab tsog group (vs. no-dab tsog group; Young et al., 2013) and in those reporting OBEs (vs. non-OBEs; Terhune, 2009). The remaining two correlational studies reported on the associations between hypnagogic hallucinations and unspecified paranormal experiences. One study found a weak-to-moderate significant positive association between the two (Sherwood, 1999), whereas the other study found a weak negatively significant correlation between hypnagogic hallucinations and paranormal experiences, suggesting that greater hypnagogic hallucinations were associated with fewer paranormal experiences (Glicksohn, 1990). Despite the mixed findings, overall, hypnagogic hallucinations and OPEPB generally appear to be positively associated (shown in three out of four studies).

2.4.9 Sleep quality and OPEPB

Associations between sleep quality and OPEPB show mixed results, with two studies finding no association (Bastos et al., 2020; Denis & Poerio, 2017). Only one study found a significant association between sleep quality and OPEPB, showing that people who reported experiencing spirit possession also reported poorer sleep quality compared to those who did not experience spirit possession (Schaffler et al., 2016).

2.4.10 Dreams and OPEPB

Frequency analysis reporting on the associations between dreams and OPEPB (Table 2) was identified in three papers. Specifically, two studies found that most of their participants (Cambodian refugees and psychology students; 62% and 59%, respectively) believed that they were being visited by a deceased relative in their dreams (Hinton et al., 2013; Kunzendorf et al., 2007). Another study found that majority of participants (60%) reported being visited by a ghost (Hinton et al., 2020). These findings indicate that the most common paranormal belief in relation to dreams is visitations.

2.4.11 EHS and OPEPB

One study found a significant positive correlation between the incidence of adult anomalous experiences and the incidence of EHS (Sherwood, 1999). Similarly, a more recent study found that a small proportion of participants (2.8%) believed that the aetiology of EHS was ‘something supernatural’ (Sharpless et al., 2020).

2.4.12 Other sleep variables and OPEPB

REM sleep and OPEPB

Four studies looked at the associations between different REM-related sleep variables and OPEPB, and all found significant associations. Specifically, one study using polysomnography found that people reporting near-death experiences had longer REM sleep latencies (i.e., took longer to reach their first REM sleep stage) than the age- and gender-matched control group (Britton & Bootzin, 2004). Another study found that persons reporting near-death experiences reported significantly greater total REM intrusion (i.e., going into REM sleep in the non-REM sleep cycle) on one or more elements (i.e., visual hallucinations, auditory hallucinations, SP, or cataplexy) compared to a matched control group (Nelson et al., 2006). This was also found in a bigger, international study showing that people with REM intrusion (vs. those without) were more likely to report near-death experiences (Kondziella et al., 2019). Lastly, one study reported a weak significant positive correlation between REM sleep behaviour disorder (dream-enactment behaviours during a loss of REM muscle paralysis; assessed using a self-reported questionnaire item) and self-reported adult anomalous experiences (Sherwood, 1999). All four studies suggest that REM sleep-related phenomena are associated with OPEPB, especially reports of near-death experiences, which is confirmed with both objective and subjective measures.

Sleep latency, efficiency, duration, disturbances and OPEPB

Overall, the evidence on the associations between sleep latency, sleep efficiency, sleep duration, sleep disturbances and OPEPB is mixed. One comparative study noted a statistically significant association between experiencing a sensation of floating prior to sleep (experienced during sleep onset) and having an OBE (De Foe et al., 2013). Another study found no difference in sleep latency between mediums (reports of speaking under the influence of spirits) and non-mediums (Bastos et al., 2020).

Two studies investigated sleep duration and OPEPB in which one found no associations between sleep duration and mediums (vs. control; Bastos et al., 2020). The other study found that persons who had experienced near-death experiences slept about an hour less than an age- and gender-matched control group (Britton & Bootzin, 2004). No associations were found between sleep disturbance and sleep efficiency, and mediumship (medium vs. non-medium controls; Bastos et al., 2020), which may be due to the small sample size.

Restless sleep, sleep apnoea, and dab tsog

One study found that those reporting dab tsog were more likely to report restless sleep compared to those who did not report dab tsog (Young et al., 2013). The same study found a significant association between symptoms of sleep apnea and dab tsog. More specifically, the frequency of breathing pauses and excessive daytime sleepiness were strongly associated with reported experiences of dab tsog (Young et al., 2013).

Sleep terrors, hypnopompic imagery, sleepwalking, and OPEPB

One study found a significant positive correlation between adult anomalous experiences and sleep terrors as well as hypnopompic imagery (i.e., hallucinations occurring upon awakening; Sherwood, 1999). Another study investigated sleepwalking and parapsychological experiences (including OBEs) and found that those who replied affirmatively to a single question about somnambulism (sleepwalking) reported higher parapsychological experiences compared to those who replied negatively (Alvarado, 1998).

Sleep and UFO experiences

Two studies reported on the associations between sleep and UFO experiences (Oluwole, 2010; Spanos et al., 1993), of which one showed that people reporting UFO-intense experiences (i.e., those who reported seeing and communicating with aliens and missing time) reported that their experiences were sleep-related significantly more often than participants who reported non-intense UFO experiences (i.e., seeing lights and shapes in the sky; Spanos et al., 1993). The other study reported frequencies and found that 4.3% of participants experienced the presence of aliens in the room during night sleep (in the absence of SP; Oluwole, 2010). Based on these findings, some extra-terrestrial experiences could be connected to sleep.

Table 2
Results of included studies (N = 44)

Associated OPEPB	Study Results[a]
	Section A: Studies of (Isolated) Sleep Paralysis
Ghost/ (evil) spirit/ witch/ soul-related	356 (56%) of 635 ps answered “yes” or “perhaps yes” to a relation between Kanashibari and spirits (Fukuda et al., 1987)
	39 (93%) of 42 ps believed their SP was the “soul scared from the body” and 38 (91%) of 42 ps believed their SP was due to a fatal spirit attack (Hinton, Pich, Chhean, & Pollack, 2005)
	43 (48%) and 20 (22%) of 89 ps from the general population in Egypt believed their SP was caused by Jinn or Shaitan, respectively (Jalal et al., 2014)
	5 (11%) of 44 students in Cairo believed their SP was caused by the Jinn (Jalal et al., 2014)
	26 (38%) of 68 ps reported that their SP was possibly due to pandafeche (Jalal et al., 2015)

4 (6%) of ps with SP called it the “pandafeche attack” (Jalal, Romanelli, et al., 2021)

10 (17%) of 59 ps believed that their SP was possibly caused by the Karabasan (Jalal, Sevde Eskici, et al., 2021)

5 (29.4) of 17 ps thought that their SP was caused by a ghost (McNally & Clancy, 2005)

43 (39%) of 110 ps believed that their ISP had a supernatural causation (Ohaeri et al., 2004)

2 (5.6%) of 36 ps believed that their ISP was caused by a ghost/evil spirit (Ramsawh et al., 2008)

8 (4.2%) of 191 ps with ISP attributed their episode to a ghost/spirit (Sharpless & Kliková, 2019)

Non-SP(vs. SP-group) group were more likely to believe that SP represented ghost possession ($\chi^2 = 11.52$, $p < .003$; Wing et al., 1994)

Ps with SP (vs. non-SP) were more likely to believe that SP might be related to ghost oppression ($\chi^2 = 5.11$, $p = .04$, Fisher’s exact test; Wing et al., 1999)

Ps who reported experiencing dab tsog (vs. those who did not) were more likely to experience SP (OR = 3.01, $p < .001$; Young et al., 2013)

OBEs	Ps with SP (vs. non-SP) often experienced OBEs more regularly (χ^2 (25, *N* = 974) = 44.65, *p* = .009; Raduga et al., 2020)
	4440 (39%) of 11,385 ps with SP reported OBEs (Cheyne & Girard, 2009)
	SP ps (*M* = .19, *SD* = .39) scored higher on OBEs than controls (*M* = .08, *SD* = .27, *p* < .01; Spanos et al., 1995)
Unspecified PB/PE	SP and paranormal beliefs correlated positively (*r* = .06, *p* < .05; Denis & Poerio, 2017)
	Paranormal beliefs (*r* = .09, *p* < .05, *N* = 453) and paranormal experiences (*r* = .18, *p* < .01, *N* = 453) correlated positively with SP (Drinkwater et al., 2020)
Alien	Ps who reported memories of alien contact (vs. control) had higher self-reported incidence of SP (*U* = 83, *p* = .002, *N* = 35; French et al., 2008)
	10 (100%) of 10 ps who reported alien abduction also tended to report episodes of SP (McNally & Clancy, 2005)
	Section B: Studies of Lucid Dreams
Unspecified PB/PE	Lucid dream frequency correlated with paranormal beliefs (*r* =.13, *p* < .01; Denis & Poerio, 2017)
	Paranormal experiences correlated with lucid dreams (*N* = 453, *r* = .11, *p* < .05; Drinkwater et al., 2020)

	Paranormal experiences correlated with lucid dreams (*r* = .28, *p* < .05; Glicksohn, 1990)
	Paranormal experiences correlated with lucid dreams (*r* = .27, *p* < .01; Sherwood, 1999)
OBEs	Significant positive correlation between lucid dreams and OBEs (*r* = .33, *p* < .001; Alvarado & Zingrone, 2007)
	Significant relationship between OBEs and lucid dreams (χ^2 (2, *N* = 157) = 6.72, *p* < .01; Blackmore, 1982)
	Significant relationship between lucid dreams and OBEs (χ^2 = 1, df = 1, *p* = .008, *r* = .19; Blackmore, 1983)
	Those reporting OBEs (vs. non-OBEs) also tended to report more lucid dreams (χ^2 (1) = 10.0, *p* = .002; Blackmore, 1984)
	Significant relationship between OBEs and lucid dreams (χ^2 (1, *N* = 196) = 4.4, *p* < .05; Blackmore, 1986)
	Lucid dreams correlated with OBE frequency (*r* = .18, *t* = 4.34, *p* < .0001; Levitan & DeGracia, 1999)
	Section C: Studies of Nightmares

Ghost/ (evil) spirit/ witch/ soul-related	82 (82%) of 100 ps believed that nightmares were caused by soul dislocation (Hinton et al., 2009) Increased odds of nightmares in those reporting dab tsog (vs. no dab tsog) (OR = 4.07, *p* <.001; Young et al., 2013)
Unspecified PB/PE	Paranormal beliefs (*N* = 453, *r* = .18, *p* < .01) and paranormal experiences (*N* = 453, r = .12, *p* < .05) correlated positively with nightmares (Drinkwater et al., 2020) Positive correlation between paranormal experiences and nightmares (*r* = .28, *p* < .01; Sherwood, 1999) Paranormal beliefs and frequency of nightmares correlated positively (*r* = .19, *p* < .05; Thaibourne & Delin, 1999)
Section D: Studies of Hypnagogic Hallucinations (HHs)	
Ghost/ (evil) spirit/ witch/ soul-related	Increased odds of HHs in those reporting dab tsog (vs. no dab tsog) (OR = 3.69, *p* < .001; Young et al., 2013)

Unspecified PB/PE	Negative correlation between paranormal experiences and HHs (*r* = -.22, *p* < .05; Glicksohn, 1990) Positive correlation between paranormal experiences and HHs (*r* = .39, *p* < .001; Sherwood, 1999)
OBEs	Ps reporting OBEs (vs. non-OBEs) yielded higher HHs scores (*F* = 14.76, *p* < .001, n2p = .04; Terhune, 2009)
Section E: Studies of Sleep Quality (SQ)	
Ghost/ (evil) spirit/ witch/ soul-related	Ps reporting spirit possession (vs. ps with no spirit possession) scored lower on SQ (*p* < .05, effect size .08; Schaffler et al., 2016)
Unspecified PB/PE	No significant correlation between SQ and paranormal beliefs (*r* = -.01, *p* > .05; Denis & Poerio, 2017)
Mediumship	No significant differences in SQ between mediums and controls (Bastos et al., 2020)

Section F: Studies of Dreams	
Ghost/ (evil) spirit/ witch/ soul-related	42 (60%) of 70 ps had dreams about being chased by a ghost (Hinton et al., 2020)
Dream visitations	62 (62%) of 100 reported visitations in their dreams (Hinton et al., 2013) 94 (59%) of 160 ps believed that the deceased can visit us in dream (Kunzendorf et al., 2007)
Section G: Studies of Exploding Head Syndrome (EHS)	
Unspecified PB/PE	92 (3%) of 3286 ps believed that the aetiology of EHS was “something supernatural” (Sharpless et al., 2020) Positive correlation between paranormal experiences and EHS (r = .35, p < .001; Sherwood, 1999)
Section H: Studies of REM sleep intrusion	

NDEs	Ps with REM sleep intrusion (vs. ps without) were more likely to exhibit NDEs (OR 2.85, p < .001; 95% CI [1.68-4.88; Kondziella et al., 2019) Ps with NDEs (n = 33, 60%) reported greater REM intrusion than matched control (n = 13, 24%, p < .001; Nelson et al., 2006)
	Section I: Studies of other sleep variables (including hypnopompic imagery, sleep apnoea, and sleep walking)
Ghost/ (evil) spirit/ witch/ soul-related	Increased odds of restless sleep (OR = 1.46, p < .05), and sleep (OR = 4.17, p < .001) and excessive daytime sleepiness (OR = 3.18, p < .001) in ps reporting dab tsog vs ps not reporting dab tsog (Young et al., 2013)
Unspecified PB/PE	Sleepwalkers more likely to have parapsychological experiences than non-sleepwalkers (M = 2.60 vs M = 1.94, respectively, $t(117) = 1.70$, p < .05, r = .25; Alvarado, 1998) Positive correlation between paranormal experiences and hypnopompic imagery (r = .26, p < .001), sleep terrors (r = .31, p < .01), and REM sleep behaviour disorder (r = .25, p < .05; Sherwood, 1999)

NDEs	REM sleep latency longer for NDE group (*M* = 109.1 min, *SD* = 53.0) than control (*M* = 77.3 min, *SD* = 27.9), $p < .05$. Shorter sleep duration in NDE group (*M* = 355.6 min, *SD* = 85.3) than control (*M* = 404 min, *SD* = 63.3, $p < .05$; Britton & Bootzin, 2004)
Aliens	7 (4.3) of 163 ps reported presence of aliens in the room in relation to night sleep (Oluwole, 2010)
	UFO intense ps (e.g., seeing/communicating with aliens) reported that their experiences were sleep related significantly more often than did non-intense UFO ps (e.g., seeing lights; χ^2 (1, N = 18) = 7.38), $p < .01$; Spanos et al., 1993)
Mediumship	No significant differences in sleep latency, sleep duration, sleep efficiency, and sleep disturbance between mediums and controls (Bastos et al., 2020)

Note. OPEPB = ostensibly paranormal experiences and paranormal beliefs; The studies reported on the associations between sleep and paranormal variables using a wide range of methods of analysis including frequencies, chi-square, t-tests and so on. Ps = participants; SP = sleep paralysis; ISP = isolated sleep paralysis; *M* = mean; *SD* = standard deviation; OR = odds ratio; Pandafeche = evil witch/ ghost-like spirit; Jinn = a certain type of spirit in Islam; Shaitan = evil spirit in Islam; Dab tsog = Hmong word for evil spirit; Karabasan = spirit-like creature rooted in Turkish folk tradition; Kanashibari = Japanese term for sleep paralysis; U = Mann-Whtiney U test; OBEs = out-of-body experiences; NDEs =

near-death experiences; Unspecified PB/PE = unspecified paranormal beliefs and paranormal experiences. The number of participants included in each analysis is reported where available.

[a]Results appear in alphabetical order in each category

2.5 Discussion

In this scoping review, we identified 44 studies concerning the associations between different sleep variables and OPEPB. Overall, the literature suggests positive associations between various sleep and paranormal variables. We found that the most investigated sleep variables were SP, lucid dreams, nightmares, REM sleep-related phenomena, and hypnagogic hallucinations. The most commonly investigated OPEPB were OBEs, and reports of ghosts, and spirits. Specifically, SP was positively associated with a variety of OPEPB, most commonly the belief that it is caused by a ghost/evil witch or spirits. Lucid dreams were mostly researched in relation to OBEs, followed by unspecified paranormal experiences and beliefs, which all revealed positive associations. Similarly, nightmares were positively associated with spirits, soul-related phenomena, and unspecified paranormal beliefs and experiences. Near-death experiences were positively associated with REM sleep-related phenomena (e.g., REM intrusion, REM sleep periods). These patterns were generally consistent across different countries, cultures, and ethnicities.

Although the majority of studies identified associations between sleep and paranormal variables, some studies reported null associations. For example, in a small sample, Bastos and colleagues found no associations between a wide range of sleep variables and mediumship. A possible explanation for these null findings is that unlike the other OBEPBs included in this review, mediumship is regularly practised (Bastos et al., 2020), indicating that this is a part of their life. The other paranormal variables explored here might be more night-time related, whereas mediumship could span the 24-hour daily cycle.

Furthermore, while most studies on hypnagogic hallucinations reported positive associations with OPEPB, one found that as subjective paranormal experiences increased, hypnagogic hallucinations decreased. This is an interesting finding which is difficult to interpret, and future work needs to establish whether this is a replicable finding and if so, why this negative association might exist.

2.5.1 Populations with greater susceptibility

Studies that involved populations who had experienced adversity (e.g., refugee status) all found associations between sleep variables (especially SP but also dreams and nightmares) and OPEPB. It is possible that stressful life experiences could play a role in the association between sleep and the paranormal, which may give researchers an indication about what areas their interventions should target. Previous studies have linked trauma to sleep disturbances (parasomnias in particular; Jalal & Hinton, 2013) and this relationship could exist due to the well-known sleep disruption in people with trauma.

All studies that included student samples found some form of associations between OPEPB (OBEs in particular) and sleep variables (especially SP and lucid dreams). Attending university can be a demanding time – and stress could also underlie this association. Future research teams might want to evaluate the potential role of stress in the association between OBEs, SP, and lucid dreams as well as assess group differences between potential groups that are ‘at risk’ and matched controls.

2.5.2 Potential explanations of associations

Possible explanations can be proposed for the associations found in this review. For example, SP and EHS usually involve some form of hallucinations (Jalal, Sevde Eskici, et al., 2021; Sharpless, 2014) which might be considered unusual by many of those experiencing them. As a result, people may assign supernatural explanations to make sense of events that occur outside of their normal experiences. In addition, those who believe in the paranormal, including the existence of ghosts, evil spirits or aliens may experience sleep disturbances due to stress.

Certain associations between sleep and the paranormal (e.g., lucid dreams and OBEs; Blackmore, 1982, 1983, 1984, 1986; Glicksohn & Barrett, 2003) may be more readily explained than others. For example, SP, lucid dreams, OBEs, and near-death experiences have all been associated with REM sleep (Levitan et al., 1999), and may have shared features. In fact, these phenomena in many cases overlap as one event can give rise to the other. As just one example, it has been proposed that certain types of OBEs have been claimed to originate from lucid dreams (Clerc, 1983). There may also be shared mechanisms underlying coexisting sleep and paranormal variables, respectively. For example, sleep variables including SP, lucid dreams, and hypnagogic/hypnopompic hallucinations are all classified as REM sleep phenomena (Jalal & Hinton, 2013; Raduga et al., 2020). Likewise, OPEPB such as OBEs and perceived creature-like encounters may coincide given their mysterious and complex nature. For example, a person who perceives the world from a perspective outside their physical body may also be more likely than those who do not to be convinced that aliens exist.

Other sleep and paranormal associations appear more unique. For example, one study included in this review found that those reporting spirit possession also tended to report poorer sleep quality than those who did not report spirit possession (Schaffler et al., 2016). One potential explanation for this finding is that altered states of consciousness (in this case spirit possession) can cause distress, possibly affecting various areas of life, including one's sleep. Again, future research should consider the role of distress, along with other psychological states, when examining the association between sleep quality and spirit possession.

2.5.3 Clinical and Practice Implications

This scoping review has potential implications for clinical practice. For example, findings reported herein might encourage clinicians to assess for relevant sleep disturbances when patients report ostensibly paranormal events – hence possibly reducing misdiagnosis. In addition, clinicians can potentially help normalize these experiences and provide alternative scientific explanations for ostensibly paranormal activity if appropriate. Primary treatment of some of these sleep experiences (e.g., EHS, ISP) may potentially decrease the prevalence of related ostensibly paranormal beliefs in the broader community. There is some evidence that psychoeducation about the nature of these disorders alone may decrease frequency (Sharpless, 2014). Further research is required before the full clinical implications are clear.

2.6 Limitations

The review applied a systematic and rigorous search strategy to evaluate the literature concerning the associations between sleep variables and OPEPB as a whole. Whereas we only focused on articles published in English, this review provides a comprehensive idea of the associations since the included studies have been conducted in various parts of the world. In addition, although several sleep variables have been highlighted throughout the review, many of them (e.g., sleep efficiency, sleep duration, sleep walking) have only been investigated in one or two studies. Over 80% of studies included in this review assessed specific foci both regarding sleep (e.g., only SP and LD) and OPEPB (e.g., OBEs, spirits, near-death experiences). The sparse evidence for most sleep and OPEPB associations warrants replication in order to establish the robustness of reported associations.

In addition, whereas some studies focused on well-defined sleep/paranormal variables and were suitably powered, others focused on measures that had not been well-validated (e.g., designed for the purposes of the study, or comprising single items) and recruited very small samples. If work in this domain is to be impactful, researchers need to pay careful attention to the measurement and ensure sample size is carefully considered prior to conducting work of this type.

The cross-sectional research conducted to date has been valuable in acknowledging the existence of associations between sleep and the paranormal. However, the causal direction of effects cannot be inferred and warrants further longitudinal and experimental research (Hill, 1965). One possibility is to test the effects of CBT for SP (CBT-SP; as proposed by Sharpless and Doghramji, 2015) on paranormal experiences/beliefs using an interventional design. This treatment has been shown to increase overall well-being by alleviating the anxiety and stress (Sharpless & Grom, 2016) that some participants in the studies included in this review report (Jalal, Sevde Eskici, et al., 2021; Wing et al., 1999; Wing et al., 1994).

2.7 Conclusion

Despite mixed results, overall, there are positive associations between sleep variables and OPEPB. The two most investigated sleep variables were SP and lucid dreams which were associated with various paranormal experiences and beliefs including ghosts, spirits, and out-of-body experiences. These findings have potential clinical implications and may help reduce the likelihood of misdiagnosis when clinicians encounter patients endorsing OPEPB. The results offered here are a good starting point for sleep researchers and clinicians, globally, to understand the associations between sleep and OPEPB. In the next chapter, we will build upon previous research, which has explored only a limited set of sleep-related variables. By expanding our investigation to include a broader array of sleep variables, we aim to achieve a more holistic understanding of the associations between sleep and the paranormal.

Chapter 3: Shared Measurements and Methodology

This chapter outlines the consistent procedures, methods, and measurements employed across the empirical chapters of this thesis.

3.1 Procedure

Chapter 4 and Chapter 5 draw upon secondary analysis of data originating from a survey initiated by the BBC Science Focus Magazine. These chapters are based on data from the same survey, which was conducted in collaboration with Professors Christopher C. French, Alice M. Gregory from Goldsmiths, University of London and colleagues. The aim was to conduct primary research to gather new data on sleep habits and phenomena. Participant recruitment took place through diverse online channels, including an insider's panel mailer, social media platforms such as Twitter, Reddit, and Radio 4's All in the mind. Respondents were informed about the opportunity to enter a prize draw, exclusively available to UK residents, for a chance to win one of five £100 Amazon vouchers. Prior to the publications presented in this thesis, a study using this dataset had already been published (Sharpless et al., 2020). It is important to note that there is no overlap between the research questions explored in the paper by Sharpless et al. (2020) – which focused on exploding head syndrome – and the studies presented in Chapters 4 and 5.

Ethical approval for all empirical investigations in this PhD thesis was granted by Goldsmiths, University of London. To participate in the studies, individuals had to provide informed consent and be at least 18 years old. For all empirical studies, participants were made aware that their anonymised data could be widely available once published and that withdrawal of responses would therefore not be possible once they had completed the survey. Informed consent was obtained online if the participants agreed to all of the points stated by checking boxes associated with each. All identifying information was stored separately from responses to other questions in a password-protected file which is only available to authorised parties. No identifying information was stored with the password-encrypted response data file. All surveys took approximately 10 – 20 minutes to complete.

3.2 Sleep-related variables

3.2.1 Subjective sleep quality variables

Data on self-reported sleep efficiency, sleep duration, sleep latency, and insomnia symptoms were included in Chapters 4 and 5. Sleep efficiency, the ratio between sleep duration and the total time dedicated to sleep in bed expressed as a percentage, was measured using three items ("*during the past month, what time have you usually gone to bed at night*", "*what time have you usually gotten up in the morning*", and "*how many hours of actual sleep did you get at night*") from the *Pittsburgh Sleep Quality Index* (PSQI; Buysse et al., 1989) which has shown to have good reliability and validity (Backhaus et al., 2002). Insomnia symptoms were measured using items from the *Insomnia Severity Index* (*ISI*; Morin et al., 2011) which has demonstrated good reliability and validity (Bastien et al., 2001). In our survey, our first item ("Please rate your overall difficulties sleeping [i.e., falling asleep, staying asleep or waking up too early], in the past two weeks") summarised three items regarding sleep difficulties from the ISI. In addition, two other items (i.e., interference and sleep satisfaction) from the ISI were used. Response options for each item used different wording but ranged from 1 (indicative of no problem) to 5 (indicative of a very severe problem). Together, all three items showed a Cronbach's alpha of .89. The theoretical range is 3 to 15, with higher scores indicating greater insomnia symptoms.

3.2.2 Isolated sleep paralysis

ISP (referred to as SP in Chapter 7 because of the small sample size and to avoid further reduction) was assessed using 11 items adapted from the FISPI (Sharpless et al., 2010), which assesses ISP symptoms based on the then current ICSD-3 (AASM, 2014). It is a semi-structured clinical interview, and the FISPI displays good psychometric properties, including high internal consistency and reliability (Sharpless et al., 2010). An example of an item is "*Have you ever had periods of time when you were going to sleep or waking up and found yourself unable to move (like you were paralysed)?"*. The response options ranged from "Never" to "Several times a week". Answers were later categorised into "No" (i.e., those responding "Never") and "Yes" (i.e., once or more) categories. This reclassification of ISP (or SP) has been observed in other studies (Denis et al., 2015; Denis, French, Schneider & Gregory, 2018). This item regarding ISP frequency was used in Chapters 4, 5, 7, 8. Chapters 4, 7, and 8 required a more detailed exploration of ISP (or SP in Chapter 7) and so included more related items regarding fear levels during episodes, as well as levels of distress and interference in daily life as a result of episodes, for example, "*How afraid are you during a typical episode of this paralysis?"*. Scores ranged from "No fear" (i.e., 0) to "Very severe fear" (i.e., 4). Participants were also asked fixed choice questions about their perceived aetiologies of ISP (e.g., '*What do you think causes you to feel paralysed?*') with possible answers: medication side effects, something in the brain, stress, electronic equipment, something supernatural, don't know. Participants were also given a free-text option to provide their own answers. The provided fixed choice answers were adapted from findings in unpublished ISP studies conducted by Dr. Brian Sharpless, who co-authored all empirical studies within this thesis and possesses extensive research and expertise on the phenomenon.

3.2.3 Additional sleep-related questions

Participants were asked questions relevant to differential diagnoses (e.g., *"Have you ever been diagnosed with narcolepsy?"*). There were also free response items to assess for other psychological and medical conditions.

3.3 Statistical Analysis

All analyses mentioned in the PhD thesis were performed using IBM SPSS Statistics (Version 27). When making scales, we did not use data replacement strategies given the large sample sizes. This means that where data were system missing for an item within a scale, the participant did not have a scale score. Elsewhere, all data were used unless otherwise stated. Given the large sample sizes, the variables were considered to be distributed approximately normally if skewness and kurtosis were between -2 and +2 SD, as recommended by George (George, 2011). Consequently, parametric analyses, including independent t-tests and chi-square tests were conducted. Non-parametric analyses were used when parametric assumptions were violated. Bonferroni correction of p-values for post hoc tests were applied where appropriate. This adjustment was used to counteract Type I Error that can occur as a result of multiple comparisons testing (MacDonald & Gardner, 2000). A p-value of < 0.05 was accepted as statistically significant.

Next chapter

In Chapter 2, SP/ISP stood out as the most extensively studied sleep variable within the spectrum of sleep difficulties in relation to OPEPB. This prominence may be attributed to its mysterious, hallucinatory, and vivid characteristics. For this reason, in the first empirical chapter of this thesis, we deep dive into the condition, aiming to offer a more detailed and nuanced understanding of ISP. The following chapter seeks not only to provide solace to individuals who report experiencing these episodes but also to facilitate and inform the development of future ISP-related interventions. By doing so, we hope to be in a stronger position to enhance the effectiveness of treatments and coping strategies for those reporting ISP, ultimately improving the overall quality of life for individuals suffering from troubling cases of this phenomenon.

Chapter 4: Isolated Sleep Paralysis: Clinical Features, Perception of Aetiology, Prevention and Disruption Strategies in a Large International Sample

A paper based on this chapter has been published in Sleep Medicine:

Rauf, B., Sharpless, B. A., Denis, D., Perach, R., Madrid-Valero, J. J., French, C. C., & Gregory, A. M. (2023). Isolated sleep paralysis: Clinical features, perception of aetiology, prevention and disruption strategies in a large international sample. *Sleep Medicine*, 104, 105-112.

4.1 Abstract

In the scoping review (Chapter 2), SP/ISP emerged as the most frequently studied sleep variable in relation to OPEPB. Because of this, the aim of this chapter was to understand more about ISP – with a focus on clinical features, perceptions of aetiology, prevention, and disruption strategies. Despite the prevalence of ISP, little is known concerning its clinical features, associated demographic characteristics, and prevention as well as disruption strategies. An online cross-sectional study was conducted. The sample comprised 3523 participants who had reported at least one lifetime episode of ISP and 3288 participants without a lifetime episode. Participants answered a survey including questions about sleep quality, SP, and SP prevention/disruption techniques. A total of 6811 participants were investigated (mean age = 46.9, SD = 15.4, age range = 18 – 89, 66.1% female). Those who reported experiencing ISP at least once during their lives reported longer sleep latencies, shorter sleep duration, and greater insomnia symptoms. Females (vs. males) and younger (vs. older) participants were more likely to experience ISP. Significant fear during episodes was reported by 76.0% of the participants. Most people (63.3%) who experienced ISP believed it to be caused by 'something in the brain'. A minority endorsed supernatural causes (7.1%). Five prevention strategies (e.g., changing sleep position, adjusting sleep patterns) with at least 60.0% effectiveness, and five disruption strategies (e.g., physical/bodily action, making noise) with varying degrees of effectiveness (ranging from 29.5 to 61.8) were identified through open-ended responses. In conclusion, ISP is associated with shorter sleep duration, longer sleep latency, and greater insomnia symptoms. The multiple prevention and disruption techniques identified in this study support existing treatment approaches and may inform subsequent treatment development. Implications for current diagnostic criteria are discussed.

4.2 Introduction

During SP episodes, individuals remain aware of their surroundings and can open their eyes, despite the momentary inability to speak or move their muscles. Extreme fear reactions and hypnagogic and hypnopompic hallucinations (i.e., seeing, hearing, and feeling things that are not there) sometimes accompany these episodes (D'Agostino & Limosani, 2016). SP episodes involving clinically significant levels of fear have been termed fearful ISP (Sharpless et al., 2010). Individuals who experience recurrent episodes of ISP and significant clinical distress may meet criteria for the disorder of RISP (AASM, 2014). More stringent clinical criteria have also been developed for use in research (i.e., fearful RISP) which include frequency thresholds (i.e., at least two fearful ISP episodes in the past six months) and the presence of either clinically-significant distress and/or impairment (Sharpless et al., 2010; Sharpless & Grom, 2016).

While a benign phenomenon on its own (McNally & Clancy, 2005), there is often a lot of fear and anxiety surrounding SP (Cheyne, Rueffer & Newby-Clark, 1999). For example, of 635 college students who had experienced SP in Japan, 60% reported feelings of anxiety and terror during an episode (Fukuda et al., 1987). Subsequent research has reported associations between anxiety, stress, and SP episodes (Spanos et al., 1995; Wing et al., 1994). A systematic review including 36,533 participants found that 7.6% of the general population experienced at least one episode of SP (Sharpless & Barber, 2011). However, prevalence rates vary by population (Stefani & Högl, 2021), with higher levels in rural (vs. urban) areas (Olunu et al., 2018), in students (28%), and clinical populations (32%; Sharpless & Barber, 2011). Racial disparities regarding SP frequency have also been noted, with African American participants reporting more recurrent SP than White participants (Paradis et al., 1997). To further understand population disparities, more research is needed to document prevalence rates by demographics as well as to extend knowledge of other clinical features of SP including fear and clinical distress.

SP can be associated with various negative factors, including psychological stress (Denis, French, & Gregory, 2018), sleep deprivation, erratic sleep schedules (Wing et al., 1994) and other sleep disturbances (Denis et al., 2015; Denis, French & Gregory, 2018). Sleep difficulties can serve as predisposing factors that may make SP episodes more likely to occur (Simard & Nielsen, 2005) or can be a consequence of the phenomenon in other cases (Sharpless & Kliková, 2019). Replication of the associations between psychological difficulties, sleep disturbances and SP will strengthen existing evidence, contributing to the development of sleep science.

4.2.1 Perceptions of aetiologies

SP episodes appear to constitute a mixture of waking consciousness and two aspects of REM sleep (i.e., muscle atonia and dream imagery; AASM, 2023; French & Santomauro, 2007). However, some sufferers explain their symptoms as something supernatural or extraordinary, whether it be a result of aliens, spirits, or ghost visits (French & Santomauro, 2007; French & Stone, 2014). In Egypt for example, SP is conceptualised as a "jinn attack" – a supernatural creature that assaults, and in many cases murders its victims (Jalal et al., 2014). Similarly, many people experiencing SP in China believe it is ghost oppression (Wing et al., 1994). Chapter 1 discusses further interpretations. It is unclear to what extent these beliefs are held in those experiencing SP, and future research is needed to assess this in order to understand the relationships between them.

4.2.2 Preventing/coping with SP

Given that so many sufferers find SP episodes upsetting and frightening, it is surprising that there are very few well-established treatment options (Sharpless, 2016). One relatively small (N = 156) existing study catalogued methods used by those affected to both prevent and disrupt ISP episodes and document their perceived effectiveness. Methods of preventing SP include changing sleep positions and patterns as well as the use of various relaxation techniques. Attempting to move extremities and smaller body parts (e.g., fingers and toes) as well as trying to “calm down” in the moment were reported to be the most effective disruption techniques (Santomauro & French, 2009; Sharpless & Grom, 2016). These methods were combined with existing treatment methods for insomnia and nightmare disorder to formulate a manualised, short-term treatment termed CBT for ISP (CBT-ISP; Sharpless & Doghramji, 2015). However, given the paucity of evidence, further research on this topic is clearly of value.

Research has come a long way in terms of pinpointing factors associated with SP (Denis, French & Gregory, 2018), however, less is available in the literature about ISP, and basic questions remain. To extend the literature to date, the specific aims of this paper were to understand more about ISP in terms of:

1. Clinical features: we examined prevalence rate by demographics, assessed fear and clinical distress/impairment associated with ISP, and attempted to replicate associations between psychological difficulties, sleep disturbances and ISP.

2. Perception of aetiology: We examined self-reported perceptions about the aetiology of ISP.

3. Prevention/coping strategies: We attempted to replicate self-reported prevention and coping strategies and the perceived effectiveness (according to the person experiencing ISP) of these different approaches.

4.3 Methods

4.3.1 Procedure

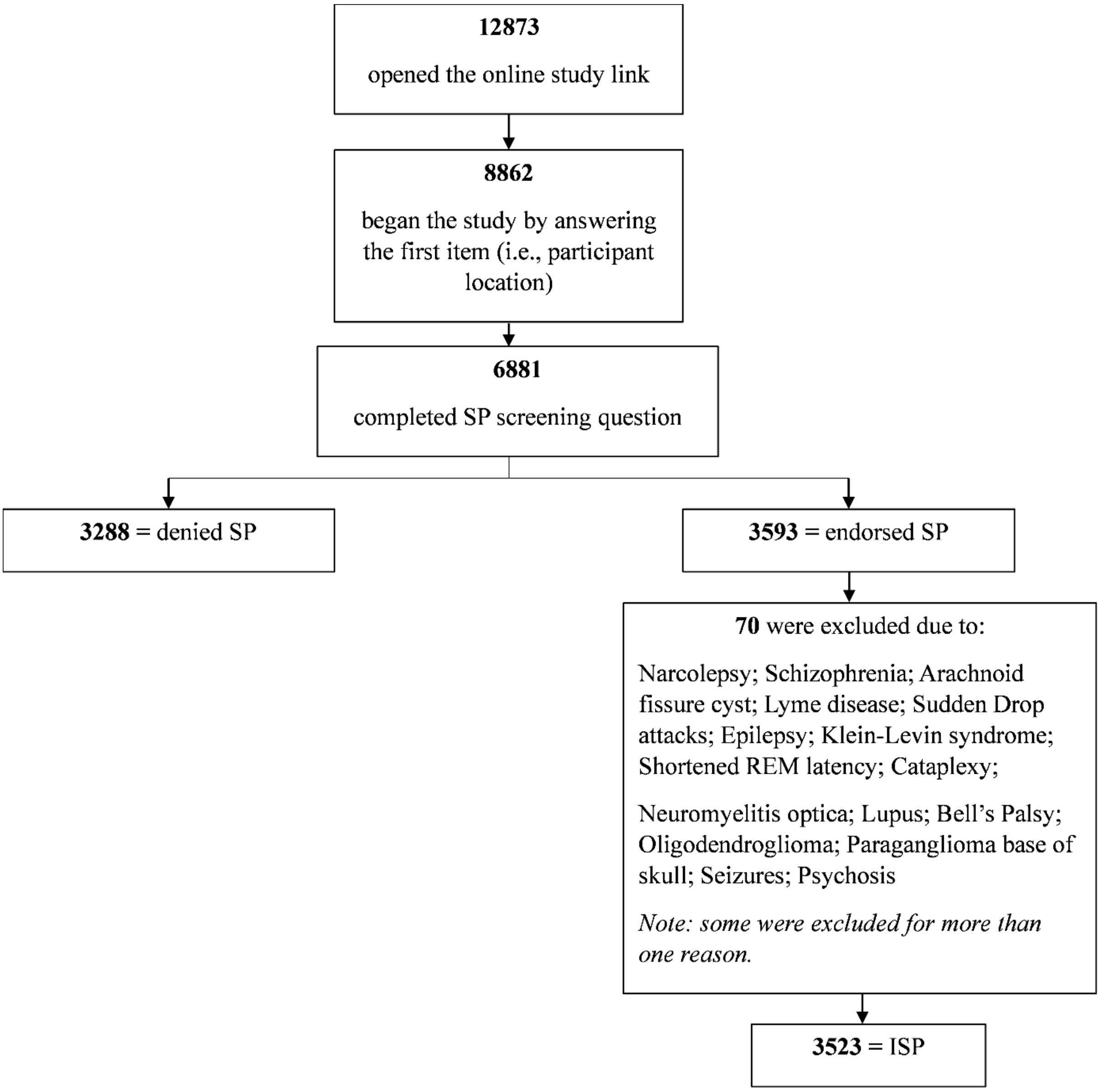
Data from the BBC Focus Study were included in this chapter (e.g., data on ISP-related and subjective sleep quality variables). Procedure details are presented in Chapter 3. Pre-registration for this study was submitted (osf.io/6qv78/).

4.3.2 Participants

Those who clicked on the survey link but supplied no other data were assigned a participant ID number and identified by the survey platform as an incomplete case. No data was collected from these participants. Out of the 6881 participants who completed the screening question for SP, 3593 (52.2%) reported experiencing SP at least once during their lifetime. As our primary interest is in ISP, we excluded data from participants with diseases and disorders with potentially overlapping symptoms (e.g., narcolepsy, schizophrenia, cataplexy). The final number of those reporting at least one ISP episode was 3523 (51.7%; see Figure 2 for detailed description of participant flow and exclusions).

Figure 2

Participant flow and exclusions



Note. SP = sleep paralysis; ISP = isolated sleep paralysis.

4.3.3 Questionnaire items

Sleep variables

The sleep variables included in this chapter are related to subjective sleep quality (i.e., sleep efficiency, insomnia symptoms, sleep duration, and sleep latency). See Chapter 3 for detailed information regarding the variables and their measurements.

ISP and ISP-related questions

ISP-related variables included here include ISP frequency, ISP-related fear, distress, and interference, as well as an item about the perceived aetiology of ISP. Items on ISP-related prevention and disruption techniques and their perceived effectiveness are also included. For detailed information on ISP-related items and their measurements, please refer to Chapter 3.

4.3.4 Qualitative data

Participants were also asked open-ended questions about the perceived aetiologies of their ISP and could list up to four prevention as well as disruption strategies, and their perceived effectiveness (0 to 100%). Responses were coded using conventional content analyses without imposing preconceived categories as well as a priori consensus procedures (see Sharpless, Denis et al., 2020). This process was repeated to explore sub-themes. Coding was conducted by six students under the supervision of a psychology researcher (RP) with experience in qualitative procedures. Interrater agreement was good (Kappa = .81). To maintain the independence of responses (i.e., preventing the possibility that multiple responses given by the same respondent were analysed as belonging to a single strategy which may skew results), qualitative data were analysed separately for each response given. Responses that were coded as reflecting multiple strategies were removed to enhance the validity of the analysis.

4.3.5 Statistical analysis

Sensitivity analyses removing outliers were conducted and the results remained within negligible variation (less than 1%). Therefore, we present results from the full dataset.

4.4 Results

4.4.1 Descriptive statistics

Participants (N = 6811) resided in the UK (81.4%), the US (6.4%), and different countries in Europe (6.1%). They identified as White (92.1%), followed by mixed ethnic groups (2.6%), and Asian (2.0%). Ethnicity was further dichotomised into those who identified as White (93.6%) and non-White (6.4%) for analytic purposes. The mean age for the entire sample was 46.9 years (*SD* = 15.4; *range* = 18 – 89). Females made up 66.1% of the entire sample. Of the 3523 participants who had reported at least one ISP episode, most of them where White (91.3%), mixed ethnic groups (4.2%), and Asian (2.9%), dichotomised into White (90.3%) and non-White (9.7%). The mean age was 42.4 years (SD = 14.6; range = 18 – 86), and 68.5% were female.

4.4.2 Demographic differences

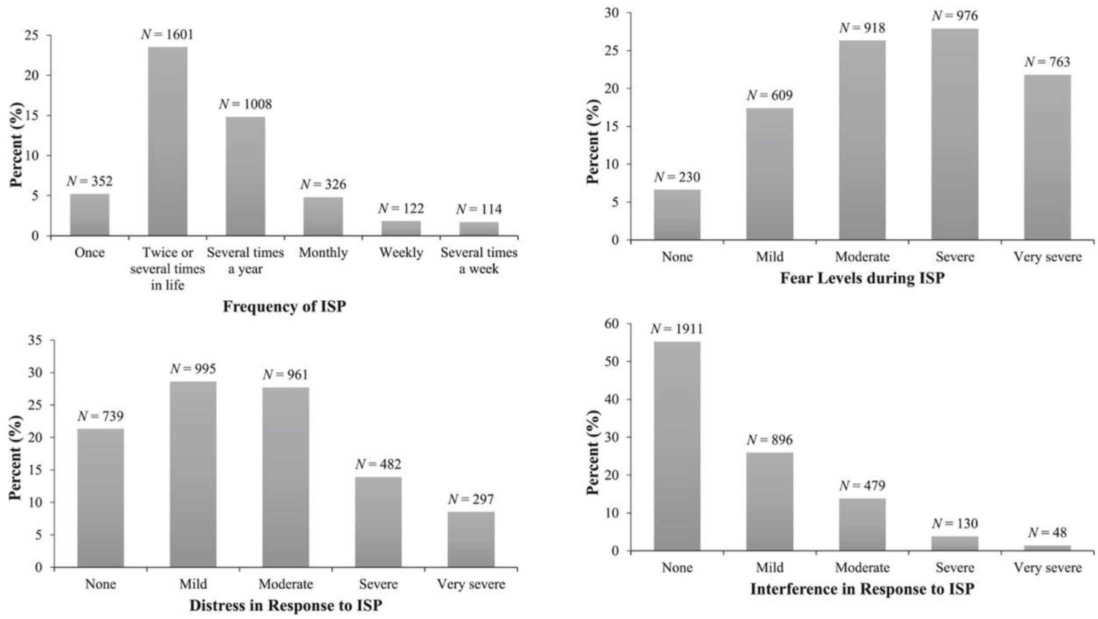
Non-white participants were more likely to report ISP than White participants (78.2% vs 49.7%; $\chi^2(1, N = 6698) = 130.0$, $p < .001$, Cramer's $V = .14$). Females were more likely to report ISP than males (53.0% vs 48.6%; $\chi^2(1, N = 6746) = 11.8$, $p = 001$, Cramer's V = .04). Participants reporting ISP were younger ($M = 42.4$ years, $SD = 14.6$) than those who did not ($M = 51.7$ years, $SD = 14.7$; $t(6809) = 26.1$, $p < .001$, Cohen's d = .63).

4.4.3 ISP frequency, fear, distress, and impairment

ISP distribution is shown in Figure 3. Out of 3496 participants who reported their fear levels during ISP episodes, 76.0% (*N* = 2657/3496) experienced clinically significant (i.e., moderate or above) levels of fear, indicating at least one fearful ISP episode. Of the ISP sample who reported their fear levels, 27.6% (*N* = 966/3496) also met criteria for recurrent fearful ISP (RFISP) based on a combination of the frequency of episodes as well as the presence of clinically significant distress as a result of episodes and/or impairment. Of note, clinically significant levels of interference were reported in 47.0% of individuals with RFISP (*N* = 454/966), but only 1.9% met RFISP criteria based on interference alone (*N* = 18/966; i.e., without the presence of significant distress). Correlation analyses indicated that an increased frequency of episodes was associated with higher distress (Spearman Rank-Order Correlation; rs (3474) = .30, $p < .001$), greater fear (rs(3496) = .14, $p < .001$) and interference with life (rs (3464) = .40, *p* <. 001).

Figure 3

Distributions of ISP Frequency, Distress, Fear, and Interference



Note. ISP = isolated sleep paralysis. *N* = number of participants in each group. Only individuals reporting ISP are included in the figures. Interference in response to ISP refers to daytime interference because of ISP.

4.4.4 Sleep and ISP

Participants who reported ISP reported longer sleep latencies (*M* = 31.2 minutes, *SD* = 32.7) over the past month than those who did not (*M* = 25.6 minutes, *SD* = 31.6) (*U* = 3340174.0, $p < .001$, effect size $r = .13$). Similarly, those reporting ISP had shorter sleep durations (*M* = 6 hrs and 48 min, *SD* = 1 hr and 10 min) than those who did not (*M* = 6 hrs and 53 min, *SD* = 1 hr and 9 min) (t(5937,233) = 2.8, p = .005, Cohen's d = .07). Insomnia symptoms as measured by the ISI were greater in ISP participants (*M* = 8.6, *SD* = 3.0) than non-ISP participants (*M* = 7.6, *SD* = 3.0; t(6769) = -13.2, $p < .001$, Cohen's d = -.32). There were no statistically significant differences in sleep efficiency between those with ISP (*M* = 84.4, *SD* = 13.0) and those without (*M* = 84.3, *SD* = 12.7; p = .732).

4.4.5 Self-reported aetiologies

Of those reporting ISP, 98.6% (*N* = 3474) provided possible causes for the condition. The most common answers about aetiology were: "something in the brain" (*N* = 2198; 63.3%), "stress" (*N* = 1373; 39.5%), "medication side effects" (*N* = 262; 7.5%), "something supernatural" (*N* = 245; 7.1%), and "electronic equipment" (*N* = 36; 1.0%).

4.4.6 Prevention strategies

The five most common ISP prevention strategies reported by participants and their perceived effectiveness are displayed in Table 3. Overall, the five prevention strategies had mean perceived effectiveness ratings of above 60.0%. An attempted internal replication of these findings can be found in Appendix B Tables B1 and B2. Through replication, the same strategies were identified in the second (all five strategies) and third (four strategies) responses, and perceived effectiveness for all techniques also had mean ratings of at least 60.0%. The most common strategies using the second and third responses were among those identified using the first response. Their perceived effectiveness also had overall mean ratings of at least 60.0% apart from two strategies (adjusting sleep environment and using/refraining from substances) in the 3rd response. There was a significant association between ISP frequency and the utilisation of prevention techniques, (χ^2(5, N = 3500) = 378.3, $p < .001$, Cramer's V = .33), indicating that people reporting more episodes were more likely to take steps to prevent their episodes (see Table B3 for detailed results).

Table 3

Most Common ISP Prevention Strategies, Their Perceived Effectiveness, and Category Sub-Themes

Strategy used	Examples	*n* (%)[a]	Perceived effectiveness[b] M (SD)
1[st] response *n* = 839			
Sleep position		**254 (30.3)[c]**	**74.60 (27.84)**
Avoid sleeping on back	"Never sleep on my back"	117 (47.4)	78.28 (25.18)
Sleep on (unspecified) side	"Sleep on side"	66 (26.7)	70.06 (30.08)
Change position (exc. elevated position)	"Change sleep position"	13 (5.3)	50.77 (34.33)
Sleep patterns/tiredness		**151 (18.0)[d]**	**77.09 (24.46)**
Sleep regularly	"Regular sleep pattern"	43 (28.9)	79.95 (21.50)
Avoid naps	"Don't take naps"	40 (26.8)	87.98 (18.37)
Avoid being overtired/sleep deprived	"Avoid sleep deprivation"	19 (12.8)	74.95 (24.66)
Adjust environment		**77 (9.2)[e]**	**61.70 (34.93)**
Increase light/illumination	"Light on"	29 (38.2)	59.90 (36.23)
Sleep location	"Not sleep in an enclosed space"	9 (11.8)	76.11 (24.47)
Decrease temperature	"Remove duvet to cool down"	8 (10.5)	74.25 (23.52)
Substances		**54 (6.4)[e]**	**79.33 (25.38)**
Increased alcohol	"Drink alcohol, often to excess"	7 (13.2)	85.00 (25.33)
Decreased alcohol	"Limit alcohol consumption when going out"	7 (13.2)	80.00 (17.32)

Increased non-sleep medication	"Anti-anxiety medication"	7 (13.2)	92.00 (10.63)
Resisting falling asleep/wakeup		**44 (5.2)**	**69.88 (34.84)**
Wake up (unspecified)	"I try to wake up"	24 (54.5)	66.65 (38.93)
Avoid going back to sleep	"Try not to fall asleep again after the episode"	9 (20.5)	66.11 (31.00)
Get up	"Get up if I'm unable to sleep and do something else rather than lying there for hours"	7 (15.9)	89.29 (10.96)

Note. ISP = Isolated Sleep Paralysis; M = Mean; SD = Standard deviation. This table presents the most common prevention strategies in the first response in which $n > 5$ (to avoid emphasising multiple categories endorsed by very few). Primary analysis outcomes are presented by order of frequency of response in bold followed by the three most common secondary analysis outcomes where applicable (n > 5). For example, in the 1st response, the prevention technique "sleep position" was identified in the primary analysis and its subthemes (e.g., avoid sleep on back) were identified in the secondary analysis. Perceived effectiveness ranges from 0 to 100, with higher ratings indicating higher perceived effectiveness of technique.

[a] Refers to % out of subsample per response (in rows in bold) or to % out of subsample per sub-theme.

[b] Assessed as perceived % of time the technique works

[c] In the secondary analysis, seven cases that were coded as reflecting multiple prevention strategies were removed.

[d] In the secondary analysis, two cases that were coded as reflecting multiple prevention strategies were removed.

[e] In the secondary analysis, one case that was coded as reflecting multiple prevention strategies was removed.

4.4.7 Disruption strategies

The five most common ISP disruption strategies and their perceived effectiveness are listed in Table 4. Most participants used techniques that involved physical/bodily action, noises, and arousal of the brain (i.e., physical action e.g., get out of bed, wake up, move body). The overall mean effectiveness ratings varied, with only two strategies (contextualisation and breathing) being rated as over 50.0% effective. The remaining disruption strategies had mean effectiveness ratings between 29.5 to 43.1%. Replication revealed that the second and third responses included approximately the same strategies identified using the first response, although perceived effectiveness was lower for all strategies. There was a significant association between ISP frequency and the utilisation of disruption techniques ($\chi^2(5, N = 3472) = 428.9$, $p < .001$, Cramer's V = .35). In general, results indicated that people reporting more episodes were more likely to take steps to disrupt their episodes (see Table B4).

Table 4

Most Common ISP Disruption Strategies, Their Perceived Effectiveness, and Category Sub-Themes

Strategy used	Examples	*n* (%)[a]	Perceived effectiveness[b] M (SD)
1st response *n* = 1,694			
Physical / bodily action		**744 (43.9)[c]**	**43.10 (39.96)**
Move (unspecified)	"Desperately try to move"	337 (48.4)	30.33 (38.04)
Move/wiggle fingers/hands	"Focus and try to move right index finger"	73 (10.5)	55.07 (35.94)
Move/wiggle toes/feet	"Try to move toes"	69 (9.9)	64.39 (33.60)
Make noise		**246 (14.5)[d]**	**29.53 (39.28)**
Scream	"Force myself to scream"	148 (62.7)	27.40 (37.87)
Call out/cry out (inc. for help)	"Cry out"	45 (19.1)	19.82 (34.29)
Speak	"Try to speak or ask for help"	25 (10.6)	32.64 (45.50)
Wake up / rouse the brain		**192 (11.3)[e]**	**42.66 (37.69)**
Force oneself awake/tell self to wake up/arouse mind	"Convince myself to wake up"	176 (92.6)	39.86 (36.74)
Stay awake	"I don't go back to sleep"	7 (3.7)	82.86 (31.47)
Contextualisation		**133 (7.9)[f]**	**53.37 (35.44)**
Rationalisation	"Explain to myself that I'm sleeping"	120 (90.9)	52.15 (35.13)
Focus on object/body parts etc	"Focus on something in	5 (3.8)	70.00 (44.72)

	the room to bring myself back”		
Breathing		**72 (4.3)[g]**	**61.82 (38.61)**
Breathing exercises	“I focus on my breathing”	38 (55.1)	57.66 (37.32)
Breathe deeply/heavily/slowly	“Deep breathing exercises”	15 (21.7)	60.33 (35.98)
Breathe rapidly	“Breathe quicker“	5 (7.2)	96.0 (8.94)

Note. ISP = Isolated Sleep Paralysis; M = Mean; SD = Standard deviation. This table presents the five most common disruption strategies in the first response in which $n > 5$ (to avoid emphasising multiple categories endorsed by very few). Primary analysis outcomes are presented by order of frequency of response in bold followed by the three most common secondary analysis outcomes where applicable (n > 5). For example, in the 1st response the disruption technique “make noise” was identified in the primary analysis and its subthemes (e.g., scream) were identified in the secondary analysis. Perceived effectiveness ranges from 0 to 100, with higher ratings indicating higher perceived effectiveness of technique.

[a] Refers to % out of subsample per response (in rows in bold) or to valid % out of subsample per sub-theme.

[b] Assessed as perceived % of time the technique works

[c] In the secondary analysis, 47 cases that were coded as reflecting multiple prevention strategies were removed.

[d] In the secondary analysis, 10 cases that were coded as reflecting multiple prevention strategies were removed.

[e] In the secondary analysis, 2 cases that were coded as reflecting multiple prevention strategies were removed.

[f] In the secondary analysis, 1 case that was coded as reflecting multiple prevention strategies were removed.

[g] In the secondary analysis, 3 cases that were coded as reflecting multiple prevention strategies were removed.

4.5 Discussion

The present study aimed to further our understanding of ISP, its perceived aetiologies, clinical features, demographic characteristics, and common prevention/disruption techniques. Overall, we found that sleep disturbances, fear, distress, and daily life interference were highly prevalent in our sample of people reporting ISP. Moreover, common ISP prevention and disruption techniques were raised by the experiencers. Findings obtained here have potential diagnostic implications.

Participants who reported at least one episode of ISP reported poorer sleep quality as compared to those who did not. Further, those reporting ISP had a longer sleep latency, shorter sleep duration and greater insomnia symptoms compared to those not reporting ISP. Importantly, the effect size for insomnia symptoms was 0.3, suggesting a particularly meaningful relationship between ISP and insomnia symptoms which may have clinical significance. The current findings corroborate evidence concerning the associations between ISP and various sleep disturbances (Denis et al., 2015; Wing et al., 1994). In line with previous research (Paradis et al., 1997), non-White participants were more likely to experience ISP than White participants. Women were more likely to experience ISP than men, and ISP tended to be more frequent in younger people compared to older. The effect size for the latter association was medium, suggesting a meaningful relationship that should be further investigated.

ISP was associated with distress. The majority of participants (76.0%) reported clinically significant (i.e., moderate or above) fear levels during their ISP episodes (i.e., they experienced fearful ISP episodes), and many participants (27.6%) suffered from recurrent fearful ISP. Regarding the causes, most people believed that ISP was the result of something in the brain and/or stress. A smaller percentage believed it to have supernatural origins. These self-reported aetiologies support previous research in which participants residing in Denmark were more likely to ascribe causes such as brain malfunctioning and reduced blood flow in the brain to their SP episodes rather than supernatural creatures (Jalal et al., 2014). Our findings provide quantitative evidence to categories previously identified.

4.5.1 Prevention and disruption strategies

Five strategies used to prevent and disrupt ISP episodes were identified using participants' open-ended responses. The three most common prevention strategies were changing sleep position, adjusting sleep patterns, and adjusting sleep environment. These findings are consistent with previous research that found changes to sleep patterns to be the most successful prevention technique (Sharpless & Grom, 2016). In the current study, the prevention strategies were reported to be moderately effective, with all five having over 60.0% of perceived effectiveness. This supports their use in existing treatments for problematic cases of ISP (e.g., CBT-ISP; Sharpless & Doghramji, 2015). These techniques can also be more informally shared with ISP experiencers in addition to the use of psychoeducation about the broader nature of ISP. As noted in several sources, individuals may feel shame or experience distress given the unusual nature of ISP symptoms, especially hallucinations (Olunu et al., 2018). Results of the present study also indicate that a small percentage possess thoughts of a supernatural origin of ISP. Increased familiarity with both ISP and tendencies to endorse anomalistic aetiologies may serve to both reassure patients and provide scientific explanations for ISP. Our results are particularly noteworthy given the absence of clinically supported effective techniques for those suffering from ISP. These prevention strategies may also be useful for further developing fruitful and tailored interventions.

The five disruption strategies identified had overall less perceived effectiveness, with only two strategies (contextualisation and breathing) yielding an overall perceived effectiveness of at least 50.0% in the first response. Contextualization (i.e., being conscious of the paralysis, positive thoughts etc) and breathing were reported to be the most effective strategies across all three responses. These findings can help enhance treatments for ISP patients as health-care providers can not only offer sympathy and understanding, but if these results are replicated, they may constitute actionable practices targeted at directly managing the condition as it is happening. Being able to disrupt an episode can offer significant relief to the experiencer as they may feel increased control over the episode (Denis, 2018). This, in turn, can lead to a reduction in fear and anxiety that often co-exist with SP, especially when struggling to end it at one's will (Sharpless & Doghramji, 2015; Wing et al., 1994).

Results also indicate that a subset of individuals with recurrent episodes of ISP experience clinically significant life interference in the absence of clinically significant distress. Should these findings be replicated, this may point towards a need to reconsider current criteria for RISP which, at present, only requires distress and/or anxiety associated with ISP episodes (AASM, 2014).

4.6 Limitations and future directions

This online study had a self-selected sample and findings may or may not generalize to the wider population. Relatedly, as the sample consisted of primarily White participants, replication with non-White samples is needed.

4.7 Conclusion

This study showed that various aspects of sleep (i.e., longer sleep latencies, shorter sleep duration, and greater insomnia symptoms) were more common in those reporting ISP (vs. non-ISP reporters). ISP episodes can cause high levels of fear and distress as they are happening. However, only a minority of participants reported significant distress or impairment as a result of episodes. People experience the latter without the former, which may imply a need to revise current diagnostic criteria. In terms of aetiology, most of the participants believed the episodes to be caused by something in the brain, and several ISP-related prevention and disruption strategies were identified. These findings may contribute to successful intervention development aimed to decrease anxiety, distress, as well as improve overall sleep quality in those who experience ISP.

Next chapter

The scoping review in Chapter 2 provided an overview of all the existing studies that investigated the associations between different sleep variables and OPEPB. As discussed, the studies mainly focused on vivid sleep variables, such as SP and lucid dreaming, among other. The reported OPEPB were primarily related to OBEs, encounters with malevolent spirits, grotesque creatures, and ghosts. Consequently, the following chapter (Chapter 5) aims to shed light on the less explored sleep and paranormal variables including sleep latency and the belief that the soul lives on after death, which will hopefully yield a more comprehensive understanding of the associations between sleep and paranormal phenomena.

Chapter 5: The Associations between Paranormal Beliefs and Sleep Variables

A paper based on this chapter has been published in the Journal of Sleep Research:

Rauf, B., Perach, R., Madrid-Valero, J. J., Denis, D., Sharpless, B. A., Poerio, G. L., ... & Gregory, A. M. (2023). The associations between paranormal beliefs and sleep variables. *Journal of Sleep Research*, e13810.

5.1 Abstract

As seen in Chapter 2, previous studies have found significant associations between paranormal beliefs and sleep variables. However, these have been conducted on a small scale and are limited in the number of sleep variables investigated. The following study aims to fill a gap in the literature by investigating paranormal beliefs in relation to a wide range of sleep variables in a large sample. Participants (N = 8853) completed a survey initiated by the BBC Focus Magazine. They reported on their demographics, sleep disturbances and paranormal beliefs. Poorer subjective sleep quality (lower sleep efficiency, longer sleep latency, shorter sleep duration, and increased insomnia symptoms) was associated with greater endorsement of belief in: (1) the soul living on after death; (2) the existence of ghosts; (3) demons; (4) an ability for some people to communicate with the dead; (5) near-death experiences are evidence for life after death; and (6) aliens have visited earth. In addition, episodes of EHS and ISP were associated with the belief that aliens have visited earth. ISP was also associated with the belief that near-death experiences are evidence for life after death. Findings obtained here indicate that there are associations between beliefs in the paranormal and various sleep variables. This information could potentially be relevant for inclusions in psychoeducation, although it is essential to note that these findings are purely correlational and establishing causality requires additional research employing alternative study designs. Moreover, the mechanisms

underlying these associations are likely complex, and need to be further explored to fully understand why people sometimes report ‘things that go bump in the night’.

5.2 Introduction

SP has been associated with different factors including spirituality and paranormal beliefs. One study that investigated possible risk factors for ISP found that those reporting ISP held significantly more spiritual beliefs (e.g., endorsing the belief that the mind and soul can leave the body and travel) than those without (Ramsawh et al., 2008). Similarly, a review of SP (N = 42 studies) found that people who reported experiencing SP were more likely to hold paranormal beliefs (e.g., believing in witchcraft, demonic assault) than those who did not (Denis, French, & Gregory, 2018). Research has also explored the specific characteristics and beliefs associated with SP in samples from specific cultures (e.g., see Chapter 1).

EHS has also been linked to belief in the supernatural and reported ostensibly paranormal experiences. Specifically, one study found positive correlations between EHS episodes and anomalous beliefs (Sherwood, 1999). A more recent study, using the dataset reported in this current paper (the BBC Science Focus dataset), found that 2.8% of sufferers endorsed the belief that EHS was the result of non-biological, supernatural causes, and 2.3% believed it to be due to electronic devices (i.e., possibly indicating some conspiratorial thinking). The study also found that those who experienced EHS had shorter sleep durations, longer sleep latencies, poorer subjective sleep quality and lower sleep efficiency; effect sizes, however, were small (Sharpless et al., 2020). Similarly, in an international sample, insomnia symptoms were positively associated with EHS episodes (Denis et al., 2019).

Despite the value of the work that has been published to date in addressing a largely ignored area of research, existing research has often been conducted on a small scale or has been relatively limited in the range of sleep variables investigated. However, other sleep variables are also likely associated with paranormal beliefs, and this needs further investigation. For example, a disturbed sleep pattern can trigger SP (Denis, French, & Gregory, 2018) which can involve hallucinations. Fear of ostensibly paranormal experiences could also interfere with or prevent sleep from occurring. Indeed, some paranormal beliefs (e.g., belief in aliens) can be deemed unhelpful as they have been associated with increased sleep disturbances, especially sleep disturbances that can produce vivid sensory imagery (e.g., SP, hypnagogic and hypnopompic hallucinations; Denis et al., 2018; McNally & Clancy, 2005; Sharpless et al., 2020). Thus, the aim of this study is to examine a wider range of sleep variables in relation to paranormal beliefs to further unpack associations between sleep and the paranormal using a large set of data collected through research collaboration with the BBC Science Focus Magazine. Specifically, the current study aims to address the following research question: What are the associations between paranormal beliefs and sleep variables? In particular, we focus on six paranormal beliefs and their associations with sleep quality variables (i.e., sleep efficiency, duration, latency, insomnia symptoms) as well as ISP and EHS.

Research of this type is important as understanding these links can represent a first step towards obtaining information that could potentially be provided in psychoeducation aimed at supporting some of those struggling with sleep.

5.3 Materials & Methods

5.3.1 Procedure

Data from the BBC Focus Study were included in this chapter (i.e., data on sleep variables and paranormal beliefs). Information about this study is presented in Chapter 3.

5.3.2 Measures

Paranormal beliefs

Four paranormal beliefs were evaluated using a sub-scale from the Paranormal Assessment Scale (Reiner & Wilson, 2015). These were: ‘*Do you believe that you have a soul that will live* *on after you die?'*, *'Do you believe in the existence of ghosts?*', *'Do you believe that some people can communicate with the dead?'* , *'Do you believe that near death experiences are evidence for life after death?'*. Two additional items developed by the authors were also included: *'Do you believe in the existence of demons?'* and *'Do you believe that aliens have visited earth and interacted with humans?'*. Response options for all six items ranged from 1 (*Definitely not*) to 5 (*Definitely yes*). All items were analysed separately.

Sleep Variables

The sleep variables included in this chapter are sleep efficiency, insomnia symptoms, sleep latency, sleep duration, and ISP (see Chapter 3 for further information about their measurement). In addition to the sleep variables presented in Chapter 3, EHS was also included in this study. EHS was assessed (e.g., *Have you ever heard a sudden, loud noise or felt something like an explosion in your head without an obvious explanation when you were going to sleep or waking up?*) using 11 items adapted from the EHS Interview (EHSI; Sharpless, 2015) which assesses EHS based on the ICSD-3 (AASM, 2014). The EHSI has been used in several studies (e.g., Kirwan & Fortune, 2021; Sharpless, 2015; Sharpless, 2018) and aligns with the interviewing format of the Anxiety Disorders Interview Schedule (Brown et al., 1994). It is noteworthy that there are no alternative interviews for EHS; only self-reported measures are available. In addition, the question above assessing EHS closely resembles the corresponding item in the Munich Parasomnia Screening, which has been validated (Fulda et al., 2008).

5.3.3 Statistical analysis

Multiple regression analyses (age and gender were added as covariates) were run to determine if paranormal beliefs predicted sleep efficiency, sleep duration, sleep latency and insomnia symptoms. Chi-square tests of independence were run when examining the associations between categorical variables. All paranormal belief variables, along with ISP and EHS were treated as categorical variables. Sleep efficiency, sleep duration, sleep latency, and insomnia symptoms were treated as continuous.

5.4 Results

5.4.1 Descriptive statistics

Of the 12,873 people who started the study, 8,853 (69%) completed it. Of those completing the study, participants classified themselves as White (*N* = 8,099, 92.9%), mixed ethnicity (*N* = 240, 2.8%), Asian (*N* = 190, 2.2%), with the remaining identifying as Black or "other". The sample was primarily female (67%), and the sample mean age was 47.04 years (SD = 15.63; range = 18-94 years). Detailed descriptive statistics are reported in Table 5. In order to increase confidence that only idiopathic cases of both EHS and SP were investigated, we excluded diseases and disorders with potentially overlapping symptoms (e.g., narcolepsy) in the analyses involving the EHS and ISP variables. The final number of those reporting at least one EHS or ISP episode was 3286 (52.7%) and 3523 (51.7%), respectively (see Appendix C; Figure C1 for participant flow and exclusions). It is worth noting that the elevated percentages of EHS and ISP reports likely stem from the self-selected nature of this study, a point elaborated on in the discussion of this chapter. Note that the exclusions for diseases and disorder do not apply when looking at the other sleep variables. The mean sleep efficiency for all participants was 84.42% (SD = 12.85). Mean sleep latency was 28 min (SD = 32.38 min), and the mean sleep duration was 6 hr and 51 min (SD = 1:10 hr). The mean for insomnia symptoms was 8.13 (SD = 3.0).

Of the participants, there were strong believers in the paranormal (i.e., those who gave a response of 'definitely yes'). For example, 12.7% (872/6867) strongly believed that the soul will live on after death, 8.1% (558/6869) strongly believed in the existence of ghosts, 5.6% (382/6859) believed that some people can communicate with the dead, 3.4% (235/6855) strongly believed that near-death experiences (NDEs) are evidence for life after death, 4.7% (321/6855) strongly believed in the existence of demons, and 3.4% (236/6855) strongly believed that aliens have visited earth or interacted with humans. Differences in numbers across the measures are due to missing data. See Table 6 for correlations between all relevant variables.

Table 5

Descriptive Statistics for all Variables

Variable	**Categories**	***N***	**%**
Gender	Male	2894	33.0
	Female	5868	67.0
Ethnicity	White	8099	92.9
	Mixed/Multiple ethnic groups	240	2.8
	Asian/Asian British	190	2.2
	Black/Black British	57	0.7
	Other	135	1.5
Soul after death	Definitely not	1731	25.2
	I don’t think so	1592	23.2
	Not sure	1584	23.1

	I think so	1088	15.8
	Definitely yes	872	12.7
Ghosts exist	Definitely not	2179	31.7
	I don't think so	1630	23.7
	Not sure	1439	20.9
	I think so	1063	15.5
	Definitely yes	558	8.1
Communicate with the dead	Definitely not	2824	41.2
	I don't think so	1608	23.4
	Not sure	1308	19.1
	I think so	737	10.7
	Definitely yes	382	5.6
NDEs evidence life after death	Definitely not	2295	33.5
	I don't think so	1967	28.7
	Not sure	1771	25.8
	I think so	587	8.6

	Definitely yes	235	3.4
Demons exist	Definitely not	3541	51.7
	I don’t think so	1520	22.2
	Not sure	975	14.2
	I think so	498	7.3
	Definitely yes	321	4.7
Aliens visited earth	Definitely not	2324	33.9
	I don’t think so	2115	30.9
	Not sure	1575	23.0
	I think so	605	8.8
	Definitely yes	236	3.4
EHS frequency	Never	2954	44.2
	Once	244	3.6
	Twice or several times in life	1493	22.3
	Several times a year	1255	18.8
	Monthly	357	5.3

	Weekly	192	2.9
	Several times a week	191	2.9
SP frequency	Never	3288	47.8
	Once	353	5.1
	Twice or several times in life	1624	23.6
	Several times a year	1027	14.9
	Monthly	336	4.9
	Weekly	130	1.9
	Several times a week	123	1.8
EHS	Yes	3732	55.8
	No	2954	44.2
SP	Yes	3593	52.2
	No	3288	47.8

	Range	***N***	**Mean(SD)**

Age	18-94	8853	47.04(15.63)
Sleep efficiency	20-100	6057	84.42(12.85)
Sleep latency	0-360min	5780	28.39(32.38)
Sleep duration	3:00-12:00h	6141	6:51(1:10)
Insomnia symptoms	3-15	6954	8.13(3.00)

Note. Sleep duration is reported in hr:min. Sleep duration (16:00 and 23:45h) and sleep latency (450, 507, and 508min) included outliers that were not included in the table above (for presentation purposes). However, those participants were still included in all analyses as their participation did not affect the results. Note that the descriptive statistics are reported for the entire sample. Idiopathic cases of EHS and ISP were reported by 3286 and 3523 participants, respectively. EHS, exploding head syndrome; NDEs, near-death experiences; SP, sleep paralysis

Table 6

Correlations, Effect Sizes, and Significance between Core Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. Insomnia symptoms	1											
2. Sleep efficiency	**-.47**	1										
3. Sleep latency	**.39**	**-.42**	1									
4. Sleep duration	**-.43**	**.59**	**-.25**	1								
5. ISP (no, yes)	**.16**	.00	**.09**	**-.04**	1							
6. EHS (no, yes)	**.14**	**-.03**	**.08**	**-.05**	**.21**	1						
7. Soul after death	**.06**	**-.05**	**.04**	**-.04**	.01	**-.03**	1					
8. Ghosts exist	**.12**	**-.08**	**.05**	**-.09**	.02	.02	**.64**	1				
9. Communicate with the dead	**.11**	**-.06**	**.04**	**-.08**	.10	.01	**.64**	**.81**	1			

10. NDEs evidence life after death	**.08**	**.04**	**.04**	**-.06**	-.01	-.02	**.73**	**.67**	**.71**	1		
11. Demons exist	**.10**	**-.05**	**.05**	**-.09**	**.03**	-.00	**.62**	**.63**	**.62**	**.61**	1	
12. Aliens visit earth	**.08**	**-.02**	**.04**	**-.09**	**.07**	**.06**	**.32**	**.46**	**.46**	**.41**	**.40**	1

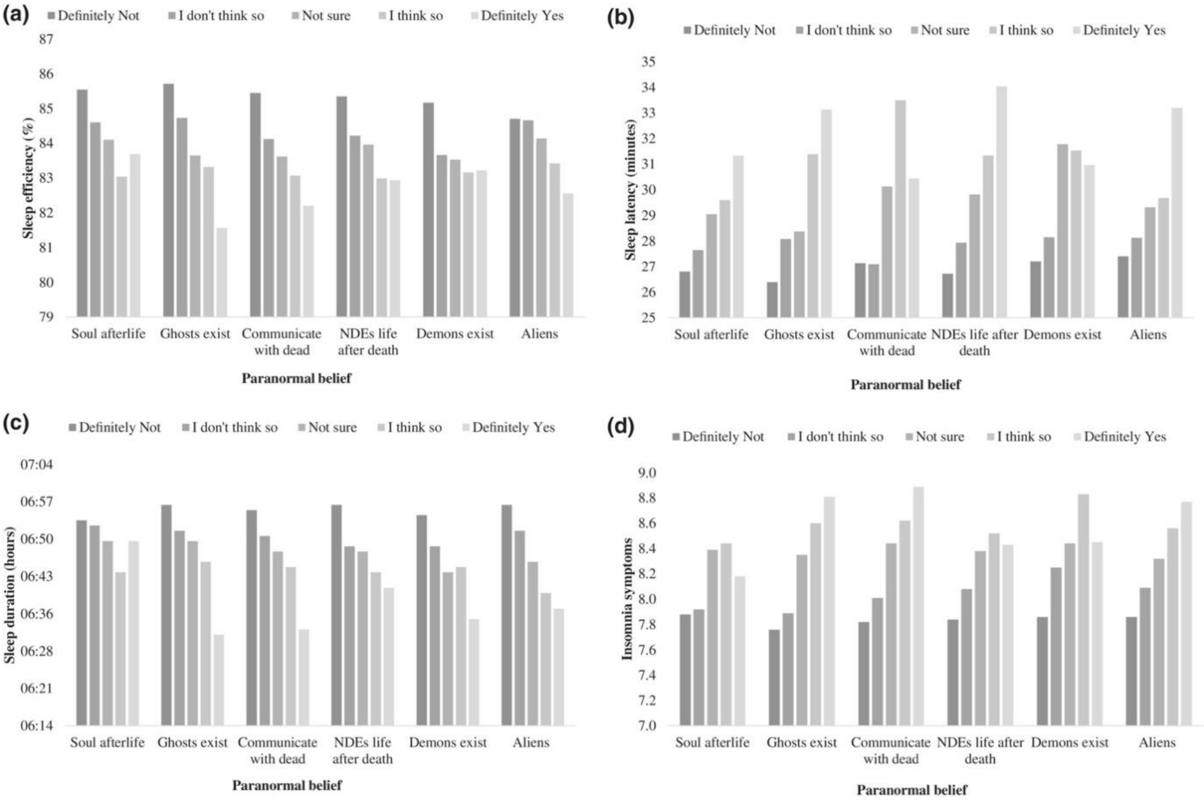
Note. Correlations/associations in bold indicate statistical significance; ISP = isolated sleep paralysis; EHS = exploding head syndrome; NDEs = near-death experiences; Items 1 to 4 (i.e., the subjective sleep quality items) are continuous variables; Insomnia symptoms range from 3 to 15, with higher scores indicating greater insomnia symptoms; Sleep efficiency ranges from 20 to 100; Sleep latency ranges from 0 to 360 minutes; Sleep duration ranges from 3 to 12 hours; Items 5 and 6 are binary (0 = No, 1 = Yes); Items 7 to 12 are ordinal variables ranging from '1 = Definitely not' to '5 = 'Definitely yes'; Correlations between two continuous variables are reported using Pearson's correlation coefficient; Correlations between continuous vs binary variables are reported using Point-biserial correlations; Strength of associations between two binary variables are reported using Cramer's *V*; Correlations between binary vs ordinal variables are reported using Point-biserial correlations; Correlations between continuous vs ordinal variables are reported using Spearman's rank correlation coefficient; Correlations between two ordinal variables are reported using Spearman's rank correlation coefficient.

5.4.2 Multiple regressions: paranormal beliefs and sleep quality variables

Separate multiple regressions were run to predict each subjective sleep quality variable (i.e., sleep efficiency, sleep latency, sleep duration, insomnia symptoms) from each paranormal belief (Table C1; see Figure 4 for illustrations of means of subjective sleep quality variables by paranormal beliefs), controlling for age and gender (Table C2). All paranormal beliefs predicted all subjective sleep quality variables, even when controlling for age and gender ($p < 0.05$ for all); R^2 ranging from 0.01 to 0.04 for the regressions with age and gender entered.

Figure 4 a – d

Relationship between Paranormal Beliefs and Sleep Quality Variables



Note. Relationship between paranormal beliefs and subjective sleep quality variables (means reported). All regression analyses focusing on the associations between paranormal beliefs and subjective sleep quality variables (controlling for age and gender) were significant (see Table C2 for further details). NDEs: near-death experiences

5.4.3 Associations between paranormal beliefs and ISP, EHS

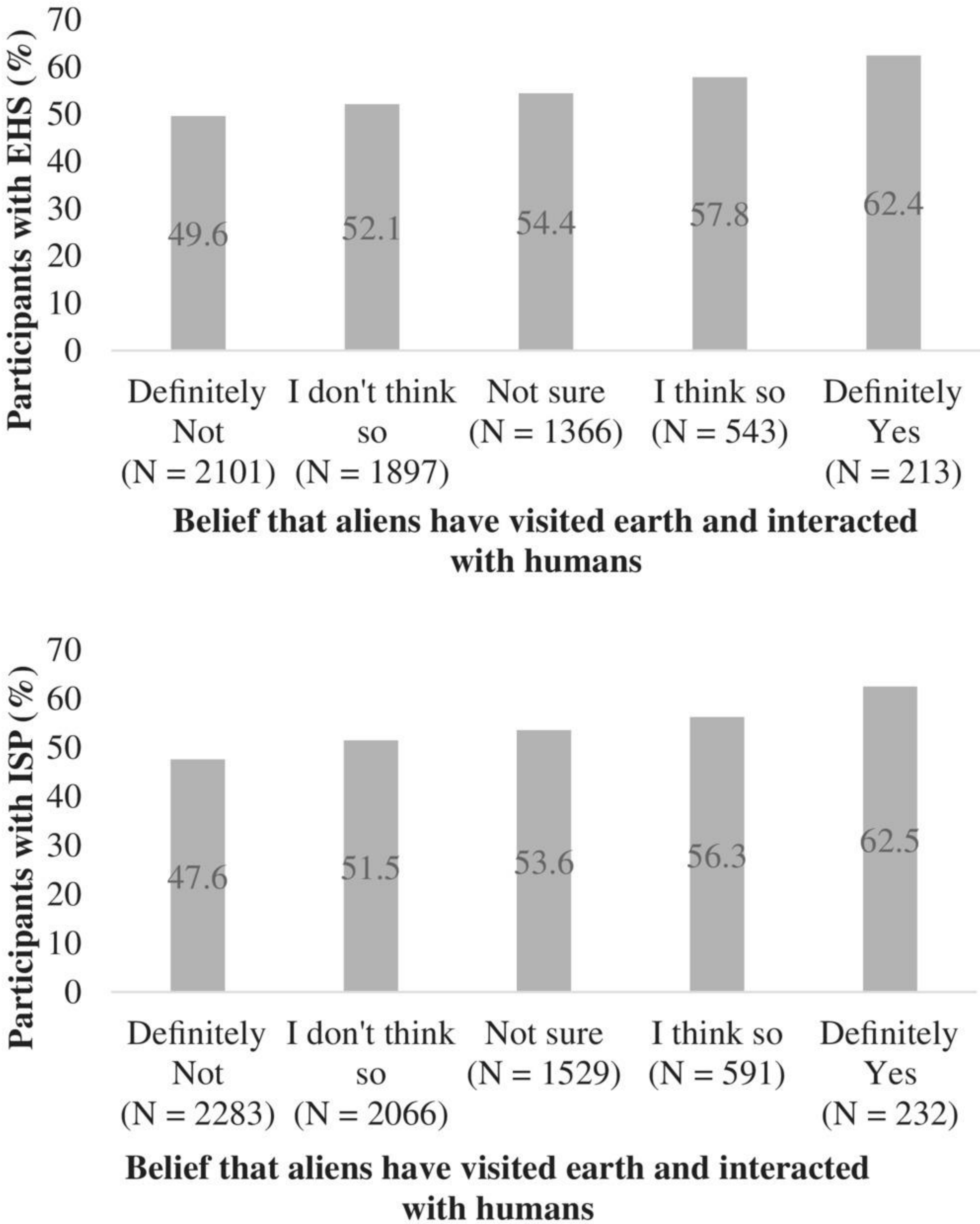
Figure 5 shows the percentages of those reporting 1) EHS and 2) ISP within each category of the belief that aliens visited earth or interacted with humans. Chi-square tests were performed to examine the relation between paranormal beliefs and the remaining two sleep variables (i.e., EHS and ISP; Table C3). The belief that aliens have visited earth or interacted with humans was significantly associated with EHS ($\chi^2(4, N = 6120) = 23.56$, $p < 0.001$, Cramer's $V = 0.06$ and ISP, $\chi^2(4, N = 6701) = 33.69$, $p < 0.001$, Cramer's $V = 0.07$) . Further analyses showed that those reporting EHS (vs. non-EHS) and ISP (vs. non-ISP) held stronger beliefs about aliens (Table C4 and Table C5. respectively). Additionally, the belief that NDEs are evidence for life after death was associated with ISP ($\chi^2(4, N = 6701) = 11.30$, $p = 0.023$, Cramer's $V = 0.04$; Table C3). Further analyses found that a larger proportion of the ISP group responded "*definitely yes*" to the belief that NDEs are evidence for life after death compared to the non-ISP group ($\chi^2(4, N = 1953) = 9.0$, $p = 0.003$, Cramer's $V = 0.07$; Table C6). See Figure 6 for percentages of those reporting ISP within each category of the belief that NDEs are evidence for life after death.

Finally, the belief that the soul lives on after death was associated with ISP ($\chi^2(4, N = 6713) = 10.48$, $p = 0.033$, Cramer's $V = 0.04$; Table C7). However, it was not significant after applying Bonferroni correction during post hoc pairwise comparisons when $p < .005$ (Table C7).

In Chapter 6, using a separate dataset (ASE dataset), we attempted to replicate our primary results. Overall, the dataset showed a broadly similar pattern of results to our primary analyses, although not all tests reached statistical significance, which may be due to the smaller sample size.

Figure 5 a,b

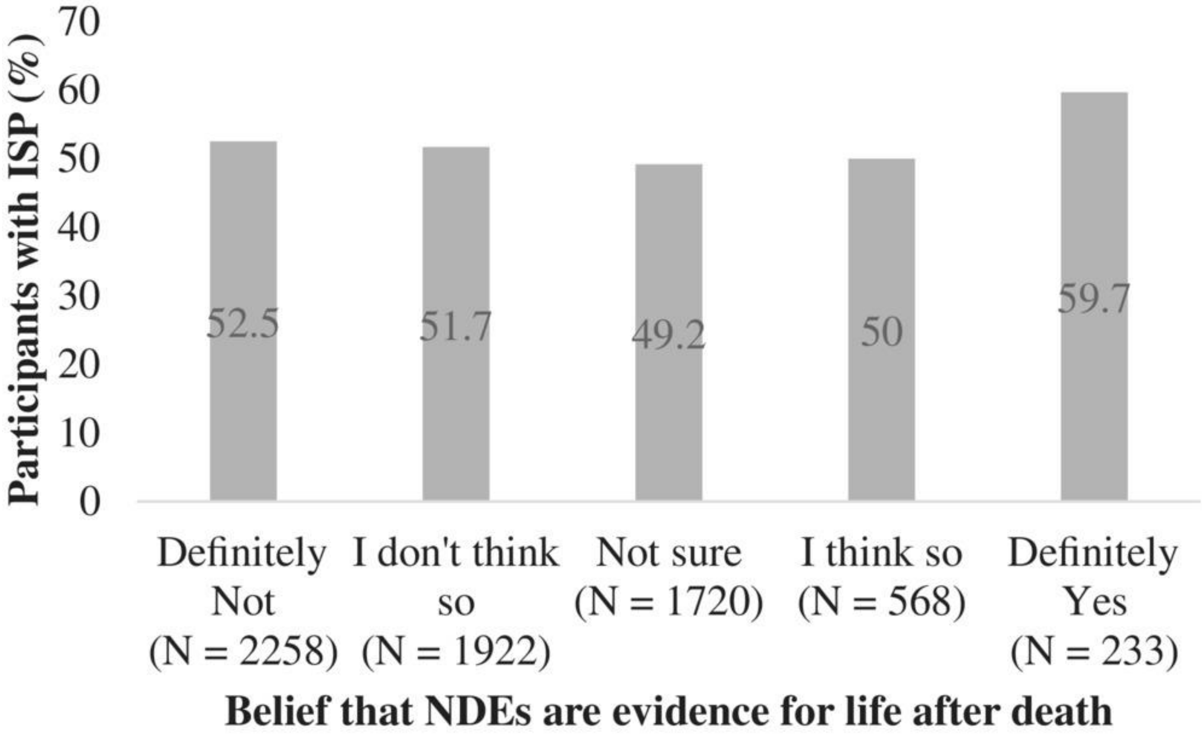
Belief that aliens have visited earth and interacted with humans, exploding head syndrome (EHS) and isolated sleep paralysis (ISP)



Note. The figures are showing the percentages of participants reporting 1) EHS and 2) ISP within each of the five response categories about the belief in aliens. Further analyses showed that people reporting EHS held stronger beliefs that aliens have visited earth than the non-EHS group ($\chi^2(4, N = 6120) = 23.56$, $p < 0.001$ for the whole model; Table C3). Likewise, people reporting ISP held stronger beliefs that aliens have visited earth than the non-ISP group ($\chi^2(4, N = 6701) = 33.69$, $p < 0.001$ for the whole model). See Tables C4 and C5 for additional information (i.e., differences between the groups).

Figure 6

Belief that near-death experiences (NDEs) are evidence for life after death and isolated sleep paralysis (ISP)



Note. The whole model was statistically significant, $\chi^2(4, N = 6701) = 11.30$, $p < 0.023$. Additional information (i.e., differences between groups with Bonferroni correction applied) is found in Table C6.

5.5 Discussion

The present study aimed to examine the associations between a wide range of paranormal beliefs and sleep variables. The results demonstrated that various anomalous beliefs were associated with ISP, EHS, and subjective sleep quality (i.e., sleep efficiency, sleep duration, sleep latency and insomnia).

We found that the belief that aliens have visited earth was more common in those who reported ISP or EHS compared to those who did not. This is consistent with previous research suggesting that paranormal beliefs are associated with SP (Denis, French, & Gregory, 2018) and EHS (Sherwood, 1999). These findings are interesting because as SP involves different types of hallucinations, including auditory and visual (Sharpless & Kliková, 2019), and EHS typically involves a bang (Sharpless et al., 2020), our findings suggest that the belief in aliens may be associated with sleep disturbances that produce sounds or images (i.e., ISP and EHS). One explanation for these associations is therefore that someone experiencing sounds or images associated with sleep could interpret this as evidence that aliens or other supernatural beings exist – although future research is required to test this further and rule out alternative explanations. In addition, the belief that NDEs are evidence of life after death was more prevalent in ISP reporters than non-reporters. To the best of our knowledge, this is a novel finding worthy of further examination. EHS was not associated with the other paranormal beliefs.

Links between paranormal beliefs and the other sleep variables were also revealed – and for all associations, it was found that a higher level of paranormal belief was associated with a poorer subjective sleep quality, even when controlling for age and gender effects. More specifically, participants who reported stronger beliefs in the soul living on after death, the existence of ghosts, that some people can communicate with the dead, that near-death experiences are evidence for life after death, that demons exist, and that aliens have visited earth also tended to report lower sleep efficiency, longer sleep latency, shorter sleep duration and increased insomnia symptoms. Likewise, in our separate dataset, those reporting stronger beliefs in the existence of a devil also reported increased insomnia symptoms.

While most of the associations reported here appear to the linear, indicating that stronger belief in paranormal experiences is associated with poorer subjective sleep quality, one particular finding warrants further discussion. Specifically, while an overall stronger belief in the soul living on after death is associated with a higher likelihood of reporting insomnia symptoms, individuals who firmly believed (‘Definitely yes’) in the soul living on after death reported fewer insomnia symptoms compared to those who expressed uncertainty (‘Not sure’). This pattern suggests that certainty in one’s beliefs about the soul’s persistence might mitigate some sleep disturbances typically associated with paranormal beliefs. Should these results be replicated, a possible explanation for this finding could be that uncertainty and indecisiveness (in this case regarding beliefs about the afterlife) may induce anxiety, which in turn can interfere with sleep. This finding also underscores the need for further research in this field to consider different aspects of paranormal beliefs separately as associations with sleep may differ.

An explanation for more general associations between sleep and paranormal belief is whether some of these associations could be explained by anxiety about certain paranormal beliefs (e.g., the existence of ghosts and demons/devil) interfering with sleep. However, it is more difficult to explain the links between other paranormal beliefs such as in the soul and in life after death, using such an explanation. It may also be important to assess for the presence of other forms of psychopathology (e.g., depression, post-traumatic stress disorder) which could both disrupt sleep and impact beliefs. In addition, potential mediators/moderators such as education, personality differences and religious beliefs should be examined in future research given their associations with both sleep (Gray & Watson, 2002; Hill et al., 2018; Moore et al., 2002) and belief in the paranormal (Aarnio & Lindeman, 2005; Williams et al., 2007). Future longitudinal and experimental studies are needed to establish the direction of effects, as well as consider other underlying factors between the assessed variables.

Although the results revealed small effect sizes, there is growing recognition that small effects are common in research on complex psychological processes (Götz et al., 2022). Our findings are nonetheless noteworthy as they may have significant real-world consequences (Funder & Ozer, 2019), given that most behaviours and attitudes are the consequence of the cumulative small effects of several factors as opposed to a large effect of a single factor (Götz et al., 2022).

5.6 Limitations

Despite the many strengths of this report, including focusing on an under-researched topic and the sample size – which was much larger than most of the previous studies within this domain, a number of limitations should be considered. First, given that the study employed a cross-sectional design, cause-and-effect relationships cannot be established. Second, despite the large sample size, participants were self-selected and unlikely to be representative of the general population. For example, the seemingly high rates of ISP and EHS could indicate that individuals with these symptoms were more likely than others to be interested in taking part in this study. Similarly, the sample overall appears to show signs of high insomnia symptoms and poor sleep quality (e.g., approximately 34% taking at least 31 minutes to fall asleep) which could reflect the self-selecting nature of the sample. These factors should be considered when interpreting the results. Likewise, the self-reported sleep durations of the sample ranged from three to 12 hours, indicating considerable variability among participants. This variability could pose challenges as it may not accurately represent the broader populations' sleep duration.

Furthermore, extreme values (e.g., those reporting sleeping for 12 hours) might have distorted statistical analyses and potentially biased results. This issue persists even though other extreme outliers (e.g., 23 hours and 45 minutes) were excluded from the analyses.

Third, other phenomena that may contribute to these beliefs were not assessed (e.g., dissociative phenomena; other forms of sleep-related hallucinations). Fourth, as most participants identified as White, the results may not generalise across different groups. Future work should attempt to recruit from a more diverse sample. Finally, the measures were all self-report, and future work examining some of the sleep variables (such as sleep efficiency) using objective measures would be valuable.

5.7 Clinical / Practice implications

Results from the current study may help clinicians avoid misdiagnosis when they are faced with patients endorsing OPEPB. Reports of paranormal activity or anomalous beliefs could be mistaken as prima facie evidence for more severe disorders, such as schizophrenia, schizotypal personality disorder, or depression with psychotic features (American Psychiatric Association, 2013; Bastien et al., 2001; Waters et al., 2016). The results provided here may encourage clinicians to assess for relevant sleep disturbances and parasomnias in addition to other forms of psychopathology. Clearly, accurate differential diagnosis could have important treatment implications (e.g., a course of CBT for either insomnia or ISP versus antipsychotic medications and supportive psychotherapy).

Additionally, knowledge of the potential clinical contributions to ostensibly paranormal beliefs – and their lack of rarity in the population – could allow providers to more effectively support their patients by enhancing their understanding and familiarity with the topic, as well as offer possible explanations for their reported experiences. More generally, psychoeducation may help reduce the overall prevalence of beliefs that some find frightening (e.g., belief in ghosts).

5.8 Conclusion

In summary, our findings demonstrate that there are significant associations between a wide range of paranormal beliefs and sleep variables. To our knowledge, we are the first to investigate and report associations between a relatively broad spectrum of anomalous and sleep-related variables using a large international study sample. The study findings can help support patients' experiences by increasing healthcare practitioners' understanding with regards to people reporting such events. In addition, these findings may decrease misdiagnosis of psychiatric disorders that share similar features with various sleep variables. Despite these interesting findings, it is essential to replicate results before strong conclusions can be drawn. Therefore, in the next chapter, we attempt to replicate these results in a different sample.

Chapter 6: The Associations between Paranormal Beliefs and Sleep Variables: A Replication Study

This chapter was published as a supplementary file related to the following paper: The associations between paranormal beliefs and sleep variables (presented in Chapter 5).

6.1 Abstract

Chapter 5 revealed associations between ISP, EHS, as well as subjective sleep quality variables and paranormal beliefs. In this chapter, we attempted to replicate these findings in order to strengthen confidence in the results. A total of 1928 participants took part in the study and provided information on demographics, sleep disturbances, and paranormal beliefs. There was a statistically significant association between belief in a devil and insomnia symptoms. Furthermore, reports of EHS and ISP were associated with the belief that communication with the dead is possible, and EHS reports were associated with the belief that the soul lives on after death. While other associations did not reach statistical significance, they generally aligned with the trends observed in Chapter 5. The results obtained in this replication study support some of the findings from Chapter 5, suggesting that there are associations between sleep and the paranormal which deserve further exploration.

6.2 Methods

6.2.1 Participants and Procedure

Data from the ASE Study were included in this chapter. A total of 1928 participants (61.6% female; *mean* age = 34.2, *SD* = 13.6, age range = 18 – 82) took part in the study. Given the replication crisis within psychology (Anvari & Lakens, 2018), in this chapter, we attempted to replicate the findings revealed in Chapter 5 using an existing large-scale dataset containing similar measures of sleep and paranormal beliefs. The survey was advertised on a university mailing list, as well as on lucid dreaming and SP websites and forums. It was described as an investigation into the links between people's experiences of wakefulness and sleep. To be eligible, participants were required to provide informed consent and be at least 18 years old. Ethical approval for the data collection was provided by the University of Sheffield. Further ethical approval was obtained from Goldsmiths, University of London for the secondary data analyses presented here. It took participants approximately 30 minutes to complete the survey.

6.2.2 Questionnaire items

Sleep variables

SP was measured using the 42-item Waterloo Unusual Sleep Experiences Questionnaire - VIIa (WQ; Cheyne, 2002). Frequency of SP was measured on a seven-point scale (0 = never to 6 = several times a week). EHS frequency was measured using one item from the Munich Parasomnia Screener (MUPS), also ranging from 0 (Never) to 6 (Every or almost every night; Fulda et al., 2008). SP and EHS responses were dichotomised into "Yes" and "No".

Insomnia was measured using the Sleep Condition Indicator (SCI; Espie et al., 2014), ranging from 0 to 32 (higher scores indicative of better sleep). Sleep latency was measured with the following item from the SCI: "*how long does it take you to fall asleep?*" and ranged from "greater than or equal to 61 min = 0" to "0 – 15min = 4". Greater scores indicated shorter sleep latency. To match with Chapter 5, sleep latency was treated as an ordinal continuous variable. An ordinal variable with five or more levels can be treated as continuous without causing any harm to the analyses (Beauducel & Herzberg, 2006; Johnson & Creech, 1983; Sullivan & Artino, 2013). Participants were also asked to indicate whether they had been diagnosed with narcolepsy and epilepsy.

Paranormal beliefs

Paranormal beliefs were measured using the 26-item revised Paranormal Belief Scale (PBS; Tobacyk, 2004). Three paranormal belief items were similar to those included in Chapter 5 and were therefore included in this study (the soul continues to exist though the body may die; there is a devil; it is possible to communicate with the dead). In Chapter 5, participants rated their agreement with paranormal beliefs on a scale ranging from 1 (Definitely not) to 5 (Definitely yes). To align with the methodology of Chapter 5, certain response categories were combined in this replication study : "moderately disagree" and "slightly disagree" were merged, as were "moderately agree" and "slightly agree". Consequently, the scale now comprises five levels instead of seven. This adjustment was made to maintain consistency with Chapter 5, allowing for comparable analyses.

6.2.3 Statistical analysis

Multiple regressions and chi-square analyses were run to investigate the associations between the paranormal beliefs and sleep variables. For post hoc testing following chi-square analyses, a corrected p-value was applied using the Bonferroni correction, resulting in a significance threshold of .005 (.05/10 comparisons). Age and gender were controlled for in the multiple regression analyses.

6.3 Results

6.3.1 Sample composition and descriptive statistics

Most participants were White (79.9%), followed by mixed ethnicity (7.7%), and Asian (7.2%). The remaining were Black (1.9%) and "other" (3.2%). After excluding individuals reporting diseases and disorders with potentially overlapping symptoms with SP and EHS (i.e., narcolepsy and epilepsy), ISP and EHS were reported in 64.3% and 49.2% of the sample, respectively. Note that the exclusions only applied to analyses involving ISP and EHS. Overall, the sample reported insomnia symptoms with a mean of 19.7 (*SD* = 7.9) and scored a sleep latency mean of 2.8 (*SD* = 1.3), which suggests that most individuals took approximately 16 to 45 minutes to fall asleep.

Of the participants, some strongly believed that (i.e., responded "strongly agree") the soul lives on after death (26.1%, n = 363), that there is a devil (10.9%, n = 151), and that it is possible to communicate with the dead (7.8%, n = 109). See Table 7 for detailed information on descriptive statistics. Table 8 shows a correlation matrix of all relevant variables.

Table 7

Descriptive Statistics

Variable	Categories	*N*	%
Gender	Female	1199	61.6
	Male	748	38.4
Ethnicity	White	1535	79.9
	Mixed/Multiple ethnic groups	148	7.7
	Asian/Asian British	138	7.2
	Black/Black British	37	1.9
	Other	62	3.2
The soul continues to exist though the body may die	Strongly Disagree	330	23.7
	Moderately/Slightly Disagree	120	8.6
	Uncertain	329	23.6

	Moderately/Slightly Agree	250	18.0
	Strongly Agree	363	26.1
There is a devil	Strongly Disagree	776	55.9
	Moderately/Slightly Disagree	166	12.0
	Uncertain	183	13.2
	Moderately/Slightly Agree	113	8.1
	Strongly Agree	151	10.9
It is possible to communicate with the dead	Strongly Disagree	586	42.1
	Moderately/Slightly Disagree	186	13.4
	Uncertain	281	20.2
	Moderately/Slightly Agree	231	16.6
	Strongly Agree	109	7.8
Sleep latency	0 - 15 min	641	37.9
	16 – 30 min	484	28.6

	31 – 45 min	262	15.5
	46 – 60 min	139	8.2
	Greater than or equal to 61 min	167	9.9
Sleep paralysis frequency	Never	618	35.0
	Once	156	8.8
	Several times in life	472	26.7
	Several times a year	263	14.9
	Monthly	149	8.4
	Weekly	61	3.5
	Several times a week	47	2.7
Exploding head syndrome frequency	Never	849	50.7
	Observed years ago, not any more	147	8.8
	Less than once a year	182	10.9
	Once or several times a year	306	18.3
	Once or several times a month	124	7.4
	Once or several times a week	49	2.9
	Every or almost every night	16	1.0

Sleep paralysis	Yes		1148	65.0
	No		618	35.0
Exploding head syndrome	Yes		824	49.3
	No		849	50.7

	Range	*N*	Mean *(SD)*
Age	18 – 82	1975	34.2 *(13.6)*
Insomnia symptoms	0 – 32	1689	19.7 *(7.9)*

Note. Sleep latency was treated as a continuous variable. Note that the descriptive statistics are reported for the entire sample. Idiopathic cases of exploding head syndrome and isolated sleep paralysis were reported by 807 and 1114 participants, respectively.

Table 8

Correlations, Effect Sizes, and Significance between Core Variables

	1	2	3	4	5	6	7
1. Insomnia	1						
2. Sleep latency	**.58**	1					
3. ISP (no, yes)	**-.16**	**-.07**	1				
4. EHS (no, yes)	**-.14**	**-.06**	**.20**	1			
5. Soul after death	.01	-.01	.02	**.06**	1		
6. Devil exists	-.05	-.04	.04	.05	**.56**	1	
7. Communicate with dead	-.03	-.02	**.08**	**.09**	**.66**	**.43**	1

Note. Correlations/associations in bold indicate statistical significance. ISP = isolated sleep paralysis; EHS = exploding head syndrome; item 2 as well as 5 to 7 were treated as ordinal variables; sleep latency (item 2) includes five categories ranging from '0 to 15 minutes' to 'greater than or equal to 61 minutes'; paranormal beliefs (5, 6, and 7) include five categories ranging from 'strongly disagree' to 'strongly agree'; item 1 (insomnia) is a continuous variable and ranges from 0 to 32, with higher scores indicating less insomnia symptoms (i.e., better sleep). ISP and EHS are the only binary variables (no, yes) in the table. Correlations between continuous vs ordinal variables are reported using Spearman's rank correlation coefficient; Correlations between continuous vs binary variables are reported using Point-biserial correlations; Strength of associations between two binary variables are reported using Cramer's *V*; Correlations between binary vs ordinal variables are reported using Point-biserial correlations; Correlations between two ordinal variables are reported using Spearman's rank correlation coefficient.

6.3.2 Multiple regressions: paranormal beliefs and sleep quality variables

Multiple regressions (Table 9) were run to predict sleep quality variables (i.e., insomnia and sleep latency) from paranormal beliefs, controlling for age and gender. Results of the multiple linear regressions indicated that the model including belief in the devil was a significant predictor of insomnia (F (3, 1359) = 12.55, p = .038). Specifically, a stronger belief in the existence of a devil was negatively associated with SCI score. Similar patterns to those found in Chapter 5 were revealed for the other associations (expect for soul lives on after death and insomnia) although they were non-significant. This may be because this replication study had a smaller sample size.

Table 9

Prediction of Sleep Variables from Paranormal Beliefs

Paranormal beliefs	*B*	SEb	Beta	*t*	*p*	f^2
Insomnia						
Soul lives on after death	.11	.14	.02	.79	.432	
Devil exists	-.31	.15	-.06	-2.08	.038*	.02
Communicate with the dead	-.06	.16	-.01	-.38	.701	
Sleep Latency						
Soul lives on after death	-.01	.02	-.02	-.62	.538	
Devil exists	-.04	.03	-.05	-1.76	.079	
Communicate with the dead	-.02	.03	-.02	-.59	.558	

Note. Dependent variables: insomnia and sleep latency. Independent variables: soul lives on after death, devil exists, communicate with the dead. Insomnia ranges from 0 to 32. Higher scores are indicative of better sleep (fewer insomnia symptoms). Sleep latency ranges from 0 to 5. Higher scores indicate shorter sleep latency. Although majority of the associations are non-significant, they do show similar patterns to Chapter 5 (apart from soul lives on after death vs insomnia). Age and gender are controlled for. f^2 = effect size (Cohen's f^2). Adjusted R^2 for the association between insomnia and belief that a devil exists is .025.
* $p < .05$

6.3.3 Associations between paranormal beliefs and EHS, ISP

Chi-square tests of independence were performed to examine the relation between paranormal beliefs and sleep variables (i.e., EHS and ISP). Please see Table 10. EHS was found to be significantly associated with the belief that the soul lives on after death ($\chi^2(4, N = 1359) = 13.78$, $p = .008$). Post-hoc comparisons showed that those reporting EHS (vs. non-EHS) were more likely to strongly agree with the belief that the soul lives on after death (Table 11). In addition, EHS and ISP were significantly associated with the belief that it is possible to communicate with the dead ($\chi^2(4, N = 1359) = 19.65$, $p = .001$ and $\chi^2(4, N = 1361) = 9.73$, $p = .045$, respectively). Post-hoc comparisons showed that participants reporting EHS (vs. non-EHS) and ISP (vs. non-ISP) were more likely to strongly agree with the belief that it is possible to communicate with the dead (Table 12).

Table 10

Descriptive Statistics of Paranormal Beliefs across Exploding Head Syndrome and Isolated Sleep Paralysis: Chi-Square Analysis

	Exploding Head Syndrome				
	Yes n(%)	No n(%)	$\chi^2(4)$	*p*	*V*
Soul lives on after death					
Strongly disagree	148 (*22.2)*	172 *(24.9)*	13.78	.008*	.10
Moderately/Slightly disagree	63 *(9.4)*	55 *(7.9)*			
Uncertain	138 *(20.7)*	185 *(26.7)*			
Slightly/Moderately agree	120 *(18.0)*	124 *(17.9)*			
Strongly agree	198 *(29.7)*	156 *(22.5)*			
Total	667 *(100%)*	692*(100%)*			
Devil exists					
Strongly disagree	357 (53.*5)*	403 (58.*4)*	3.74	.443	
Moderately/Slightly disagree	82 *(12.3)*	79 *(11.4)*			

Uncertain	94 *(14.1)*	85 *(12.3)*			
Slightly/Moderately agree	56 *(8.4)*	56 *(8.1)*			
Strongly agree	78 *(11.7)*	67 *(9.7)*			
Total	667 *(100%)*	690 *(100%)*			
Communicate with the dead					
Strongly disagree	256 *(38.4)*	316 *(45.7)*	19.65	.001*	.01
Moderately/Slightly disagree	99 *(14.8)*	81 *(11.7)*			
Uncertain	124 *(18.6)*	153 *(22.1)*			
Slightly/Moderately agree	122 *(18.3)*	104 *(15.0)*			
Strongly agree	66 *(9.9)*	38 *(5.5)*			
Total	667 *(100%)*	692 *(100%)*			

	Isolated Sleep Paralysis				
	Yes n(%)	No n(%)	$\chi^2(4)$	*p*	*V*

Soul lives on after death					
Strongly disagree	189 (*22.7*)	132 *(25.0)*	2.71	.608	
Moderately/Slightly disagree	71 *(8.5)*	47 *(8.9)*			
Uncertain	206 *(24.8)*	117 *(22.1)*			
Slightly/Moderately agree	143 *(17.2)*	101 *(19.1)*			
Strongly agree	222 *(26.7)*	132 *(25.0)*			
Total	831 *(100%)*	529 *(100%)*			
Devil exists					
Strongly disagree	448 *(54.0)*	312 *(59.1)*	4.86	.302	
Moderately/Slightly disagree	107 *(12.9)*	54 *(10.2)*			
Uncertain	112 *(13.5)*	*67 (12.7)*			
Slightly/Moderately agree	67 *(8.1)*	45*(8.5)*			
Strongly agree	95 *(11.5)*	50 *(9.5)*			
Total	829 *(100%)*	528 *(100%)*			
Communicate with the dead					
Strongly disagree	326 (39.*2)*	246 *(46.4)*	9.73	.045*	.09
Moderately/Slightly disagree	116 *(14.0)*	65 *(12.3)*			

Uncertain	171 *(20.6)*	106 *(20.0)*
Slightly/Moderately agree	144 *(17.3)*	83 *(15.7)*
Strongly agree	74 *(8.9)*	30 *(5.7)*
Total	831*(100%)*	530*(100%)*

Note. V = Cramer's V; $\chi^2(4)$ = 4 degrees of freedom. Corrected p-values for post-hoc analyses for the statistically significant results are presented in Tables 11 and 12.
* $p < .05$

Table 11

Chi-Square Post Hoc Tests Using the Bonferroni Adjustment: Exploding Head Syndrome and Soul Living on After Death

	Exploding Head Syndrome				
	Yes	No	$\chi^2(1)$	*p*	*V*
	n*(%)*	n*(%)*			
Strongly disagree	148 *(69.8)*	172 *(75.4)*	.90	.185	
Moderately/Slightly disagree	64 *(30.2)*	56 *(24.6)*			
Strongly disagree	148 *(51.4)*	172 *(47.6)*	.49	.343	
Uncertain	140 *(48.6)*	189 *(52.4)*			
Strongly disagree	148 *(54.6)*	172 *(57.5)*	7.73	.484	
Slightly/Moderately agree	123 *(45.4)*	127 *(42.5)*			
Strongly disagree	148 *(41.8)*	172 *(52.4)*		.005*	.11
Strongly agree	206 *(58.2)*	156 *(47.6)*			

Moderately/Slightly disagree	63 *(31.0)*	55 *(22.5)*	4.11	.043	
Uncertain	140 *(69.0)*	189 *(77.5)*			
Moderately/Slightly disagree	63 *(33.9)*	55 *(30.2)*	.56	.453	
Slightly/Moderately agree	123 *(66.1)*	127 *(69.8)*			
Moderately/Slightly disagree	63 *(23.4)*	55 *(26.1)*	.45	.504	
Strongly agree	206 *(76.6)*	156 *(73.9)*			
Uncertain	138 *(52.9)*	185 *(59.3)*	2.38	.123	
Slightly/Moderately agree	123 *(47.1)*	127 *(40.7)*			
Uncertain	138 *(40.1)*	185 *(54.3)*	13.73	<.001*	.14
Strongly agree	206 *(59.9)*	156 *(45.7)*			
Slightly/Moderately agree	120 *(36.8)*	124 *(44.3)*	3.50	.061	
Strongly agree	206 *(63.2)*	156 *(55.7)*			

Note. p-value after Bonferroni's correction = .005 (original p-value .05/10 comparisons). $\chi^2(1)$ = the number within the parentheses indicated the degrees of freedom. Percentages reported in this table are artificially computed due to pairwise comparisons. Please look at the original chi square tables with all six response options for correct percentages.
* $p \leq .005$

Table 12

Chi-Square Post Hoc Tests Using the Bonferroni Adjustment: Exploding Head Syndrome, Isolated Sleep Paralysis, and Communicating with the Dead

	Exploding Head Syndrome				
	Yes n*(%)*	No n*(%)*	$\chi^2(1)$	*p*	*V*
Strongly disagree	256 *(72.1)*	316 *(78.6)*	4.31	.038	
Moderately/Slightly disagree	99 *(27.9)*	86 *(21.4)*			
Strongly disagree	256 *(66.8)*	316 *(74.9)*	.02	.903	
Uncertain	124 *(32.6)*	106 *(25.1)*			
Strongly disagree	256 *(67.4)*	316 *(74.9)*	5.52	.019	
Moderately/Slightly agree	124 *(32.6)*	106 *(25.1)*			
Strongly disagree	256 *(78.3)*	316 *(89.3)*	15.24	<.001*	.15
Strongly agree	71 *(21.7)*	38 *(10.7)*			

Moderately/Slightly disagree	99 *(43.8)*	81 *(34.5)*	4.22	.040	
Uncertain	127 *(56.2)*	154 *(65.5)*			
Moderately/Slighlty disagree	99 *(44.4)*	81 *(43.3)*	.05	.826	
Moderately/Slighlty agree	124 *(55.6)*	106 *(56.7)*			
Moderately/Slightly disagree	99 *(58.2)*	81 *(68.1)*	2.88	.090	
Strongly agree	71 *(41.8)*	38 *(31.9)*			
Uncertain	124 *(50.0)*	153 *(59.1)*	4.21	.040	
Moderately/Slightly agree	124 *(50.0)*	106 *(40.9)*			
Uncertain	124 *(63.6)*	153 *(80.1)*	12.99	<.001*	.18
Strongly agree	71 *(36.4)*	38 *(19.9)*			
Moderately/Slightly agree	122 *(63.2)*	104 *(73.2)*	3.75	.053	

Strongly agree	71 *(36.8)*	38 *(26.8)*			

	Isolated Sleep Paralysis				
	Yes n(%)	No (n%)	$\chi^2(1)$	*p*	*V*
Strongly disagree	326 *(72.9)*	246 *(79.1)*	3.77	.052	
Moderately/Slightly disagree	121 *(27.1)*	65 *(20.9)*			
Strongly disagree	326 *(65.1)*	246 *(69.9)*	2.17	.141	
Uncertain	175 *(34.9)*	106 *(30.1)*			
Strongly disagree	326 *(68.8)*	246 *(74.8)*	3.41	.065	
Moderately/Slightly agree	148 *(31.2)*	83 *(25.2)*			
Strongly disagree	326 *(80.5)*	246 *(89.1)*	9.11	.003*	.12
Strongly agree	79 *(19.5)*	30 *(10.9)*			

Moderately/Slightly disagree	116 *(39.9)*	65 *(38.0)*	.16	.694
Uncertain	175 *(60.1)*	106 *(62.0)*		
Moderately/Slighlty disagree	116 *(43.9)*	65 *(43.9)*	.00	.997
Moderately/Slighlty agree	148 *(56.1)*	83 *(56.1)*		
Moderately/Slightly disagree	116 *(59.5)*	65 *(68.4)*	2.17	.140
Strongly agree	79 *(40.5)*	30 *(31.6)*		
Uncertain	171 *(53.6)*	106 *(56.1)*	.29	.587
Moderately/Slightly agree	148 *(46.4)*	83 *(43.9)*		
Uncertain	171 *(68.4)*	106 *(77.9)*	3.96	.047
Strongly agree	79 *(31.6)*	30 *(22.1)*		
Moderately/Slightly agree	144 *(64.6)*	83 *(73.5)*	2.70	.101

Strongly agree	79 *(35.4)*	30 *(26.5)*

Note. p-value after Bonferroni's correction = .005 (original p-value .05/10 comparisons). $\chi^2(1)$ = the number within the parentheses indicated the degrees of freedom. Percentages reported in this table are artificially computed due to pairwise comparisons. Please look at the original chi square tables with all six response options for correct percentages.
* $p < .005$

6.4 Discussion

This chapter aimed to replicate the findings from Chapter 5, particularly in light of the ongoing replication crisis in psychology (Anvari & Lakens, 2018). The findings from the current study align with the results identified in Chapter 5. Regarding subjective sleep quality variables and paranormal beliefs, only the association between the belief in a devil and insomnia symptoms was significant. Specifically, greater endorsement in the belief that there is a devil was associated with worsened insomnia symptoms. While the other associations concerning subjective sleep quality and paranormal beliefs in this chapter did not reach significance, all results, with the exception of the association between the belief in the soul living on after death and insomnia symptoms, conform to the trends identified in Chapter 5.

Additionally, it was observed that reports of EHS and ISP (compared to non-reports) were associated with agreement in the belief that communication with the dead is possible. Moreover, individuals reporting EHS (compared to those without EHS) expressed stronger concurrence with the belief that the soul lives on after death. Although these were the sole findings reaching statistical significance, the remaining associations between EHS, ISP, and paranormal beliefs were in the same direction as observed in Chapter 5.

Combined with the results in Chapter 5, these findings provide support for an association between various sleep variables and specific paranormal beliefs. However, it is crucial to acknowledge that the majority of the findings in this current replication were non-significant, indicating the need for cautious interpretation.

6.5 Limitations

This replication study is not without limitations. First, it is essential to acknowledge that certain effect sizes were notably small (e.g., $f^2 = .02$ and $V = .01$), albeit achieving statistical significance. Therefore, the conclusions and implications drawn from the findings should be approached with caution, recognising the limited magnitude of these effects. Furthermore, the combination of two categories into a single category (i.e., slightly agree and moderately agree) might have resulted in the loss of valuable nuanced data unique to each of the distinct response groups. Thus, the interpretations of the results should be tempered with an awareness of this simplification. In essence, these limitations underscore the need for a careful consideration of the study's findings, taking into account the small effect sizes and potential data simplification to ensure a comprehensive understanding of the research findings.

It is important to take into account the disparities between study 1 (presented in Chapter 5) and study 2 (this replication study), as they could have impacted the outcomes. Notably, the time required to complete each survey varied (ranging from 10 to 20 minutes for study 1 and up to 30 minutes for this current study). It is possible that participants in this study may have experienced waning interest due to the extended duration, potentially affecting their engagement with the survey, particularly the latter questions. Moreover, despite both studies examining similar aspects (such as insomnia symptoms, SP, belief that a demon/devil exists), they employed different measurement tools. For example, Chapter 5 utilised the ISI (Morin et al., 2011) for insomnia symptom assessment, whereas this study used the SCI (Espie et al., 2014). Discrepancies in measurement methods and question phrasing could have also influenced participants' responses.

6.6 Conclusion

In conclusion, this replication study provides data that allows cautious support for certain associations between sleep variables and paranormal beliefs, consistent with those identified in Chapter 5. Nevertheless, it is crucial to note that not all of these associations reached statistical significance, emphasising the need for cautious interpretation of the results.

Next chapter

In this and the previous chapter, we have demonstrated some associations between sleep variables and paranormal beliefs. This exploration has advanced our understanding of how specific beliefs may interact with different aspects of sleep. Despite our comprehensive assessment of paranormal beliefs as an example of beliefs held often regardless of scientific support, there are other variables that fit this description, such as religious beliefs (Staddon, 2013). To broaden our current insights, we shift our focus to exploring associations between sleep and religion. Indeed, in the next two chapters, we will explore the associations between SP/ISP, religious faith, and religious belief systems. Previous research suggests a potential association between the paranormal beliefs and religious beliefs (Lindeman & Svedholm-Häkkinen, 2016; Tobacyk & Milford, 1983), since both revolve around phenomena that are inherently beyond the scope of current scientific understanding or knowledge (Sen & Yesilyurt, 2014; Staddon, 2013). Notably, measurements of paranormal belief frequently encompass elements closely aligned with religious concepts. For instance, the Revised Paranormal Belief Scale (RPBS; Tobacyk, 2004) includes questions pertaining to faith in God, the existence of heaven and hell, and the notion of the soul persisting after bodily death – all of which are also present in various religious beliefs (Atkinson & Bourrat, 2011). Given the parallels and overlaps between paranormal and religious beliefs, it is fitting to embark on a deeper exploration of the association between religion and sleep. Therefore, Chapter 7 serves as a pilot study, laying the crucial groundwork for the subsequent main study. Chapter 7 aims to ascertain the feasibility of a larger study, while the central objective of Chapter 8 is to acquire a better understanding of the associations between ISP and religious faith, and religious belief systems, which could help in the development of more personalised interventions and support for individuals who struggle with SP.

Chapter 7: An Investigation into the Associations between Religiosity and Sleep Paralysis: A Pilot Study

7.1 Abstract

Our previous work has examined the links between paranormal beliefs and sleep. Here, we extend our focus to explore the associations between religion and SP. Previous research has investigated the association between religion and SP. However, religious faith has sometimes been measured using a one-single item, not fully gauging the veracity of religious faith. In order to examine the relationship between SP and religious faith, a pilot study was conducted to test the appropriateness of the methodology before running a more extensive study on this topic. Participants (*n* = 96) completed an online questionnaire, answering items about SP, religious belief system, religious faith, and help-seeking behaviours. Those reporting SP (vs. those who did not) reported greater religious faith. Furthermore, the majority of those who reported SP reported moderate or above levels of fear in conjunction with the episodes and distress as a result of the episodes. The pilot study demonstrated the effectiveness of the methodology, as indicated by the feedback systematically collected from participants. The feedback analysis revealed no major concerns regarding the questionnaire items, overall supporting progression onto the main study (see Chapter 8). The results presented here also suggest that there is a significant association between SP and religious faith. In addition, those reporting episodes of SP report feelings of significant clinical fear during and as a result of an episode (72.9%). Given that no concerns were raised about the current pilot study and the interesting preliminary associations reported, future research should build upon it in an attempt to replicate findings, and there should be an enhanced larger-scale survey (see Chapter 8).

7.2 Introduction

As outlined in Chapter 1, paranormal and religious beliefs exhibit both similarities and differences (Orenstein, 2002; Tobacyk & Milford, 1983). At their core, both paranormal and religious beliefs involve interpretations of phenomena that extend beyond the boundaries of empirical observation and conventional scientific understanding (French & Stone, 2013; Schilbrack, 2013). They provide structures to engage with existential questions, pursue meaning and purpose of life, and explore the mysteries of the unknown (Galek et al., 2015). However, notable distinctions also exist between these two concepts. For example, religious beliefs are typically derived from sacred books and authoritative religious figures, implying a collective and global adherence that shapes moral behaviour (Williams et al., 2009). Paranormal beliefs, on the other hand, may emerge from personal experiences and anecdotal accounts, reflecting a more individualistic and exploratory approach to understanding phenomena (Holt et al., 2017). Another potential difference between the two, which relates to the previous point, is the longstanding cultural and historical presence of religious beliefs. This societal legitimacy may provide a degree of normalisation and validation to religious beliefs, in contrast to paranormal beliefs, which may lack the widespread recognition seen in religious beliefs (Williams et al., 2009).

7.2.1 Religious faith

The literature on the role of religion on various facets of life has been remarkably inconsistent throughout history. Some studies have underscored the benefits of religious faith (Babamohamadi et al., 2015; Gillum & Ingram, 2006; Molteni et al., 2021; Plante et al., 2000; Seeman et al., 2003) while others have found less favourable associations between religion and different life domains (Ellison et al., 2011; Haynes, 2010; Murray et al., 2007; Park et al., 2012).

Studies highlighting benefits of religion include those showing that religion is associated with positive outlooks on life. For example, Plante et al. (2000) investigated the relationship between self-reported religious faith and psychological functioning in 342 university students and found that strength of religious faith was significantly associated with optimism, experiencing meaning in life, coping with stress, and viewing life as a positive challenge. Other studies have also reported similar findings (Babamohamadi et al., 2015; Gillum & Ingram, 2006; Seeman et al., 2003). In addition to psychological factors, religious faith has also been shown to be associated with positive sleep outcomes. This was demonstrated in a study examining religion and sleep quality which included 1,774 adult participants (Krause & Ironson, 2017). In essence, the findings showed that individuals who were more hopeful about the future (a belief found to be common in people with a strong sense of God-mediated control) reported higher sleep quality. However, church attendance was not found to be associated with sleep quality, suggesting that some aspects of religion may be more conducive to better sleep outcomes than others.

Despite these positive effects (Molteni et al., 2021; Plante et al., 2000), it is important to acknowledge that religion has also been associated with less favourable outcomes, such as obsessive-compulsive disorder (Park et al., 2012) and overall dissatisfaction with life (Murray et al., 2007). For instance, in a cohort study of 8318 respondents, religious individuals were found to be more likely to experience an episode of major depression over a 12-month period compared to non-religious individuals (Leurent et al., 2013). Furthermore, religiosity has been reported as a hindrance to seeking professional help for mental health issues (Haynes, 2010). With regards to sleep outcomes, Adam and colleagues (2007) investigated the associations between sleep behaviours and demographic characteristics in a sample of 2,454 children aged

5 to 19. The findings indicated that, for both younger and older children, an increased duration of engagement in religious activities was associated with a reduction in overall sleep time. Overall, these studies highlight positive and negative associations between religion and psychological factors as well as sleep outcomes. However, it is uncertain whether these findings extend to SP. Therefore, a pilot study examining religion in relation to SP would be necessary before proceeding with a larger-scale investigation.

7.2.2 Religiosity and supernatural attribution to SP

A couple of studies have found associations between SP and religion (Jacobson, 2009; Jalal et al., 2021; Jalal & Hinton, 2013). For example, Jalal, Sevde Eskici et al. (2021) reported that among 59 predominately Muslim students in Turkey, ten (17%) believed their SP episodes might have been caused by the Karabasan. Similarly, Jalal and Hinton (2013) discovered that attributing supernatural causes to SP was associated with higher levels of religiosity. For a more comprehensive review of the literature, see Chapter 1 section 1.15.

7.2.3 Religion-specific prevention and/or disruption techniques

Earlier studies have explored religion-specific techniques in relation to sleep (Cheyne & Pennycook, 2013; Jalal, Sevde Eskici, et al., 2021; Ramsawh et al., 2008). For example, prayer has been shown to be associated with self-reported good sleep quality (Ellison et al., 2011) and lower sleep disturbances (Britt et al, 2022). Regarding religious techniques and SP, research indicates that participants employ religious methods such as reciting the Quran (Jalal, Sevde Eskici, et al., 2021), reading the Bible (Ramasawh et al., 2008), and engaging in prayer (Ohaeri et al., 2004; Ramsawh et al., 2008) to prevent SP episodes. For a more extensive review of the literature regarding religion-specific coping techniques in the context of sleep and SP, please refer to Chapter 1, section 1.17. While past research has offered valuable insights, an assessment of the perceived effectiveness of these coping techniques has remained unexplored.

Therefore, this pilot study is designed to evaluate the feasibility of introducing a questionnaire item that allows participants to rate the effectiveness of their reported religion-specific techniques in managing SP. This initial step is instrumental in the development and design of a larger-scale investigation.

Despite the informative work that has been conducted about the associations between SP and religion (Hufford, 2005; Jalal, Sevde Eskici, et al., 2021; Jalal & Hinton, 2013), to our knowledge, many of the studies to date are based on cultural interpretations, include one-single item assessments of religion, and consist of relatively small sample sizes. As far as we are aware, there are currently no large studies that have comprehensively examined SP as well as other sleep variables with a specific focus on religion. Furthermore, previous studies have also been limited to specific regions and ethnic groups, making generalisations difficult. Therefore, this pilot study aims to assess the feasibility of conducting a larger study that examines religious faith, religious belief systems, and their association with SP. Moreover, the findings of this pilot study will enable us to potentially modify, improve, or refine the methodology to ensure the larger study is as good as it can be.

In summary, the primary aim of this pilot study was to assess the feasibility and appropriateness of the study's questionnaire, methodology, and recruitment process, laying the groundwork for a larger, fully powered investigation. As part of this feasibility assessment, the study also aimed to explore research questions related to the associations between SP and religion, and to see whether religious groups differ from each other, and from the non-religious, regarding the frequency, interpretation and coping mechanisms associated with SP. The exploration of these questions aimed to provide insights into potential challenges and nuances, contributing to the overall assessment of the study's feasibility. With this in mind, we aim to address the following research questions:

1. Is there an association between level of religious faith and likelihood of experiencing SP?

2. Are there any differences between religious groups in terms of the percentage of those reporting SP?

3. Is level of religious faith associated with interpretations of SP?

4. Are there group differences between religious groups in terms of percentages of those endorsing different interpretations for SP?

5. Is there an association between level of religious faith and techniques used to prevent/disrupt SP episodes?

6. Are there differences between religious groups in terms of percentages of those using different techniques to prevent/disrupt SP episodes?

7. How effective are religion-specific techniques perceived to be to prevent and/or disrupt SP episodes?

8. Are there any differences between religious groups in terms of fear during the episode, as well as distress and interference as a result of an episode?

9. Are there any differences between religious groups in terms of telling someone about their SP?

10. Are there any differences between religious groups in terms of seeking professional support?

The pilot study incorporated an extensive set of research questions, recognising that such inclusivity could potentially result in a lengthy and intricate result section. This intentional decision, while acknowledging the challenge of handling numerous questions, played a pivotal role in shaping and directing the subsequent main study presented in Chapter 8. The exhaustive set of research questions in the pilot study served as the foundation for formulating pertinent and well-worded research questions for the main study.

The goal of this research is to lay the groundwork for larger-scale research that can eventually help inform behavioural interventions aimed at addressing SP. If SP is associated with religious faith and/or religious belief systems, the initial step in the process is to replicate the results with a more extensive sample size. By doing so, researchers can further explore the impact of religion on SP and examine whether it should be considered when designing interventions to manage the condition.

7.3 Methods

7.3.1 Procedure

In this cross-sectional pilot study, a total of 96 participants (selected through an opportunity sample) were recruited. Recruitment took place through a lecture presented at Goldsmiths, University of London, where participants were given an overview of the study. The study was described as an investigation into various variables, encompassing religiosity and sleep. Participants who were marked as having falsely finished the study (i.e., took just a few seconds to complete the study or did not complete the study at all as identified through Qualtrics) were excluded from all analyses (N = 13).

7.3.2 Measures

Religion

Religious affiliation ("*What is your current religion, if any?*") was assessed using the same items as those used in Census England (ONS, 2022). Participants were provided with a list of religions to choose from, including Atheist, Agnostic, Christian, Buddhist, Hindu, Jewish, Muslim, and Sikh. Additionally, participants had the option to specify any other religion not included in the provided list. Religious belief systems were assessed and because of the small numbers endorsing certain groups, categories were subsequently combined into three belief systems (i.e., atheists, agnostics, and religious). A separate construct – religious faith (e.g., "*My religious faith is extremely important to me*", *"I look to my faith as a source of inspiration"* and *"My faith impacts many of my decisions"*), was assessed by the reliable and valid 10-item Santa Clara Strength of Religious Faith Questionnaire (*SCSORFQ*; Plante & Boccaccini, 1997a, 1997b), with each item ranging from 1 (strongly disagree) to 4 (strongly agree). Scores from the 10 items were added, making up a total score, with higher scores reflecting greater religious faith (theoretical range 10 – 40; Cronbach's alpha: .95).

SP

Prevention and disruption techniques for SP (e.g., "*Do you ever do anything to try to prevent these episodes from occurring?"*) were assessed. Those who responded "yes" to preventing/disrupting episodes were asked to choose up to two prevention and two disruption techniques from a list of techniques, with the first technique being considered their 'primary method'. If one technique was chosen as the primary method, it could not be selected as the 'secondary method'. Additionally, participants had the option to list any techniques that were not included in the provided list using an open text response box. Perceived effectiveness for each technique was rated using a slider ranging from 0% (Does not work at all) to 100% (Works extremely well).

Furthermore, participants who reported experiencing SP were asked questions about whether they had disclosed these experiences to anyone, and if so, to whom "*Have you ever told anyone about these experiences? If so, whom*?". They were also asked if they had sought professional help for their episodes "*Have you ever sought professional help for sleep paralysis? If so, from whom?*". Fixed responses were provided (e.g., medical professional, religious leader, sleep specialist) as well as free-text opportunities to give answers beyond those provided. Responses were later categorised as “yes” (indicating they had informed someone) and “no” (indicating they had not disclosed their experiences). This categorisation was implemented to facilitate concise data analysis and presentation, particularly as this item was not the primary focus of the study. See Chapter 3 for detailed information regarding SP-related items and their measurements.

Participants’ attitudes and concerns about the questionnaire

Towards the end of the questionnaire, all participants were asked to share their views about the questionnaire through three questions. These items inquired about any additional questions they believed should have been included: *“Were there any questions we did not ask, that you think should have been asked in this questionnaire?”, “Were any of the questions unclear? If so, please specify”, and “Were any of the questions offensive? If so, please specify”*. These questions were asked in order to improve the main study.

7.3.2 Statistical analysis

The analysis of research questions involved the use of independent t-tests, one-way ANOVAs, and chi-square tests. Further details about the statistical analysis can be found in Chapter 3.

7.3.3 Deviation from protocol

In the preregistration, it was stated that multiple religious belief systems would be studied individually. However, due to small sample sizes in some of the religious belief systems (e.g., only n = 1, 1.2% identified as Hindu), we decided to group all religious affiliations together into a single category, which we referred to as “religious”. This group, together with a group of atheists and a group of agnostics were compared. Atheists and agnostics were considered separately given differences between these two groups (atheists do not believe in God; agnostics are unsure about the existence of God; Poidevin, 2010).

7.4 Results

7.4.1 Descriptive statistics

Detailed descriptive statistics are reported in Table 13. Ninety-six students undertaking a psychology course at Goldsmiths, University of London took part in the pilot study. The participants classified themselves as White (42.7%), Asian (28.1%), mixed ethnicity (12.5%), or Black (11.5%). The remaining identified as "other". The sample was primarily female (79.2%), and the sample mean age was 21.03 years (*SD* = 5.44; *range* = 18-52). Most of the participants identified as Muslims (N = 31, 36.5%), Atheists (N = 22, 25.9%), Agnostics (N = 15, 17.6%), or Christians (N = 14, 16.5%). However, due to the low number of participants in certain religious groups (e.g., only one participant identified as either Buddhist, Hindu or Sikh), analyses concerning religious belief systems involved three main categories: atheists, agnostics, and religious (i.e., Christian, Muslim, Buddhist, Hindu, Sikh). On average, the sample scored a mean religious faith of 20.84 *(SD* = 7.60; theoretical range 10 – 40).

SP was reported by more than half of the sample (52.7%), with episodes ranging from once in their lifetime to several times a week. Of those reporting SP, the majority reported clinically significant fear during (72.9%) and after (51.9%) their SP episode(s) (i.e., at least moderate levels of fear/distress). Most participants did not think the episodes interfered with their everyday life (76.9%; i.e., reported no to mild interference).

Table 13

Descriptive Statistics for Relevant Variables

Variable	Categories	*n*	%
Gender	Male	16	16.7
	Female	76	79.2
	Other	4	4.2
Ethnicity	White	41	42.7
	Mixed/Multiple ethnicities	12	12.5
	Asian/Asian British	27	28.1
	Black/Black British/Caribbean/African	11	11.5
	Other	5	5.2
Religious affiliation[a]	Atheist	22	25.9
	Agnostic	15	17.6
	Christian	14	16.5
	Jewish	0	0.0
	Muslim	31	36.5
	Buddhist	1	1.2

	Hindu	1	1.2
	Sikh	1	1.2
Sleep paralysis frequency[b]	Never	43	47.3
	Once	14	15.4
	Twice or several times in my life	16	17.6
	Several times a year	10	11.0
	Monthly	6	6.6
	Several times a week	2	2.2
Sleep paralysis	No	43	47.3
	Yes	48	52.7
Fear during SP[b]	Not at all afraid	2	4.2
	Mildly afraid	11	22.9
	Moderately afraid	19	39.6
	Severely afraid	10	20.8
	Very severely afraid	6	12.5
Post-episode distress[b]	Not at all	13	25.0
	Mild distress	12	23.1
	Moderate distress	18	34.6

	Severe distress	7	13.5
	Very severe distress	2	3.8
Post-episode interference[b]	Not at all	27	51.9
	Mild interference	13	25.0
	Moderate interference	9	17.3
	Severe interference	2	3.8
	Very severe interference	1	1.9
	Range	*N*	**Mean** *(SD)*
Age	18 – 52	96	21.03 (5.44)
Religiosity	10 – 36	69	20.84 (7.60)

Note. SD = standard deviation. SP = sleep paralysis. Only participants reporting SP answered the questions about fear during SP as well as distress and interference is response to SP.
[a] = included an "other" response option which was excluded from analyses. Three main categories were used in analyses concerning religious belief systems: atheist, agnostic, and religious (i.e., Christians, Muslims, Buddhist, Hindu, Sikh).
[b] = included a "don't know" response option which was excluded from analyses.
The theoretical range for religiosity is 10 to 40.

7.4.2 SP, Religious Faith, and Religious Belief System

An independent samples t-test was performed to compare the average religious faith scores of the SP and non-SP groups. The results showed that those who reported experiencing SP reported marginally higher religious faith (M = 22.47, SD = 7.11) than those who did not report SP (M = 18.68, SD = 7.90; $t(63) = -2.04$, p = .046, Cohen's d = .60).

There was no significant association between religious belief system (i.e., atheist, agnostic, religious) and SP (no, yes; X^2 (2, N = 80) = 2.22, p > .05).

7.4.3 Perceived SP aetiology

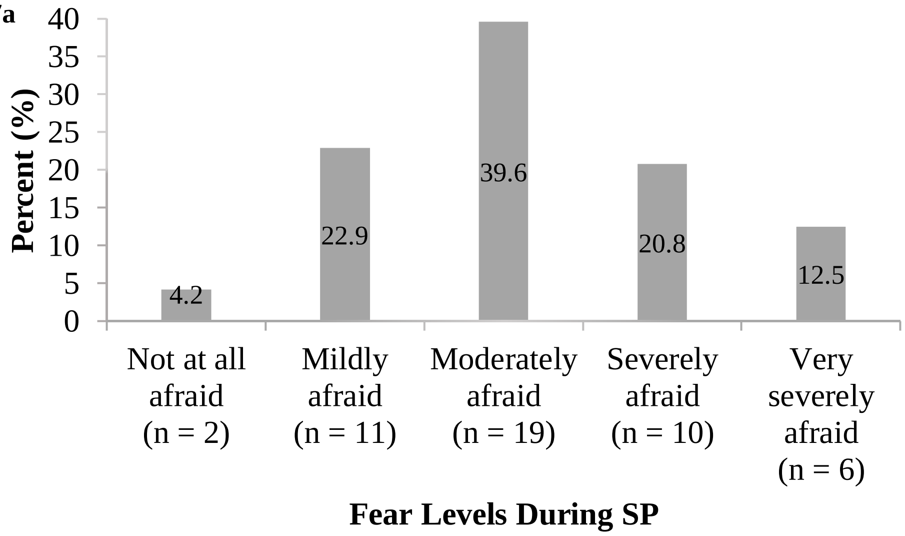
There were no associations between interpretations of SP aetiology and religious faith (p > .05). There was a significant association between the belief that SP is caused by stress and religious belief systems (X^2 (2, N = 85) = 11.27, p = .004, Cramer's V = .36). Post-hoc comparisons with Bonferroni correction applied (p = .008) showed that the belief that SP is caused by stress was more commonly held by agnostics (73.3%) compared to atheists (18.2%; X^2 (1, N = 37) = 11.25, p = .001). No other significant associations between SP aetiologies and religious belief systems were found (p > .05).

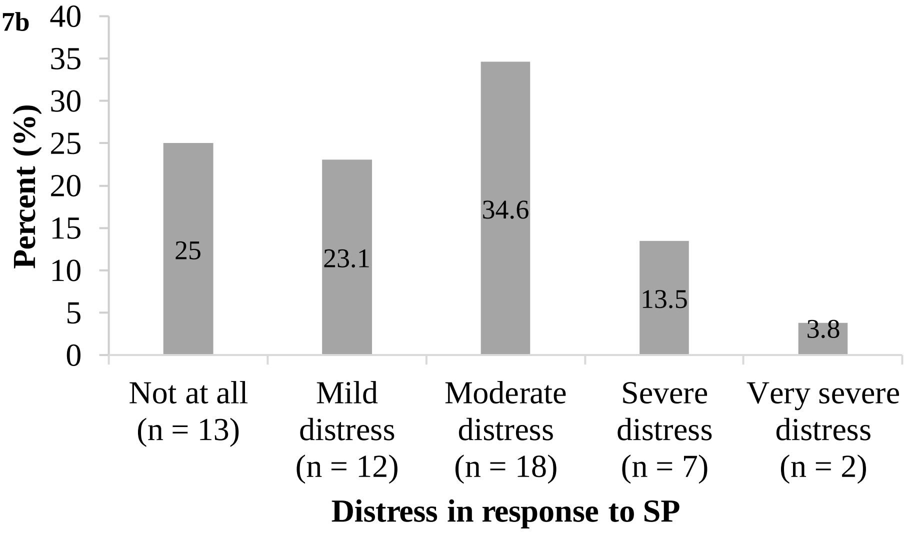
7.4.4 SP-related Fear, Distress, and Interference

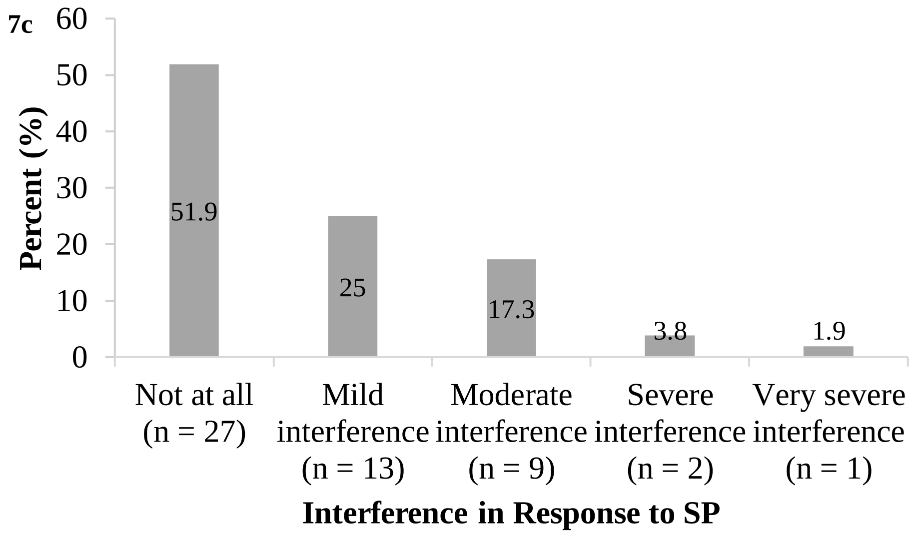
See Figure 7 for distributions of SP frequency in relation to fear, distress, and interference. One-way ANOVAs found no significant differences in fear levels during an SP episode, as well as distress and interference in response to SP across the religious belief systems (p > .05).

Figure 7

Distributions of SP Frequency, Fear, Distress, and Interference

7a


7b




Note. SP = sleep paralysis; figure 7a: fearful SP (those reporting moderate or above levels of fear during SP) was reported in 72.9% (n = 35) participants.

7.4.5 SP-related prevention/disruption techniques, religious faith, and religious belief systems

There were no significant differences in religious faith scores between participants who utilised different prevention/disruption techniques vs those who did not ($p > .05$). There was a significant association between employing physical/bodily action as a primary method to disrupt an episode (vs. not employing) between the religious belief systems (X^2 (2, $N = 85$) $= 14.03$, $p = .001$, Cramer's $V = .41$). Post-hoc tests showed that using physical/bodily action to disrupt an episode was less common in those identifying as agnostics (46.7%) compared to atheists (95.5%; (X^2 (1, $N = 37$) $= 11.53$, $p = .001$). No other associations were found between the utilisation of prevention and disruption techniques and religious belief systems ($p > .05$). See Appendix D Table D1 for perceived effectiveness of using prayer to prevent and disrupt an SP episode.

7.4.6 Help-seeking across the religious affiliations

Of those reporting SP, fifty-one (49.5%) participants answered the question about telling someone about their SP of whom 40 (78.4%) people reported telling someone about their SP experience. Two participants (3.9%) reported seeking help for their SP.

There was no significant association between confiding in someone about one's SP experience (vs. not) and the three religious belief systems ($\chi^2(2, N = 43) = 1.47$ $p = .479$). Likewise, there was no significant association between seeking help for SP and the religious belief systems ($\chi^2(2, N = 43) = 6.10$, $p = .047$; post-hoc pairwise comparisons were $p > .008$).

7.4.7 Participants' views about questionnaire

No significant concerns regarding the survey were raised by the participants, suggesting a generally positive attitude towards the questionnaire. However, in terms of question clarity, three participants mentioned confusion in responding to questions about their religious faith, particularly as they identified as Atheists (e.g., "*After selecting Atheist, some of the follow up questions do not effectively apply*"). No participant found any of the questions offensive and there were no suggestions for additional questions that should have been included.

7.5 Discussion

The current pilot study aimed to investigate the roles of religious faith and religious belief system in relation to SP in 96 UK-based undergraduate. The results of this investigation could be valuable in shaping and assisting future research on a larger scale. We found that participants who reported experiencing SP reported greater religious faith than those who did not report SP. Nonetheless, the three religious belief systems (atheists, agnostics, religious) did not differ in terms of reports of SP, suggesting that an individual's likelihood of reporting SP is not affected by their religious beliefs or lack thereof. It was also found that the belief that SP was caused by stress was a belief more commonly endorsed by agnostics compared to atheists. Using physical/bodily action as a primary method to disrupt an SP episode was more commonly used by atheists compared to agnostics. No other significant differences were found. Regarding the perceived effectiveness of utilising prayer as a means to prevent or disrupt SP episodes, two individuals reported successfully preventing an episode through prayer, with a perceived mean effectiveness of 92.5%. Notably, no participants reported using prayer as the primary technique to disrupt an ongoing SP episode. While all these findings are intriguing, a larger-scale study with more power is needed before strong conclusions can be drawn.

Finally, the absence of significant concerns raised by the participants with regards to the questionnaire items indicates the potential suitability of this study for a larger-scale investigation. However, three participants noted confusion in responding to questions about their religious faith, especially as they identified as Atheist. It was acknowledged as we developed the survey that individuals identifying as Agnostic and Atheists might encounter challenges in completing the SCSORFQ, given that the items were designed with greater relevance to those adhering to a religious group. The questionnaire explicitly clarified that this approach was adopted to facilitate specific statistical analyses. Furthermore, we made sure to emphasise that answering the questions was optional, and participants had the freedom to skip any question if they preferred.

7.5.1 Possible explanations for the association between SP and religious faith

We found that those reporting having experienced SP reported higher levels of religious faith compared to participants who did not report SP. It should be noted, however, that due to the small sample size of this study, definitive conclusions cannot be drawn. Nonetheless, several potential explanations for this finding may be considered. One possible explanation is that people who experience SP may turn to religious faith and practices as a means of coping with the distressing and often unexplainable nature of SP. This is supported by research showing that religious practices and faith can be helpful in situations where individuals feel helpless or lack control (Molteni et al., 2021). Another possibility is that individuals with higher levels of religious faith may experience more fear and anxiety surrounding SP, factors that are known to perpetuate the condition and lead to more frequent episodes of SP (Jalal & Hinton, 2013). Some religions believe in phenomena, such as Jinn, ghosts, and evil spirits which can induce fear in some of their followers (Kabir et al., 2005; Khalifa et al., 2011). Therefore, the visual hallucinations that often accompany SP might resemble some of these religion-specific figures and trigger an emotionally reactive response. Again, future investigation and replication of findings are warranted.

Finally, our results cannot provide information on the direction of effects between the associations between SP and religious faith. However, there may be multiple reasons for this association such as both variables being impacted by personality traits, mental health variables, or life experiences. It is important to further confirm the association between SP and religious faith before exploring potential moderating or mediating factors.

The belief that SP was caused by stress was more commonly endorsed by those identifying as agnostics compared to atheists. This finding needs replication and should be interpreted with caution, because despite being significant, the number of participants in each religious belief system who endorsed this belief was considerably small. Furthermore, the religious belief systems did not differ in terms of fear during an episode, as well as distress and interference as a result of an episode. However, SP episodes were associated with distress, with 72.9% participants reporting moderate or above levels of fear during an episode, and 51.9% reporting post-episode distress. It is of particular interest to examine whether people find solace in religion during and after their SP episode, or if religious beliefs provide challenges for SP experiencers. Moreover, it is noteworthy that only two participants sought help for their SP episodes, indicating that a considerable number of individuals (specifically students in this context) may endure the condition without seeking professional assistance. Given that 72.9% of people report at least moderate levels of fear during an episode, it is concerning that there is silence surrounding an experience that very often is deemed to be frightening. Shame and fear of being perceived as peculiar are two common beliefs among many SP experiencers (Sharpless, 2016), perhaps even more so in religious communities due to a possible strong desire to belong (Gebauer & Maio, 2012). It is therefore of great importance to encourage help-seeking behaviours in the SP population, as it is evident that professional help-seeking behaviours are crucial factors for wellbeing (Xu et al., 2018). To further advance the understanding of these findings, further research should aim to replicate them and explore the factors that influence individuals' decisions to seek help, such as personal attitudes towards mental health and access to healthcare services.

7.6 Limitations and future directions

Undertaking a pilot study is a crucial step in the research process. In our case, the pilot study provided an opportunity to test the feasibility of our research design, procedures, and instrumentation, and to identify and resolve any potential issues before proceeding with the main study. Notably, this pilot study revealed that the initially planned number of research questions lacked sufficient power for comprehensive investigation. As a result, although we decided to maintain the research questions since they offer valuable insight into this topic, we reoriented our focus in the main study to ensure that our research questions are addressed and discussed in depth. This means that we moved away from certain aspects, such as reporting and discussing the frequency of SP-related distress, fear, and interference, as well as the number of individuals who seek help for their SP.

Despite the value of this work in informing the main study, this pilot study is not without limitations. First, the study comprised a student population – a generally homogeneous sample (Peterson, 2001), thus limiting the external validity of our findings. This emphasised the need for the main study to recruit more broadly. More generally, there is a need to recruit various populations to ensure generalisability of findings. Furthermore, participants were recruited exclusively through one lecture, meaning that there was a homogenous group of participants (in that they were all first-year psychology undergraduate students). Furthermore, the lecture covered the topic of sleep which could have impacted answers via priming on responses. In addition, the sample size was small, further challenging the generalisability of the data and the ability to analyse different religious groups. Undoubtedly, a larger sample size would have better elucidated the associations between SP and religion due to enough power to detect effects. Moreover, is it important to consider the potential variation in experiences based on the timing of SP episodes. For example, the impact of experiencing a single SP event during childhood could vary significantly from experiencing a single episode later in life. These discrepancies could arise from differences in psychological, emotional, and physiological responses influenced by developmental stage and life experience. Therefore, considering the age at which SP episodes occur is essential for obtaining a more comprehensive and accurate understanding of this phenomenon. Similarly, differences may arise in terms of whether those experiencing more or less SP episodes when considering if individuals confide in others and if so, whom. For example, individuals experiencing frequent episodes might be more inclined to confide in healthcare professionals compared to those who have only experienced episodes infrequently. Therefore, categorising SP into 'No' and 'Yes' classifications may have overlooked these subtleties.

As evident from the pilot study, the limited numbers within some of the religious groups (e.g., zero identified as Jewish, one as Buddhist, one as Hindu, one as Sikh) prevented an in-depth analysis of differences. Consequently, we combined all religious groups into a single category named "religious". Given the disparity in numbers across various religious groups, future research should consider maintaining this combined grouping approach for more powered analyses. Finally, we are not able make causal inferences due to the nature of the study design. Future work should employ other study designs (e.g., longitudinal) that are better able to provide insight into the cause-and-effect relationships between religious faith, religious belief systems, and SP – although this was outside of the remit of our main paper (Chapter 8) in part because of the time limitations associated with a PhD.

7.7 Implications

This small-scale pilot study plays a key role in the development of a larger-scale study. Its primary purpose was to test the methodology and study questionnaire, and to determine if any adjustments were necessary. The overall feedback indicates that participants were generally comfortable with the questionnaire, signalling that no significant modifications are necessary. As stated above, a small subset of participants (N = 3) who identified as atheists found the subsequent religious faith questions somewhat incongruous. However, this inclusion was essential to facilitate meaningful comparisons among the three religious belief systems. Furthermore, we were able to use the pilot study to gauge how many participants we should recruit for the larger study in order to detect effect sizes which can possibly be used for power analyses for the main study. Besides providing direction for larger studies, this pilot study also yielded some preliminary insights. For example, although not within the primary focus of this chapter, we observed that university students in the UK who report SP exhibit high levels of fear both during and after an episode, and that they are not likely to seek help. Although replication is needed, these findings are vital, as they highlight important areas for further research.

7.8 Conclusion

To conclude, the aim of this pilot study was to assess the feasibility of a questionnaire exploring the associations between SP, religious faith, and religious belief systems. We found that the research methodology, recruitment methods, and tools were all appropriate for the study, and none of the participants expressed any major reservations about the questionnaire items. Despite being a pilot study, we uncovered some intriguing insights. Specifically, we observed that those who reported experiencing SP (vs. those who did not) also reported higher levels of religious faith. Although many participants reported experiencing fear during and after episodes of SP, very few sought professional help, suggesting that many people suffer silently without seeking medical assistance. To expand on these findings, future research should focus on recruiting a larger sample size and aim to replicate the findings of this study. Additionally, researchers should aim to further understand the association between SP and religious faith and explore ways to improve help-seeking behaviour among individuals reporting SP. Overall, this pilot study has set the foundation for further research in this field and has highlighted the importance of further understanding this prevalent condition (see

Chapter 8). The next chapter will examine the associations between ISP and religion, taking into account the study limitations and key insights identified in this pilot study.

Chapter 8: The Associations between Isolated Sleep Paralysis and Religion

8.1 Abstract

Chapter 7 tested the feasibility of conducting a larger-scale study further examining the associations between ISP and religion. The insights gained from the pilot study were beneficial in informing and guiding the current study. To guide future research and behavioural treatments for ISP, we tested the associations between ISP, religious belief systems (i.e., atheist, agnostic, religious), and religious faith (i.e., the extent to which an individual believes, practices, and relies on their religious identity). Participants (N = 1579, mean age = 44.8, SD = 17.6, age range = 18 – 89) completed an online cross-sectional assessment. ISP-related items were assessed using the FISPI. Religious faith and religious belief systems were measured using the Santa Clara Strength of Religious Faith Questionnaire and items from Census England, respectively. Those reporting ISP (54.5%) reported lower levels of religious faith than those who did not. ISP was more commonly reported by agnostics (62.3%) and atheists (62.0%) than by religious participants (46.8%). The belief that ISP is caused by something supernatural was more commonly endorsed by individuals reporting greater religious faith levels, while the belief that it is caused by something in the brain was more commonly held by individuals reporting lower religious faith. Using prayer as a prevention and disruption technique was associated with religious faith and religious belief system ($p < .05$ for all associations). This study demonstrates a negative association between reporting ISP and religion, offering new insights and implications for further studies. Given somewhat contrasting results with those from Chapter 7, future research is needed to elucidate this discrepancy. It is essential to replicate and expand on these results and explore their implications for developing treatments targeting ISP.

8.2 Introduction

Various psychological variables have been linked to religious faith, including help-seeking behaviours (Crosby & Bossley, 2012; Gebauer et al., 2012). Additionally, religious faith has been associated with sleep-related variables such as sleep quality (Cho & Kim, 2023; Ellison et al., 2011; T. D. Hill et al., 2006), restless sleep (Nguyen et al., 2022), and sleep patterns (Wallace & Forman, 1998). Some of these same variables are also risk indicators for experiencing SP (Denis, French, & Gregory, 2018). Furthermore, previous work has demonstrated direct associations between SP and religiosity (Jacobson, 2009; Jalal, Sevde Eskici, et al., 2021; Jalal & Hinton, 2013) – although overall there is a paucity of research in this area, particularly in relation to ISP. This area of research is particularly significant as there is evidence that religiosity is associated with supernatural explanations of SP which in turn is associated with fear of the experience (Jalal & Hinton, 2013). To inform future research and to eventually enhance treatments related to ISP, the present study aims to examine the associations between ISP, religious belief systems (i.e., atheist, agnostic and religious), and religious faith (i.e., the extent to which an individual believes, practices, and relies on their religious identity).

8.2.1 Religion and different life domains

Religion is associated with various aspects of life. Positive associations have been found between religion and several psychological variables. These variables include improved mental well-being (Babamohamadi et al., 2015; Chirico et al., 2020; Gebauer et al., 2012; Kucharska, 2020; McCullough & Willoughby, 2009). For example, Gebauer et al. (2012) found a weak positive correlation between religiosity and social self-esteem as well as between religiosity and psychological adjustment, implying that religiosity is linked to positive psychological outcomes. However, the authors assessed religiosity using a single item ("My personal religious beliefs are important to me”), while the other constructs were assessed more comprehensively (with more items). Of note, other studies have found that negative religious mindsets (e.g., God is being punitive) are associated with greater anxiety levels (Kucharska, 2020; Rosmarin & Leidl, 2020). Additionally, aspects of religion (e.g., religious attendance) have been associated with physiological factors such as reduced blood pressure (Seeman et al., 2003) and overall physical health (Jim et al., 2015).

Religiosity has also been associated with a few positive sleep outcomes. For example, a study found that high school seniors who attended religious services at least once a week and considered religion to be crucial were more likely to sleep for a minimum of seven hours compared to those who did not attend religious services at all and did not deem religion to be important (Wallace & Forman, 1998). In another study, individuals who reported attending religious services at least once a week were more likely to report excellent, very good, or good sleep quality than those who never attended or attended less than once a month (Hill et al., 2006). However, it is important to note that religious service attendance is only one aspect of religion, and research is needed to explore different components of religion to better represent and capture its complexity. Furthermore, the measurement of attendance relied on individuals self-reporting how frequently they attended religious services which might not entirely reflect their level of religious faith, as some people may attend for reasons related to social support and social interactions.

Negative associations between religion and sleep have also been shown. For example, individuals who indicated that they watched religious television programs more frequently also reported experiencing restless sleep more frequently than others (Nguyen et al., 2022). Likewise, Cho and Kim (2023) found that sleep quality was slightly higher in participants who identified as non-religious versus religious individuals. Together, research to date suggests a potentially complex association between religion and sleep.

Moreover, apart from its association with sleep, religion has been negatively associated with psychological help-seeking behaviours. For example, studies have shown that religious individuals who experience mental health problems are more hesitant to seek conventional psychotherapy and may not experience as many benefits from these treatments as non-religious individuals (Lefevor et al., 2017; Lukachko et al., 2015). However, the latter study focused exclusively on an African-American sample, and the generalisability of these findings to other populations needs to be established. In addition, Crosby and Bossley (2012) investigated 235 college students and found that individuals reporting high levels of religiosity preferred seeking help from religious sources rather than seeking professional psychological help. Overall, the associations between religion and various life domains are complex and inconsistent across the literature. Whether these patterns extend to the association between religion and ISP remains uncertain, thus necessitating future research. Investigating these associations is important as it can provide insights for future treatments and interventions in this domain.

8.2.2 Religion and SP

A few studies have found associations between religiosity and SP (Jacobson, 2009; Jalal, Sevde Eskici, et al., 2021; Jalal & Hinton, 2013). Further details are provided in Chapter 1, Section 1.14.

8.2.3 The current study

In sum, several life domains, including aspects of sleep (Cho & Kim, 2023; Hill et al., 2006; Nguyen et al., 2022; Wallace & Forman, 1998), have been associated with religion. However, associations between ISP and religion remain poorly understood. This is noteworthy due to the potential influence of religiosity on interpretations of the condition. Such interpretations can either amplify or alleviate associated fear (Jalal & Hinton, 2013). Previous studies examining the association between SP and religion have either relied on a single item to assess religious faith or have not captured the full range of religious belief systems. Given that religiosity is a multifaceted construct that encompasses various dimensions (e.g., beliefs, practices, and subjective experiences; Hackney & Sanders, 2003), it is essential to employ a comprehensive measure to capture its complexity. Accordingly, in this study, we use a comprehensive assessment of religious faith and encompass three distinct religious belief systems in order to gain a nuanced understanding of the associations with ISP. We address the following research questions:

1. Is there an association between level of religious faith and the likelihood of reporting ISP, interpretations of ISP, and techniques used to prevent/disrupt episodes?

2. Are there any differences between religious belief systems (atheist, agnostic, religious) in terms of the percentage of those reporting ISP, endorsing different interpretations for ISP, and the techniques used to prevent/disrupt episodes?

3. Are there any differences in levels of fear during ISP episodes or levels of distress and interference after episodes between religious belief systems?

4. How effective are religion-specific techniques perceived to be to prevent and/or disrupt ISP episodes?

5. Are there any differences between religious belief systems in terms of willingness to disclose ISP to others?

ISP can be a troubling and frightening experience (Sharpless & Barber, 2011), however at present, there is a lack of scientifically supported treatments for this condition, though some have been formulated (e.g., Sharpless, 2016). Any potential associations found here can help inform and facilitate future research and consequently enhance behavioural interventions intended at reducing problematic cases of ISP.

8.3 Method

8.3.1 Participants

A total of 1605 participants completed the survey (83% of those who started it). To ensure that only idiopathic cases of SP (i.e., ISP) were included in the analyses, participants (*n* = 26; 1.6%) who reported narcolepsy were excluded. No other sleep disorders or medical conditions were used as grounds for exclusion. The final sample size was 1579, of which 65.7% identified as female. The mean age for the entire sample was 44.76 years (*SD* = 17.64, range 18 – 89). Participants were predominantly White (81.0%). Most participants reported being Atheist (N = 527, 36.7%), Christian (N = 406, 28.3%), Agnostic (N = 316, 22.0%), and Muslim (N = 115, 8.0%). A smaller proportion of participants identified as Buddhist (N = 32, 2.2%), Hindu (N = 24, 1.7%), and Jewish (N = 16, 1.1%). Overall, these figures show some similarities and differences to results from the UK Census where 37.2% reported no religion, 46.7% reported being Christian, 6.5% reported being Muslim, 1.7% identified as Hindu, 0.5% identified as Buddhist or Jewish (Office for National Statistics (ONS, 2022).

8.3.2 Procedure

This pre-registered (https://osf.io/n52w7) online cross-sectional study was advertised on various social media platforms including twitter, instagram, facebook, and reddit. To take part, participants had to be at least 18 years of age, agree to the terms of the study, and provide informed consent.

8.3.3 Measurements

ISP-related variables

ISP, ISP-related fear, distress, and interference, ISP aetiology, and ISP prevention/disruption techniques were measured. See Chapter 3 for detailed information regarding ISP-related items and their measurements. Additional ISP-related items are presented in Chapter 7.

Religious belief system and religious faith

Religious belief systems (the religion in which the participants belonged to) and religious faith were included. Cronbach's alpha for the religious faith item was .97. For a comprehensive overview of items related to religion and their measurements, please see Chapter 7.

8.3.4 Statistical analysis

A priori power analysis was conducted using G*Power version 3.1.9.7 (Faul et al., 2007) to estimate the minimum sample size required for this study. In the pilot study (Chapter 7), the observed effect sizes were notably large, potentially inflated due to the small sample size. Recognising the inherent risk of overestimation in small samples (Fritz et al., 2012), we adopted a precautionary approach by inputting a more conservative or smaller effect size in the power analysis for our main study, as seen in previous literature (Harms et al., 2018). Consequently, employing a significance criterion of $\alpha = 0.05$ and a desired power of 0.80, the calculated minimum sample size needed with a small effect size of Cramer's $V = 0.12$ is $N = 964$.

Independent samples t-tests, chi-squares, one-way ANOVAs, and regressions were run. For the chi-square pairwise comparisons involving religious belief systems (atheist, agnostic, religious) and ISP-related variables (binary; no, yes), the significance threshold was set at .008 (.05/6). Similarly, for the five separate t-tests for ISP aetiologies (binary; no, yes) and religious faith scores (continuous variable), the significance threshold was adjusted to .01 (.05/5). The skewness and kurtosis of the variables indicated that the variables were distributed approximately normally (George, 2011).

We did not use data replacement strategies for making scale scores for the religious faith items due to the relatively large sample size, resulting in the exclusion of twelve participants who answered some but not all religious faith-related questions, leaving them without a scale score.

8.3.5 Open-ended data

The item about ISP-related prevention and disruption techniques included free-entry boxes, allowing participants to provide additional information about which techniques they use in their own words. To analyse the qualitative data pertaining to religion-related coping strategies (which was the only qualitative data used within this paper), two independent coders (JJM-V and BR) searched all the open-ended responses for reports of utilising religion-related prevention and disruption techniques in relation to ISP episodes. During the coding process, only one religious technique emerged from the responses, namely ‘prayer’. Inter-coder agreement was 100%.

8.3.6 Deviation from protocol

As outlined in Chapter 7, the various religious belief systems (e.g., Christian, Muslim, Jewish, Buddhist) were combined into a singular category labelled “religious”. Three main religious belief systems were considered in the analyses: religious, atheist, and agnostic. For more information about the grouping, refer to Chapter 7, section 7.3.3.

While not explicitly stated in the pre-registration, we conducted regression sensitivity analyses whereby we controlled for age and gender in order to consider the impact of these variables on our results. These additional results are presented in Appendix E Table E1. In general, results were similar once controlling for age and gender. This was true even when

Bonferroni correction was applied for all except one finding which became nonsignificant following this correction as discussed below.

8.4 Results

8.4.1 Descriptive statistics

Descriptive statistics are presented in Table 14. We categorized religious belief systems into atheist (n = 527, 36.7%), agnostic (n = 316, 22.0%), and religious (n = 593, 41.3%) in order to conduct more statistically powered analyses. Overall, mean religious faith levels were 19.35, SD = 9.31; study sample range 10 (low religious faith) – 40 (highly religious faith). At least one episode of ISP was reported by 56.5% (n = 867) of the participants.

Table 14

Descriptive Statistics of the Key Variables in the Study

Variable	Categories	*N*	%
Gender	Male	498	32.2
	Female	1017	65.7
	Other	33	2.1
Ethnicity	White	1252	81.0
	Mixed/Multiple ethnic groups	78	5.0
	Asian/British Asian	124	8.0
	Black/British Black	33	2.1
	Arab	33	2.1
	Other	25	1.6
ISP frequency	Never	667	43.5
	Once	110	7.2
	Twice or several times in my life	440	28.7
	Several times a year	215	14.0

	Monthly	52	3.4
	Weekly	25	1.6
	Several times a week	25	1.6
ISP	No	667	43.5
	Yes	867	56.5
Religious affiliations	Atheist	527	36.7
	Christian	406	28.3
	Buddhist	32	2.2
	Hindu	24	1.7
	Jewish	16	1.1
	Muslim	115	8.0
	Agnostic	316	22.0
Religious belief systems	Atheist	527	36.7
	Agnostic	316	22.0
	Religious[a]	593	41.3

Fear during ISP	Not at all afraid	76	9.0
	Mildly afraid	176	20.7
	Moderately afraid	226	26.6
	Severely afraid	229	27.0
	Very severely afraid	142	16.7
Post-episode distress	Not at all	224	26.2
	Mild distress	271	31.7
	Moderate distress	233	27.3
	Severe distress	82	9.6
	Very severe distress	44	5.2
Post-episode interference	Not at all	523	61.1
	Mild interference	207	24.2
	Moderate interference	88	10.3
	Severe interference	28	3.3
	Very severe interference	10	1.2

	Range	*N*	**Mean** *(SD)*
Age	18 – 89	1546	44.76 *(17.64)*

Religious faith	10 – 40	1535	19.35 *(9.31)*

Note. ISP = isolated sleep paralysis. SD = standard deviation. Higher religious faith scores indicate stronger religious faith.
[a]The following religious affiliations fall into the "Religious" category: Christian, Buddhist, Hindu, Jewish, Muslim

8.4.2 ISP, religious faith, and religious belief systems

Correlations and strength of associations of relevant variables are presented in Table 15. An independent samples t-test was conducted to compare the mean religious faith scores between the ISP and non-ISP groups. Participants who reported experiencing ISP reported lower levels of religious faith (M = 18.38, SD = 8.74) than those who did not (M = 20.47, SD = 9.85, t(1322.55) = 4.30, p < .001, Cohen's d = 0.23).

There was a significant association between ISP (no, yes) and religious belief systems (atheists, agnostics, religious), (X^2 (2, N = 1423) = 32.75, p < .001, Cramer's V = 0.15). Post-hoc pairwise comparisons showed that ISP was more frequently reported in those identifying as agnostic (62.3%) and atheist (62.0%) compared to religious participants (46.8%; X^2 (1, N = 899) = 19.77, p < .001, Cramer's V = 0.15 and X^2 (1, N = 1107) = 25.66, p < .001, Cramer's V = 0.15, respectively).

Table 15

Correlations, Effect Sizes, and Significance between Core Variables

	1[a]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Religious faith	1																		
2. ISP (no, yes)	**-.11**	1																	
3. Cause medication	.03	-.03	1																
4. Cause brain	**-.10**	**.33**	**.16**	1															
5. Cause stress	.04	**.31**	**.17**	**.20**	1														
6. Cause electric equipment	**.08**	-.03	**.14**	**.06**	**.08**	1													
7. Cause supernatural	**.17**	**.13**	-.02	.05	**.09**	**.15**	1												
8. Sleep position	-.02	**.23**	-.01	**.15**	**.13**	.02	**.07**	1											
9. Sleep pattern	-.03	**.14**	-.02	**.09**	**.08**	**.11**	.00	-.04	1										
10. Environment	-.03	**.16**	.01	**.06**	**.11**	-.01	**.10**	-.05	-.03	1									
11. Substances	-.02	**.10**	**.12**	-.00	.02	-.01	-.00	-.03	-.02	-.02	1								
12. Resist sleep	-.01	**.12**	-.01	.04	.01	-.01	.01	-.04	-.02	-.02	-.02	1							

13. Pray primary prevention	**.08**	**.05**	-.01	.01	.02	-.00	**.14**	-.01	-.01	-.01	-.01	-.01	1						
14. Bodily action	-.04	**.40**	-.02	**.18**	**.14**	.04	**.07**	**.18**	**.13**	.04	.02	**.08**	.01	1					
15. Make noise	-.03	**.26**	-.02	**.08**	**.12**	-.02	**.12**	**.11**	.05	**.16**	**.07**	.01	**.07**	**-.13**	1				
16. Rouse brain	.02	**.20**	-.00	**.08**	**.07**	-.02	.00	**.06**	.04	**.06**	**.05**	**.18**	-.01	**-.10**	**-.07**	1			
17. Contextualise	**-.07**	**.16**	.01	**.07**	**.06**	-.01	-.04	**.08**	.04	**.10**	.04	.03	**.06**	**-.08**	**-.05**	-.04	1		
18. Breathe	-.01	**.09**	.03	.02	.02	-.01	-.02	**.08**	.02	-.02	**.10**	-.02	-.01	-.05	-.03	-.02	-.02	1	
19. Pray primary disruption	**.08**	**.06**	-.02	-.01	.00	-.01	**.07**	**.10**	**.05**	-.01	-.01	**-.06**	**.17**	-.03	-.02	-.02	-.01	-.01	1

Note. Correlations/associations in bold indicate statistical significance. Relevant correlations are found in column “1”. ISP = isolated sleep paralysis; items 3 to 7 refer to perceived aetiologies of ISP; Pray primary prevention = utilising prayer as a primary prevention technique; Pray primary disruption = utilising prayer as a primary disruption technique; items 8 to 13 refer to primary prevention strategies; items 14 to 19 refer to primary disruption strategies. Primary prevention and disruption techniques are the first methods they reported employing to cope with an ISP episode. The item ‘Religious faith’ is the only continuous variable ranging from 10 (low religious faith) to 40 (high religious faith).

[a]Point-biserial correlations were conducted to examine the correlation between the continuous variable ‘religious faith’ (item 1 in the table) and the binary variables coded as 0 (no) and 1 (yes) (binary items ranging from 2 to 19).

Cramer’s *V* was used to report the strength of association and significance between items 2 to 19, which are binary variables (no, yes).

8.4.3 Perceived ISP aetiology

Participants who endorsed the belief that ISP was caused by something in the brain (n = 535) reported lower levels of religious faith (*M* = 18.07, *SD* = 8.70) than those who did not (*M* = 20.04, *SD* = 9.55, $t(1182.02) = 4.08$, $p < .001$, Cohen's $d = 0.21$). Those who believed that ISP was caused by something supernatural (*N* = 75) reported higher levels of religious faith (*M* = 26.35, *SD* = 9.01) than those who did not (*M* = 18.99, *SD* = 9.19, $t(1533) = -6.77$, $p < .001$, Cohen's $d = 0.80$). Those who believed ISP to be caused by electronic equipment (n = 8) reported higher levels of religious faith (*M* = 28.38, *SD* = 9.86) than those who did not (*M* = 19.31, *SD* = 9.29, $t(1533) = -2.75$, $p = .006$, Cohen's $d = 0.98$). Whereas the aforementioned analyses remained significant with Bonferroni correction, this latter difference did not when age and gender were controlled for (Table E1). There were no significant differences in religious faith scores between those who endorsed the remaining ISP aetiologies and those who did not (Bonferroni $p > .01$).

There was a significant association between religious belief systems and the belief that ISP is caused by 1) something in the brain ($\chi^2(2) = 25.50$, $p < .001$, Cramer's $V = 0.13$) and 2) something supernatural ($\chi^2(2) = 27.55$, $p < .001$, Cramer's $V = 0.14$). Post-hoc tests with Bonferroni adjustment showed that the belief that ISP was caused by something in the brain was more common in atheists (41.6%) and agnostics (36.1%) than religious participants (27.3%, $p < .008$). In addition, the belief that ISP is caused by something supernatural was more commonly endorsed by agnostics (5.1%) and religious participants (7.1%) than by atheists (0.8%; $p < .008$). See Table 16 for detailed results.

Table 16

Chi-Square Analysis of the Association between Religious Belief Systems and Perceived ISP Aetiologies

	Religious Belief Systems								
	Atheist		Agnostic		Religious				
	N	%	N	%	N	%	$\chi^2(2)$	*p*	*V*
ISP aetiology									
Medication									
Yes	25	4.7	18	5.7	31	5.2	.38	.828	-
No	502	95.3	298	94.3	562	94.8			
Brain									
Yes	219	41.6	114	36.1	162	27.3	25.50	**<.001**	.13[a]
No	308	58.4	202	63.9	431	72.7			
Stress									
Yes	138	26.2	93	29.4	150	25.3	1.86	.395	-
No	389	73.8	223	70.6	443	74.7			
Electronic									
Yes	1	0.2	0	0.0	5	0.8	4.56	.102	-

No	526	99.8	316	100.0	588	99.2			
Supernatural									
Yes	4	0.8	16	5.1	42	7.1	27.55	**<.001**	.14[b]
No	523	99.2	300	94.9	551	92.9			

Note. ISP = isolated sleep paralysis; p-values in bold indicate statistical significance; V = Cramer's V.

[a]Post-hoc chi-square pairwise comparisons with an adjusted alpha using Bonferroni correction (.05/6 = .008) showed that the belief that ISP was caused by something in the brain was more common in atheists (41.6%) and agnostics (36.1%) than religious participants (27.3%; $\chi^2(1) = 25.20$, $p < .001$, Cramer's $V = .15$ and $\chi^2(1) = 7.48$, $p = .006$, Cramer's $V = .09$, respectively).

[b] [a]Post-hoc chi-square pairwise comparisons with an adjusted alpha using Bonferroni correction (.05/6 = .008) showed that the belief that ISP was caused by something supernatural was more common in agnostics (5.1%) and religious participants (7.1%) compared to atheists (0.8%; $\chi^2(1) = 15.81$, $p < .001$, Cramer's $V = .14$ and $\chi^2(1) = 28.33$, $p < .001$, Cramer's $V = .16$, respectively).

8.4.4 Religious faith, religious belief systems and ISP-fear, distress, and interference

There was no statistically significant correlation between religious faith scores and fear experienced during an episode, as well as distress and interference as a result of ISP. One-way ANOVAs yielded no statistically significant differences between the three religious belief systems (i.e., atheist, agnostic, religious) in terms of ISP fear, distress, and interference score.

8.4.5 ISP-related prevention/disruption techniques, religious faith, and religious belief systems

Differences in religious faith scores between participants who utilise prevention/disruption techniques versus those who do not are found in Tables E2 and E3. Among those who completed the questionnaire (N = 1579), 761 respondents reported utilising various primary prevention and disruption techniques, especially prayer (N = 12). Participants who used prayer as a primary method to prevent (N = 5; M = 33.25, SD = 7.63) and disrupt (N = 7; M = 30.83, SD = 4.58) an episode versus those who did not (N = 1579; M = 19.32, SD = 9.29 and N = 1572; M = 19.31, SD = 9.30, respectively) reported higher religious faith levels ($t(1533) = -3.00$, $p = .003$, Cohen's d = -1.50 and $t(5.16)$, $p = .002$, Cohen's d = 1.24, respectively). In addition, those reporting contextualisation (e.g., telling themselves that they are only sleeping) as a primary disruption technique, and bodily action or making noise as a secondary disruption technique (vs. those who did not) reported lower levels of religious faith ($p < .05$; Table E3). The associations between the religious belief systems (i.e., atheist, agnostic, religious) and the utilisation of primary/secondary prevention and disruption techniques are found in Tables E4 and E5.

8.4.6 Perceived effectiveness of primary ISP prevention/disruption techniques

Five out of 260 participants who answered "yes" to the question about whether they do anything to prevent episodes reported utilising prayer to prevent an ISP episode from occurring and this technique was perceived as 90% effective (SD = 22.36). Seven (out of 544) participants reported disrupting an episode using prayer which they perceived to be 87% effective (SD = 29.47). All of the participants reporting these specific prevention/ disruption techniques – apart from one (agnostic), reported their religious belief system as 'religious'.

8.4.7 Religious belief system and confiding in someone about ISP

There was a significant association between confiding in someone about ISP (no, yes) and religious belief system ($\chi^2(2) = 24.61$, $p < .001$, Cramer's $V = .18$). Specifically, atheists (92.9%) were more likely to confide in someone about their ISP experience(s) compared to religious participants (79.0%, $\chi^2(1) = 24.29$, $p < .001$, Cramer's $V = .20$). There was no significant association between seeking help for ISP (no, yes) and the three different religious belief systems ($\chi^2(2) = .56$, $p = .757$).

8.4.8 Reduced dataset

It is possible that including those who reported experiencing ISP only once in their lifetime could impact the overall results as their experiences may not be comparable to those who report multiple episodes. To examine this, analyses were also run on a reduced dataset that excluded individuals who reported experiencing SP only once, thereby focusing solely on those who reported experiencing ISP more than once (vs. never). These analyses can be found in Tables E6 and E7. The results were similar to those obtained from the full dataset.

8.5 Discussion

We examined the associations between ISP, religious faith, and religious belief systems. Those reporting ISP (vs. those who did not) reported lower levels of religious faith, with ISP being more commonly reported by agnostics and atheists compared to religious individuals. Together, these findings converge to show an inverse association between ISP, self-reported levels of religiosity and religious belief systems. We also provide novel insights concerning ISP-related interpretations and coping strategies. However, it is crucial to note that some of these results diverge from specific findings in the pilot study in the previous chapter (Chapter 7). For example, Chapter 7 found that those reporting SP (compared to those who did not) reported higher levels of religious faith, whereas the opposite was true in this study. Possible explanations for these disparities, such as differences in sample sizes and sample characteristics, are discussed in the general discussion (Chapter 9). Readers should be mindful of these contradicting findings when interpreting the results in this chapter.

8.5.1 The associations between ISP, religious faith, and religious belief systems

ISP and religion (i.e., religious faith and religious belief system) had an inverse association. Participants who reported experiencing ISP (vs. those who did not) reported lower levels of religious faith, including when controlling for age and gender. This finding is in line with previous findings that religious attendance (vs. non-attendance) is associated with better self-reported sleep outcomes, including better sleep patterns (Wallace & Forman, 1998) and sleep quality (Hill et al., 2006). One possibility is that having religious faith may act as a psychological buffer against ISP. Religious people tend to have higher self-control scores on self-report measures (McCullough & Willoughby, 2009). Thus, highly religious individuals may exercise greater self-discipline and self-control with regards to their sleep habits, including maintaining a consistent sleep-wake schedule – a behaviour that has been associated with lower rates of SP (Van der Kloet et al., 2012). Similarly, prayer has been associated with stress reduction (Ferguson et al., 2010), which may explain why religious participants were less likely to report episodes of ISP. However, it is essential to consider that the efficacy of religious practices in reducing ISP may not be solely attributed to their religious content. Instead, the act of prayer itself can be inherently calming (Zarhin, 2022). Indeed, research has demonstrated that engaging in specific relaxation rituals, such as progressive muscle relaxation, deep breathing, and guided imagery can effectively reduce stress levels (Toussaint et al., 2021), which in turn may be associated with fewer occurrences of ISP.

Furthermore, there is evidence that religious individuals are less likely to consume excessive amounts of alcohol (Luczak et al., 2014), a substance that has been shown to exacerbate SP episodes (Denis et al., 2015). Therefore, it is possible that the lower self-reported incidence of ISP among individuals with higher levels of religiosity could relate to their tendency to engage in self-control, religious practices, and health-related behaviours.

An alternative explanation for the finding that those reporting ISP reported lower religious faith than others is that experiencing ISP could potentially lead to a loss of religious faith over time. Individuals who report experiencing ISP may struggle with feelings of uncertainty and lack of control (Denis, 2018), which could make it more challenging for them to maintain their religious faith. They may question why they are experiencing such episodes and feel as though their faith is not providing them with adequate answers, comfort, and protection.

Critically, response bias may have influenced the results of the study. We found that religious (vs. atheists) participants reported being less likely to disclose their ISP experiences to someone. This could possibly be due to stigma (Abuhammad & Al-Natour, 2021) or perception of ISP as a mental health issue (Sharpless, 2016). Additionally, it is possible that religious participants may have interpreted ISP symptoms in a way other than in the context of ISP. We found that the belief that ISP was caused by something supernatural was more commonly endorsed by those reporting high religious faith and religious individuals. Such an interpretation of ISP could influence a decision to report ISP experiences, as they may be perceived as spiritual phenomena rather than a sleep disorder.

8.5.2 Perceived ISP aetiology

Those who endorsed the belief that ISP was caused by something supernatural (vs. those who did not) reported greater religious faith. Conversely, individuals who attributed ISP to a biological origin (i.e., something in the brain) reported lower levels of religious faith than their counterparts. These findings align with evidence of an association between ascribing supernatural causes to SP and higher levels of religiosity (Jalal & Hinton, 2013). In the same vein, atheists and agnostics (vs. religious participants) were more likely to subscribe to the idea of ISP being caused by something in the brain, whereas agnostics and especially religious participants were more inclined to endorse the belief that ISP has a supernatural origin than atheists. These findings align with evidence that Egyptian Muslim participants tended to attribute SP to supernatural causes, while Danish participants, who may largely identified as non-religious, tended to explain the phenomenon in naturalistic or scientific terms (Jalal et al., 2014). Overall, these findings suggest that religious belief systems play a significant role in shaping how individuals explain ISP. Specifically, those who identify as irreligious appear to attribute physiological explanations to ISP, while religious or uncertain individuals are more inclined to apply non-scientific explanations to the condition.

8.5.3 Prevention and disruption techniques

Very few participants reported using prayer to prevent or disrupt an episode. This is consistent with previous research (Sharpless & Grom, 2016). Using prayer to prevent and/or disrupt an ISP episode was associated with higher levels of religious faith. In addition, those who used prayer reported a high effectiveness rate of 90% for ISP-prevention and 87% for ISP-disruption, confirming the previous study's observation that prevention techniques are perceived as more effective than disruption techniques for ISP (Sharpless & Grom, 2016), although the difference in percentages was small in our study. Our study supports the possibility that religious coping strategies can be valuable in treating ISP in certain participants. However, it remains unclear whether prayer is functionally different or either more or less effective than the use of traditional, secular relaxation techniques. Additionally, we found that individuals who contextualised an ISP episode (i.e., telling oneself that they are sleeping) versus those who did not, reported lower levels of religious faith. This may be related to our finding that those who accepted scientific explanations (vs. those who did not) reported lower levels of religious faith.

8.6 Limitations and future directions

There are limitations that need to be considered. We only collected data at a single time-point, such that future research utilising different designs, including experimental or longitudinal studies, is needed to establish the direction of effects between variables. In addition, the high percentage of participants reporting ISP in this study may be due to the self-selective nature of recruitment, which could impact the generalisability of the results to the wider population (i.e., 56.5% of participants reported ISP in our study whereas it is estimated that only 7.6% of the general population will experience SP at least once in their life; Sharpless & Barber, 2011).

Additionally, only a few participants reported relying on prayer as their primary prevention or disruption technique ($N = 5$ and $N = 7$, respectively), so caution should be exercised in interpreting these results. Finally, by grouping religions, important differences between groups may have been missed. It is important to note that different religious belief systems have unique beliefs, practices, and cultural backgrounds (White et al., 2021) that may influence their experiences of sleep-related phenomena such as ISP. For instance, fundamental beliefs such as the concept of God can vary greatly across religions. While Christians adhere to the belief in the Holy Trinity (Father, Son, and the Holy Spirit), Muslims emphasise the existence of one God (Sichone, 2005). Hindus and Buddhists encompass a broader spectrum of beliefs regarding their conception of divinity (Al-Ghananeem, 2022). Furthermore, differences are observed in beliefs about the afterlife. Christianity and Islam believe in heaven/paradise and hell (Sichone, 2005), while Judaism tends to place less emphasise on this aspect (Tanasyah, 2022). In contrast, Buddhism and Hinduism believe in reincarnation (i.e., rebirth; Al-Ghananeem, 2022). These religious differences may also lead to unique interpretations about sleep and dreams, and beliefs about the supernatural, which could impact their ISP experiences. For example, lucid dreaming, a dream state where the dreamer is aware that they are dreaming, is approached and interpreted differently across different religions (Mota-Rolim et al., 2020). Similar disparities in religious interpretations may exist regarding ISP. Thus, grouping religions together may have not been the optimal approach. However, this was necessitated by the low number of participants in certain religious groups, as previously discussed in the paper. Given the fundamental differences among religions, future research should aim to recruit a sufficient number of participants from each religious belief system to examine them separately and gain a more nuanced understanding of ISP and religious belief systems.

8.7 Conclusions

This study provides novel cross-sectional evidence that reports of ISP were associated with lower levels of religious faith and ISP was more commonly reported in atheists and agnostics than in religious participants. This could be due to various reasons, including religious individuals having a psychological buffer against experiencing ISP or individuals losing religious faith over time as a result of ISP episodes. There were also differences in perceived causes of ISP and the utilisation of certain prevention and disruption techniques across the three religious belief systems and levels of religiosity. While these findings provide a starting point for future research, replication is crucial. Ultimately, such research may be useful in providing further support for individuals experiencing ISP. Finally, the divergent results between the pilot and main studies offer valuable insights into the complex interplay of factors influencing SP and its association with religion. Moving forward, we express genuine enthusiasm for the potential of future studies to build upon the nuanced insights gained from these investigations.

Chapter 9: General Discussion

9.1 Summary of thesis aims

The final chapter will provide a summary of the thesis, discuss the research findings within a broader context, evaluate both the strengths and limitations, and propose potential avenues for future exploration before offering an overall conclusion. The main aim of this thesis was to explore the associations between sleep variables and paranormal as well as religious beliefs. To accomplish this goal, the thesis began with a literature review in the general introduction (Chapter 1), reviewing the existing research on sleep, paranormal, and religious beliefs. In Chapter 2, an initial scoping review was conducted to gather all the available evidence on the associations between various sleep variables and OPEPB. During this process, it became apparent that there was a scarcity of studies that examined a wider range of sleep variables and paranormal beliefs. Chapter 3 delved into shared measurements and methodology employed across the various empirical studies in this thesis. Given the prevalence of research on SP/ISP identified in the scoping review, potentially due to its intriguing nature, Chapter 4 aimed to deepen our understanding of this parasomnia through further investigation. Chapter 5 of this thesis was dedicated to addressing the research gap identified in Chapter 2 by thoroughly exploring the associations between under-researched sleep variables and paranormal beliefs, followed by a replication study in Chapter 6. Chapters 7 and 8, with Chapter 7 serving as a pilot study, investigated SP/ISP and its association with religious faith and religious beliefs. This exploration was motivated by the overlapping features between paranormal and religious beliefs (Tobacyk & Milford, 1983).

9.2 Summary of the findings

The findings for each individual study are summarised below.

In Chapter 2, the scoping review included 44 studies examining the associations between sleep variables and OPEPB. The overall findings indicated that increased sleep disturbances were consistently associated with an increased tendency to endorse OPEPB. Among the sleep variables investigated, the majority of studies focused on SP, followed by lucid dreams, and nightmares. Specifically, SP was found to be predominantly associated with beliefs that it is caused by supernatural entities such as ghosts, evil witches, or spirits. Lucid dreams, on the other hand, were primarily explored in relation to OBEs. Nightmares exhibited associations with phenomena related to spirits and the soul. These patterns remained generally consistent across diverse countries, cultures, and ethnicities, highlighting the universality of these findings.

Chapter 4 utilised secondary data from the BBC Focus study, and a total of 6811 participants (3523 reporting ISP and 3288 without ISP) were analysed. The findings showed that reports of ISP were associated with longer sleep latencies, shorter sleep duration, and greater insomnia symptoms. ISP reports were also more prevalent in females compared to males, younger compared to older individuals, and non-white participants compared to white participants. Clinically significant fear during episodes was reported by 76% of the participants, and while most people believed ISP to be caused by something in the brain (63.3%), 7.1% believed it to be caused by something supernatural. Five prevention (e.g., changing sleep position, adjusting sleep patterns) and five disruption (e.g., physical/bodily action, make noise) techniques were also identified to cope with the episodes.

Chapter 5, utilising the same dataset as in Chapter 4, included 8853 participants. The results showed that poorer self-reported sleep quality (i.e., lower sleep efficiency, longer sleep latency, shorter sleep duration, and increased insomnia symptoms) was associated with greater endorsement in the six paranormal beliefs investigated (i.e., 1) the soul living on after death, 2) the existence of ghosts, 3) demons, 4) an ability for some people to communicate with the dead, 5) near-death experiences are evidence for life after death, and 6) that aliens have visited earth or interacted with humans). Furthermore, the study identified additional associations between specific parasomnias and paranormal beliefs. Both EHS and ISP were found to be associated with the belief that aliens have visited earth or interacted with humans. ISP was also associated with the belief that near-death experiences are evidence for life after death. In Chapter 6, a replication study was conducted using other data (ASE dataset). While the results were predominantly non-significant, the overall trend generally aligned with the findings from Chapter 5.

Chapter 7 served as a pilot study involving a sample of 96 university students. Although the study investigated the associations between SP, religious belief system, and religious faith, the primary objective of this study was to assess the questionnaire and methodology employed. The results indicated no significant concerns or major issues, thereby providing confidence and assurance to proceed with the main study using the established questionnaire and methodology. In addition, results from the study showed that those reporting SP (vs. those who did not) reported higher levels of religious faith. Chapter 8 further explored the associations between ISP and religion in 1579 participants. Here, the results showed that those reporting ISP (vs. those who did not) reported lower levels of religious faith. Furthermore, the prevalence of self-reported ISP was higher among agnostics and atheists in contrast to religious participants. Perceived aetiology of ISP and the utilisation of prevention and disruption techniques for ISP were also found to be associated with religious belief system and religious faith. In Chapter 7, the cases considered involve SP, while Chapter 8 focused on cases involving ISP. The reason for this distinction is that the sample size in Chapter 7 was already small, and excluding additional participants would further reduce the number of participants, making it challenging to interpret the findings accurately.

9.2.1 Overall Thesis Findings

ISP Findings

Chapter 2 – the scoping review, revealed that SP was the sleep variable most frequently considered in association with OPEPB, primarily due to the abundance of research in this specific domain. Consequently, Chapter 4 delved into ISP with the aim of advancing our understanding of this phenomenon. Specifically, it was found that 7.1% of the participants in Chapter 4 believed ISP to have a supernatural cause. Although this percentage may appear inconsequential at first glance, it represents a large total number of people when considering the percentage of those reporting SP (estimated to be up to 7.6% of the general population; Sharpless & Barber, 2011). This is potentially concerning considering previous research that has demonstrated an association between attributing SP to supernatural forces and increased fear of the experience, as well as prolonged paralysis (Jalal & Hinton, 2013). Hence, assisting individuals in reframing their experiences could prove crucial in alleviating some of the distress.

Moreover, both Chapter 4 and Chapter 7 found that a significant proportion of their samples reported clinically significant fear and distress in response to their sleep paralysis. Specifically, 76.0% of the participants in Chapter 7 and 76.9% of the participants in Chapter 4 reported experiencing moderate or above levels of fear during an episode, suggesting that the vast majority of SP episodes are associated with fear. These findings align with previous research studies (Cheyne, Rueffer & Newby-Clark, 1999; Sharpless et al., 2010).

Sleep variables and paranormal beliefs

The findings across Chapters 5, 6, 7, and 8, consistently showed significant associations between sleep variables and paranormal as well as religious beliefs. For Chapters 5 and 6, the associations varied depending on the specific type of paranormal belief examined. Notably, Chapters 5, in particular, demonstrated positive associations between the endorsement in certain paranormal beliefs (e.g., belief that aliens have visited earth or interacted with humans) and reports of ISP and EHS, and negative associations between the endorsement in all six paranormal beliefs investigated and the sleep quality variables. Although Chapter 6 exhibited fewer significant associations, likely due to the smaller sample size compared to Chapter 5, it still displayed a consistent pattern of results that mostly aligned with the trend observed in Chapter 5. Therefore, the findings found in Chapters 5 and 6 suggest that greater endorsement in paranormal beliefs is associated with poorer sleep outcomes. These findings are in alignment with the studies on various sleep variables and paranormal beliefs presented in the scoping review in Chapter 2.

As previously mentioned, while religious beliefs and paranormal beliefs can differ in certain aspects (Orenstein, 2002), there are also notable similarities between them (Tobacyk & Milford, 1983). As a result, in this thesis, both paranormal and religious beliefs were considered from a perspective that recognises the absence of empirical support for these beliefs. In contrast to the findings in Chapters 5 and 6, the results presented in Chapter 8 indicated that individuals who reported experiencing ISP (vs. no ISP) reported lower levels of religious faith. Moreover, the prevalence of ISP was higher in agnostics and atheists than among religious participants. This suggests that while certain paranormal beliefs are associated with negative sleep outcomes (e.g., higher reports of ISP and EHS, poorer sleep quality), religious beliefs may not exhibit the same associations with sleep variables, ISP in particular. One possible explanation for this discrepancy may lie in the nature of the paranormal beliefs explored in Chapters 5 and 6, which encompassed mostly vivid phenomena such as aliens, demons, neath-death experiences, and communication with the dead. In contrast, the religious faith items primarily focused on concepts related to God, belonging, prayer, and community. These represent fundamentally different aspects, with the former addressing extraordinary occurrences while the latter emphasise spiritual beliefs and practices within a religious context. It is worth considering that if other supernatural religious beliefs, such as angels, reincarnations, or ghosts, had been explored, we might have observed different and potentially similar findings to those found in Chapters 5 and 6. Moreover, the different patterns found regarding paranormal and religious beliefs may be influenced by other factors, including lifestyle. As previously discussed in Chapter 8, research has indicated that religious individuals are more likely to adopt healthier behaviours when compared to non-religious individuals (Luczak et al., 2014; McCullough & Willoughby, 2009). This implies that religious beliefs might be more closely associated with a particular lifestyle, in contrast to holding paranormal beliefs which may primarily represent a belief system rather than a holistic way of living. Therefore, while both paranormal and religious beliefs share the common ground of being rooted in scientifically unestablished phenomena (Broad, 1949; French & Stone, 2014; Schilbrack, 2013), our research outcomes underscore their possible fundamental differences, which corroborates prior studies (Orenstein, 2002; Rice, 2003).

Furthermore, it is important to highlight a contrasting finding observed in Chapter 7, which served as a pilot study closely linked to Chapter 8. In Chapter 7, it was found that reports of SP were associated with higher levels religious faith, which contradicts the findings in Chapter 8. However, other findings in Chapter 7, while not statistically significant, exhibited a comparable pattern to Chapter 8. For example, SP was more frequently reported by those identifying as agnostics, followed by atheists compared to religious participants. Similarly, though not reaching statistical significance, the belief that SP has a supernatural origin was more commonly held by religious participants compared to those identifying as atheist and agnostic. This was also observed in Chapter 8. However, the belief that SP was caused by something in the brain was more commonly endorsed by religious participants (vs. atheists and agnostics), which again contradicts the results in Chapter 8. This discovery appears somewhat perplexing, as the pilot study indicated that religious participants (vs. atheists and agnostics) endorsed both supernatural and biological explanations for SP, although the former not reaching statistical significance. These two explanations appear dissimilar from each other, which may suggest that an individual's beliefs are complex and multifaceted in nature. Further research is needed to understand the mechanisms and reasons underlying the simultaneous endorsement of divergent beliefs within a sample of individuals. One possible approach is to ask participants to provide justifications for their endorsement of each explanation. Importantly, it is worth noting that our studies allowed participants to select multiple explanations for what they believed caused SP/ISP. It is possible that this freedom to choose multiple options influenced their responses. Had they been limited to selecting only one explanation, they might have chosen the one they found most plausible.

Moreover, the conflicting findings between Chapter 7 (pilot study) and Chapter 8 (main religion study) regarding the association between SP/ISP and religious faith might be attributed to several factors. By examining the descriptive statistics of both studies, we can identify potential contributors to these contradictory results. One possible explanation is the difference in sample characteristics between the two findings. The pilot study, conducted primarily to assess the study's feasibility, had limited statistical power to test the research questions. It included a relatively small sample size of 96 students. In contrast, the main study involved a much larger sample, encompassing approximately 1,530 participants and spanning a wider range of age groups. Notably, the pilot study focused on younger participants with a mean age of 21.03 years, while the main study had a wider age range with a mean age of 44.76. Age is known to be associated with both SP (Ohayon & Pakpour, 2022) and religious beliefs (Dillon & Wink, 2007; Krause, 2008), and this age disparity might have influenced the associations differently in each study. For example, the younger individuals in the pilot study may be at a stage where they are actively shaping or solidifying their religious beliefs. In contrast, participants in the main study, representing a broader age spectrum, might have more established and varied religious beliefs influenced by their cumulative life experiences. The interplay between age and religious beliefs may have contributed to different patterns in associations with SP/ISP. Indeed, existing research supports the notion that religious faith tends to solidify with age (Krause, 2008).

The contradictory findings may also be associated with other differences between the two samples, including ethnic and cultural compositions. In the pilot study, the sample included a diverse range of ethnicities (e.g., 42.7% White, 28.1% Asian/Asian British, 12.5% multiple ethnicities), whereas, although the main study had a larger sample size, it was predominately composed of White participants (1,252 (81.0%) out of 1,535 (100%) respondents). The numbers for other ethnicities were considerably smaller. Religious beliefs and practices are known to be influenced by cultural backgrounds and ethnic identities (Lazar, 2004), and the differing ethnic and potentially, cultural compositions of the two studies, may have contributed to the contradictory findings. Furthermore, the exclusive inclusion of students in the pilot study suggests they may belong to a unique cohort influenced by specific cultural or societal factors that shape their experiences of SP and religious faith. In contrast, the main study likely included more diverse cohorts, possibly indicating shifts in cultural attitudes or societal norms over time. These shifts could have influenced the associations between ISP and religious faith in ways that differ from the more homogenous cohort represented in the pilot study. To gain a deeper understanding of the conflicting findings, it would be valuable to explore cultural, contextual, and ethnic factors, and to examine their associations with ISP. This could involve conducting further research considering qualitative methods, or examining additional variables related to cultural beliefs and religious practices within different ethnic groups. Moreover, a larger sample with an equal distribution of participants across religious groups would facilitate a more nuanced investigation of differences between the groups.

Findings related to EHS and ISP

Chapter 2, the scoping review, found that reports of SP were associated with reports of alien abduction or contact by aliens. Similarly, Chapter 5 found that those reporting EHS and ISP reported greater endorsement in the belief that aliens have visited earth or interacted with humans. Additionally, ISP episodes were associated with the belief that near-death experiences are evidence for life after death. These findings imply that those reporting experiences of EHS and/or ISP may be more susceptible to entertaining beliefs in extra-terrestrial encounters and the metaphysical realm. It raises the question whether the sensory inputs associated with these sleep disturbances contribute to a predisposition towards otherworldly beliefs. One possible explanation for these associations is that individuals who experience sleep disturbances accompanied by hallucinations, including auditory and visual hallucinations, may interpret them as compelling evidence for the existence of aliens or other supernatural phenomena. The vivid and often unsettling nature of these sleep-related events might lead individuals to seek alternative explanations beyond scientific frameworks, ultimately embracing the belief in extra-terrestrial encounters or the afterlife.

Alternatively, it is plausible that beliefs in aliens and notions of the afterlife were already present in individuals prior to the onset of EHS or ISP. Therefore, when they experience hallucinations during their nocturnal episodes, they might immediately attribute these occurrences to something supernatural, guided by their pre-existing beliefs.

9.2.2 Overall Thesis Limitations, Strengths, Implications, and Future Directions

The discussion section of each chapter sheds light on the strengths and limitations of the research. In this section, a comprehensive summary of the strengths and limitations is presented for the entire thesis.

Study sample

One advantage of utilising a self-selected sample is the heightened enthusiasm and willingness of participants to share detailed and comprehensive reports of their experiences (Khazaal et al., 2014). When individuals actively choose to participate based on their personal interest or investment in the topic, they may be more likely to offer valuable and rich insights and information related to parasomnias, sleep disturbances, paranormal and/or religious beliefs. This enthusiastic engagement can lead to fruitful contributions to the study, providing valuable knowledge to inform future treatments or interventions.

However, a limitation associated with this type of sample is the potential for bias. For example, the high prevalence of those reporting SP/ISP and EHS in the chapters was considerably higher than what is typically observed in the general population. Therefore, this self-selection process may not accurately reflect the broader population, as a smaller proportion of individuals are estimated to experience these specific parasomnias. It is important to acknowledge these limitations and recognise that the conclusions drawn from the studies within this thesis should be interpreted with consideration for the biases associated with the self-selected sample. To enhance the generalisability of future research, it is important to include more diverse and representative samples that better reflect the demographics and characteristics of the general population. One effective approach is to employ random sampling, where participants are selected at random from the target population. For example, modern commutation patterns can be harnessed through techniques such as random digit dialling, which involves generating random phone numbers that include both landlines and cell phone numbers (Labrique et al., 2023; Maniar et al., 2023).

Another potential limitation pertains to the dichotomisation of ISP/SP episodes into 'No' and 'Yes' categories across all studies presented in the thesis. While this categorisation facilitated simplicity and ease of analyses, it is essential to acknowledge some of the drawbacks associated with this approach. For example, it may have resulted in the loss of valuable information by obscuring nuances in the data and overlooking differences in frequency or intensity among individuals reporting ISP.

Study design

Given the paucity of evidence regarding the association between sleep and paranormal as well as religious beliefs, it was crucial to initiate research by identifying any potential associations between these variables using a cross-sectional design before proceeding with other study designs. These studies help lay the groundwork and serve as a foundation that must first be solidified through replication and later elaborated upon using more in-depth investigations, such as longitudinal and experimental designs. Cross-sectional study designs offer several advantages, such as cost-effectiveness, easy recruitment, and the ability to capture a snapshot of a diverse population at a single point in time (Omair, 2015).

However, due to the nature of the study design, it is not possible to establish the direction of associations or causal relationships. The specific sequence of events remains unclear: whether sleep disturbances and parasomnias lead to or decrease paranormal and religious beliefs, or if it is the beliefs that influence or alleviate sleep difficulties and conditions. There is also the possibility that other factors are simultaneously contributing to both phenomena. It is recommended that future research adopts study designs which can enhance understanding of the direction of effect. For example, one idea is to employ an intervention study, such as a randomised controlled trial, involving participants who report ISP and hold paranormal or religious beliefs. Random assignment can be used to divide the participants into an intervention and control group. The intervention group can receive a workshop that provides information about ISP, its origin, and scientific explanations of the phenomenon. In contrast, the control group, serving as a waitlist control, would experience no intervention during the study period. The primary objective of this study would be to assess whether enhancing knowledge about ISP, without directly altering their beliefs, leads to changes in paranormal and/or religious beliefs. If the intervention group shows significant changes in their beliefs compared to the control group, it could suggest that increased knowledge about ISP may influence paranormal or religious beliefs. This way, researchers can develop a more nuanced and comprehensive understanding of the direction of the associations between sleep and paranormal as well as religious beliefs. Nonetheless, it is essential to acknowledge that this design, while promising, is not without its potential challenges, such as the need to carefully control for extraneous variables that might confound the results (Skelly et al.,

2012) and the ethical considerations of altering participants' knowledge while preserving their existing beliefs. Alternatively, employing a longitudinal study design, as discussed below, may help mitigate some of these concerns (Caruana et al., 2015).

Self-reported measurements

All empirical studies covered in this thesis included self-reported measures to assess various dimensions of sleep, including sleep latency, sleep duration, ISP, and EHS. These measures, with the exception of the EHSI, are all validated and reliable (Buysse et al., 1989; Morin et al., 2011; Sharpless et al., 2010). Despite lacking formal validation, the EHSI has been employed in various EHS studies (e.g., Kirwan & Fortune, 2021; Sharpless, 2015; Sharpless, 2018) as it currently stands as the sole interview tool available for EHS. Regarding the other measures, the PSQI is widely recognised as the gold standard subjective measure for evaluating sleep quality (Mollayeva et al., 2016). Interestingly, correlations between the PSQI and objective sleep measures, such as polysomnogram, have been reported to be weak (Backhaus et al., 2002; Buysse et al., 1989; Manzar et al., 2015). This could be attributed to the fact that the PSQI evaluates ongoing sleep habits and sleepiness, while a laboratory-based polysomnogram is typically a one-time or brief assessment (Buysse et al., 2008), possibly making the PSQI assessment more comprehensive (Zhu et al., 2018). Conversely, actigraphy, another objective method, involves the use of a wrist-worn device that records movements (Sadeh & Acebo, 2002). Actigraphy has demonstrated strong-to-moderate correlations with self-reported measures, such as total sleep time, sleep latency, and sleep efficiency recorded in sleep diaries (Kearns et al., 2023). These correlations may be attributed to the portability of actigraphy, allowing individuals to wear the device from the comfort of their own bed (Bootzin et al., 2002). In contrast, polysomnography, typically administered in a laboratory setting, may not entirely reflect authentic and long-term sleep patterns and behaviours (Blackwell et a., 2017), and therefore may lack ecological validity. However, it is worth noting that the use of portable polysomnography is increasingly becoming more prevalent (Cagle et al., 2023).

To assess insomnia symptoms, the ISI was employed (Morin et al., 2011). Certain facets of insomnia can be a challenge to capture with objective sleep measures. For example, Morin et al. (2011) found a significant correlation between the ISI and only two parameters from a polysomnogram, namely, sleep efficiency and number of awakenings. Conversely, conditions like paradoxical insomnia, characterised by a complaint of severe disturbance despite objective evidence suggesting otherwise, are defined by a more subjective experience (AASM, 2023). This emphasises the importance of employing subjective sleep measures in research.

Essentially, all of the above suggests that the choice of sleep measure ultimately depends on the research's objectives and questions, as well as the temporal scope of interest, whether it pertains to short-term or long-term insights into sleep. In sum, recognising the significance of subjective experiences, self-reported measures enable individuals to provide their own perspectives on their sleep, which in some cases may hold greater importance than solely relying on objective measures. Undoubtedly, employing a combination of both approaches would be optimal.

Nonetheless, self-reported measures, in general, can be influenced by various biases. For example, some individuals may experience recall bias, leading them to inaccurately remember specific sleep-related experiences from the past. Moreover, the PSQI and ISI focus on different time frames. While the PSQI enquires about participants' sleeping habits over the past month, the ISI focuses on the past two weeks. This variance in time frames could potentially result in discrepancies in participants' responses due to different experiences over these time frames and differences in recollection accuracy, making it difficult to compare the measures.

Additionally, participants may respond to certain questions in a socially desirable manner (Althubaiti, 2016). To address these limitations, it is important to attempt to reduce the cognitive load on participants. This can be achieved by keeping data collection instruments concise and focused on capturing essential details, thereby minimising recall bias (Khare & Vedel, 2019). In the context of some of the studies within this thesis, the data from the BBC Focus dataset were collected as part of a larger survey. The question overload in the broad survey may have affected respondents' ability to thoroughly contemplate each question. Moreover, in addressing social desirability bias, researchers can incorporate indirect questioning regarding sensitive topics. This approach is designed to alleviate the pressure on respondents to provide responses they believe are socially expected, ultimately promoting more candid and authentic answers (Fisher, 1993).

Considering the above, future research should continue relying on subjective measures for assessing sleep, while concurrently exploring the potential advantages of incorporating objective measures such as actigraphy and polysomnography. This comprehensive approach would offer a more robust and nuanced understanding of sleep patterns. In the context of paranormal and religious studies, such an approach can enhance the precision of our understanding about the associations between sleep and the paranormal, and religion, ultimately fostering greater accuracy in our insights.

9.3 Implications for treatments

While the research in this thesis did not focus on treatments, the findings have several potential implications for the future development of interventions and treatments. While these have been discussed in the relevant chapters, implications of the key thesis findings are discussed below.

The first key finding with treatment implications pertains to ISP. In Chapter 4, we identified the most commonly utilised techniques for prevention and disruption of ISP episodes, as reported by individuals. Among the identified techniques, the five prevention methods stood out as particularly effective, and were reported by the participants to have at least a 60% effectiveness rate. However, the perceived effectiveness of disruption techniques varied more widely between individuals. With this knowledge, healthcare professionals can not only normalise the experience and provide understanding but, if these findings are replicated and these techniques shown to be effective within clinical practices, they may also be able to offer actionable practices aimed at managing episodes before or during their occurrence. This additional guidance can further enhance the support provided to individuals experiencing ISP.

A second treatment implication found in Chapter 4 revolves around the current diagnostic criteria for RISP. Currently, to be diagnosed with RISP, individuals must experience multiple episodes of ISP which cause clinically significant distress, such as bedtime anxiety or fear of sleep (AASM, 2023; Ramos et al., 2019). However, our findings in Chapter 4 suggested that there was a subset of individuals who reported recurrent episodes of ISP and clinically significant life interference in their daily lives, despite the absence of clinically significant distress. This suggests that while not all experiences of ISP may induce extreme fear, some individuals can still be greatly impacted by the episodes. This consideration is crucial when developing treatment approaches for individuals with ISP.

The third key finding with implications for treatments is that poor subjective sleep quality, as well as reports of EHS and ISP, are associated with various paranormal beliefs. This emphasises the responsibility of healthcare professionals, in particular primary care providers, to evaluate the sleep patterns and experiences of patients who express convictions in the paranormal. As outlined in Chapter 1, ISP (Olunu et al., 2018), EHS (Sharpless et al., 2020), and other less intense sleep disturbances such as insomnia and sleep disruption (Ohayon et al., 1996) can generate hallucinatory content, which certain individuals might interpret as supernatural occurrences. Alternatively, individuals who already hold paranormal beliefs may find their convictions reinforced by their sleep experiences. It is important to note that many individuals expressing OPEPB may be erroneously diagnosed with other disorders such as schizophrenia and depression with psychotic features (Gangdev et al., 2015). This misdiagnosis can lead to inappropriate treatment, such as the administration of antipsychotic medication. The consequences of such wrongful diagnosis and treatment can be detrimental, encompassing delayed treatment for the patient, psychological distress, exacerbation of the underlying condition, and financial hardships (Leon et al., 1995). Moreover, misdiagnosis can erode the individual's trust in healthcare professionals, potentially leading them to resort to self-medication and handling their issues independently (Grant et al., 2004). Therefore, the findings from Chapter 5 suggest that when healthcare professionals encounter patients who express experiences and beliefs related to the paranormal, it may be prudent to assess for relevant sleep disturbances, sleep disorders, and parasomnias, alongside considering other forms of psychopathology. Of note, this certainly does not imply that everyone with paranormal endorsements will necessarily exhibit signs of psychopathology and/or sleep disturbances. However, given our findings indicating an association between paranormal beliefs and sleep variables, it is worth considering these associations further. This evaluation can help uncover potential connections between paranormal beliefs and sleep disturbances, enabling appropriate treatment for the patient, including but not limited to, psychoeducation, sleep hygiene information, or CBT for sleep disorders. It is crucial to target these recommendations specifically towards primary care providers, such as general practitioners, who are shown to lack adequate sleep-related training during their medical education (Romiszewski et al., 2020). By incorporating sleep education, including information about the associations between sleep and paranormal beliefs, through workshops, seminars, or online courses, primary care providers can be appropriately equipped to offer effective support to their patients and guide them towards appropriate resources and assistance.

The final treatment implication pertains to the association between great religious faith levels and lower rates of ISP (in Chapter 8). Although in need of replication due to the contradicting findings in Chapter 7, this finding suggests that healthcare providers may need to take into consideration a person's religious and spiritual beliefs when assessing ISP as they may eliminate or perpetuate the episodes. By incorporating this aspect into the assessment process of ISP, healthcare providers can provide more personalised and culturally sensitive care to those experiencing the condition. By understanding how these beliefs may impact the interpretation and coping mechanisms related to ISP, healthcare providers can tailor treatment approaches accordingly.

9.4 Future Directions

The thesis presents specific suggestions for future research in the respective chapters, but a brief recap and discussion of those suggestions will be presented here. In Chapter 5, the study investigated the associations between a wide range of sleep variables and paranormal beliefs. However, certain sleep variables that can be interpreted within the paranormal sphere, such as sleep walking and sleep talking (Handley, 2012), were not explored. To gain a more comprehensive understanding of sleep and the paranormal, future research should explore these additional sleep disorders and their potential relationship with paranormal beliefs. By doing so, we can shed light on these associations and further unravel the mysteries surrounding them.

Additionally, as mentioned above, future research should employ study designs that not only attempt to replicate the associations between sleep and paranormal as well as religious beliefs, but also explain why these associations exist and how they come about. One approach that can be employed is a longitudinal study. For instance, it can investigate whether changes in sleep variables precede or follow changes in paranormal beliefs, providing valuable insight into the direction of causality. By following willing participants from childhood to adulthood, for example, researchers can investigate how sleep disturbances and paranormal beliefs evolve across various life phases. Additionally, as previously discussed, a well-designed and carefully planned randomised controlled trial can also provide valuable insights into establishing the direction of effect. By implementing controlled interventions that target sleep variables, such as SP, and assessing their impact on paranormal or religious beliefs, researchers can gather evidence on whether manipulating sleep directly impacts the development or alternation of paranormal or religious beliefs.

Furthermore, it is important to consider that the associations between sleep and paranormal as well as religious beliefs may be influenced by various factors that were not explored in this thesis. For a more comprehensive understanding, future research is encouraged to consider variables that could potentially contribute to these associations. For example, education and personality differences have been shown to be associated with both paranormal beliefs (Darolia & Chugh, 2022; Rice, 2003) and sleep (Jones et al., 2019; Lišková et al., 2016).

9.5 Overall conclusion

The work presented within this thesis sought to explore the associations between sleep variables and paranormal as well as religious beliefs. The findings documented in this thesis demonstrate that: 1) reports of ISP are associated with poorer subjective sleep quality. Additionally, individuals reporting ISP employ five common techniques to prevent and disrupt episodes, indicating active efforts to manage the condition. Interestingly, a notable proportion (7.1%) of the sample attributes ISP to supernatural causes; 2) there is an association between increased self-reported sleep disturbances and a stronger inclination towards endorsing different paranormal beliefs; 3) there is an association between reports of ISP and religious belief systems, and religious faith.

Collectively, the findings suggest that it is feasible to consider the role of certain sleep variables when assessing reports of paranormal and/or religious experiences as they exhibit a significant interplay. Investigating the impact of sleep in the context of individuals reporting paranormal and religious beliefs may enhance the accuracy of diagnoses and treatments. This approach could further stimulate the development of targeted behavioural interventions, particularly addressing sleep issues such as ISP.

In order to build upon these findings, future research should aim to replicate these associations, exploring mediating and moderating factors that may influence the observed findings. Employing longitudinal or interventional study designs would be beneficial in establishing the direction of effects and further enhancing our understanding of the associations between sleep, paranormal, and religious beliefs.

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Appendices

Appendix A.

Search Strategies for all Four Databases.

EMBASE

#	Searches	Results
1	exp sleep/ or sleep.mp.	411006
2	sleep wake disorders.mp. or exp sleep disorder/	257680
3	dream.mp. or exp dream/	16396
4	(dream* or narcolep* or "circadian rhythm" or dyssomnia* or "early awakening*" or "early waking" or EHS or "exploding head syndrome" or hallucination* or hypnagogi* or hypnopompic or insomnia* or "insufficient sleep" or "insufficient sleep syndrome" or "isolated sleep paralysis" or nightmare* or "night terror*" or "night waking" or non-REM* or "nonrestorative sleep" or NREM or "perceived insufficient sleep" or "rapid eye movement" or REM or "REM sleep intrusion" or "REM sleep parasomnia*" or "Sensory sleep start" or "sleep apnoea" or "sleep depriv*" or "sleep disorder*" or "sleep disrup*" or "sleep disturbance*" or "sleep duration" or "sleep efficiency" or "sleep enuresis" or "sleep fragment*" or "sleep latency" or "sleep length" or "sleep onset insomnia" or "sleep onset latency" or "sleep paralysis" or "sleep pattern*" or "sleep problem*" or "sleep terror" or "sleep-wake transition disorder*" or sleepwal* or bruxism).tw.	224997
5	1 or 2 or 3 or 4	507911
6	parapsychology.mp. or exp parapsychology/	975
7	(parapsycholog* or "alien abduction*" or "astral body" or "astral projection" or anomalous or "anomalous experience*" or demon or demons or demonic or "extrasensory perception*" or ghost* or haunt* or "near-death experience*" or OBE or "old hag" or "out-of-body experience*" or paranormal* or "precognitive dream*" or precogni* or premonition or prophecy or prophetic or psychic or "sensed presence" or spirit* or "paranormal experience*" or supernatural* or "supernatural experience*" or jinn or "dab tsog" or khmaoch or pandafeche or evil or karabasan or creature or creatures or	195599

	possession or possessed or "psychic dream*" or "prophetic dream*" or sebeteledi or setshitshama or "khmaoch sangkat" or "bei guai chaak" or E-meng or "gui ya chuang" or "bei gui ya" or morica or muera or al-Jathoom or maere or mare or hagge or "night palsy" or wizard-pressing or witch-riding or "stand stills" or luupainaja or dukak or painajainen or "unihalvaus appesart" or cauchemar or mora or pan-ephialtes or graiae or epofeles or "kibo kibongal" or nachtmerrie or lidercnyomas or matrod or dicekek or digeunton or tindihan or uquamairineq or bakhtak or tromlui or incubo or pesuarole or kanashibari or ka-wi-nulita or mottaka or "tsog tsuam" or "poj ntxoog" or "kena tindih" or haddiela or "se me subio el muetro" or pesadilla or boratat or "suk ninmyo" or "ogun oru" or mareritt or mara or svartalfar or kabus or bangungut or vjek or gnotek or zmora or strzyga or pesadelo or lamia or incubus or ephialtes or kikimora or "nocna mora" or "zao duh" or murawa or tokoloshis or pesadilla or pesante or "amuku be" or "phi um" or "phi khau" or emisambwa or "shadow people" or "ridden by the witch" or kokma or popabawa or madzikirira).tw.	
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"Dreams"[Mesh] OR "Sleep"[Mesh] OR "Sleep Wake Disorders"[Mesh] OR "circadian rhythm"[tiab] OR dream*[tiab] OR dyssomnia*[tiab] OR "early awakening*"[tiab] OR "early waking"[tiab] OR EHS[tiab] OR "exploding head"[tiab] OR "exploding head syndrome"[tiab] OR hallucination*[tiab] OR hypnagogi*[tiab] OR hypnopompic[tiab] OR insomnia*[tiab] OR "insufficient sleep"[tiab] OR "insufficient sleep syndrome"[tiab] OR "isolated sleep paralysis"[tiab] OR "lucid dreaming"[tiab] OR narcolep*[tiab] OR nightmare*[tiab] OR “night terror*”[tiab] OR "night waking"[tiab] OR non-REM*[tiab] OR "nonrestorative sleep"[tiab] OR NREM[tiab] OR Parasomnia*[tiab] OR "perceived insufficient sleep"[tiab] OR "rapid eye movement"[tiab] OR REM[tiab] OR "REM sleep intrusion"[tiab] OR "REM sleep parasomnia*"[tiab] OR "Sensory sleep start"[tiab] OR sleep*[tiab] OR "sleep apnea"[tiab] OR "sleep depriv*"[tiab] OR "Sleep Disorder*"[tiab] OR "sleep disrup*"[tiab] OR "sleep disturbance*"[tiab] OR "sleep duration"[tiab] OR "sleep efficiency"[tiab] OR "sleep enuresis"[tiab] OR "sleep fragment*"[tiab] OR "sleep latency"[tiab] OR "sleep length"[tiab] OR "sleep onset insomnia"[tiab] OR "sleep onset latency"[tiab] OR "sleep paralysis"[tiab] OR "sleep pattern*"[tiab] OR "sleep problem*"[tiab] OR "sleep quality"[tiab] OR "sleep terror"[tiab] OR "sleep-wake transition disorder*"[tiab] OR sleepwal*[tiab] OR bruxism[tiab] OR napping[tiab] OR sleepiness[tiab] OR snoring[tiab]

AND

"Parapsychology"[Mesh] OR “aliens”[tiab] OR “alien”[tiab] OR “alien abduction”[tiab] OR “astral body”[tiab] OR “astral projection”[tiab] OR anomalous[tiab] OR “anomalous experience*”[tiab] OR demon[tiab] OR demons[tiab] OR demonic[tiab] OR “extrasensory perception*”[tiab] OR ghost*[tiab] OR haunt*[tiab] OR “near-death experience*”[tiab] OR OBE[tiab] OR “old hag”[tiab] OR “out-of-body experience*”[tiab] OR paranormal[tiab] OR parapsycholog*[tiab] OR “precognitive dream*”[tiab] OR precogni*[tiab] OR premonition[tiab] OR prophecy[tiab] OR prophetic[tiab] OR psychic[tiab] OR “sensed presence”[tiab] OR spirit[tiab] OR spirits[tiab] OR paranormal experience*[tiab] OR supernatural*[tiab] OR “supernatural experience*”[tiab] OR jinn[tiab] OR “dab tsog”[tiab] OR khmaoch[tiab] OR pandafeche[tiab] OR evil[tiab] OR karabasan[tiab] OR creature[tiab] OR creatures[tiab] OR possession[tiab] OR possessed[tiab] OR “psychic dream*”[tiab] OR “prophetic dream*”[tiab] OR sebeteledi[tiab] OR setshitshama[tiab] OR “khmaoch sangkat”[tiab] OR “bei guai chaak”[tiab] OR E-meng[tiab] OR “gui ya chuang”[tiab] OR “bei gui ya”[tiab] OR morica[tiab] OR muera[tiab] OR al-Jathoom[tiab] OR maere[tiab] OR mare[tiab] OR hagge[tiab] OR “night palsy”[tiab] OR wizard-pressing[tiab] OR witch-riding[tiab] OR “stand stills”[tiab] OR luupainaja[tiab] OR dukak[tiab] OR painajainen[tiab] OR “unihalvaus appesart”[tiab] OR cauchemar[tiab] OR mora[tiab] OR pan-ephialtes[tiab] OR graiae[tiab] OR epofeles[tiab] OR “kibo kibongal”[tiab] OR nachtmerrie[tiab] OR lidercnyomas[tiab] OR matrod[tiab] OR dicekek[tiab] OR digeunton[tiab] OR tindihan[tiab] OR uquamairineq[tiab] OR bakhtak[tiab] OR tromlui[tiab] OR incubo[tiab] OR pesuarole[tiab] OR kanashibari[tiab] OR ka-wi-nulita[tiab] OR mottaka[tiab] OR “tsog tsuam”[tiab] OR “poj ntxoog”[tiab] OR “kena tindih”[tiab] OR haddiela[tiab] OR “se me subio el muetro”[tiab] OR pesadilla[tiab] OR boratat[tiab] OR “suk ninmyo”[tiab] OR “ogun oru”[tiab] OR mareritt[tiab] OR mara[tiab] OR svartalfar[tiab] OR kabus[tiab] OR bangungut[tiab] OR vjek[tiab] OR gnotek[tiab] OR zmora[tiab] OR strzyga[tiab] OR pesadelo[tiab] OR lamia[tiab] OR incubus[tiab] OR ephialtes[tiab] OR kikimora[tiab] OR “nocna mora”[tiab] OR “zao duh”[tiab] OR murawa[tiab] OR tokoloshis[tiab] OR pesadilla[tiab] OR pesante[tiab] OR “amuku be”[tiab] OR “phi um”[tiab] OR “phi khau”[tiab] OR emisambwa[tiab] OR “shadow people”[tiab] OR “ridden by the witch”[tiab] OR kokma[tiab] OR popabawa[tiab] OR madzikirira[tiab]

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DE "Sleep" OR DE "Dreaming" OR DE "Napping" OR DE "NREM Sleep" OR DE "REM Sleep" OR DE "Sleep Onset" OR DE "Sleep Quality" OR DE "Snoring" OR DE "Sleep Apnea" OR DE "Sleep Deprivation" OR DE "Sleep Talking" OR DE "Sleep Wake Cycle" OR DE "Sleepiness" OR DE "Lucid Dreaming" OR DE "Nightmares" OR DE "REM Dreams" OR DE "Sleep Wake Disorders" OR DE "Hypersomnia" OR DE "Insomnia" OR DE "Narcolepsy" OR DE "Parasomnias" OR DE "Sleepwalking" OR TI (dream* OR narcolep* OR “circadian rhythm” OR dyssomnia* OR “early awakening*” OR “early waking” OR EHS OR “exploding head syndrome” OR hallucination* OR hypnagogi* OR hypnopompic OR insomnia* OR “insufficient sleep” OR “insufficient sleep syndrome” OR “isolated sleep paralysis” OR nightmare* OR “night terror*” OR “night waking” OR non-REM* OR “nonrestorative sleep” OR NREM OR “perceived insufficient sleep” OR “rapid eye movement” OR REM OR “REM sleep intrusion” OR “REM sleep parasomnia*” OR “Sensory sleep start” OR “sleep apnoea” OR “sleep depriv*” OR “sleep disorder*” OR “sleep disrup*” OR “sleep disturbance*” OR “sleep duration” OR “sleep efficiency” OR “sleep enuresis” OR “sleep fragment*” OR “sleep latency” OR “sleep length” OR “sleep onset insomnia” OR “sleep onset latency” OR “sleep paralysis” OR “sleep pattern*” OR “sleep problem*” OR “sleep terror” OR “sleep-wake transition disorder*” OR sleepwal* OR bruxism) OR AB (dream* OR narcolep* OR “circadian rhythm” OR dyssomnia* OR “early awakening*” OR “early waking” OR EHS OR “exploding head syndrome” OR hallucination* OR hypnagogi* OR hypnopompic OR insomnia* OR “insufficient sleep” OR “insufficient sleep syndrome” OR “isolated sleep paralysis” OR nightmare* OR “night terror*” OR “night waking” OR non-REM* OR “nonrestorative sleep” OR NREM OR “perceived insufficient sleep” OR “rapid eye movement” OR REM OR “REM sleep intrusion” OR “REM sleep parasomnia*” OR “Sensory sleep start” OR “sleep apnoea” OR “sleep depriv*” OR “sleep disorder*” OR “sleep disrup*” OR “sleep disturbance*” OR “sleep duration” OR “sleep efficiency” OR “sleep enuresis” OR “sleep fragment*” OR “sleep latency” OR “sleep length” OR “sleep onset insomnia” OR “sleep onset latency” OR “sleep paralysis” OR “sleep pattern*” OR “sleep problem*” OR “sleep terror” OR “sleep-wake transition disorder*” OR sleepwal* OR bruxism)

AND

DE "Parapsychology" OR TI (“alien abduction*” OR “astral body” OR “astral projection” OR “anomalous experience*” OR demon OR demons OR demonic OR “extrasensory perception*” OR ghost* OR haunt* OR “near-death experience*” OR OBE OR “old hag” OR “out-of-body experience*” OR paranormal* OR “precognitive dream*” OR precogni* OR premonition OR prophecy OR prophetic OR psychic OR “sensed presence” OR spirit OR spirits OR “paranormal experience*” OR supernatural* OR “supernatural experience*” OR jinn OR “dab tsog” OR khmaoch OR pandafeche OR evil OR karabasan OR creature OR creatures OR possession OR possessed OR sebeteledi OR setshitshama OR “khmaoch sangkat” OR “bei guai chaak” OR E-meng OR “gui ya chuang” OR “bei gui ya” OR morica OR muera OR al-Jathoom OR maere OR mare OR hagge OR “night palsy” OR wizard-pressing OR witch-riding OR “stand stills” OR luupainaja OR dukak OR painajainen OR “unihalvaus appesart” OR cauchemar OR mora OR pan-ephialtes OR graiae OR epofeles OR “kibo kibongal” OR nachtmerrie OR lidercnyomas OR matrod OR dicekek OR digeunton OR tindihan OR uquamairineq OR bakhtak OR tromlui OR incubo OR pesuarole OR kanashibari OR ka-wi-nulita OR mottaka OR “tsog tsuam” OR “poj ntxoog” OR “kena tindih” OR haddiela OR “se me subio el muetro” OR pesadilla OR boratat OR “suk ninmyo” OR “ogun oru” OR mareritt OR mara OR svartalfar OR kabus OR bangungut OR vjek OR gnotek OR zmora OR strzyga OR pesadelo OR lamia OR incubus OR ephialtes OR kikimora OR “nocna mora” OR “zao duh” OR murawa OR tokoloshis OR pesadilla OR pesante OR “amuku be” OR “phi um” OR “phi khau” OR emisambwa OR “shadow people” OR “ridden by the witch” OR kokma OR popabawa OR madzikirira) OR AB (“alien abduction*” OR “astral body” OR “astral projection” OR “anomalous experience*” OR demon OR demons OR demonic OR “extrasensory perception*” OR ghost* OR haunt* OR “near-death experience*” OR OBE OR “old hag” OR “out-of-body experience*” OR paranormal* OR “precognitive dream*” OR precogni* OR premonition OR prophecy OR prophetic OR psychic OR “sensed presence” OR spirit OR spirits OR “paranormal experience*” OR supernatural* OR “supernatural experience*” OR jinn OR “dab tsog” OR khmaoch OR pandafeche OR evil OR karabasan OR creature OR creatures OR possession OR possessed OR sebeteledi OR setshitshama OR “khmaoch sangkat” OR “bei guai chaak” OR E-meng OR “gui ya chuang” OR “bei gui ya” OR morica OR muera OR al-Jathoom OR maere OR mare OR hagge OR “night palsy” OR wizard-pressing OR witch-riding OR “stand stills” OR luupainaja OR dukak OR painajainen OR “unihalvaus appesart” OR cauchemar OR mora OR pan-ephialtes OR graiae OR epofeles OR “kibo kibongal” OR nachtmerrie OR lidercnyomas OR matrod OR dicekek OR digeunton OR tindihan OR uquamairineq OR bakhtak OR tromlui OR incubo OR pesuarole OR kanashibari OR ka-wi-nulita OR mottaka OR “tsog tsuam” OR “poj ntxoog” OR “kena tindih” OR haddiela OR “se me subio el muetro” OR pesadilla OR boratat OR “suk ninmyo” OR “ogun oru” OR mareritt OR mara OR svartalfar OR kabus OR bangungut OR vjek OR gnotek OR zmora OR strzyga OR pesadelo OR lamia OR incubus OR ephialtes OR kikimora OR “nocna mora” OR “zao duh” OR murawa OR tokoloshis OR pesadilla OR pesante OR “amuku be” OR “phi um” OR “phi khau” OR emisambwa OR “shadow people” OR “ridden by the witch” OR kokma OR popabawa OR madzikirira)

Web of Science

TS=(sleep* OR dream* OR “sleep wake disorder*” OR “circadian rhythm” OR dyssomnia* OR “early awakening*” OR “early waking” OR EHS OR “exploding head” OR “exploding head syndrome” OR hallucination* OR hypnagogi* OR hypnopompic OR insomnia* OR “insufficient sleep” OR “insufficient sleep syndrome” OR “isolated sleep paralysis” OR “lucid dreaming” OR narcolep* OR nightmare* OR “night terror*” OR “night waking” OR non-REM* OR “nonrestorative sleep” OR NREM OR Parasomnia* OR “perceived insufficient sleep” OR “rapid eye movement” OR REM OR “REM sleep intrusion” OR “REM sleep parasomnia*” OR “Sensory sleep start” OR “sleep apnoea” OR “sleep apnea” OR “sleep depriv*” OR “sleep disorder*” OR “sleep disrup*” OR “sleep disturbance*” OR “sleep duration” OR “sleep efficiency” OR “sleep enuresis” OR “sleep fragment*” OR “sleep latency” OR “sleep length” OR “sleep onset insomnia” OR “sleep onset latency” OR “sleep paralysis” OR “sleep pattern*” OR “sleep problem*” OR “sleep quality” OR “sleep terror” OR “sleep-wake transition disorder*” OR sleepwal* OR bruxism OR snoring)

AND

TS=(parapsycholog* OR “alien abduction*” OR “astral body” OR “astral projection” OR anomalous OR “anomalous experience*” OR demon OR demons OR demonic OR “extrasensory perception*” OR ghost* OR haunt* OR “near-death experience*” OR OBE OR “old hag” OR “out-of-body experience*” OR paranormal* OR “precognitive dream*” OR precogni* OR premonition OR prophecy OR prophetic OR psychic OR “sensed presence” OR spirit* OR paranormal experience* OR supernatural* OR “supernatural experience*” OR jinn OR “dab tsog” OR khmaoch OR pandafeche OR evil OR karabasan OR creature OR creatures OR possession OR possessed OR “psychic dream*” OR “prophetic dream*” OR sebeteledi OR setshitshama OR “khmaoch sangkat” OR “bei guai chaak” OR E-meng OR “gui ya chuang” OR “bei gui ya” OR morica OR muera OR al-Jathoom OR maere OR mare OR hagge OR “night palsy” OR wizard-pressing OR witch-riding OR “stand stills” OR luupainaja OR dukak OR painajainen OR “unihalvaus appesart” OR cauchemar OR mora OR pan-ephialtes OR graiae OR epofeles OR “kibo kibongal” OR nachtmerrie OR lidercnyomas OR matrod OR dicekek OR digeunton OR tindihan OR uquamairineq OR bakhtak OR tromlui OR incubo OR pesuarole OR kanashibari OR ka-wi-nulita OR mottaka OR “tsog tsuam” OR “poj ntxoog” OR “kena tindih” OR haddiela OR “se me subio el muetro” OR pesadilla OR boratat OR “suk ninmyo” OR “ogun oru” OR mareritt OR mara OR svartalfar OR kabus OR bangungut OR vjek OR gnotek OR zmora OR strzyga OR pesadelo OR lamia OR incubus OR ephialtes OR kikimora OR “nocna mora” OR “zao duh” OR murawa OR tokoloshis OR pesadilla OR pesante OR “amuku be” OR “phi um” OR “phi khau” OR emisambwa OR “shadow people” OR “ridden by the witch” OR kokma OR popabawa OR madzikirira)

Appendix B.

Table B1

Most common ISP prevention techniques, most common sub-themes, and perceived effectiveness for the second and third responses

Strategy used	Examples	*n* (%)[a]	Perceived effectiveness M (SD)[b]
2[nd] response *n* = 433			
Adjusting sleep patterns/Reducing Tiredness		**70 (16.2)**	**68.47 (32.12)**
Avoid naps	"Avoid naps"	18 (25.7)	76.94 (19.03)
Avoid being overtired/sleep deprived	"Don't resist tiredness"	17 (24.3)	74.47 (32.93)
Sleep regularly	"Go to bed at a regular time"	12 (17.1)	72.33 (31.43)
Sleep position		**59 (13.6)**	**61.25 (27.99)**
Sleep on (unspecified) side	"Sleep on side"	19 (32.8)	53.42 (27.19)
Avoid sleeping on back	"Don't sleep on back"	18 (31.0)	72.72 (18.48)
Change position (other)	"Avoid sleeping on front"	6 (10.3)	55.83 (25.77)
Adjusting sleep environment		**40 (9.2)[c]**	**64.72 (32.69)**
Increase light/illumination	"Turn on lights"	7 (17.9)	72.86 (18.0)
Change sleep location	"I would go sleep in my mum's bed or her bedroom floor"	6 (15.4)	95.00 (10.0)
Miscellaneous	"Must not be too hot + set alarm to diminish stress"	5 (12.8)	69.00 (43.93)
Wake up/Rouse oneself		**32 (7.4)**	**66.91 (32.03)**

Wake up (unspecified)	"Try to wake up"	16 (50.0)	61.88 (32.50)
Avoid going back to sleep	"Try not to fall asleep"	8 (25.0)	76.88 (32.62)
Get up	"Get up and walk around"	7 (21.9)	63.71 (33.44)
Using/Refraining from substances		**23 (5.3)[c]**	**65.0 (30.26)**
Decrease use/avoid use of alcohol	"Less drinking"	6 (27.3)	86.67 (8.17)
3rd response n = 187			
Adjusting sleep patterns/Reducing tiredness		**28 (15.0)[c]**	**68.39 (27.99)**
Avoid naps	"Limit naps on weekend"	9 (33.3)	87.22 (19.54)
Sleep regularly	"Regular sleep routine"	7 (25.9)	44.29 (21.49)
Sleep position[d]		**16 (8.6)**	**74.38 (25.68)**
Adjust sleep environment		**14 (7.5)**	**58.21 (31.05)**
Increase light/illumination	"Lights on"	8 (57.1)	60.63 (27.31)
Avoid stress/negative affect[e]		**11 (5.8)**	**67.18 (28.90)**
Using/Refraining from substances[d]		**11 (5.8)**	**38.27 (31.76)**
4th response n = 65			
Sleep position		**6 (9.2)**	**52.50 (28.59)**

Note. ISP = Isolated Sleep Paralysis; M = Mean; SD = Standard deviation. This table presents the most common three prevention strategies per response in which $n > 5$ (to avoid emphasizing multiple categories endorsed by very few). Primary analysis outcomes are presented by order of frequency of response in bold followed by the three most common secondary analysis outcomes where applicable (n > 5). For example, in the 1st response, the prevention technique "sleep position" was identified in the primary analysis and its subthemes (e.g., avoid sleep on back) were identified in the secondary analysis.

[a] Refers to % out of subsample per response (in rows in bold) or to % out of subsample per sub-theme.
[b] Assessed as perceived % of time the technique works
[c] In the secondary analysis, one case that was coded as reflecting multiple prevention strategies was removed.
[d] Prevention strategies in this category did not meet our criteria of $n \geq 5$ and therefore were not included in the secondary analysis
[e] The secondary analysis did not show a higher level of detail on prevention strategies in this category.

Table B2

Most common ISP disruption techniques, most common sub-themes, and perceived effectiveness for the second and third responses

Strategy used	Examples	*n* (%)[a]	Perceived effectiveness M (SD)[b]
2[nd] response = 823			
Physical / bodily action		**287 (34.9)[c]**	**32.31 (33.84)**
Move (unspecified)	"Try to move"	75 (29.4)	20.76 (31.44)
Movement of eyes/eyelids	"Open eyes"	36 (14.1)	40.07 (29.87)
Move/wiggle fingers/hands	"Concentrate on moving a finger"	28 (11.0)	35.83 (33.18)
Make noise		**155 (18.8)[d]**	**15.88 (25.53)**
Scream	"Attempt to shout"	83 (55.7)	21.63 (28.63)
Speak	"Attempt to talk"	35 (23.5)	9.00 (17.94)
Call out/cry out	"I try to cry out"	25 (16.8)	11.24 (23.97)
Contextualisation		**58 (7.0)**	**42.88 (36.83)**
Rationalize/consciously recognise SP/tell self not real/still dreaming etc	"Convince myself I am dreaming"	44 (75.9)	35.50 (34.90)
Focus on object/body parts/people/physical sensations	"Focus on a part of my body"	6 (10.3)	72.50 (29.96)
3[rd] response *n* = 358			
Physical / bodily action		**88 (24.6)[e]**	**20.36 (30.36)**
Movement of eyes/eyelids (open, close, blink, move)	"Move my eyes"	15 (19.5)	18.67 (32.32)

Move (unspecified)	"Move"	13 (16.9)	10.00 (17.32)
Make noise		**44 (12.3)**	**16.45 (28.30)**
Scream	"Force myself to scream"	26 (59.1)	8.62 (14.73)
Call out/cry out (including for help)	"Call out for help"	7 (15.9)	18.57 (31.85)
Contextualisation		**41 (11.5)**	**39.29 (37.13)**
Rationalize/consciously recognise SP/tell self not real/still dreaming etc	"Remind myself this is a dream"	35 (85.4)	39.03 (36.55)
4^{th} response n = 106			
Noise		**12 (11.3)**	**8.33 (19.46)**
Scream	"Scream"	6 (50.0)	16.67 (25.82)
Acceptance and mind techniques		**11 (10.4)**	**80.00 (37.68)**
Acceptance/succumb	"Accept it and try to sleep"	6 (54.5)	96.67 (8.17)

Note. ISP = Isolated Sleep Paralysis; M = Mean; SD = Standard deviation. This table presents the most common three prevention strategies per response in which $n > 5$ (to avoid emphasizing multiple categories endorsed by very few). Primary analysis outcomes are presented by order of frequency of response in bold followed by the three most common secondary analysis outcomes where applicable ($n > 5$). For example, in the 1^{st} response, the prevention technique "make noise" was identified in the primary analysis and its subthemes (e.g., scream) were identified in the secondary analysis.

[a] Refers to % out of subsample per response (in rows in bold) or to valid % out of subsample per sub-theme.

[b] Assessed as perceived % of time the technique works

[c] In the secondary analysis, 32 cases that were coded as reflecting multiple prevention strategies were removed.

[d] In the secondary analysis, 6 cases that were coded as reflecting multiple prevention strategies

were removed.
[e] In the secondary analysis, 11 cases that were coded as reflecting multiple prevention strategies were removed.

Table B3

Associations between Isolated Sleep Paralysis Frequency and Prevention Techniques: Chi-square Main and Post Hoc Tests

	Prevention techniques				
	Yes n(%)	No n(%)	$\chi^2(5)$	*p*	*V*
ISP frequency					
1. Once	16(1.8)	334(12.8)	378.27	<.001	*.33*
2. Twice or several times in life	256(28.8)	1334(51.1)			
3. Several times a year	339(38.1)	664(25.4)			
4. Monthly	147(16.5)	177(6.8)			
5. Weekly	67(7.5)	54(2.1)			
6. Several times a week	65(7.3)	47(1.8)			

ISP frequency compared	$\chi^2(1)$	p-value
1 vs 2	31.74	**<.001**
1 vs 3	115.67	**<.001**
1 vs 4	154.58	**<.001**
1 vs 5	168.59	**<.001**
1 vs 6	178.59	**<.001**

2 vs 3	111.67	**<.001**
2 vs 4	142.87	**<.001**
2 vs 5	126.39	**<.001**
2 vs 6	136.71	**<.001**
3 vs 4	14.79	**<.001**
3 vs 5	25.65	**<.001**
3 vs 6	30.76	**<.001**
4 vs 5	4.65	.031
4 vs 6	7.04	.008
5 vs 6	.42	.516

Note. 1 = Once; 2 = Twice of several times in life; 3 = Several times a year; 4 = Monthly; 5 = Weekly; 6 = Several times a week. P-value with Bonferroni adjustment = .05/12 = 004; ISP = isolated sleep paralysis

Table B4

Associations between Isolated Sleep Paralysis Frequency and Disruption Techniques: Chi-square Main and Post Hoc Tests

	Disruption techniques				
	Yes n(%)	No n(%)	$\chi^2(5)$	*p*	*V*
ISP frequency					
1. Once	85(4.0)	263(19.8)	428.91	<.001	.35
2. Twice or several times in life	850(39.6)	729(54.9)			
3. Several times a year	769(35.9)	224(16.9)			
4. Monthly	261(12.2)	59(4.4)			
5. Weekly	95(4.4)	25(1.9)			
6. Several times a week	85(4.0)	27(2.0)			

ISP frequency compared	$\chi^2(1)$	p-value
1 vs 2	99.02	**<.001**
1 vs 3	317.31	**<.001**
1 vs 4	218.86	**<.001**
1 vs 5	119.82	**<.001**
1 vs 6	95.79	**<.001**

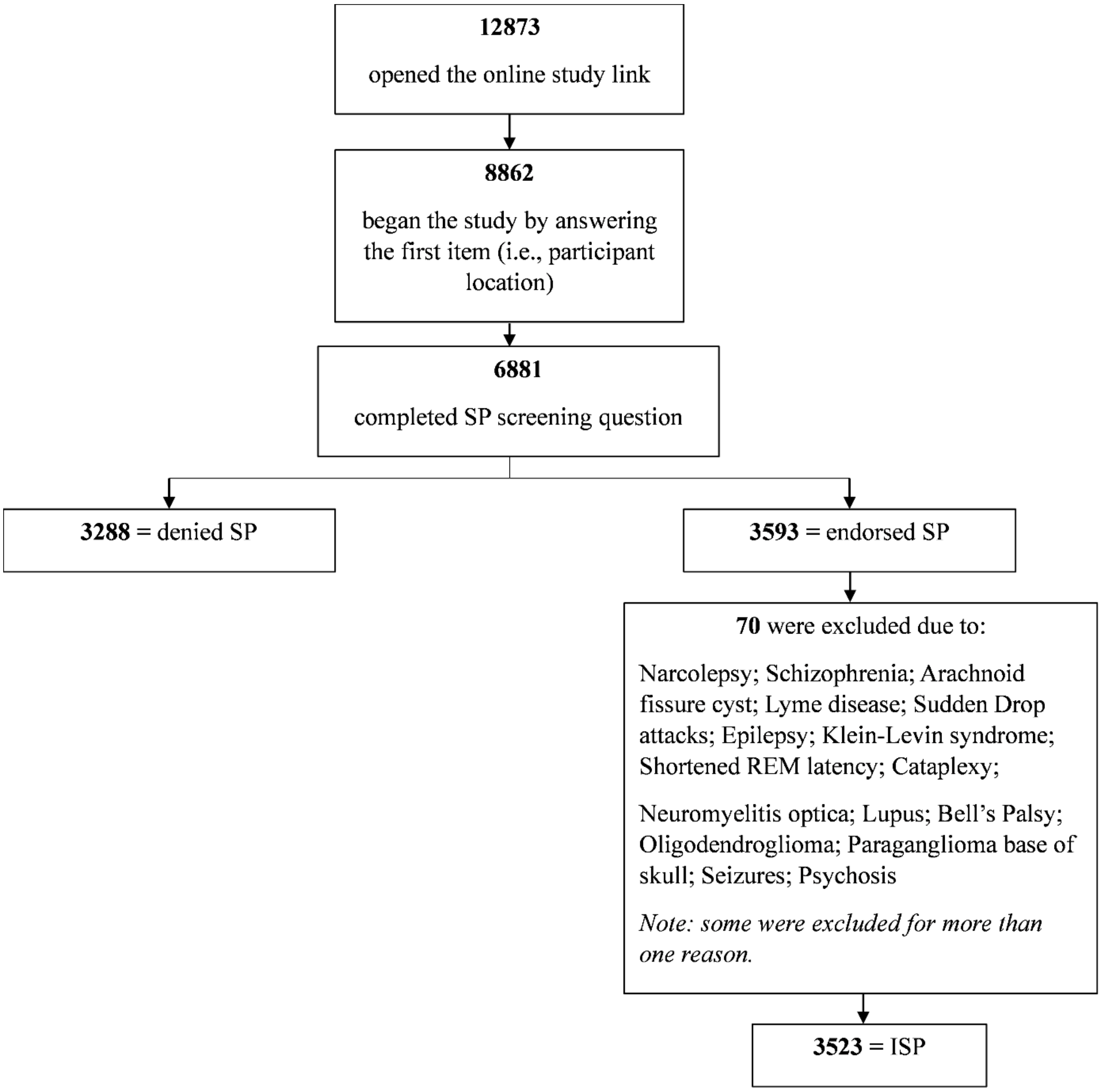
2 vs 3	149.26	**<.001**
2 vs 4	84.33	**<.001**
2 vs 5	32.09	**<.001**
2 vs 6	19.20	**<.001**
3 vs 4	2.08	.149
3 vs 5	.33	.566
3 vs 6	.57	.492
4 vs 5	.21	.647
4 vs 6	2.79	.095
5 vs 6	.77	.379

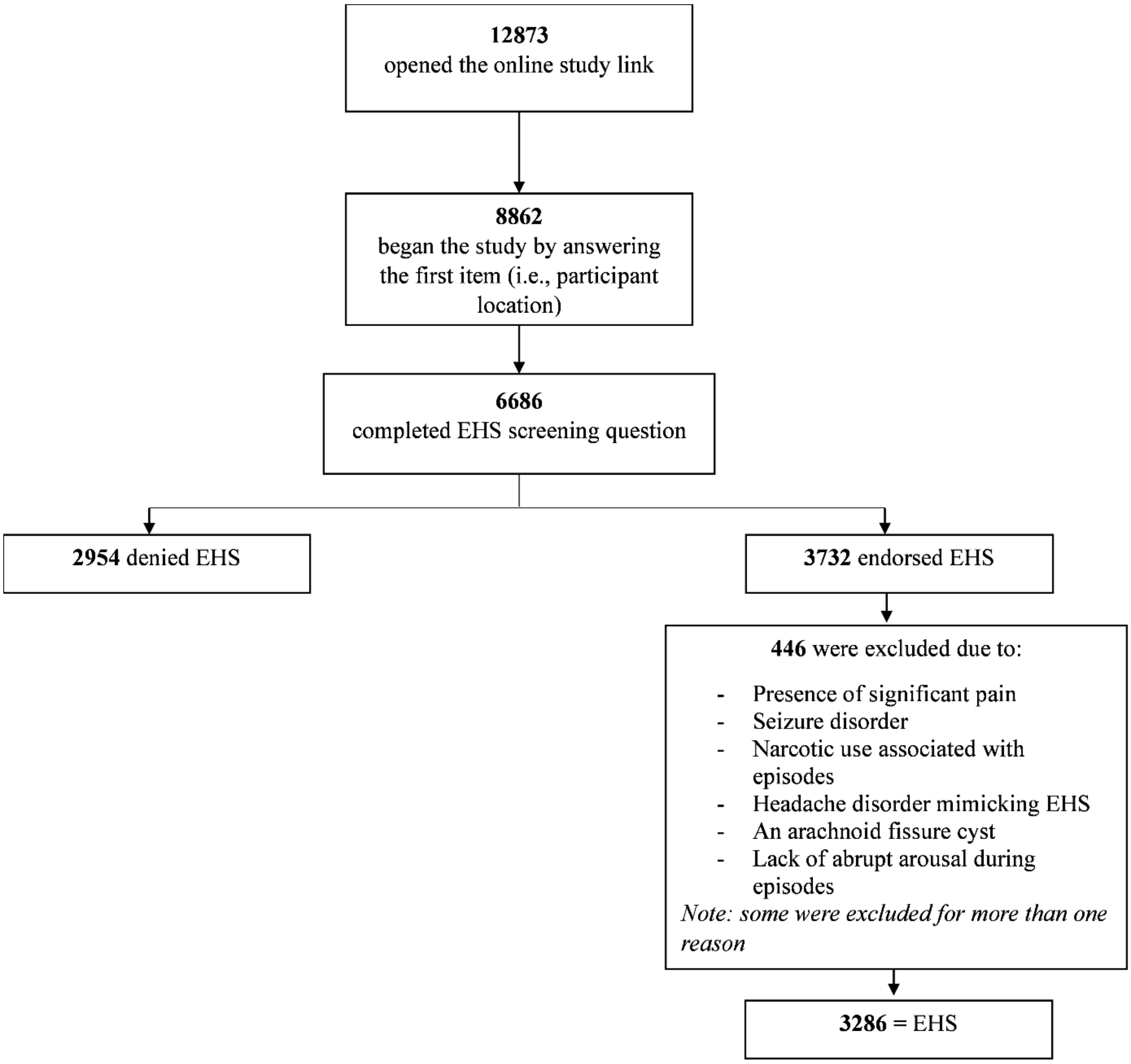
Note. 1 = Once; 2 = Twice of several times in life; 3 = Several times a year; 4 = Monthly; 5 = Weekly; 6 = Several times a week. P-value with Bonferroni adjustment = .05/12 = 004; ISP = isolated sleep paralysis.

Appendix C.

Figure C1 a,b

Participant Flow and Exclusions for ISP and EHS Analyses





Note. ISP = isolated sleep paralysis; EHS = exploding head syndrome.

Table C1

Prediction of Sleep Variables from Paranormal Beliefs

Sleep Efficiency

Paranormal beliefs	*B*	SEb	Beta	*t*	*p*	R^2
Soul after death	-.58	.12	-.06	-4.68	<.001	.004
Ghosts exist	-.94	.13	-.09	-7.27	<.001	.01
Communicate with the dead	-.82	.14	-.08	-5.98	<.001	.01
NDEs evidence life after death	-.69	.15	-.06	-4.48	<.001	.003
Demons exist	-.64	.14	-.06	-4.47	<.001	.003
Aliens visited earth	-.43	.15	-.04	-2.79	.005	.001

Sleep Duration

Paranormal beliefs	*B*	SEb	Beta	*t*	*p*	R^2
Soul after death	-114.57	40.30	-.04	-2.84	.004	.001
Ghosts exist	-284.69	42.00	-.09	-6.78	<.001	.01
Communicate with the dead	-269.43	44.51	-.08	-6.05	<.001	.01

NDEs evidence life after death	-235.07	49.88	-.06	-4.71	<.001	.004
Demons exist	-286.61	46.81	-.08	-6.12	<.001	.01
Aliens visited earth	-325.40	49.90	-.08	-6.52	<.001	.01

Sleep Latency

Paranormal beliefs	*B*	SEb	Beta	*t*	*p*	R^2
Soul after death	1.08	.32	.05	3.37	.001	.002
Ghosts exist	1.58	.33	.06	4.72	<.001	.004
Communicate with the dead	1.49	.36	.06	4.20	<.001	.003
NDEs evidence life after death	1.64	.40	.06	4.13	<.001	.003
Demons exist	1.40	.37	.05	3.74	<.001	.002
Aliens visited earth	1.03	.40	.04	2.62	.009	.001

Insomnia Symptoms

Paranormal beliefs	*B*	SEb	Beta	*t*	*p*	R^2
Soul after death	.13	.03	.06	4.89	<.001	.003

Ghosts exist	.28	.03	.12	10.21	<.001	.02
Communicate with the dead	.28	.03	.11	9.48	<.001	.01
NDEs evidence life after death	.22	.03	.08	6.53	<.001	.01
Demons exist	.24	.03	.09	7.77	<.001	.01
Aliens visited earth	.23	.03	.08	6.98	<.001	.01

Note. Regression analyses predicting the sleep quality variable from a single paranormal belief are reported in this table.

Table C2

Prediction of Sleep Quality Variables from Paranormal Beliefs Controlling for Age and Gender

			Sleep Efficiency			
Paranormal beliefs	*B*	SEb	Beta	*t*	*p*	R^2
Soul after death	-.32	.12	-.03	-2.55	.011	.04
Age	-.15	.01	-.17	-13.52	<.001	
Gender	-2.90	.35	-.11	-8.24	<.001	
Ghosts exist	-.65	.13	-.07	-4.99	<.001	.04
Age	-.14	.01	-.17	-13.29	<.001	
Gender	-2.65	.35	-.10	-7.49	<.001	
Communicate with the dead	-.47	.14	-.05	-3.42	.001	.04
Age	-.15	.01	-.17	-13.45	<.001	
Gender	-2.77	.36	-.10	-7.82	<.001	
NDEs evidence life after death	-.34	.15	-.03	-2.20	.028	.04
Age	-.14	.01	-.17	-13.31	<.001	
Gender	-2.90	.35	-.11	-8.25	<.001	
Demons exist	-.50	.14	-.05	-3.54	<.001	.04
Age	-.15	.01	-.17	13.58	<.001	

Gender	-2.89	.35	-.12	-8.30	<.001	
Aliens visited earth	-.60	.15	-.05	-3.95	<.001	.04
Age	-.15	.01	-.17	-13.58	<.001	
Gender	-2.89	.35	.12	-8.30	<.001	

Sleep Duration

Soul after death	-104.03	41.01	-.03	-2.54	.011	.01
Age	-20.89	3.59	-.08	-5.83	<.001	
Gender	9.84	116.58	.00	.08	.933	
Ghosts exist	-282.57	43.10	-.09	-6.56	<.001	.01
Age	-20.00	3.58	-.07	-5.59	<.001	
Gender	133.70	117.13	.02	1.14	.254	
Communicate with the dead	-265.71	45.87	-.08	-5.79	<.001	.01
Age	-20.23	3.58	-.07	-5.66	<.001	
Gender	116.33	117.38	.01	.99	.322	
NDEs evidence life after death	-221.57	50.73	-.06	-4.37	<.001	.01
Age	-19.85	3.59	-.07	-5.53	<.001	
Gender	50.50	116.28	.01	.43	.664	
Demons exist	-290.03	47.05	-.08	-6.17	<.001	.01
Age	-21.31	3.57	-.08	-5.96	<.001	
Gender	36.77	114.97	.00	.32	.749	

Aliens visited earth	-346.32	50.03	-.09	-6.92	<.001	.01
Age	-22.90	3.59	-.08	-6.39	<.001	
Gender	-84.98	114.25	-.01	-.74	.457	

Sleep Latency

Soul after death	.93	.32	.04	2.91	.004	.01
Age	-.13	.03	-.06	-4.75	<.001	
Gender	4.65	.91	.07	5.13	<.001	
Ghosts exist	1.31	.34	.05	3.89	<.001	.01
Age	-.14	.03	-.06	-4.80	<.001	
Gender	4.35	.91	.07	4.77	<.001	
Communicate with the dead	1.26	.36	.05	3.49	<.001	.01
Age	-.13	.03	-.06	-4.77	<.001	
Gender	4.37	.92	.07	4.77	<.001	
NDEs evidence life after death	1.49	.40	.05	3.75	<.001	.01
Age	-.14	.03	-.07	-4.92	<.001	
Gender	4.50	.90	.07	-4.98	<.001	
Demons exist	1.20	.37	.04	3.26	.001	.01
Age	-.13	.03	-.06	-4.63	<.001	
Gender	4.73	.90	.07	5.27	<.001	
Aliens visited earth	1.04	.39	.04	2.67	.008	.01

Age	-.13	.03	-.06	-4.42	<.001	
Gender	5.23	.89	.08	5.86	<.001	

Insomnia Symptoms

Soul after death	.10	.03	.05	3.65	<.001	.02
Age	-.02	.00	-.08	-6.19	<.001	
Gender	.62	.08	.10	7.92	<.001	
Ghosts exist	.25	.03	.11	8.81	<.001	.03
Age	-.02	.00	-.08	-6.43	<.001	
Gender	.52	.08	.08	6.64	<.001	
Communicate with the dead	.24	.03	.10	8.07	<.001	.03
Age	-.02	.00	-.08	-6.49	<.001	
Gender	.52	.08	.08	6.56	<.001	
NDEs evidence life after death	.19	.03	.07	5.71	<.001	.02
Age	-.02	.00	-.08	-6.53	<.001	
Gender	.59	.08	.09	7.55	<.001	
Demons exist	.21	.03	.08	6.73	<.001	.02
Age	-.01	.00	-.07	-5.96	<.001	
Gender	.61	.08	.10	7.89	<.001	
Aliens visited earth	.23	.03	.08	6.87	<.001	.02
Age	-.01	.00	-.07	-5.50	<.001	

Gender	.70	.08	.11	9.09	<.001

Note. Results for multiple regression analyses are presented in the table. Dependent variables: sleep efficiency, sleep duration, sleep latency, and insomnia symptoms. Independent variables: soul after death, ghosts exist, communicate with the dead, near-death experiences (NDEs) are evidence for life after death, demons exist, aliens visited earth. Each model predicts a sleep quality variable from a paranormal belief controlling for age and gender. R^2 = R squared.

Gender: 1 = Male, 2 = Female.

Table C3

Descriptive statistics of Paranormal Beliefs across Exploding Head Syndrome and Isolated Sleep Paralysis: Chi-square Analysis

	Exploding Head Syndrome		Significance		Cramer's V
	Yes n(%)	No n(%)	$\chi^2(4)$	*p*	
Soul after death					
Definitely not	843(*26.1)*	743*(25.6)*	$\chi^2 = 6.47$	.167	
I don't think so	765*(23.7)*	652*(22.4)*			
Not sure	740*(22.9)*	638*(22.0)*			
I think so	494*(15.3)*	476*(16.4)*			
Definitely yes	386*(12.0)*	397*(13.7)*			
Total	3228*(100%)*	2906*(100%)*			
Ghosts exist					
Definitely not	1011(*31.3)*	948(*32.6)*	$\chi^2 = 4.54$	.338	
I don't think so	761*(23.6)*	720*(24.8)*			
Not sure	690*(21.4)*	588*(20.2)*			
I think so	515*(16.0)*	424*(14.6)*			
Definitely yes	251*(7.8)*	225*(7.7)*			
Total	3228*(100%)*	2905*(100%)*			

Communicate with the dead				
Definitely not	1327 (*41.1)*	1228*(42.4)*	χ^2 = 7.21	.125
I don't think so	752*(23.3)*	692*(23.9)*		
Not sure	645*(20.0)*	513*(17.7)*		
I think so	340*(10.5)*	295*(10.2)*		
Definitely yes	162*(5.0)*	170*(5.9)*		
Total	3226*(100%)*	2898*(100%)*		
NDEs evidence life after death				
Definitely not	1107(*34.4)*	970(*33.5)*	χ^2 = 4.79	.310
I don't think so	946*(29.4)*	810*(28.0)*		
Not sure	815*(25.3)*	756*(26.1)*		
I think so	247*(7.7)*	258*(8.9)*		
Definitely yes	107*(3.3)*	102*(3.5)*		
Total	3222*(100%)*	2896*(100%)*		
Demons exist				
Definitely not	1671(*51.9)*	1528(*52.7)*	χ^2 = 3.92	.417
I don't think so	744*(23.1)*	619*(21.3)*		
Not sure	429*(13.3)*	409*(14.1)*		

I think so	233*(7.2)*	202*(7.0)*			
Definitely yes	142*(4.4)*	142*(4.9)*			
Total	3219*(100%)*	2900*(100%)*			
Aliens visited earth					
Definitely not	1043(*32.4)*	1058*(36.5)*	$\chi^2 = 23.56$	< .001***	.06
I don't think so	988*(30.7)*	909*(31.4)*			
Not sure	743*(23.1)*	623*(21.5)*			
I think so	314*(9.7)*	229*(7.9)*			
Definitely yes	133*(4.1)*	80*(2.8)*			
Total	3221*(100%)*	2899*(100%)*			

	Isolated Sleep Paralysis				
	Yes n(*%*)	No n(*%*)	*X(4)*	*p*	
Soul after death					
Definitely not	869(*25.2)*	840*(25.8)*	$\chi^2 = 10.48$	.033*	.04
I don't think so	771*(22.3)*	785*(24.1)*			
Not sure	823*(23.8)*	708*(21.7)*			
I think so	572*(16.6)*	488*(15.0)*			
	420*(12.2)*				

Definitely yes	3455*(100%)*	437*(13.4)*			
Total		3258*(100%)*			
Ghosts exist					
Definitely not	1097(*31.8)*	1050*(32.2)*	χ^2 = 4.50	.342	
I don't think so	807*(23.4)*	790*(24.2)*			
Not sure	*702(20.3)*	*686(21.0)*			
I think so	562*(16.3)*	473*(14.5)*			
Definitely yes	285*(8.3)*	263*(8.1)*			
Total	3453*(100%)*	3262*(100%)*			
Communicate with the dead					
Definitely not	1431 (*41.5)*	1350*(41.5)*	χ^2 = 3.41	.492	
I don't think so	779*(22.6)*	790*(24.3)*			
Not sure	670*(19.4)*	601*(18.5)*			
I think so	375*(10.9)*	335*(10.3)*			
Definitely yes	194*(5.6)*	180*(5.5)*			
Total	3449*(100%)*	3256*(100%)*			
NDEs evidence life after death					
Definitely not	1185(*34.4)*	1073*(33.0)*	χ^2 = 11.30	.023*	.04

I don't think so	994*(28.8)*	928*(28.5)*			
Not sure	846*(24.5)*	874*(26.9)*			
I think so	284*(8.2)*	284*(8.7)*			
Definitely yes	139*(4.0)*	94*(2.9)*			
Total	3448*(100%)*	3253*(100%)*			
Demons exist					
Definitely not	1745(*50.6)*	1738*(53.4)*	$\chi^2 = 9.11$	.058	
I don't think so	774*(22.5)*	712*(21.9)*			
Not sure	484*(14.0)*	451*(13.9)*			
I think so	275*(8.0)*	209*(6.4)*			
Definitely yes	169*(4.9)*	145*(4.5)*			
Total	3447*(100%)*	3255*(100%)*			
Aliens visited earth					
Definitely not	1086(3*1.5)*	1197*(36.8)*	$\chi^2 = 33.69$	< .001***	.07
I don't think so	1064*(30.9)*	1002*(30.8)*			
Not sure	820*(23.8)*	709*(21.8)*			
I think so	333*(9.7)*	258*(7.9)*			
Definitely yes	145*(4.2)*	87*(2.7)*			
Total	3448*(100%)*	3253*(100%)*			

Note. NDEs = Near-death experiences. $\chi^2(4)$ = degrees of freedom is 4. Post-hoc chi-squares with Bonferroni correction (*p* < .005) revealed no statistically significant associations between the belief that the soul lives on after death and ISP.

*$p < .05$
***$p < .001$.

Table C4

Chi-square Post Hoc Tests Using the Bonferroni Adjustment: Exploding Head Syndrome and Aliens Visited Earth

	Exploding Head Syndrome		Significance		Cramer's V
Aliens	Yes n (%)	No n (%)	$\chi^2(1)$	*p*	
Definitely not	1043 (48.3)	1058 (53.8)	12.57	<.001*	.06
I don't think so	1118 (51.7)	909 (46.2)			
Definitely not	1043 (54.6)	1058 (62.9)	25.39	<.001*	.08
Not sure	866 (45.4)	623 (37.1)			
Definitely not	1043 (74.8)	1058 (82.2)	21.83	<.001*	.09
I think so	352 (25.2)	229 (17.8)			
Definitely not	1043 (87.6)	1058 (93.0)	18.73	<.001*	.09
Definitely yes	147 (12.4)	80 (7.0)			
I don't think so	988 (53.3)	909 (59.3)	12.44	<.001*	.06
Not sure	866 (46.7)	623 (40.7)			
I don't think so	988 (73.7)	909 (79.9)	12.95	<.001*	.07
I think so	352 (26.3)	229 (20.1)			
I don't think so	988 (87.0)	909 (91.9)	13.09	<.001*	.08

Definitely yes	147 (13.0)	80 (8.1)			
Not sure	743 (67.9)	623 (73.1)	6.35	.012	-
I think so	352 (32.1)	229 (26.9)			
Not sure	743 (83.5)	623 (88.6)	8.48	.004*	.07
Definitely yes	147 (16.5)	80 (11.4)			
I think so	314 (68.1)	229 (74.1)	3.20	.074	-
Definitely yes	147 (31.9)	80 (25.9)			

Note. "Aliens" refers to the questionnaire item "*Do you believe that aliens have visited earth or interacted with humans*?". Adjusted p-value is (0.05/10 comparisons) = .005.
**p* < .005.

Table C5

Chi-square Post Hoc Tests Using the Bonferroni Adjustment: Isolated Sleep Paralysis and Aliens Visited Earth

	Isolated Sleep Paralysis		Significance		Cramer's V
Aliens	Yes	No	$\chi^2(1)$	*p*	
	n (%)	n (%)			
Definitely not	1086 (50.0)	1197 (54.4)	8.79	.003*	.05
I don't think so	1088 (50.0)	1002 (45.6)			
Definitely not	1086 (56.4)	1197 (62.8)	16.07	<.001*	.07
Not sure	838 (43.6)	709 (37.2)			
Definitely not	1086 (76.3)	1197 (82.3)	15.53	<.001*	.07
I think so	337 (23.7)	258 (17.7)			
Definitely not	1086 (88.1)	1197 (93.2)	19.76	<.001*	.09
Definitely yes	147 (11.9)	87 (6.8)			
I don't think so	1064 (55.9)	1002 (58.6)	2.53	.112	-
Not sure	838 (44.1)	709 (41.4)			
I don't think so	1064 (75.9)	1002 (79.5)	4.89	.027	-
I think so	337 (24.1)	258 (20.5)			
I don't think so	1064 (87.9)	1002 (92.0)	10.80	≤.001*	.07
Definitely yes	147 (12.1)	87 (8.0)			

Not sure	820 (70.9)	709 (73.3)	1.56	.211	-
I think so	337 (29.1)	258 (26.7)			
Not sure	820 (84.8)	709 (89.1)	6.92	.009	-
Definitely yes	147 (15.2)	87 (10.9)			
I think so	333 (69.4)	258 (74.8)	2.89	.089	-
Definitely yes	147 (30.6)	87 (25.2)			

Note. "Aliens" refers to the questionnaire item "*Do you believe that aliens have visited earth or interacted with humans*?". Adjusted p-value is (0.05/10 comparisons) = .005.
**p* < .005.

Table C6

Chi-square Post Hoc Tests Using the Bonferroni Adjustment: Isolated Sleep Paralysis and Near-death Experiences

	Isolated Sleep Paralysis		Significance		Cramer's V
NDEs	Yes n (%)	No n (%)	$\chi^2(1)$	*p*	
Definitely not	1185 (53.9)	1073 (53.6)	.03	.863	-
I don't think so	1014 (46.1)	928 (46.4)			
Definitely not	1185 (57.9)	1073 (55.1)	3.07	.080	-
Not sure	863 (42.1)	874 (44.9)			
Definitely not	1185 (80.2)	1073 (79.1)	.59	.444	-
I think so	292 (19.8)	284 (20.9)			
Definitely not	1185 (89.5)	1073 (91.9)	4.37	.037	-
Definitely yes	139 (10.5)	94 (8.1)			
I don't think so	994 (53.5)	928 (51.5)	1.51	.219	-
Not sure	863 (46.5)	874 (48.5)			
I don't think so	994 (77.3)	928 (76.6)	.19	.667	-
I think so	292 (22.7)	284 (23.4)			
I don't think so	994 (87.7)	928 (90.8)	5.25	.022	-
Definitely yes	139 (12.3)	94 (9.2)			

Not sure	846 (74.3)	874 (75.5)	.39	.531	-
I think so	292 (25.7)	284 (24.5)			
Not sure	846 (85.9)	874 (90.3)	9.00	.003*	.07
Definitely yes	139 (14.1)	94 (9.7)			
I think so	284 (67.1)	284 (75.1)	6.18	.013	-
Definitely yes	139 (32.9)	94 (24.9)			

Note. NDEs = near-death experiences, refers to the questionnaire item "*Do you believe that near-death experiences are evidence for life after death?*". Adjusted p-value is (0.05/10 comparisons) = .005.
*p < .005.

Table C7

Chi-square Post Hoc Tests Using the Bonferroni Adjustment: Isolated Sleep Paralysis and Soul Lives on After Death

	Isolated Sleep Paralysis		Significance	
Soul	Yes	No	$\chi^2(1)$	*p*
	n (%)	n (%)		
Definitely not	869 (52.4)	840 (51.7)	.16	.693
I don't think so	790 (47.6)	785 (48.3)		
Definitely not	869 (50.8)	840 (54.3)	3.93	.047
Not sure	842 (49.2)	708 (45.7)		
Definitely not	869 (60.0)	840 (63.3)	3.15	.076
I think so	580 (40.0)	488 (36.7)		
Definitely not	869 (66.9)	840 (65.8)	.40	.530
Definitely yes	429 (33.1)	437 (34.2)		
I don't think so	771 (47.8)	785 (52.6)	7.09	.008
Not sure	842 (52.2)	708 (47.4)		
I don't think so	771 (57.1)	785 (61.7)	5.74	.017
I think so	580 (42.9)	488 (38.3)		
I don't think so	771 (64.3)	785 (64.2)	.00	.995
Definitely yes	429 (35.8)	437 (35.8)		
Not sure	823 (58.7)	708 (59.2)	.08	.781

I think so	580 (41.3)	488 (40.8)		
Not sure	823 (65.7)	708 (61.8)	3.94	.047
Definitely yes	429 (34.3)	437 (38.2)		
I think so	572 (57.1)	488 (52.8)	3.74	.053
Definitely yes	429 (42.9)	437 (47.2)		

Note. "Soul" refers to the questionnaire item "*Do you believe that you have a soul that will live on after you die?*". Adjusted p-value is (0.05/10 comparisons) = .005. No significant differences between the different groups were found. Cramer's *V* not reported due to non-significant results.

Appendix D.

Table D1

Perceived Effectiveness of Prayer as a Primary or Secondary Technique

Techniques used	Examples	n	Perceived effectiveness M (SD)
Primary techniques			
Prayer prevent	"Praying"	2	92.50 (10.61)
Prayer disrupt	-	0	-
Secondary techniques			
Prayer prevent	"Praying before sleep"	2	90.00 (14.14)
Prayer disrupt	"Try to recite prayer"	2	80.00 (28.28)

Note. Effectiveness of primary and secondary techniques was measured using a slider ranging from 0 (technique not at all effective) to 100 (technique extremely effective). Primary techniques refer to the main/first techniques the participants reported using to prevent or disrupt an episode. Secondary techniques refer to the additional techniques used by the participants.

Appendix E.

Table E1

Results from Linear Regressions on the Association between Various Dichotomous Variables and Religious Faith Controlling for Age and Gender

	B	SEb	Beta	*t*	*p*	R^2
ISP (no, yes)	-1.92	.48	-.10	-3.99	<.001	.03
Cause brain	-2.05	.50	-.10	-4.10	<.001	.03
Cause supernatural	6.77	1.10	.16	6.16	<.001	.05
Cause electronic	8.40	3.28	.07	2.56	.011	.03
Pray prevention	12.66	4.63	.07	2.74	.006	.03
Contexualise	-3.63	1.41	-.07	-2.57	.010	.03
Pray disruption	10.55	3.78	.07	2.79	.005	.03

Note. These are results from separate multiple regression models with age and gender controlled for in each analysis. Dependent variable = religious faith (continuous); ISP = isolated sleep paralysis; electronic = electronic equipment; pray prevention refers to using prayer (no, yes) as a primary prevention technique for ISP; pray disruption refers to using prayer as a primary disruption technique. Upon post-hoc testing for multiple comparisons using Bonferroni correction (.05/5 = .01), the association between religious faith and belief that ISP is caused by electronic equipment was no longer significant ($p > .01$).

Table E2

Differences Between Those Utilising Primary and Secondary ISP-related Prevention Techniques versus Those who Do Not on Religious Faith Scores

	Primary prevention technique						
	Change sleep position						
	Yes		No				
	M	*SD*	*M*	*SD*	*t(df)*	*p*	*d*
Religious faith	18.79	8.58	19.39	9.36	.61(1533)	.541	-
	Adjust sleep pattern						
	17.34	9.14	19.40	9.31	1.35(1533)	.177	-
	Adjust environment						
	17.77	8.50	19.40	9.33	1.19(1533)	.235	-
	Using/refraining from substances						
	17.95	6.97	19.37	9.34	.92(21.01)	.366	-
	Resist sleep/wake up						
	18.67	7.99	19.37	9.34	.41(1533)	.683	-

	Pray						
	33.25	7.63	19.32	9.29	-3.00(1533)	.003	-1.50
	Secondary prevention technique						
	Change sleep position						
Religious faith	17.10	8.86	19.40	9.32	1.34(1533)	.181	-
	Adjust sleep pattern						
	19.47	8.17	19.35	9.34	-.07(1533)	.941	-
	Adjust environment						
	19.00	8.85	19.36	9.33	.26(1533)	.796	-
	Using/refraining from substances						
	17.58	8.19	19.38	9.33	.98(1533)	.327	-
	Resist sleep/wake up						
	18.58	8.69	19.38	9.33	.58(1533)	.560	-
	Pray						
	29.00	2.83	19.34	9.31	-1.47(1533)	.143	-

Note. d = Cohen's d; The *N* in the "Yes" groups were substantially lower than in the "No" group; Primary prevention technique refers to the first-line approach to prevent isolated sleep paralysis. Secondary prevention technique refers to the second technique used. See Table E1 for sensitivity analyses when age and gender are controlled for.

Table E3

Differences Between Those Utilising Primary and Secondary ISP-related Disruption Techniques versus Those who Do Not on Religious Faith Scores

	Primary disruption technique						
	Physical/bodily action						
	Yes		No				
	M	*SD*	*M*	*SD*	*t(df)*	*p*	*d*
Religious faith	18.45	8.83	19.54	9.40	1.72(1533)	.086	-
	Make noise						
	18.48	8.37	19.43	9.39	1.19(148.59)	.238	-
	Wake up/rouse the brain						
	18.38	8.34	19.41	9.36	.96(1533)	.340	-
	Contextualisation						
	15.79	6.71	19.47	9.36	3.65(51.82)	.001	.40
	Breathing						
	18.71	7.30	19.36	9.33	.37(16.59)	.719	-

	Pray						
	30.83	4.58	19.31	9.30	-6.12(5.16)	.002	-1.24
	Secondary disruption technique						
	Physical/bodily action						
Religious faith	18.02	8.25	19.49	9.40	1.99(178.88)	.049	.16
	Make noise						
	17.28	7.88	19.58	9.43	3.31(194.87)	.001	.25
	Wake up/rouse the brain						
	18.26	8.65	19.44	9.36	1.30(1533)	.194	-
	Contextualisation						
	20.26	8.83	19.31	9.33	-.83(1533)	.408	-
	Breathing						
	17.92	7.90	19.38	9.33	.79(1533)	.430	-
	Pray						
	34.20	5.12	19.31	9.28	-3.59(1533)	<.001	-1.61

Note. See Table E1 for sensitivity analyses when age and gender are controlled for. Where df is not 1533, equal variances are not assumed.

Table E4

Religious belief systems and ISP prevention techniques

Primary prevention techniques

	Atheist		Agnostic		Religious				
	N	%	N	%	N	%	$\chi^2(2)$	*p*	*V*
Sleep position									
Yes	34	6.5	32	10.1	23	3.9	13.94	.001[a]	.10
No	493	93.5	284	89.9	570	96.1			
Sleep pattern									
Yes	14	2.7	13	4.1	10	1.7	4.86	.088	-
No	513	97.3	303	95.9	583	98.3			
Environment									
Yes	19	3.6	10	3.2	14	2.4	1.53	.466	-
No	508	96.4	306	96.8	579	97.6			
Substances									
Yes	8	1.5	5	1.6	5	0.8	1.38	.501	-
No	519	98.5	311	98.4	588	99.2			

	N	%	N	%	N	%	$\chi^2(2)$	*p*	*V*
Resist sleep									
Yes	11	2.1	7	2.2	10	1.7	.38	.825	-
No	516	97.9	309	97.8	583	98.3			
Pray									
Yes	0	0.0	0	0.0	5	0.8	7.13	.028[b]	.07
No	527	100.0	316	100.0	588	99.2			

Secondary prevention techniques

	Atheist		Agnostic		Religious				
	N	%	N	%	N	%	$\chi^2(2)$	*p*	*V*
Sleep position									
Yes	13	2.5	8	2.5	9	1.5	1.62	.446	-
No	514	97.5	308	97.5	584	98.5			
Sleep pattern									
Yes	14	2.7	9	2.8	9	1.5	2.38	.305	-
No	513	97.3	307	97.2	584	98.5			
Environment									

Yes	16	3.0	16	5.1	11	1.9	7.31	.026[c]	.07
No	511	97.0	300	94.9	582	98.1			
Substances									
Yes	8	1.5	8	2.5	9	1.5	1.48	.477	-
No	519	98.5	308	97.5	584	98.5			
Resist sleep									
Yes	18	3.4	8	2.5	11	1.9	2.71	.258	-
No	509	96.6	308	97.5	582	98.1			
Pray									
Yes	0	0.0	0	0.0	2	0.3	2.85	.241	-
No	527	100.0	316	100.0	591	99.7			

Note. ISP = isolated sleep paralysis; *V* = Cramer's *V*; Sleep position = changing sleep position; Sleep pattern = adjusting sleep pattern; Environment = adjusting environment; Substances = using/refraining from substances; Resist sleep = resisting sleep, waking up.

[a]Post-hoc chi-square pairwise comparisons with an adjusted alpha using Bonferroni correction (.05/6 = .008) showed that agnostics (10.1%) were more likely to change sleep position to prevent an ISP episode than religious participants (3.9%; $\chi^2(1) = 14.16$, $p < .001$, Cramer's $V = .13$).

[b]Post-hoc chi-square comparisons could not be run due to low numbers in the groups.
[c]Post-hoc chi-square pairwise comparisons showed that adjusting environment to prevent an ISP episode was more common in those identifying as agnostics (5.1%) than religious participants (1.9%; $\chi^2(1) = 7.36$, $p = .007$, Cramer's $V = .09$).

Table E5

Religious belief systems and ISP disruption techniques

Primary disruption techniques

	Atheist		Agnostic		Religious				
	N	%	N	%	N	%	$\chi^2(2)$	*p*	*V*
Bodily action									
Yes	96	18.2	69	21.8	72	12.1	15.83	<.001[a]	.11
No	431	81.8	247	78.2	521	87.9			
Make noise									
Yes	45	8.5	23	7.3	41	6.9	1.11	.575	-
No	482	91.5	293	92.7	552	93.1			
Rouse brain									
Yes	38	7.2	16	5.1	20	3.4	8.42	.015[b]	.08
No	489	92.8	300	94.9	573	96.6			
Contextualise									
Yes	21	4.0	16	5.1	5	0.8	16.23	<.001[c]	.11
No	506	96.0	300	94.9	588	99.2			

Breathe									
Yes	5	0.9	6	1.9	5	0.8	2.29	.318	-
No	522	99.1	310	98.1	588	99.2			
Pray									
Yes	0	0.0	1	0.3	6	1.0	6.13	.047[d]	.07
No	527	100.0	315	99.7	587	99.0			

Secondary disruption techniques

	Atheist		Agnostic		Religious				
	N	%	N	%	N	%	$\chi^2(2)$	p	V
Bodily action									
Yes	62	11.8	34	10.8	31	5.2	16.63	<.001[e]	.11
No	465	88.2	282	89.2	562	94.8			
Make noise									
Yes	59	11.2	37	11.7	39	6.6	9.52	.009[f]	.08
No	468	88.8	279	88.3	554	93.4			

Rouse brain									
Yes	43	8.2	27	8.5	33	5.6	3.97	.138	-
No	484	91.8	289	91.5	560	94.4			
Contextualise									
Yes	25	4.7	14	4.4	27	4.6	.05	.976	-
No	502	95.3	302	95.6	566	95.4			
Breathe									
Yes	8	1.5	8	2.5	6	1.0	3.16	.206	-
No	519	98.5	308	97.5	587	99.0			
Pray									
Yes	0	0.0	0	0.0	4	0.7	5.70	.058	-
No	527	100.0	316	100.0	589	99.3			

Note. ISP = isolated sleep paralysis; V = Cramer's V; Bodily action = using physical/bodily action; Rouse brain = waking up/rousing the brain.

[a] Post-hoc chi-square comparisons (Bonferroni p-value = .008) found that using physical/bodily action to disrupt an ISP episode was more common in atheists (18.2%) and agnostics (21.8%) compared to religious participants (12.1%; $\chi^2(1) = 8.08$, $p = .004$, Cramer's $V = .09$ and $\chi^2(1) = 14.78$, $p < .001$, Cramer's $V = .13$, respectively).

[b] Post-hoc chi-square comparisons (Bonferroni p-value = .008) found that rousing the brain to disrupt an ISP episode was more common in atheists (7.2%) than religious participants (3.4%; $\chi^2(1) = 8.37$, $p = .004$, Cramer's $V = .09$).

[c] Post-hoc chi-square comparisons (Bonferroni p-value = .008) found that contextualisation was more common in atheists (4.0%) and agnostics (5.1%) than religious participants (0.8%; $\chi^2(1)$ = 12.15, $p < .001$, Cramer's $V = .10$ and $\chi^2(1)$ = 16.27, $p < .001$, Cramer's $V = .13$, respectively).

[d] Post-hoc chi-square comparisons (Bonferroni p-value = .008) found no significant difference in the utilisation of prayer as a primary disruption technique across the three religious belief systems ($p > .008$).

[e] Post-hoc chi-square pairwise comparisons (Bonferroni p-value = .008) showed that using physical/bodily action to disrupt an episode was more common in those identifying as atheist (11.8%) and agnostics (10.8%) compared to religious participants (5.2%; $\chi^2(1)$ = 15.66, $p < .001$, Cramer's $V = .12$ and, $\chi^2(1)$ = 9.50, $p = .002$, Cramer's $V = .10$, respectively).

[f] Post-hoc chi-square pairwise comparisons (Bonferroni p-value = .008) showed that making noise to disrupt an episode was more common in atheists (11.2%) and agnostics (11.7%) than religious participants (6.6%; $\chi^2(1)$ = 7.46, $p = .006$, Cramer's $V = .08$ and $\chi^2(1)$ = 7.09, $p = .008$, Cramer's $V = .09$, respectively).

Table E6

T-test Results Comparing Religious Faith Scores of Individuals Reporting ISP and Those Who Do Not, Excluding Individuals Who Reported Experiencing ISP Once

	Isolated Sleep Paralysis						
	Yes		No				
	M	SD	M	SD	*t*-test(*df*)	*p*	*d*
Religious faith	18.26	8.66	20.47	9.85	4.44(1320.55)	<.001	.24

Note. M = Mean; SD = Standard deviation; *df* = degrees of freedom; d = Cohen's d; Religious faith ranges from 10 to 40, higher scores reflecting greater religious faith; The "Yes" category does not include participants who reported experiencing isolated sleep paralysis only once in their lifetime. Results remained unchanged in a multiple linear regression ($\beta = -.107$, $p < .001$) when age and gender were controlled for (F (3, 1377) = 15.92, $p < .001$, $R^2 = .034$ for overall model).

Table E7

Chi-Square Analysis of the Association between Religious Belief Systems and ISP, Excluding Individuals Who Reported Experiencing ISP Once

Religious Belief Systems

	Atheist		Agnostic		Religious				
	N	%	N	%	N	%	$\chi^2(2)$	*p*	*V*
ISP									
Yes	287	41.3	176	25.3	232	33.4	34.87	<.001	.16
No	199	31.7	119	18.9	310	49.4			

Note. ISP = isolated sleep paralysis; Post-hoc chi-square pairwise comparisons with a Bonferroni adjusted alpha level set at .008 (.05/6) showed that ISP was more commonly reported by atheists (59.1%) and agnostics (59.7%) than religious participants (42.8%; $\chi^2(1) = 27.07$, $p < .001$, Cramer's $V = .16$ and $\chi^2(1) = 21.73$, $p < .001$, Cramer's $V = .16$, respectively).