# Lucid nightmares: Lucid dreaming therapy for the treatment of idiopathic and posttraumatic nightmares

Justin Bergamini

Dr. Stephanie Wiebe

Faculty of Human Sciences

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**Abstract**

This paper will seek to synthesize the literature related to idiopathic and posttraumatic nightmares, lucid dreaming, and lucid dreaming therapy, to provide greater clarity to clinicians considering treating idiopathic and posttraumatic nightmares with lucid dreaming therapy. Nightmares are associated with many psychological disorders, more severe symptomology and increased risk of suicide and developing our understanding of nightmares and their respective treatments are of clinical importance. One such treatment is lucid dreaming therapy, the only treatment in which the individual actively alters the nightmare content while dreaming. Given the mixed findings of lucid dreaming therapy, questions remain whether it is an appropriate treatment for idiopathic and posttraumatic nightmares.

*Keywords:* nightmares, lucid dreaming, lucid dreaming therapy, PTSD

## Introduction

Increased attention has been paid to mental health during the COVID-19 pandemic as uncertainty, lockdowns, loss, and illness contribute to an increase in mental illness (Hossain et al., 2020). This trend is present in the increased prevalence and frequency of nightmares during COVID-19 (Kennedy & Grandner, 2021; Kilius et al., 2021; Pesonen et al., 2020; Scarpelli et al., 2021). Nightmares are a parasomnia characterized by dysphoric dream content that generally occur during rapid eye movement (REM) sleep and generally result in awakening (American Academy of Sleep Medicine, 2015; American Psychiatric Association, 2013b). Nightmares are typically classified into two subcategories: idiopathic nightmares (I-N) or posttraumatic nightmares (PT-N). The former refers to nightmares without a known cause and the latter refers to nightmares triggered by a traumatic event and featuring themes, imagery, or re-enactment of the trauma event(s) (Rosenzweig, 2018). PT-N tend to be more dysphoric than I-N (Rosenzweig, 2018). Nightmares occur in healthy populations (Li et al., 2010), but occur much more frequently in clinical populations (Levin & Fireman, 2002). Frequent nightmares (occurring once or more per week) is prevalent in roughly five percent of the population (Li et al., 2010). Nightmares are associated with many clinical conditions, such as major depressive disorder (MDD; Mume, 2009), generalized anxiety disorder (GAD; Nadorff et al., 2014), bi-polar disorder (Steardo et al., 2019), borderline personality disorder (BPD; Semiz et al., 2008) , schizophrenia (Sheaves et al., 2015), and post-traumatic stress disorder (PTSD; Wittmann et al., 2007).

There is disagreement surrounding whether bad dreams and nightmares are qualitatively different phenomena or the same phenomena differing in intensity (Levin & Fireman, 2002). For this paper, bad dreams will fall under the nightmare category, as they share many of the same features, comorbidities, and are often used interchangeably in the research literature. Given the

negative association between nightmares and mental wellbeing, it is important that we continue to develop treatments. One such treatments is lucid dreaming therapy (LDT). Lucid dreaming is the state of being aware that one is dreaming (Schredl, 2018a). LDT teaches participants to induce lucid dreaming to alter dysphoric dream content into something more positive and constructive (de Macêdo et al., 2019).

## Features of Nightmares

### Diagnostic Criteria

The International Classification of Sleep Disorders (ICSD) describes nightmares as typically being long, complicated dreams that become progressively more frightening, and result in the person waking (American Academy of Sleep Medicine, 2015). However, there is ongoing debate regarding whether frightening dreams need to result in awakening to be categorized as nightmares (Robert & Zadra, 2014). This is exhibited in the change in diagnostic criteria for nightmare disorder (ND) from the DSM-4 and the DSM-5, with the former requiring awakening, and the latter no longer including this feature in the diagnostic criteria (American Psychiatric Association, 1994, 2013b). The dreamer will typically become lucid quickly after waking and will quickly be able to recall the dream content (Levin & Fireman, 2002).

The ICSD-3 states that anxiety and fear are the typical emotional feature of nightmares (American Academy of Sleep Medicine, 2015). However, nightmares can also be associated with anger, embarrassment, disgust, and other negative feelings (American Academy of Sleep Medicine, 2015). There continues to be debate surrounding the defining features of nightmares, regarding the emotional quality of dreams and whether the dysphoric dreams triggers immediate awakening (Spoormaker et al., 2006). Some argue that a nightmare must have a frightening

quality, and must trigger awakening, and deem dysphoric dreams that are not terrifying and/or do not trigger awakening should instead be labelled bad dreams (Spoormaker et al., 2006).

Sleep terrors differ from nightmares in several ways. Sleep terrors typically occur during non-rapid eye movement sleep (NREM), involve greater motor activation, like talking, screaming, and moving of limbs and even walking (American Academy of Sleep Medicine, 2015). And when the individual experiencing sleep terrors wakes up they will usually be confused and have no memory of any dream content (American Academy of Sleep Medicine, 2015).

**Content, Themes & Emotions**

Nightmares are often characterized by an imminent threat to personal safety (American Academy of Sleep Medicine, 2015). Common themes in nightmares include being chased or attacked, and the feeling of helplessness (Robert & Zadra, 2014). The content of nightmares is influenced by the context of the individual experiencing the nightmare. Research analyzing the dream content of children found that imaginary creatures were frequent in children between the ages of seven and nine (American Psychiatric Association, 2013a). Whereas being kidnapped was most common in those between the age of 10 and 12 (American Psychiatric Association, 2013a). An analysis of dream content, with a sample made up of 50% students, found that themes of infidelity, humiliation and rejection were common (Robert & Zadra, 2014). The COVID-19 pandemic has also affected dream content. With nightmares becoming more frequent and the nightmare content increasingly containing themes of illness and disease (Kilius et al., 2021; Pesonen et al., 2020).

**Demographics & Prevalence**

Roughly five percent of the population experience frequent nightmares (one or more per week) (Levin & Fireman, 2002; Li et al., 2010; Sandman et al., 2013; Schredl, 2010; Zadra & Donderi, 2000). Though there is some variance in the rate reported, depending on inclusion/exclusion criteria related to immediate waking and vivid recall. Nightmares are much more common in children. With 10-50% of children between the ages of three and six experiencing nightmares (American Academy of Sleep Medicine, 2015). Research suggests that 50-60% of children between the age of five and ten experience frequent nightmares (Schredl et al., 2009). The onset of nightmares is typically gradual. Likewise, the frequency of nightmares will typically decrease gradually (Schredl et al., 2009). However, for a subgroup of children the frequency of nightmares does not decrease as they enter adolescence and adulthood. These individuals will often be lifelong sufferers of nightmares (American Academy of Sleep Medicine, 2015). Experiencing frequent nightmares is highly heritable (Coolidge et al., 2010; Hublin et al., 1999). In a twin-cohort study, the variance in nightmare frequency was attribute 51% to heritability and 49% to non-shared environment (Coolidge et al., 2010). While another twin study showed a 35% of the variance in nightmare frequency was attributed to genetic factors (Hublin et al., 1999).

A meta-analysis of dream data from 187,000 participants found a large difference in nightmare frequency between men and women (Schredl & Reinhard, 2011). The prevalence of frequent nightmares is much higher among women. Levin and Nielsen suggested five potential sources of the gender differences in nightmare frequency. The first being self-report bias, as women have been shown to have higher dream recall than men (Schredl & Reinhard, 2008) and are more open to sharing painful emotional experiences (Hartmann, 1984). They also listed gender-specific risk factors such as sexual-assault, the underlying processes contributing to

higher rates of depression in women, coping-style differences, and biological differences in emotional processes as potential sources of the higher frequency of nightmares among women.

A study that sought to determine the source of the gender disparity in nightmare frequency found that once you control for trait neuroticism, a personality trait higher in women, and for dream recall, there was no longer a statistically significant difference in nightmare frequency between men and women (Schredl, 2014). A study assessing the association between nightmares and masculine and feminine sex roles found that masculinity was negatively correlated with nightmare frequency in both men and women and femininity was positively correlated with nightmare frequency in both men and women (Schredl & Göritz, 2021). These findings suggest that the gender difference in nightmare frequency is at least, in part, influenced by social factors.

While frequent nightmares are present in about five percent of non-clinical populations (Li et al., 2010; Sandman et al., 2013), they are much more prevalent in clinical populations (Levin & Nielsen, 2007). With 30% percent of clinical populations experiencing frequent nightmares (Swart et al., 2013). A cross-sectional study with a sample of 8558 participants found that the risk for psychiatric disorder was 5.74 greater for those experiencing frequent nightmares (Li et al., 2010).

Nightmares are more prevalent among individuals diagnosed with MDD, than the general population (Mume, 2009). Research by Mume found that 16.7% of participants with MDD experienced frequent nightmares (2009). More than three times the rate of the healthy control group. The presence of nightmares in individuals with MDD is associated with greater risk of suicide (Ağargün et al., 1998; Hedström et al., 2021). Nightmares are more common in individuals with MDD with melancholic features (Agargun et al., 2007; Besiroglu et al., 2005).

Many studies show a strong association between anxiety and nightmares (Levin & Fireman, 2002; Nadorff et al., 2014; T. A. Nielsen et al., 2000; Zadra & Donderi, 2000). GAD is one of the most common anxiety disorders, and is characterized by excessive worry (American Psychiatric Association, 2013a). Sleep disturbances are also a common symptom of GAD (Nadorff et al., 2014). In a study of older adults with GAD, nightmare frequency was correlated with more severe symptomology, lower quality of life, poorer overall mental health, and higher levels of depression (Nadorff et al., 2014). The study found that 21.6% of older adults with GAD experienced frequent nightmares. A rate five times higher than those of healthy older adults (Salvio et al., 1992). Individuals tend to report higher levels of anxiety, stress, arousal and lower confidence and contentment the day after a nightmare (Köthe & Pietrowsky, 2001).

A study featuring 30 participants with dissociative disorder, found that 57% met a the diagnostic criteria for ND and that those suffering from ND were more likely to engage in self-mutilation, have attempted suicide in the past year, and were more likely to have a comorbidity of BPD (Agargun et al., 2003).

Nightmares are a common comorbidity of BPD (Claridge et al., 1998; Semiz et al., 2008). Research by Semiz and colleagues found that nightmares were much more common in the BPD group than in the healthy control group (2008). They also found that those in the BPD group with ND exhibited greater psychopathology than those in the group without ND. A study examining the relationship between emotional cascades, a process whereby rumination on negative affect increases emotional intensity, and nightmares in individuals with BPD found that emotional cascading increased the likelihood of having a nightmare that evening (Selby et al., 2013). They also found that the day after a nightmare, participants were at higher risk of

emotional cascading. These findings point to a bi-directional relationship between emotional dysregulation and nightmare frequency.

There is preliminary evidence suggesting a shared etiology between psychotic symptoms and frequent nightmares (Koffel & Watson, 2009; Sheaves et al., 2015). Frequent nightmares are a common feature of schizophrenia and other psychosis-related disorders. One study found 55% of individuals with psychotic symptoms experienced frequent nightmares (Sheaves et al., 2015). The study also found distressing nightmares were associated with more severe psychosis and delusions. Frequent nightmares in childhood increase the risk of psychotic experiences in adolescence (H. L. Fisher et al., 2014). In a healthy student sample, nightmare distress was predictive of paranoia and psychoticism (Levin & Fireman, 2002).

One of the diagnostic criteria of PTSD is the presence of cognitive intrusions related to the traumatic event(s) (American Psychiatric Association, 2013a). These can take the form of intrusive imagery, flashbacks, and/or nightmares (American Psychiatric Association, 2013a). A theoretical review of the disorder went as far as to call PT-N a hallmark of the disorder (Ross et al., 1989). The presence of frequent nightmares prior to a traumatic event increases the risk of developing PTSD (Ohayon & Shapiro, 2000). Roughly 80% of individuals with PTSD experience nightmares (Morgenthaler et al., 2018).

**Impact on Wellbeing**

There are conflicting data on the impact of nightmares on sleep architecture. A 2015 study using polysomnographic data found little difference in sleep architecture in nightmare sufferers compared to healthy control group (Paul et al.). Whereas, a 2012 polysomnographic study found that nightmare sufferers experienced altered sleep architecture (Simor et al.). This

was characterized by reduced sleep efficiency and slow wave sleep and increased nocturnal awakenings and sleep latency. Polysomnographic research on nightmares has proven challenging. As nightmares tend to occur less frequently in the context of a sleep laboratory (Woodward et al., 2000) and lower levels of distress are attributed to nightmares experienced in a sleep laboratory (Domhoff & Kamiya, 1964; Weisz & Foulkes, 1970).

Subjectively nightmare sufferers self-report lower quality sleep and daytime wakefulness (Lancee, Spoormaker, et al., 2010; Paul et al., 2015). The lower subjective appraisal of sleep quality are thought to be the result of prolonged sleep latency following a nightmare awakening and worry that the nightmare will return once they fall back to sleep (Paul et al., 2015). Research by Kothe and Pietrowsky, in a sample of 41 people without psychiatric diagnoses who experience occasional nightmares, found that 48.9% of participants had trouble falling back asleep after waking from a nightmare (2001). Fifty-seven percent of participants reported the sleep following the nightmare as “restless and uncomfortable” (pp.46-47), and 58% reported feeling tired the following day.

There is ample evidence that suggests a positive relationship between nightmare frequency and suicidal ideation, suicide attempts, and self-harm (Nadorff et al., 2011; Nadorff et al., 2013; Sandman et al., 2017; Sjöström et al., 2009; Tanskanen et al., 2001). Of note, one study found no relationship between nightmares and suicidality in both depressed and non-depressed samples (Hedström et al., 2021). Research examining the relationship between nightmares and suicidality found that the duration of the presence of nightmares had a significant influence on suicidality (R. Nadorff et al., 2013). Individuals suffering nightmares over longer periods of time were at significantly higher risk for suicide. This relationship was present even after controlling for present nightmare frequency, symptoms of anxiety, depression, and PTSD.

A study of previous suicide attempters, found the presence of nightmares led to a four-fold increase in the risk of future suicide attempts over a two-year period (Sjöström et al., 2009). Nightmares are thought to be a unique predictor and risk factor of suicide (Bernert et al., 2015). As the relationship between suicide and nightmares is present even after controlling for other suicide risk factors, such as anxiety, depression, substance use disorder, and sleep disturbances (Bernert et al., 2015; Nadorff et al., 2016; Sjöström et al., 2007).

Researchers have begun examining what it is about nightmares that causes this increase in suicidality. A study of individuals experiencing PT-N found that perceptions of hopelessness, defeat, and entrapment played a strong mediating role in the relationship between nightmares and suicidality (Littlewood et al., 2016). Research has shown that both nightmare frequency and nightmare distress have a positive association with suicidality, and that nightmare distress mediated the relationship between nightmare frequency and suicidal ideation (Lee & Suh, 2016). Of note, research by Cogan and colleagues did not find a relationship between nightmare frequency and distress and suicidal ideation, after controlling for depressive and PTSD symptoms (Cogan et al., 2019). A study conducted with a sample of individuals admitted to hospital following a suicide attempt, found that 90% were experiencing sleep disturbances, and that of the various sleep disturbances measured, nightmares were most strongly associated with suicidality (Sjöström et al., 2007). Those experiencing nightmares were more likely to experience suicidal thoughts, wish to die, and have suicidal actions. Nightmares are also associated with self-harming behaviours (Ennis et al., 2017; Singareddy et al., 2013).

## Aetiology of Nightmares

While there is no consensus surrounding the aetiology of nightmares, a diathesis-stress model is widely used in the study of nightmares (Schredl, 2018b). This model asserts that

nightmares stem from an interaction between psycho-physiological vulnerabilities and external stressors (Salomon & Jin, 2020). The study of the origin of nightmares has long been influenced by the psychoanalytic and psychodynamic tradition – originating with Sigmund Freud's *The Interpretation of Dreams.* Freud believed that the repressive capacity of the super-ego were diminished during sleep and that as a result, the subconscious content of the Id would be made conscious, in the form of dreams (Nielsen & Levin, 2007b). He believed that dreams served a wish fulfilment purpose and that nightmares are dreams with a masochistic variation (Nielsen & Levin, 2007b).

Other psychodynamic models of nightmare formation include that of Jones, who argued the following of nightmares "The intensity of the fear is proportionate to the guilt of the repressed incestuous wishes that are striving for imaginary gratification" (1931, p.343). Jung argued that dreams are the manifestation of unresolved psychological conflicts and that nightmares are symbolic representations of one's shadow (2012). Other psychodynamic models of dreams assert that nightmares are the result of failure to master traumatic experiences (Greenberg et al., 2017) or the transformation of shame into fear (Lansky, 1995). Some of the assertions of the psychoanalytic models of nightmare formation are difficult to study empirically. Though there is evidence that supports some of their claims (Nielsen & Levin, 2007b). The tenets of these models have influenced contemporary models of nightmare formation and in some cases have had their tenets integrated into the newer models (Nielsen & Levin, 2007b).

Hartman developed a personality model of nightmare formation, related to the personality component of boundary permeability (1984). This aspect of personality is characterized by the degree to which emotional and cognitive content can be made conscious and a permeability between oneself and others (Hartmann, 1984; T. Nielsen & Levin, 2007). He argued nightmares

stem from thin psychological boundaries. A later model of nightmare formation developed by Hartman centered around image contextualization (1996). Asserting that dreams stem from an adaptive emotional processing function. Whereby dreams are made up of images that contextualize an individual's emotional concerns. Nightmares are thought to be the contextualizing images of intense or distressing emotions (Hartmann, 1996).

Research on the relationship between nightmares and big five personality factors found that nightmare frequency was correlated with trait neuroticism (Schredl & Göritz, 2017). Neuroticism is the personality disposition to experience negative affect (Widiger & Oltmanns, 2017). While trait neuroticism and nightmares are highly heritable (Nivard et al., 2015; Vukasović & Bratko, 2015) (Coolidge et al., 2010; Hublin et al., 1999), and are associated with one another, a twin-cohort study found no genetic connection between childhood anxiety and nightmares (Coolidge et al., 2010).

The threat simulation model of nightmare formation explains the origins of nightmares from an evolutionary perspective. It asserts that nightmares serve an adaptive function of playing out dangerous and threatening scenarios in the relative safety of the mind, so as to increase the likelihood of successfully navigating these situations in the real world (Revonsuo, 2000). Thereby increasing the fitness of the individual nightmare sufferer. While most of the modern models of nightmare formation rest on the assumption that dreams are adaptive and nightmares are the breakdown of adaptive processes, the threat simulation model operates on the assumption that nightmares are adaptive (Revonsuo, 2000). While there is evidence that nightmares are genetically-heritable (Coolidge et al., 2010), the evidence does not support the theory that nightmares infer benefits in terms of managing potentially dangerous situations. As research has

shown that the presence of nightmares prior to experiencing a traumatic event increases the likelihood of developing PTSD (Ohayon & Shapiro, 2000).

The REM sleep desomatization model of nightmare formation stems from research by Fischer and colleagues, that found very low levels of autonomic arousal during REM sleep nightmares (1970). It was theorized that the neurophysiological conditions present during REM sleep allow intense emotional experiences to be processed and de-coupled from their somatic qualities (Nielsen & Levin, 2007b). Another neurophysiological model of nightmare formation is that of mood regulation. This model asserts that dreams serve the adaptive function of processing emotions and that nightmares are the result of the capacity for emotions to become assimilated being surpassed (Kramer, 1991).

Levin and Nielson theorized that individuals with high affect distress will manifest this trait in higher emotionality in both waking life and in dream content (2007). Levin and Nielson developed a comprehensive neurobiological model of nightmares, which integrated many of the tenets of past models (2007b). The affect network dysfunction model of nightmare production. The model synthesizes a cognitive and neurobiological approach. They use data from neuroimaging, heart rate, and emotional processing as the basis of the model. They argue nightmare formation is the result of dysfunction in the affect network of the brain – the amygdala, hippocampus, medial prefrontal cortex, and anterior cingulated cortex. The areas of the brain responsible for fear extinction during regular dreaming (Nielsen & Levin, 2007). On a cognitive level, they assert that dreams serve the purpose of fear extinction by pairing fear memories with novel contexts and non-frightening stimuli. For individuals with high affect distress, this process becomes disrupted and results in the formation of nightmares (Nielsen & Levin, 2007).

## Idiopathic & Posttraumatic Nightmares

The study of nightmares is often split into two distinct streams – idiopathic nightmares (I-N) and posttraumatic nightmares (PT-N) (Hasler & Germain, 2009). It is difficult to determine what percentage of frequent nightmare sufferers fall under either category, as studies related to the prevalence of frequent nightmares tend not to differentiate between the two (American Psychiatric Association, 2013b). I-N refers to nightmares in which the etiological origin is unknown. When I-Ns reach certain diagnostic criteria set out in the Diagnostic and Statistic Manual of Mental Disorders-5, a diagnosis for ND is warranted. These diagnostic criteria are as follows: 1) Repeated, well-remembered, extremely dysphoric nightmares, that usually involve perceived threats to safety, and generally occur during second have of the sleep episode; 2) On awakening from the dysphoric dream, person becomes rapidly oriented and alert; 3) The sleep disturbances cause significant disturbances to life functioning; 4) Nightmares are not attributed to the effects of substance use or medication; 5) Coexisting medical or mental disorders do not adequately explain the presence of nightmares (American Psychiatric Association, 2013b).

As nightmares are a common comorbid of other psychological disorders, it is believed ND is under-diagnosed and under treated (Nadorff et al., 2015; Schredl, 2010). One study found that 62% percent of individuals with clinically significant nightmares did not discuss their nightmares with medical providers and 67% believed nightmares were not a treatable condition (Schredl, 2010). These findings, paired with our understanding of the significant detriment health impact of nightmares, highlight the need for clinicians to proactively screen for nightmares when working with clients.

PT-N, sometimes referred to as PTSD-related nightmares or trauma-related nightmares, are nightmares with an onset triggered by a traumatic event, containing trauma-related imagery,

themes or re-enactments (Hasler & Germain, 2009; Levin & Nielsen, 2007; Spoormaker et al., 2006). While many of the individuals suffering from PT-N have PTSD, some would not qualify for a full PTSD diagnosis (Spoormaker et al., 2006). One of the key characteristics of PTSD is the presence of cognitive intrusions (American Psychiatric Association, 2013a). The intrusions can take the form of flashbacks of the traumatic event or PT-N, in which the individual has dream content consistent with the traumatic event (American Psychiatric Association, 2013b). The prevalence of nightmares among individuals with PTSD is roughly 60-80% (Levin & Nielsen, 2007; Spoormaker et al., 2006; Swart et al., 2013). A study of war-related PTSD participants found that 56% still experienced nightmares 40 years after the traumatic event (Schreuder et al., 2000). Similarly a study of World War II prisoners of war found 47% still experienced nightmares about their experiences as POWs, 65 years later (Rintamaki et al., 2009). Suggesting a high degree in nightmare persistence in the absence of treatment.

Changes in dream content tend to occur during the acute stage following a traumatic incident or event (Mellman & Pigeon, 2011). An analysis of dream content following a major hurricane in Hawaii was compared to that of a pre-hurricane sample and found that dreams contained more stress-related themes than the pre-hurricane sample (74% versus 48%) (Pagel et al., 1995). While only 13% of the post-hurricane sample experienced dream content specifically related to the hurricane. These findings suggest that traumatic events will impact content of dreams, without necessarily invoking trauma re-enactment nightmares. Research examining dream content following a traumatic event found that those who experience PT-N are more likely to develop PTSD and had more severe symptomology than those who do not experience PT-N (Mellman et al., 2001).

PT-N can be classified as follows, posttraumatic nightmares: dream content associated with a trauma by the dreamer; replicative/re-enactment nightmares: dream content is a strict replication of the original traumatic event; mixed: dream content is partially similar to the traumatic event; non-replicative/symbolic: dream content is not a realistic account of but refers to the traumatic event (Wittmann et al., 2007, p. 30). Wittmann and colleagues conducted an analysis of several studies and found roughly 50% of traumatized participants experienced exact re-enactment nightmares (2007). Nightmares that depict an exact re-enactment of the traumatic event tend to become re-occurring (Schreuder et al., 1998).

Beyond the trauma reexperiencing component of PT-N, a major difference between I-N and PT-N is that the latter is much more likely to occur during non-REM sleep. One study found 57% of participants with PTSD experience nightmares outside of REM sleep (Woodward & Arsenault, 2000). An explanation for this marked difference between I-N and PT-N can be made from our understanding of PTSD. PTSD sufferers will often experience trauma-related cognitive intrusions during waking life, triggered by cues that remind them of the traumatic event (Wittmann et al., 2007). Traumatic events are stored in our episodic memory and a meta-analysis showed that episodic memories are processed significantly more frequently in NREM sleep (Baylor & Cavalerro, 2001). It is believed that the episodic trauma memories being processed during NREM act as triggers for the PT-N (Wittmann et al., 2007).

Like I-N, PT-N impact objective and subjective measures of sleep quality (Spoormaker et al., 2006; Wittman & de Dassel, 2015). PT-N frequency is associated with poorer sleep efficiency, increased nocturnal awakenings and lower total sleep time (Wittman & de Dassel, 2015). A study made up of Cambodian refugees found 52% took one to two hours to fall back asleep following a nightmare (Hinton et al., 2009). While 31% were unable to fall asleep again

that night. Nocturnal awakenings are more common among those suffering from PT-N than I-N (Germain & Nielsen, 2003).

## Treatments

There are many treatments for nightmares. Some treatments are effective in treating both I-N and PT-N. While others have only been studied in the context of one of the manifestations of nightmares. These include pharmacological and psychotherapeutic treatments.

### Pharmacological

Prazosin, an Alpha-1 Blocker, used primarily for the treatment of high blood pressure and benign prostate hyperplasia, is the most prominent medication used in the treatment of nightmares (Aurora et al., 2010; Morgenthaler et al., 2018). It is believed that the efficacy of the drug is derived from its downregulation of areas of the sympathetic nervous system typically active during nightmares (Aurora et al., 2010). Prazosin has been shown to be an effective treatment for PT-Ns in at least ten clinical studies (Boehnlein & Kinzie, 2007; Boynton et al., 2009; Daly et al., 2005, 2005; Germain et al., 2012; Peskind et al., 2003; Raskind et al., 2000, 2003, 2007, 2013; Taylor & Raskind, 2002; Yager, 2013). These studies have shown a reduction in nightmare frequency and distress. In 2010 the American Academy of Sleep Medicine (AASM) listed Prazosin as a level A (recommended) treatment for PT-N (Aurora et al., 2010). In the follow-up position paper, they downgraded Prazosin to a level B treatment (may be used) (Morgenthaler et al., 2018). The downgrading was based on their analysis of a recent study with contradictory findings. The study of 304 participants with PTSD, found Prazosin to be no more effective than placebo (Raskind et al., 2018). While there are no studies regarding the use of Prazosin in the treatment of I-N, the AASM listed it as a potential treatment in their 2018

position paper. Though the AASM did not list it as a recommended treatment (Morgenthaler et al., 2018).

The AASM included no pharmacological treatments in their recommended treatments section of their 2018 position paper. However, they did include several in the *may be used* section. Along with Prazosin, they listed the following medications as potential treatments for PT-N: the atypical antipsychotics Olanzapine, Risperidone and Aripiprazole; Clonidine, Cyproheptadine, Fluvoxamine, Gabapentin, Nabilone, Phenelzine, Topiramate, Trazodone, and tricyclic antidepressants (Morgenthaler et al., 2018). Regarding I-N, AAMS listed Prazosin, Nitrazepam, and Triazolam as potential drug treatments. The latter two are benzodiazepine hypnotics. The AASM judgment is based on a study that found both benzodiazepine hypnotics to be effective in reducing unpleasant dreams (Ellingsen, 1983; Morgenthaler et al., 2018).

**Psychotherapeutic**

Imagery rehearsal therapy (IRT) is the psychotherapeutic intervention for nightmares with the largest body of empirical support. It was listed as recommended treatment for ND by the Oxford Centre for Evidence Based Medicine (Cranston et al., 2011) and the AASM (Morgenthaler et al., 2018). IRT involves having the nightmare sufferer re-script their nightmare content into something neutral or positive. They are then tasked with imagining the newly formed dream content in waking life, multiple times per day (Pagel, 2021). IRT is often paired with other therapeutic modalities, such as pre-sleep relaxation, sleep diaries, and psychoeducation. As the individual is asked to imagine their nightmare as they re-script it, there could potentially be benefits derived from exposure. IRT has been shown to decrease nightmare frequency and distress, improve sleep quality, and reduce PTSD symptoms (Casement &

Swanson, 2012; Harb et al., 2012; B. Krakow et al., 2000, 2001; B. Krakow & Zadra, 2006; Lancee, Bout, et al., 2010; Lu et al., 2009).

The earliest approach used to directly treat nightmares is desensitization and exposure therapy (Gieselmann et al., 2019). This therapy involves vividly imagining nightmare content while engaging in relaxation techniques. Overtime, the imaginal exposure is conducted without the accompanying relaxation techniques. Desensitization and exposure therapy has been shown to be effective in the treatment of nightmares (Davis & Wright, 2007). Another form of exposure therapy for nightmares is exposure, relaxation, and rescripting therapy (ERRT). ERRT combines the exposure elements of traditional exposure and desensitization therapy with the rescripting elements of IRT. There have been several randomized control trials (RCT) showing ERRT to be an effective treatment for both I-N and PT-N (Cogan et al., 2019; Davis et al., 2011; Davis & Wright, 2007; Pruiksma et al., 2018).

Psychotherapeutic treatments for nightmares with limited empirical support include eye movement desensitization and reprocessing therapy (EMDR), sleep dynamic therapy, progressive deep muscle relaxation, hypnosis, and lucid dreaming therapy (LDT). While there are no RCTs assessing the efficacy of EMDR in the treatment of nightmares, a series of cases of 83 Vietnam War Veterans with PTSD found EMDR to be effective in reducing PT-N frequency (Silver et al., 1995). Sleep dynamic therapy is an integrative treatment for disturbed sleep, involving psychoeducation, cognitive behavioural therapy, emotional processing and IRT. A single study of 66 trauma exposed individuals found a significant reduction in nightmares after completion of treatment and at the 12-week follow-up (B. J. Krakow et al., 2002). Progressive deep muscle relaxation, a therapeutic technique often used in the treatment of anxiety (Liu et al., 2020) and insomnia (Alexandru et al., 2009), involves the tensing and relaxing of one body part

at a time. A study of 32 female nightmare sufferers compared the efficacy of progressive deep muscle relaxation and systemic desensitization (Miller & DiPilato, 1983). At completion of the study, both interventions were equally effective in reducing nightmare frequency. At follow-up the systemic desensitization group were experiencing better results.

There are several case studies employing hypnosis as a treatment for nightmares. A case report study of 36 participants suffering from parasomnias, ten of whom were experiencing nightmares, underwent one 50-minute hypnosis session (Hauri et al., 2007). Seventy-one percent experienced improved symptoms at the 18-month follow-up and 67% maintained these benefits at the five-year follow-up. Another case study of three nightmare sufferers found hypnosis to be beneficial in all three cases (Kingsbury, 1993). A case study of a 28 year old suffering from recurrent nightmares for nine years underwent hypnotherapy, and experienced a complete cessation of nightmares (Seif, 1985). Another case study of a 24 year old parolee suffering from PT-N was taught self-hypnosis in the context of psychotherapy and experienced a reduction in nightmare frequency (Donatone, 2006). A case study of a nine year old girl who was experiencing, what was believed to be nightmares originating from the devil, underwent spiritually integrated hypnotherapy and experienced a reduction in nightmare frequency (Pelling & Gee, 2016).

## Lucid Dreaming

The most basic definition of lucid dreaming is being aware that one is dreaming (Schredl, 2018a). Additional features of lucid dreaming include the ability to deliberately wake oneself from the dream, to direct one's actions, to control external dream content, and remember waking life (Schredl, 2018a). Lucid dreaming can occur spontaneously or through deliberate induction. A meta-analysis found that 55% of individuals have experienced a lucid dream at some point in

their lives (Saunders et al., 2016). When this was assessed in a student sample, the incidence of lucid dreaming was 80% (Saunders et al., 2016). These findings suggests that the capacity for lucid dreaming is widespread. The same study found that 21% of people experience frequent lucid dreams. Lucid dreaming is not a binary of being lucid while dreaming or not. There appears to be degrees of lucidity while dreaming. A study asking participants to rate the following statement "I was aware that I was dreaming" (0=not at all, 1= just a little, 2= moderately, 3= pretty much, 4=very much) found that 51% of dreams were reported as having at least some lucidity (Dyck et al., 2017). Though research of this nature leads to potential issues surrounding recall bias or participants wanting to satisfy the experimenter. In untrained lucid dreamers, lucidity is typically the result of the dreamer noticing a dreamlike sense (67%), noticing something incongruent with the nature of waking life (19%), and the remaining cases lucidity was preceded by a nightmare (Gackenbach, 2010).

**History**

There are many historical references to the phenomena of lucid dreaming. Aristotle wrote the following about dreaming, "when one is asleep, there is something in consciousness which declares that what then presents itself is but a dream" (Laberge, 1998, p13). The cultivation of an awareness that one is dreaming is present in the Hindu and Buddhist perspective (Kuan, 2007). This practice is known as Yoga Nidra. Another example of lucid dreaming in antiquity is St. Augustine of Hippo's description of the lucid dreams of a local physician (Laberge, 1998). Likewise, reports of lucid dreaming can be found in the Islamic tradition. A 12th century Sufi cleric described the practice of controlling one's dreams (Laberge, 1998). Dutch psychiatrist Frederick van Eeden is credited with coining the term lucid dreaming and being the first person to seriously study the phenomena (Laberge, 1998).

Despite historical descriptions and subjective reports of lucid dreaming going back more than a thousand years (Schredl, 2018a), it wasn't until the 1970s that we obtained empirical support for the phenomena. Lucid dreaming was measured independently by two researchers (Hearne, 1978; Laberge, 1980). At the time there was ongoing speculation that what people thought was lucid dreaming was actually moments of wakefulness occurring throughout the night (Schredl, 2018a). During REM sleep the only part of the body capable of movement is the eyes. As such, researchers had lucid dreamers agree to engage in a series of deliberate eye movements once lucid dreaming had been induced. The researchers used electrooculogram recordings to measure the eye movements and electroencephalogram and electromyogram to ensure the participants were sleeping. In the studies, the lucid dreamers were able to carry out the specified eye movements. Which were distinct from the typical eye movements occurring during REM sleep (Hearne, 1978; Laberge, 1980).

**Correlates**

Meta-cognition refers to the ability to reflect on one's own mental states (Schooler, 2002). It has been hypothesized that lucid dreaming is a form of meta-cognition. REM sleep is associated with reduced activity in the dorsolateral prefrontal and frontopolar cortices (Hobson & Pace-Schott, 2002), two areas of the brain involved in meta-cognition. Research by Voss and colleagues found that brain activity during lucid dreaming is a hybrid between that typically observed during sleep and wakefulness (Voss et al., 2009). Similarly, neuroimaging research found increased activity in areas of the pre-frontal cortex associated with higher cognition during lucid dreaming in REM sleep (Dresler et al., 2012). A study examining the neural correlates of meta-cognition and lucid dreaming found that frequent lucid dreamers have greater volume of grey matter in the Brodman area 9/10 of the frontal cortex (Filevich et al., 2015). They also

found a relationship between capacity for meta-cognition and lucid dreaming. Another cognitive correlate of lucid dreaming is insight. Insight refers to the propensity for obtaining a clear and sudden understanding of how to reach a problem's solution (Bourke & Shaw, 2014). Frequent lucid dreamers scored higher in compound remote association tests (Bourke & Shaw, 2014). A test designed to measure insight.

In terms of personality, lucid dreaming frequency is associated with the personality trait of openness, neuroticism, and disagreeableness (Hess et al., 2017). Lucid dreaming is associated with nightmare frequency (Hess et al., 2017). This is may be the result of nightmares often inducing lucid dreaming, as the frightening dream content triggers the realization that one is dreaming (Gackenbach, 2010). Lucid dreaming is also associated with the personality feature of internal locus of control (Blagrove & Hartnell, 2000; Patrick & Durndell, 2004). Research shows that an individual's capacity for dream recall is correlated with successful lucid dreaming following a lucid dreaming induction intervention (Aspy, 2020). Individuals suffering from narcolepsy experienced higher rates of spontaneous lucid dreaming than healthy populations (Dodet et al., 2015; Rak et al., 2015).

The reasons an individual will chose to induce lucid dreaming vary substantially. A study of 328 lucid dreamers found that wish-fulfillment was the most common motivation for lucid dreaming (Stumbrys & Erlacher, 2016). With 40% of participants citing wish-fulfilment as their reason for lucid dreaming. This was followed by solving waking problems, overcoming fears/nightmares, spiritual experiences, physical/mental healing, training motor skills, and meditation (Stumbrys & Erlacher, 2016). These findings support evidence from previous studies indicating that having fun and wish-fulfillment are the primary reasons people chose to induce lucid dreaming (Schädlich & Erlacher, 2012). Acting out sexual fantasies and flying are two of

the most common activities people take part in during deliberate lucid dreaming (Stumbrys et al., 2014). Novice lucid dreamers often report becoming excited when lucid dreaming is induced and the subsequent emotional arousal leading them to wake up. As a result, deliberate lucid dreamers will often practice emotional modulation while lucid dreaming (Hoss et al., 2019).

There is evidence that motor skills can be developed during lucid dreaming (Erlacher & Schredl, 2010; Schädlich et al., 2017; Stumbrys et al., 2016). One study had participants tap a specific sequence with there fingers while lucid dreaming and found that they performed significantly better during waking than the control group (Stumbrys et al., 2016). These findings aligns with those of a pilot study, in which participants were asked to practice throwing coins into a cup while lucid dreaming and while awake (Erlacher & Schredl, 2010). Lucid dreaming training was also found to improve performance in throwing darts (Schädlich et al., 2017).

**Induction Techniques**

There are several techniques used to increase the likelihood of inducing lucid dreams. A systemic review of lucid dreaming induction techniques has been conducted (Stumbrys et al., 2012). The authors of the review classified the techniques into three categories: cognitive, external stimulation, and miscellaneous techniques (Stumbrys et al., 2012). Cognitive techniques include mnemonic induction of lucid dreaming (MILD), reality testing (RT), senses initiated lucid dreaming (SSILD), and hypnosis. This list is not exhaustive, but simply covers some of the more popular and research-supported techniques. MILD involves rehearsing a dream scenario before falling asleep, visualizing and holding the intention of becoming lucid during the next dream (Stumbrys et al., 2012). MILD is often paired with a wake-up-back-to-bed protocol (WBTB). RT involves regularly testing whether one is dreaming or awake by looking for features inconsistent with waking reality. The assumption is that once this practice becomes

habit, it will be done while dreaming and trigger lucid dreaming (Stumbrys et al., 2012). SSILD involves repeatedly shifting one's senses between auditory, tactile, and visual senses before sleep and is often paired with a WBTB protocol (Aspy, 2020).

External stimulation techniques involve the use of external stimuli that are introduced during REM sleep. The external stimuli serve as a cue that one is dreaming. External stimuli can involve tactile, auditory, light, electro, or vestibular stimulation (Stumbrys et al., 2012). Many of the external stimulation techniques involve the use of consumer products designed for lucid dreaming induction (Stumbrys et al., 2012).

Miscellaneous techniques include using drugs and other exogenous substances to increase the likelihood of lucid dreaming and the WBTB technique. Galantamine and Donepezil are exogenous substances shown to increase lucid dreaming frequency (LaBerge, 2004; LaBerge et al., 2018). Both drugs are acetylcholinesterase inhibitors, used in the treatment of dementia (LaBerge et al., 2018). The drugs increase the synaptic transmission of acetylcholine. A neurotransmitter associated with focus (Bazzari, 2018). The WBTB technique involves waking oneself up before or during REM sleep and going back to sleep after 30-120 minutes with intention of becoming lucid during the next phase of sleep (Schredl, 2018a; Stumbrys et al., 2012).

A large-scale study of 355 participants interested in lucid dreaming measured combinations of lucid dreaming induction techniques (Aspy, 2020). The techniques were MILD, WBTB, SSILD, and RT. The study found practicing RT throughout the day did not increase lucid dreaming frequency. In addition, RT did not improve efficacy when paired with MILD and WBTB. A hybrid technique, pairing MILD with WBTB and SSIL with WBTB were both effective in inducing lucid dreams. The average lucid dreaming rate was 16.5% in the former and

16.9% in the latter. These results were in line with those of the National Australian Lucid Dream Induction study (Aspy et al., 2017). They also found lucid dreaming induction techniques were significantly more effective in participants who were able to fall asleep rapidly after engaging in the techniques (Aspy, 2020).

**Potential Risks**

Lucid dreaming may pose a psychological risk. However, the potential risks are not clear. As studies on the relationship between lucid dreaming and psychological disorders have generated conflicting conclusions. This is the case with depression (Soffer-Dudek et al., 2011; Taitz, 2011), PTSD (Harb et al., 2016; Heugten-van der Kloet et al., 2014), and general psychological distress (Soffer-Dudek et al., 2011; Soffer-Dudek & Shahar, 2009). It is thought that the lack of consistency in research findings may be the result of some researchers not differentiating between spontaneous or deliberate lucid dreams and not measuring specific qualities of lucid dreams (Aviram & Soffer-Dudek, 2018). Such as levels of dream awareness and control.

A study of university students taught to lucid dream found that lucid dreaming frequency was strongly related to symptoms of depression (Taitz, 2011). A longitudinal study found that experiencing lucid dreams characterized by high dream awareness and low dream control were associated with psychopathological symptoms (Aviram & Soffer-Dudek, 2018). The same study found deliberate induction of lucid dreaming predicted a future increase in dissociation and schizotypy. Another study found that participants who scored high on a lucid dreaming assessment were more prone to memory errors and confabulation (Corlett et al., 2014). Lucid dreaming may embolden hallucinations and deliria in psychotic individuals (Mota et al., 2016).

Another potential risk of lucid dreaming is related to sleep quality. As WBTB-based induction techniques involve the fragmentation of sleep, disruption of sleep architecture, and potentially less sleep (Vallat & Ruby, 2019). There is some evidence that lucid dreaming has a deleterious effect of sleep quality (Gott et al., 2020). Another way lucid dreaming poses a risk to an individuals sleep quality is by changing brain activity during sleep (Vallat & Ruby, 2019). As neuroimaging studies have shown increased activity in areas of the brain normally depressed during sleep (Dresler et al., 2012; Hobson & Pace-Schott, 2002; Voss et al., 2009). There are concerns that regular lucid dreaming could disrupt the regular functioning of these areas.

## Lucid Dreaming Therapy

LDT involves deliberately inducing lucid dreaming for the purpose of treating a psychological condition (Mota-Rolim & Araujo, 2013). LDT has been studied in the context of treating insomnia (Ellis et al., 2021) and nightmares (de Macêdo et al., 2019). LDT has also been suggested as a potential treatment for narcolepsy (Schiappa et al., 2018). LDT typically involves psychoeducation related to lucid dreaming, imagining constructive alternative endings to nightmares, and instruction on how to induce lucid dreaming at home. There are currently eleven studies of LDT in the treatment of nightmares. They will be presented in chronological order.

The first study related to LDT as a treatment for nightmares was a case report study conducted in 1982 (Halliday, 1982). The participant experienced PT-N following an industrial accident. They were taught about lucid dreaming and as a result were able to alter the content of their nightmares to something emotionally neutral. This was followed by two more case report studies (Abramovitch, 1995; Brylowski, 1990). The first involved a woman in psychiatric care (Brylowski, 1990). The intervention involved a protocol of MILD, use of a dream diary, and lucid dreaming psychoeducation. The study found that LDT was effective in reducing nightmare

distress (Brylowski, 1990). The second study involved a participant with ND who experienced nightmares related to going home (Abramovitch, 1995). The study does not provide details related to the nature of the LDT. LDT was effective in changing the content of the nightmare.

This was followed by a study of five case reports (Zadra & Pihl, 1997). All five participants experienced frequent nightmares. Three of the participants experienced the onset of nightmares following a traumatic event. The participants were first taught progressive muscle relaxation. Then they were asked to imagine in detail the content of their nightmare with a therapist. The participants were then instructed to select a salient and recurrent aspect of their dream, in which they will perform a specific task while telling themselves they are dreaming. They are instructed to then engage in this task while dreaming, with the intention of inducing lucidity. The therapist also worked with the participants to identify constructive alternatives endings to the nightmare. Three of the participants successfully induced lucid dreaming and nightmare distress and frequency was reduced in all five participants.

Another study was conducted with eight participants suffering from I-N (Spoormaker et al., 2003). Participants worked with the researcher to identify recurrent elements from their nightmares, were provided psychoeducation on lucid dreaming, and conducted a single 1-hour session of lucid dreaming induction training. Participants were instructed to go to bed with the intention that the next time they observe the recurrent theme to remind themselves that they are dreaming and to become lucid. Lucid dreaming was successfully induced in half of the participants. LDT was successful in reducing nightmare frequency and distress in six of the participants.

The next study was a single case report of an individual suffering from I-N for the past 17 years (Tanner, 2004). Treatment involved the participant maintaining a dream diary, instruction

on diaphragmatic breathing, and the use of MILD prior to falling asleep. The client reported not having successfully induced lucid dreaming but did experience a reduction in nightmare frequency and distress, and improved sleep quality.

This was followed by a cross-sectional design study. The first RCT assessing the efficacy of LDT in the treatment of nightmares (Spoormaker & van den Bout, 2006). The study was made up of 23 nightmare sufferers. Thirteen of the participants had previously experienced a traumatic event, four experienced PT-N, and one had been diagnosed with PTSD. The participants were randomly assigned to a two-hour single session individual lucid dreaming therapy group, a two-hour single session group lucid dreaming therapy group, and a waitlist control group. The procedure for both experiment groups involved psychoeducation related to nightmares and lucid dreaming, the identification of recurrent nightmare content/themes, instruction that before bed they would intend to become lucid when they observe this recurrent content/theme. They were also instructed to imagine this recurrent theme/content while thinking that they are dreaming. Participants discussed and identified alternative endings to their nightmare scenario. The author described how the imaginal and rescripting component of the LDT treatment is like that of IRT. Seven of the 8 participants in the individual LDT group experienced a reduction in nightmare frequency. With four participants becoming lucid and successfully altering the nightmare. Four of the 8 participants who received group LDT experienced a reduction in nightmares. Two were able to alter the nightmare during lucid dreaming.

Another case report study was conducted with a man in emergency care following multiple suicide attempts, who had a history of PTSD (Been & Garg, 2010). The participant was instructed to read the Wikipedia entry on lucid dreaming and to write out the details of his

nightmare upon awakening and imagine himself altering the dream as he attempts to fall back to sleep. After several days, the participant was able to become lucid and alter his nightmares to something more pleasant. Client reported decreased nightmare distress and improved sleep quality.

The next study was an RCT, comparing the efficacy of self-administered IRT, IRT with sleep hygiene, IRT with sleep hygiene and LDT, and a waitlist control (Lancee, Bout, et al., 2010). The study had 213 participants who reported experiencing nightmares. The exclusion criteria included scoring high in PTSD, schizophrenia, and suicidal ideation. The LDT group underwent self-administered IRT and sleep hygiene protocols. They were also instructed to imagine the nightmare content while thinking this is only a dream with the intention of inducing lucidity the next time they are dreaming. The study found that IRT alone was the most effective in reducing nightmare frequency and that IRT paired with LDT was slightly more effective in reducing nightmare distress than IRT alone. The authors stated that the self-administered mechanism of training in lucid dreaming is likely insufficient and that future research in LDT should be conducted face-to-face.

The next study was an RCT comparing the efficacy of gestalt therapy (GT) and GT with LDT (GT+LDT) (Holzinger et al., 2015). Thirty-two participants completed the study. The participants were reported as meeting the ICSD-2 criteria for ND. However, they did not assess for PTSD or nightmare onset following a traumatic event. The GT group underwent nine weeks of group GT. The GT intervention involved confrontation of the frightening dream content during group therapy, changing the dream plot (re-scripting), and emotionally processing the dreams. The GT+LDT group underwent the same protocol with the addition of lucid dreaming training, consisting of lucid dreaming psychoeducation, imagining the content and themes of the

nightmare, keeping a dream diary, identifying constructive alternatives to the nightmare ending, and listening to a lucid dreaming induction hypnosis recording. The study found both groups were effective in reducing nightmare frequency and participants in the GT+LDT group self-reported the therapy as more effective than those in the GT group. Seventy-five percent of participants in the GT+LDT group reported successfully inducing lucid dreaming. Measure of nightmare distress were not taken.

The final study was an RCT assessing the efficacy of LDT in the treatment of PT-N (Holzinger et al., 2020). Thirty-one participants completed the study. Participants were randomly assigned to a LDT group or an active comparison group. The LDT group engaged in six, weekly 60-minute group therapy sessions. Half of the session was spent discussing the participants experience related to dreams, sleep, and lucid dreaming from the past week. The other half of the session was spent on theoretical and practical training in lucid dreaming induction. The lucid dreaming induction method was employed in the study was self-hypnosis. The only statistically significant result measured in the LDT group was a reduction in anxiety and depressive symptoms. There were no improvements in nightmare frequency, sleep quality, or PTSD symptoms. Of the 20 participants in the LDT group who completed the study only two reported successfully inducing lucid dreaming.

## Discussion

It is clear that nightmares are associated with more severe symptomology in a variety of psychological disorders and increased risk of suicidality (Agargun et al., 2003; Hedström et al., 2021; Levin & Fireman, 2002; Levin & Nielsen, 2007; Mume, 2009; Sandman et al., 2017; Semiz et al., 2008). As such, improving our understanding of how to treat nightmares is of great importance. One such treatment is LDT. It is the only treatment for nightmares that has the

individual actively change the nightmare content while dreaming. As such it has the added benefit of increase the sense of self-efficacy and agency in nightmare sufferers who successfully induce lucidity and alter the nightmare (Spoormaker & van den Bout, 2006). This could be particularly powerful in individual's experiencing PT-N. As hopelessness, defeat and entrapment are common features of PTSD and play a mediating role between nightmares and suicide in individuals with PTSD (Littlewood et al., 2016). The therapeutic mechanism in LDT remains unclear, as some participants will report improvements without ever experiencing lucid dreaming. It is thought that knowing it is possible to control one's dreams provides a belief/placebo effect (Spoormaker et al., 2003). It is possible that some of the benefit derived from LDT stems from the exposure component of imagining nightmare content and/or the rescripting of the dream.

Most of the studies use MILD as a means of inducing lucid dreaming. However, there is little evidence that MILD is an effective way of inducing LD without it being paired to a WBTB protocol (Aspy, 2020; Aspy et al., 2017). A potential challenge of using LDT in the treatment of nightmares is that lucid dreaming induction techniques are more effective in those who are able to fall asleep shortly after engaging in the technique (Aspy, 2020) and nightmare sufferers experience longer than average sleep latency (Paul et al., 2015).

**Clinical Implications**

As research has shown that clients are unlikely to bring up the presence of nightmares with their healthcare provider (Nadorff et al., 2015) and that the presence of nightmares is a unique predictor of suicidality (Bernert et al., 2015), it is imperative that clinicians screen for nightmares as part of their client intake. When a clinician is working with a client who is experiencing I-N or PT-N, they will need to assess which treatment is appropriate for their client.

Based on the review of the available evidence LDT can be considered an effective treatment for I-N. This position is in line with that of the AASM (Morgenthaler et al., 2018). However, IRT is the treatment for both I-N and PT-N with the strongest empirical support (Morgenthaler et al., 2018).

One of the ethical considerations for clinicians considering treating a client's nightmares with LDT is the potential for sleep disruption. As the most effective cognitive techniques for inducing lucid dreams involve a hybrid approach with WBTB (Aspy, 2020; Aspy et al., 2017). Given the importance of sleep in healthy psychological function (Scott et al., 2021) and the sleep challenges presented by frequent nightmares, it does not seem prudent for clinicians to encourage a LD induction technique that involves waking oneself up during the night and disrupting ones sleep. Given that nightmares often trigger lucidity (Stumbrys, 2018), a clinician could encourage the client to alter dream content if they find themselves spontaneously lucid. This approach could be paired well with IRT.

In terms of treating I-N, there are several reasons why a clinician may opt to use LDT. If the client has trouble with imagining vivid mental imagery, then a mental imagery heavy approach such as IRT and ERRT may not be appropriate. Research has shown that the capacity to generate vivid mental imagery varies across individuals (Isaac & Marks, 1994). It may be appropriate to use LDT with a client experiencing I-N if the client had a previous interest in lucid dreaming or if they have a desire to actively confront the fearful aspects of their dreams. Another context in which LDT may be an appropriate approach for treating I-N is if a client finds themselves spontaneously lucid during their nightmares.

In terms of treating PT-N with LDT, there should be a higher degree of caution on the part of the clinician. For one, the reported distress and risk of suicide is higher among individuals

experiencing PT-N than I-N. And we have stronger support for the efficacy of IRT in treating PT-N. Another element that should give clinicians pause is that PT-N are equally likely to occur to NREM and REM sleep and little is known about inducing LD during NREM (Stumbrys & Erlacher, 2012). The presence of trauma re-enactments in PT-N makes LDT an intervention with unique risk and potential. As the therapeutic benefit of LDT is centered around the client changing the nightmare content/narrative. Unlike the IRT and ERRT, in which the client imagines a nightmare alternative and hopes that through repeated exposure to the alternative it will replace the original nightmare, LDT emphasizes the client actively changing the dream. In the case of PT-N, the clinician needs to determine whether the client is ready to confront and change the nightmare content. Which could be a re-enactment of an assault or rape.

Studies also show that the majority of lucid dreams lack the ability to control dream content (Aviram & Soffer-Dudek, 2018; Harb et al., 2016; Voss et al., 2012). As such, an individual experiencing a lucid PT-N could experience a high degree of awareness, without the ability to change the nightmare content. Research into lucid nightmares has shown that an inability to change the nightmare or wake oneself up are both common features (Stumbrys, 2018). Lucid dreams with high awareness and no control led to increased rates of psychopathology (Aviram & Soffer-Dudek, 2018). It is also possible for pain experienced during lucid dreaming to be carried over into wakefulness (Raduga et al., 2020). Given that deliberate lucid dreaming induction predicted future dissociation (Aviram & Soffer-Dudek, 2018), a common symptom of PTSD (Rintamaki et al., 2009), clinicians should be mindful that LDT could exacerbate this.

With these risks in mind, there does appear to be potential unique benefits of LDT in treating PT-N. A perspective on trauma recovery and fear extinction suggests that deliberate

exposure to the stressor is insufficient for fear extinction and that novel meanings/narratives need to be associated with the fearful/traumatic event (Dunsmoor et al., 2015; Zhang et al., 2020). As such, LDT has the potential of the client actively changing the narrative associated with the traumatic event. A potentially fruitful application of LDT in the treatment of PT-N could be to engage in prolonged exposure therapy or cognitive processing with the client until the trauma memory no longer elicits arousal. This could then be followed by a LDT protocol in which the participant attempts to alter the PT-N during lucid dreaming. Thereby attaching novel associations to the trauma memory.

**Limitations & Future Research**

While research into the use of lucid dreaming as a treatment for nightmares goes back forty years, there are still major gaps in our understanding. This is particularly true when attempting to assess the efficacy of LDT in the treatment of I-N and PT-N as separate phenomena. This is because much of the research does not assess whether their participants had experienced trauma, and if they did assess this, did not assess whether the onset of the nightmares followed the trauma or whether the nightmares contain trauma related imagery or themes. Research in LDT, and lucid dreaming more generally, rarely specify characteristics of the lucid dream. As a result, we are left without an understanding of whether the participant simply became aware that they were dreaming, the minimum criteria for lucid dreaming, or whether they experienced dream control. Another challenge in assessing the efficacy of LDT is the lack of standardization in LDT across studies. With the method of lucid dream induction and duration of treatment varying substantially.

Research on lucid dreaming often fails to delineate whether participants experience spontaneous or deliberate lucid dreams. Future research on lucid dreamers should make this

variable clear. Future research into the lucid dreaming as a therapeutic modality should also make clear the potential risks associated with the practice. Another potential fruitful area for future study would be assessing the efficacy of LDT for PT-N in the context of different stages of trauma recovery.

## Conclusion

The prevalence of frequent nightmares in clinical populations and their under-reporting creates an impetus for researchers and clinicians to develop our understanding of how to treat them. Lucid dreaming therapy serves as one such treatment, providing nightmare sufferers with the potential to actively change the content of their nightmares. Given the differences between I-N and PT-N, it is important that we continue to develop our understanding of how different treatments ameliorate each phenomenon. LDT has been demonstrated to be an effective treatment for both I-N and PT-N. Though questions remain whether it is the most effective or appropriate treatment. Variables such as capacity for lucid dreaming induction, risks associated with lucid dreaming, sleep disruption, and stages of trauma recovery all need to be considered when assessing the appropriateness for LDT in the treatment of nightmares.

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