Nightmares

Assessment, Theory, and Treatment

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Voor mijn vader

die mij gedurende mijn hele promotie vroeg wanneer ik ‘nou eens een echte baan kreeg’

Night·mare

an evil female spirit afflicting sleepers with a feeling of suffocation

Source: Online Etymology Dictionary

Contents

Preface

The scientific field of nightmares has evolved quickly in the last ten to fifteen years. A positive and necessary development, as the lack of scientific attention for nightmares in the past has led to considerable problems. For example, clinical psychologists, psychiatrists, and general practitioners barely know anything about nightmares, let alone how to assess, diagnose, and treat them. Nightmare sufferers do not know that their nightmares can be treated, and do not seek help. The estimation that only a small minority of people with a sleep disorder gets adequate treatment certainly applies to nightmare sufferers.

The inclusion of the diagnosis 'Posttraumatic Stress Disorder' in the DSM-III in 1980 has contributed to the increasing awareness for nightmares. One adverse side effect, however, was that nightmares were – and still are – commonly viewed as a symptom of this anxiety syndrome, or as a symptom of another anxiety syndrome. As the current dissertation tries to point out, this position cannot hold.

Moreover, only a few areas have received much scientific attention: relationships of nightmares with personality characteristics and sleep correlates of posttraumatic nightmare sufferers have been thoroughly studied. Other areas have received much less attention. Prevalence studies with validated measurements, studies of nightmare characteristics, randomized controlled effect-studies, and theoretic reviews are needed.

Examining the current state of the art was the first step of this dissertation. It therefore starts with a review on nightmares that includes several aspects like the definition, prevalence, etiology, associated features, and current treatments. After this, the peculiar phenomenon that nightmares fade in the sleep laboratory is explored with ambulant polysomnographic recordings, whereas other methods of assessment are investigated as well. Another question about the assessment is explored with a study into the validation of a new sleep-questionnaire. This questionnaire was tested for its predictive qualities in cooperation with the Sleep-Wake Center of Kempenhaeghe in Heeze, the Netherlands.

Chapters four, five, and six address the prevalence of nightmares and its associated features. The clinical definition of nightmares – waking up from an extremely frightening dream – is evaluated for its relevance and accuracy. Another major theme concerns the prevalence of other sleep disorders and their relationships with psychiatric complaints.

Chapters seven and eight consist of two studies on a cognitive-restructuring treatment for nightmares, on which there has been no prior experimental research. Besides an evaluation of the effects of this treatment, these studies also pointed out directions for a cognitive-behavioral theory on nightmares. Literature on that topic has been completely absent, reason why chapter nine sought to provide a first step.

It is a natural evolution that an integrated cognitive-behavioral theory on nightmares will emerge. Cognitive-behavioral techniques have given way to a vast amount of treatments for all sorts of mental disorders; cognitive-behavioral models help to understand the onset and persistence of many disorders. Nightmares can and should be incorporated as well. This dissertation aims to be a small but necessary step on this scientific ladder upwards.

Victor I. Spoormaker

1 | Nightmares: from Anxiety Symptom to Sleep Disorder

Abstract

The DSM-IV definition of nightmares – extremely frightening dreams from which the person wakes up with a detailed memory and a quick orientation afterwards – is unnecessary strict. Other emotions (anger, grief) have also been reported in bad dreams, and waking up directly from the bad dream does not seem to be related to increased distress. In addition, assessment of nightmares is problematic. Polysomnographic recordings have a decreasing effect on nightmare frequency, retrospective measurements tend to underestimated nightmare frequency, and nightmare sufferers may feel reluctant to fill out (daily) prospective measurements. About 3-4% of the general population suffers from nightmares. It is necessary to distinguish idiopathic nightmares from posttraumatic nightmares, which are part of a posttraumatic stress reaction or disorder that may result from experiencing a traumatic event. Both types of nightmares seem to be associated with an elevated level of periodic limb movements, although only posttraumatic nightmares seem to be related to increased nocturnal awakenings. For understanding the associations of nightmare frequency with several mental complaints and personality traits, it is necessary to address the concept of nightmare distress: the impact on daily functioning caused by nightmares that may be a mediating variable between most of the relationships. Nightmares can be treated with several cognitive-behavioral techniques. The cognitive-restructuring technique Imagery Rehearsal is the treatment of choice for nightmares, although a randomized controlled trial with an attention control-group has not yet been carried out and its theoretical base needs to be addressed. The promising effects of the pharmacological agent Prazosin need to be evaluated in larger placebo-controlled trials. Nightmares are more than just a symptom of a larger syndrome and need to be viewed from a sleep medicine perspective: nightmares are a distinctive sleep disorder that can and should receive specific treatment.

Keywords: nightmares, definition, assessment, polysomnography, etiology, PTSD, treatment.

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Invited paper to Sleep Medicine Reviews

Introduction and definition(s)

The *Diagnostic and Statistical Manual for Mental Disorders, edition IV-TR* [1] defines a nightmare as an "extremely frightening dream" from which a person wakes up directly. After a nightmare orientation is fast and the nightmare leaves a detailed memory "usually involving threats to survival, security, or self-esteem" [1].

Nightmares are highly visual and have a complicated plot. Nightmares differ from night terrors since the latter phenomenon is not accompanied by visual images, and orientation after a night terror may take several minutes, while there is often amnesia for the night terror itself [1]. Night terrors occur during slow wave sleep, nightmares usually occur during REM sleep [2], although nightmares can also occur during NREM sleep [3, 4].

In the literature, however, definitions of nightmares differ in the use of two criteria. The criterion "extremely frightening dream" can be broadened to include other negative emotions as well, since many nightmare sufferers report other distressing negative emotions in their dreams, such as anger or grief [5, 6]. Moreover, 'immediate awakening' from a nightmare is not always seen as a necessary criterion (see Table 1).

Table 1: Different definitions of nightmares

	Criterion	
	Fear / Anxiety	All negative emotions
Criterion		
Direct awakening	frightening / anxiety dream	bad / disturbing dream
No direct awakening	nightmare (DSM-IV)	nightmare

Findings on the 'immediate awakening' criterion have been conflicting. One study found no relationship between direct awakening from a frightening dream and associated distress [7], whereas another study found that bad dreams from which persons woke up directly were more strongly related to several psychopathology and well-being measures than negative dreams from which persons did not wake up directly [8]. Schreuder et al. [9] found that waking up from a bad dream resulted in higher SCL-90 total-scores (psychoneuroticism / general psychopathology) and higher scores on several posttraumatic complaints. Yet, most participants – posttraumatic stress disorder (PTSD) patients – in this study had both types of frightening dreams, making waking up directly a less valid criterion for the clinical diagnosis.

Recently Blagrove, Farmer, and Williams [10] suggested that bad dreams from which the dreamer wakes up may be more intense, but that bad dreams with and without direct awakening are confounded by the same negative emotional tone. Their study showed that the frequency of dreams with a negative affect is a better index of low well-being than nightmare frequency, making a strong case for the definition of a nightmare as a bad dream.

At this moment the inclusion of the criteria 'extremely frightening dream' and 'waking up' from that dream in the DSM-IV-TR are questionable. However, research on the definition should not only focus on nightmare-associated distress and well-being, but also on characteristics (e.g. sleep correlates) of nightmares and bad dreams. For example, what if researchers found that nightmares and night terrors have similar relationships with low well-being? This would not imply that these two disorders are indistinguishable phenomena. The same may apply to bad dreams and nightmares. Correlations of bad dreams and nightmares with well-being do not tell us whether these are two different phenomena or two different types of the same phenomenon. Yet, rather than excluding bad dreams from the DSM-IV, a code should be used to differentiate nightmares with or without direct awakening.

For reasons of clarity, in this review the term *nightmares* is used for all disturbing dreams that lead to direct awakening and the term *bad dreams* for all disturbing dreams without direct awakening, in accordance with Zadra and Donderi [8].

In addition, we will distinguish two types of nightmares: posttraumatic and idiopathic nightmares. Experiencing a traumatic event may result in a posttraumatic stress disorder (PTSD), and posttraumatic nightmares are part of PTSD – see section *Etiology / Associated features*. Moreover, posttraumatic nightmares can also occur as part of a posttraumatic stress reaction without complete PTSD. Idiopathic nightmares are nightmares unrelated to a traumatic event or PTSD.

Assessment

Polysomnography

Polysomnographic recordings in the sleep laboratory yield a serious problem: nightmares tend to occur less often in this setting (Fisher et al., 1970). As noted by Woodward et al. [11], several studies found a low incidence of posttraumatic nightmares in a sleep laboratory – about 1–10% per night [3, 4, 12-16]. The artificial setting of the sleep laboratory may influence the contents of dreams. Indeed, two studies found that dreams recalled in the sleep laboratory are less charged with affect than dreams recalled at home [17, 18].

A recent study [19] tested whether the frequency of posttraumatic nightmares would also decrease when polysomnography was recorded with an ambulant method. The twelve participants of the study – inpatients of a psychiatric clinic for the treatment of organized violence – stayed in the clinic during the 2 x 24 hour polysomnographic recordings. The nightmare incidence in these participants, as measured with daily logs that were filled out for seven consecutive days, was 34.5 %. The nightmare incidence during the recordings was only 8 %, which was significantly lower. These results suggest that polysomnographic recordings outside the sleep laboratory decrease nightmare frequency. However, as there was no control-group, this study remains indicative at best.

The best way(s) to adequately measure nightmares with polysomnographic recordings could be to conduct it for a longer period so participants can adjust to the artificial setting and/or to conduct polysomnographic recordings with an ambulant method preferably in the home-environment.

Self-report

Retrospective questionnaires and prospective logs are the most common means of measuring various nightmare characteristics. Both raise serious issues. Questionnaires lead to a lower reported frequency of both bad dreams [20] and nightmares [8] than logs, most probably due to an underestimation of nightmare frequency via questionnaires. This underestimation is thought to occur by forgetting over time – a daily log causes more attention to be focused on nightmares [21]. The questionnaires used in the above studies, however, had a relatively long retrospective duration: one month and/or one year [8, 20].

Although logs seem to be the method-of-choice for assessing nightmare characteristics (in particular nightmare frequency), one study found that nightmare sufferers were reluctant to keep a log [22]. Moreover, logs seem to increase dream recall in general by an increased focus on dreams – it is possible that logs may also *increase* nightmare frequency via the same mechanism [21].

One study [19] compared a short-term retrospective questionnaire (past seven days) with a log and did not find an underestimation of nightmare frequency for the questionnaire. Moreover, the logs and questionnaire correlated very highly with each other for nightmare frequency ($r = .92$). The limitation of this study is that the questionnaire was filled out after seven consecutive days of keeping a log – the fact that participants did not forget their nightmares may be due to their log and not to the short-term duration of the questionnaire. These findings need to be further investigated.

One advantage of self-report measurements over polysomnography is that self-report measurements can distinguish between nightmare frequency and nightmare distress, two related but independent constructs [23]. Why this distinction is relevant will be discussed in the section *Etiology / Associated features*.

Prevalence

Prevalence-estimates of nightmares in the general population vary. Nielsen and Zadra [24] estimated that 4-8% of the general population has a "current problem" with nightmares. The *International Classification of Sleep Disorders* [25] estimates a prevalence of "perhaps 1%". Bixler et al. [26] found a prevalence of 5.3% for nightmares (defined as bad dreams) whereas Klink and Quan [27] found a prevalence of 8.1% with the same definition and questions. It is unclear, however, whether these nightmares occurred frequently (e.g. several times a week or month) or occasionally. Two more recent studies showed a nightmare-prevalence of around 3-4% [28, 29], although one study did not clearly define nightmares but rather asked participants whether they had 'nightmares' [28].

Different criteria or thresholds for 'diagnosing' nightmares can be helpful in understanding the varying prevalence-estimates. For example, Hublin et al. [29] found that 3% had nightmares weekly, and around 10% had nightmares monthly. These findings were confirmed by a recent study (Spoormaker et al., submitted manuscript) where 2.2% of the general Dutch population suffered "much" or "very much" from nightmares, whereas 7% suffered "a little" from nightmares.

More women than men report that they suffer from nightmares [30]; the *DSM-IV* describes the ratio within 2-4:1 [31]. However, women have a higher dream recall as well

[28, 32], which inevitably leads to a higher recall of nightmares. In addition, Klink and Quan [27] found an equal prevalence of nightmares in elderly men and women. As nightmares had the highest prevalence in young adult females, this cross-sectional study indicated that nightmares may decline with age in women [27].

Etiology / Associated features

Table 2: Etiology of nightmares

Genetics	Genetic influences accounted for 37% of the variance in adult nightmares in a large-scale twin-study [29].
Trauma	Experiencing or witnessing a traumatic event may result in posttraumatic nightmares [1, 9, 38-40].
Drugs	Drugs affecting the neurotransmitters norepinephrine, serotonine, and dopamine are most likely to induce nightmares [49-50].
Stress / state anxiety	Stress increases the frequency of nightmares [57, 61-63].
Personality factors	Neuroticism is associated with nightmares, but this relationship is mediated by state anxiety and nightmare distress [10, 57].
Maintenance factors	Nightmares tend to persist through cognitive avoidance and sleep unhygienic behaviors [35-37].

Genetic factors and persistence

A nationwide twin-cohort study in Finland found a genetic influence on nightmares [29]. For childhood nightmares genetic effects accounted for an estimated proportion of .45, whereas this proportion was around .37 in adult nightmares.

Interestingly, this study also found that about 80-90% of adults who had suffered from nightmares in childhood reported still having nightmares ‘at least sometimes’. Although this finding could have been affected by a recall bias, because nightmares in childhood were measured retrospectively, two other studies are also indicative of a childhood onset of nightmares. In a study with thirty nightmare sufferers, a childhood or adolescence onset of nightmares was reported to be “usual” [33]. In one large-scale epidemiological study on sleep disorders, more than half of all frequent nightmare sufferers had had a nightmare before the age of ten [34].

These findings indicate that nightmares persist over a long time, although the frequency may decrease. Future studies should use a longitudinal design to investigate this childhood

onset; it would be interesting to address maintenance factors as well. For example, several cognitive and behavioral responses have been reported to be associated with the persistence of nightmares as a sleep disorder: cognitive avoidance (e.g. "It was only a dream" [35]), sleep unhygienic behaviors (e.g. irregular sleep schedules [36]) or conditioned responses (e.g. fear of going to sleep or returning to sleep after a nightmare [37]).

Posttraumatic Stress Disorder (PTSD)

Experiencing a traumatic event may result in posttraumatic nightmares that are part of a posttraumatic stress reaction or PTSD. PTSD consists of three clusters: a) intrusion: re-experiencing the traumatic event in nightmares or flashbacks; b) avoidance of stimuli that can be related to the traumatic event; and c) hyperarousal (e.g. insomnia, increased tension during the day) [1]. Posttraumatic nightmares are part of the re-experiencing cluster of nightmares, and are one of the major complaints of persons who suffer from PTSD [9, 38, 39]. A prevalence of around 60% for nightmares was found in PTSD patients [40]. Another study found a prevalence of 56% for nightmares in PTSD patients who had experienced their (war-related) trauma more than forty years earlier [9] indicating that, if not treated, posttraumatic nightmares are a life-long complaint as well.

Sleep correlates

Nightmares disrupt the sleep [32, 41] and are associated with other sleep disorders such as night terrors [42], chronic insomnia [43], and sleep-disordered breathing [44], although the latter finding applied to posttraumatic nightmares only. However, nightmares are associated with breathing problems (asthma) [27] and increased snoring [28] in the general population. Gross and Lavie [45] showed that dreams after an apneic event were more negatively toned than other dreams in apnea patients. An apneic event (or rather its associated distress) might induce negative emotions in dreams and increase the frequency of nightmares.

Very few polysomnographic studies have been reported on sleep correlates of idiopathic nightmare sufferers [2, 4, 46, 47]. Almost all studies focus exclusively on posttraumatic nightmare sufferers, i.e. PTSD patients. As PTSD is a mental disorder characterized by a highly disrupted sleep [48], findings from posttraumatic nightmare sufferers may differ from idiopathic nightmare sufferers. Sleep correlates of PTSD are not a focus of this review, rather we address the sleep correlates of nightmares, and in particular similarities or differences between posttraumatic and idiopathic nightmares.

One recent study [47] compared these two types of nightmares – and included a healthy control group as well. The three groups did not differ on any of these measures: total sleeping time, sleep-onset latency, REM latency, REM efficiency, REM density, REM percentage, SWS percentage, and the number of micro-arousals. Yet, both types of nightmares were associated with an elevated number of periodic limb movements. Posttraumatic nightmare sufferers experienced more and longer nocturnal awakenings – and thus a lower sleep efficiency – than idiopathic nightmares sufferers and the control-group. Thus, insomnia seems to be related to posttraumatic nightmares in particular, and

might (partly) be a function of a process caused by posttraumatic stress. It has often been suggested that a lowered arousal threshold characterizes sleep in PTSD [12, 39, 47]. The finding that periodic limb movements are related to both types of nightmares needs more theoretical attention. Due to the strict inclusion criteria, however, this study had relatively small sample sizes and a limited statistical power for testing the differences among the three groups. Further research is necessary; future studies should also focus on differences in apneic events between posttraumatic and idiopathic nightmare sufferers.

Drug-induced nightmares

Nightmares can also be drug-induced. In a review on drug-induced nightmares, Thompson and Pierce [49]) noted that beta-blockers and alpha-agonists account for 34% of the clinical trials with reported nightmares as an adverse effect, a finding supported by a recent review [50] where beta-blockers affecting norepinephrine receptors were found to most likely lead to nightmare-complaints. The most probable pharmacological mechanism considered the induction of nightmares via the suppression of REM sleep – leading to more intense REM episodes [51].

One limitation for both studies was, however, that causality could not be determined. With the Naranjo [52] algorithm that describes causality as definite, probable, possible, or doubtful, almost all pharmacological agents were described as probably or possibly inducing nightmares. The only agent described as a definite/significant nightmare-inducer was a selective serotonine reuptake inhibitor (SSRI – paroxetine), with other SSRIs mostly rated as probable. Similar ratings were found for dopamine-agonists. Associations of nightmares with agents affecting GABA and acetylcholine (cholinergic antagonists) were mostly rated as possible.

Associated mental complaints and personality factors

Nightmares were associated with anxiety and depressive disorders in insomniacs [43] and with affective complaints in PTSD patients [53], although the relationship between depression and nightmares was inverse (i.e. PTSD patients with posttraumatic nightmares had lower levels of depression than PTSD patients without posttraumatic nightmares). However, nightmares (bad dreams) were unrelated to anxiety in a student sample [20], a finding confirmed by one recent study of the general population [54] that did not find any relationships: nightmares were not related to depression, anxiety, or any PTSD-cluster – not even to the intrusion-cluster of PTSD. Although nightmares may be unrelated to specific mental complaints in the general population, they are associated with the general level of mental complaints (general psychopathology) [55]. Moreover, nightmares were related to psychiatric disorders – the higher the frequency of nightmares, the higher the likelihood of a co-morbid psychiatric disorder [29].

This can be understood by the personality-factor neuroticism – neuroticism and general psychopathology are similar concepts (e.g. Zadra & Donderi [8] found a correlation of .66 between these two variables). There is mounting evidence that neuroticism is associated with nightmares [8, 10, 33, 55-57], although not all studies found this relationship [58, 59].

There are, however, limits to the generalizability of these findings: the studies consisted either of small clinical samples of frequent nightmare sufferers or of non-clinical university student samples.

The type of measurement may also be relevant, because most retrospective studies found a relationship between nightmares and neuroticism. It has been suggested that persons with high neuroticism are more likely to remember and report nightmares retrospectively [20]. For example, Bernstein and Belicki [60] found that the level of negative emotions in dreams correlated with neuroticism when measured retrospectively but not when measured prospectively. Yet, three prospective studies also found a correlation between nightmares and neuroticism [8, 10, 57], so a recall bias for neurotics via a retrospective method of measurement can only partly explain the heterogeneous findings on the nightmares-neuroticism relationship.

Recently, Schredl [57] showed that the association between neuroticism and nightmares was mediated by state anxiety. As opposed to the trait-like variable neuroticism, state anxiety is an indication of the current level of anxiety / stress. Stress increases the frequency of negative emotions in dreams [61, 62] and the frequency of bad dreams and nightmares [63]. One hypothesis states that persons with high neuroticism experience more stress and therefore more nightmares [57], although the nature of this process remains unclear and needs more theoretical and empirical attention.

In addition to the method of measurement and mediating stress, another variable has been shown [10] to be of major importance: nightmare distress.

Nightmare distress

Nightmare distress [20, 23] denotes the impact of nightmares (e.g. on daily functioning). Nightmare distress is weakly related to nightmare frequency [23] and seems to be an almost trait-like variable with correlations to trait but not state anxiety [64] and neuroticism [63]. Nightmare distress is also associated with physical complaints [63] and stress-related symptoms [8]. Blagrove et al. [10] showed that nightmare distress is a mediating variable for the relationships of nightmare frequency with various mental complaints. When controlled for nightmare distress, neither retrospective nor prospective nightmare frequency was related to any mental complaints or personality factors any more. Well-being correlated more strongly with nightmare distress than with nightmare frequency. The authors suggested that “there may be attributional or confounding effects of nightmare distress on nightmare frequency and its correlations”.

However, when nightmare distress was controlled for, the frequency of *bad dreams* remained weakly but significantly related to anxiety, depression, and neuroticism – suggesting that there is a strong case for defining nightmares as bad dreams and for the relationship between neuroticism and nightmares.

One limitation of this study was that it measured nightmare distress with the (most frequently used) Nightmare Distress scale by Belicki [23]. The response-format of this scale is based upon frequencies. For example, responses to an item like “Do your nightmares affect your well-being” can be “never, rarely, sometimes, often, always”. An answer on such a format is likely to be confounded by nightmare frequency [65]. The correlation of nightmare frequency with nightmare distress may thus be too high, and

indeed, another nightmare distress scale using an intensity-scale had a lower correlation with nightmare frequency [65]. At least partly, nightmare frequency and Belicki's nightmare distress seem to be tapping into the same variance. It is not surprising that controlling for nightmare distress decreases the correlation of nightmare frequency with neuroticism.

However, causal interpretations cannot yet be made due to the cross-sectional design of all the above studies – experimental studies are necessary. The concept of nightmare distress needs to be evaluated as well: is it a mental complaint or a personality trait? Is it measured correctly? And can nightmare distress be affected by treatment?

Interventions

Pharmacological interventions

The last review on nightmare, in 1993, [66] concluded that cognitive-behavioral treatment is the treatment of choice for nightmares. This conclusion is supported by studies into the pharmacotherapeutic treatment of posttraumatic nightmares, which have shown a poor response to treatment [67].

In recent years, however, several studies [68-71] have indicated that Prazosin seems to reduce posttraumatic nightmare frequency. Prazosin, an alpha-1 adrenergic antagonist, has been used for treating hypertension. It may work through inhibiting the elevated noradrenergic levels reported in PTSD [72]. Most studies supporting Prazosin were open-label studies indicating promising results; one was a placebo-controlled study. In this study [71] Prazosin significantly reduced nightmares, sleep disturbances, and PTSD-severity (no changes in the placebo-group). In addition, Prazosin was tolerated very well. Yet, these results should be interpreted with caution, since the sample size was very small (only ten war-veterans participated), and a larger study with more statistical power is necessary to determine the possible effects of Prazosin.

Cognitive-behavioral interventions

Targeting anxiety

Several cognitive-behavioral techniques have been found to be effective in decreasing nightmare frequency. Monitoring nightmares, relaxation therapy, and exposure exercises decreased nightmare frequency and the nightmare induced fear [22, 73, 74], although exposure has shown the best outcomes [75]. In the latter study a self-help manual was mailed that instructed participants to write down the nightmare after awakening and to re-experience it in imagination. Exposure reduced nightmare frequency more than relaxation-therapy (no reduction in the waiting-list group). However, the high numbers of dropouts (almost sixty percent in the self-exposure group and forty percent in the relaxation group) were very problematic and indicate a reluctance of nightmare sufferers to work with their nightmare-images just to relieve the anxiety.

Restructuring the nightmare

According to Marks [76], a cognitive-behavioral treatment for nightmares should work on exposure, abreaction, and mastery. Cognitive restructuring techniques provide mastery and exposure by instructing ways to alter the storyline of the nightmare – the nightmare-script. One technique is called Imagery Rehearsal Therapy (IRT) [77].

In Krakow et al.'s most recent effect-study [78], participants (sexual assault survivors with PTSD) received two three-hour sessions (one week interval) and a one-hour follow-up session three weeks later. In the first session, nightmare sufferers were instructed to think about nightmares and explore (and discuss) the possibility that although nightmares "may be trauma-induced, they may also be habit-sustained". Imagery skills were discussed and practiced: pleasant imagery exercises and cognitive-behavioral tools for dealing with unpleasant images that might emerge. In the second session, participants were instructed to write down a self-selected nightmare that was not too intense (preventing too much exposure) – and to come up with a different ending. The participants could choose any ending, and were told to write it down as well as rehearse it in session. They had to keep rehearsing the new nightmare 'mentally' at home and should not work on more than two nightmares a week.

IRT has shown good results in randomized controlled trials, with effect sizes (standardized mean differences) larger than one for nightmare frequency reduction after one to three group sessions [36, 77, 78]. Accordingly, IRT improved sleep quality and decreased PTSD-symptoms. However, there was a high dropout rate from 25 % to 40 % in all studies. In one study, the dropout rate was almost significantly higher in the treatment-group than in the control-group [78]. Moreover, the control-group of these studies consisted of a waiting-list group that received no treatment at all. Professional attention for one's nightmares may reduce nightmare frequency, and an attention control-group is necessary for determining whether the imagery rehearsal technique or other therapeutic factors reduce nightmare frequency.

Another alternative cognitive-restructuring technique is called lucid dreaming therapy (LDT). Lucid dreaming means realizing that one is dreaming in the dream itself. Lucid dreaming has been verified with polysomnographic recordings [79] and is a learned cognitive skill [80, 81]. Especially because nightmares can spontaneously 'trigger' lucidity in nightmares [82], lucid dreaming may be an appropriate technique for treating nightmares.

With LDT, nightmare sufferers are taught to become lucid in their nightmare through various daily exercises. Nightmares almost always have a recurrent theme or situation, and these are linked with lucidity. Once participants realize in their nightmare that they are *only dreaming*, the anxiety may decrease. Moreover, they can perform actions in the nightmare itself that alter the storyline of the nightmare. As a consequence, persons will experience fewer nightmares and less fear of nightmares.

Evidence for LDT is scant; only some case-studies have been conducted. Yet, they have shown promising results [83, 84], although one series of cases with systematic measurements did not find any decreases in sleep quality and anxiety measurements at follow-up, just a reduction in nightmare frequency (after one individual LDT session) [84]. A recurring – odd – finding was that for some participants, nightmares changed and became less frequent without obtaining lucidity. It is probable that mastery of nightmares and

nightmare self-efficacy are even more important than already thought. Randomized controlled trials are necessary to evaluate LDT in larger samples and to evaluate its therapeutic factor(s).

The theoretic basis of cognitive-restructuring treatment needs to be expanded, and the finding that IRT decreases PTSD-symptom severity and improves sleep quality needs to be conceptually evaluated. At this point, IRT is the treatment of choice for nightmares.

Implications

A sleep medicine perspective on nightmares

As Krakow et al. [36] noted, it is still a prevailing view that nightmares are secondary to another disorder (e.g. PTSD or another anxiety disorder). In this psychiatric view, nightmares are a symptom of a larger syndrome, which means that nightmares need not be treated specifically. For example, Kaplan and Sadock [85] state in their *Synopsis of Psychiatry*: "No specific treatment is usually required for nightmares."

This view does not hold with the findings described in this review. In the general population, nightmares do not correlate with any co-morbid mental complaint. Moreover, nightmares are highly prevalent and very persistent in the general population. Around 3-4% suffers from nightmares often, and about ten percent occasionally. The percentage never suffering from nightmares was around thirty percent in the large-scale Finnish twin-study [29]. Nightmares are not a nightly symptom of anxiety, but rather a sleep complaint that can become a sleep disorder.

The same applies to posttraumatic nightmares. Although a part of PTSD, these nightmares may be more than just a symptom of PTSD. The finding that IRT decreases not only posttraumatic nightmare frequency but also other PTSD-symptoms, and improves sleep quality is incompatible with the "symptom of a larger syndrome" view. This view would predict that if nightmares are treated, the underlying syndrome would still be there in the same severity. Nightmares seem to be key-element of PTSD and may – together with other sleep disorders such as insomnia, periodic limb movements, and apnea – very well be the hallmark of PTSD, as suggested by Ross et al. [39].

Moreover, a high co-morbidity with other mental disorders would not mean that nightmares are not a distinct disorder. Co-morbidities with other mental disorders are also present for depressive disorders, anxiety disorders, and psychophysiological insomnia. These are also separate disorders that warrant specific treatment. Since nightmares seem to be a life-long complaint for which there is an effective treatment, it is even more valuable for professionals to diagnose and treat nightmares.

It is therefore necessary to adopt a sleep medicine perspective on nightmares. Nightmares disrupt the sleep, cause distress, and impair daily functioning. Without treatment, nightmares persist in disrupting the sleep via several conditioned responses or sleep unhygienic behaviors. Nightmares should be viewed as a distinctive sleep disorder that can and should be addressed with specific treatment. The DSM-IV already has a separate diagnosis for nightmares; we suggest professionals use it more frequently.

Surprisingly, studies focusing on the development of psychological (and physiological) theories for nightmares have been scant. Some treatment studies have introduced several interesting concepts that need to be developed further into a theory.

The behavioral view holds that nightmares are a learned behavior [36]. The best support comes from the results of cognitive-behavioral treatment studies showing that nightmares can be *un*learned. Moreover, the finding that nightmares are less frequent in an artificial setting like a sleep laboratory suggests that nightmare sufferers have more control over their nightmares than perceived. Of course, as nightmares are not accompanied by any overt behavior, nightmares are a learned *cognitive* behavior.

Another somewhat more cognitive view focuses more on the representation of nightmares [83, 84, 85]. Nightmares are thought to be represented in a particular storyline, a script. This script consists of a series of expectations. The storyline of the nightmare has been experienced so often that a nightmare sufferer knows exactly what to expect next in the nightmare. That is why, for example, posttraumatic nightmares are often a replay of the original traumatic event. One neutral (visual) stimulus during REM sleep may start the nightmare-script – thus initiating a nightmare. The finding that cognitive-restructuring techniques show better effects in targeting nightmares than other cognitive-behavioral techniques (e.g. relaxation, exposure) supports this view.

Both approaches can be helpful in better understanding the nature, origin, and persistence of nightmares. Both approaches can be combined into one theory considering acquirement and representation of nightmares. Yet, at this time, both of these developing theories on nightmares should get more attention.

Conclusion

In summary, many findings on nightmares are indicative and this developing field of sleep medicine needs to be further investigated. The DSM-IV definition of nightmares needs to be refined since two criteria seem unnecessarily narrow; nightmares are not restricted to fear or anxiety alone and direct awakening is not related to waking distress. Bad dreams that do not wake up the person should be included in the definition, preferably with an extra code for the presence of direct awakening.

Polysomnographic recordings of nightmares decrease nightmare frequency, but a longer adaptation period or an ambulant method may solve this problem. Retrospective questionnaires with a relatively long duration (past month or more) lead to underestimations of nightmare frequency, whereas retrospective questionnaires with a shorter duration (e.g. past seven days) and prospective logs do not. It has therefore been difficult to assess the prevalence of nightmares and the prevalence of nightmare *sufferers*, but three studies found around the same percentage of 3-4%. Nightmares can be posttraumatic as part of posttraumatic stress reaction, idiopathic, or drug-induced. Posttraumatic nightmares are associated with nocturnal awakenings, and both posttraumatic and idiopathic nightmares seem to be associated with periodic limb movements – a finding that needs further attention. Findings on relationships with other mental complaints have been puzzling. Although nightmares are unrelated to specific mental complaints in the

general population, they are related to the general level of mental complaints and the personality-factor neuroticism. State anxiety and nightmare distress may function as mediating variables.

Nightmares can be treated with several cognitive-behavioral techniques; one type of which concerns targeting anxiety (e.g. relaxation and desensitization techniques) and another type concerns cognitive-restructuring techniques (e.g. Imagery Rehearsal). Imagery Rehearsal is the best-documented technique, with several randomized controlled trials (although an attention control-group would be preferred over a waiting-list control-group) and very promising effects in just one to three sessions. The mechanisms of this technique need to be further developed into a cognitive-behavioral theory. In addition, the promising effects of the pharmacological agent Prazosin need to be evaluated in larger placebo-controlled trials.

Nightmares deserve to be viewed from a sleep medicine perspective; they are not merely a nightly symptom of anxiety, but a separate sleep disorder that can and should receive specific treatment.

Practice points

1. Emotions in nightmares are not limited to fear or anxiety alone: anger and grief are also frequently mentioned emotions. Moreover, 'immediate awakening' should not be a necessary criterion for diagnosing a nightmare; it should rather be a code differentiating *bad dreams* from *nightmares*.
2. Nightmares are difficult to assess. For conducting polysomnography in the sleep laboratory on nightmare sufferers it may be helpful to have an adaptation period of several days.
3. Somewhat counter-intuitively, drugs that suppress REM sleep may increase nightmare frequency by the mechanism of increasing the intensity of REM episodes.
4. The association of nightmares with neuroticism is likely to be mediated by the current level of stress (state anxiety) and by nightmare distress.
5. Nightmares can be effectively treated with Imagery Rehearsal Treatment.
6. A sleep medicine perspective on nightmares provides a better view than a psychiatric perspective. Nightmares should be viewed as a distinct sleep disorder that can and should be addressed with specific treatment.

Research Agenda

1. The current clinical definition for nightmares is unsatisfactory. Studies should address whether bad dreams and nightmares are different phenomena or different types of the same phenomenon. Not only related constructs, but also polysomnographic correlates would be valuable.
2. The decreasing effect of polysomnographic recordings on nightmare frequency should be investigated with an ambulant method of measurement in the home-environment.
3. The associations of both posttraumatic and idiopathic nightmares with periodic limb movements and sleep apneic events need to be examined more closely, and further conceptualizing is necessary to understand these relationships.
4. More research is needed on the causality of drug-induced nightmares. The effects of Prazosin need to be evaluated in a larger placebo-controlled trial, and its pharmacological mechanism needs to be addressed as well.
5. Randomized controlled trials with an attention control-group are necessary to evaluate cognitive-restructuring techniques such as IRT. LDT still needs to be studied with a randomized controlled trial; a comparison between LDT and IRT should be helpful in understanding what lucidity adds to a cognitive-restructuring treatment.
6. A conceptual framework for nightmares needs to be developed.

Abbreviations

DSM-IV	Diagnostic and Statistical Manual for Mental Disorders, edition IV
IRT	Imagery Rehearsal Treatment
LDT	Lucid Dreaming Treatment
NREM	Non Rapid Eye Movement
PTSD	Posttraumatic Stress Disorder
REM	Rapid Eye Movement

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--- Part One ---

Assessment of Nightmares

Polysomnography, Questionnaires, or Logs?

2 | Does Polysomnography Reduce Nightmare Frequency?

Abstract

Polysomnographic recordings in a sleep laboratory seem to have a decreasing effect on nightmare frequency. Objectives of this study were to investigate this effect with an ambulant method of polysomnography and to investigate other nightmare measurements (diary and questionnaire). Participants were PTSD-inpatients suffering from posttraumatic nightmares (N = 12). All participants kept a diary and filled out a questionnaire considering their sleep and nightmares. Polysomnographic sleep-data were recorded in the clinic for two consecutive 24-hour periods. Significantly fewer than expected nightmares were recorded with polysomnography. The questionnaire correlated very highly with the diary and seems to be the method of choice for assessing nightmare frequency.

Keywords: PTSD, nightmares, nightmare frequency, polysomnography, questionnaires, diary.

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Introduction

While the current debate on nightmares focuses on associated features of nightmares (Blagrove, Farmer, & Williams, 2004), studies investigating the methods of measuring nightmares have been scant. That is striking since all common measurements yield serious flaws. As for the self-report measurements, retrospective questionnaires seem to underestimate the nightmare frequency (Wood & Bootzin, 1990), whereas prospective logs might provide a more accurate view. One problem with prospective logs, however, is that many nightmare sufferers seem to be reluctant to keep a log (Neidhart, Krakow, Kellner, & Pathak, 1992). This has serious consequences for e.g. nightmare-treatment studies – where the dropout-rate is already relatively high (Krakow et al., 2001).

Polysomnographic recordings in a sleep laboratory have another serious limitation: in almost all studies a lower than expected frequency of nightmares has been found. The percentage of nightmares a night recorded in the sleep laboratory varies from about 10 % (Hefez, Metz, & Lavie, 1987; Lavie, Hefez, Halperin, & Enoch, 1979; Schlosberg & Benjamin, 1978; van der Kolk, Blits, Burr, Sherry, & Hartmann, 1984) to about 1 % (Dow, Kelsoe, & Gillin, 1996; Glaubman, Mikulincer, Porat, Wasserman, & Birger, 1990; Mellman, David, Kulick-Bell, Hebding, & Nolan, 1995; Mellman, Kulick-Bell, Ashlock, & Nolan, 1995; Mellman, Nolan, Hebding, Kulick-Bell, & Dmoinguez, 1997; Ross et al., 1994; Woodward, Bliwise, Friedman, & Gusman, 1996; Woodward, Friedman, & Bliwise, 1996). It seems that the sleep laboratory has a major influence on nightmare frequency: they tend to fade (Fisher, Byrne, Edwards, & Kahn, 1970). This phenomenon, however, has not yet been statistically tested.

The present study sought to investigate whether polysomnographic recordings outside the sleep laboratory will show higher levels of nightmares. Moreover, relationships with prospective logs and retrospective questionnaires will be explored as well.

Methods

Participants

All 24 Posttraumatic Stress Disorder (PTSD) inpatients of Centrum '45, the Dutch national psychiatric center for the treatment of victims of organized violence, were approached to participate in this study. This population was chosen because of the high incidence of posttraumatic nightmares (Schreuder, van Egmond, Kleijn, & Visser, 1998). A nightmare was defined as a frightening dream leading to direct awakening (American Psychiatric Association, 2000).

Fourteen participants voluntarily agreed to cooperate, two of which eventually withdrew. The mean age was 59.8 (SD = 4.8). All participants returned a written informed consent. Main reasons of non-participating were being afraid of experiencing more nightmares and not experiencing nightmares at all. All twelve participants, seven women and five men, had suffered from posttraumatic nightmares more than ten years and had been in the clinic for at least two months. PTSD-diagnoses were established during an intensive intake procedure.

Ten participants were on medication (antidepressants), five participants had a co-morbid depressive disorder.

Materials

The following sleep data were based on EEG and eye movement recording: total sleeping time, sleep efficiency (ratio between time asleep and time in bed), sleep latency, number of awakenings, number of arousals, amount of slow wave sleep (SWS), amount of Rapid Eye Movement sleep (REM sleep), and REM latency. Limb movements were recorded as well.

A self-report questionnaire was used for assessing sleep and nightmare data, the Nocturnal Intrusions after Traumatic Events (NITE). The NITE consisted of nineteen questions, eight of which concerned the general sleep, and eleven of which concerned dreams and nightmares (Schreuder et al., 1998). The NITE was filled out in two forms: a daily (diary) form and a weekly (questionnaire) form about the last seven days. Most items are theoretically meaningful on their own, but taken together they stand for a measure of Nightmare Distress, with a Cronbach's alpha of .90 (Kleijn, Schreuder, & Mook, 2001).

Procedure

Participants were asked to keep a diary for seven consecutive days and fill out a questionnaire on the seventh day. With these self-report data an estimate was made for the expected amount of nightmares. Polysomnographic recordings were recorded afterwards (2 times 24hr) in the clinic.

Medication did not change during the data collection, and should therefore impact nightmare frequency on both self-report and polysomnographic data alike, or not at all. Medication use could, however, have influenced the polysomnographic sleep characteristics; e.g. serotonergic agents seem to improve the quality of sleep (Neylan et al., 2001).

Results

Twelve participants reported a total amount of 29 nightmares in seven consecutive nights (incidence of 34.5 % per night). Five participants reported exact replications of their traumatic event(s), seven participants had symbolic nightmares (which were defined as nightmares with a theme related to the traumatic event). Only two nightmares were recorded during polysomnography, both at one participant. This percentage of 8.3 was significantly lower than the expected percentage of 34.5 % (non-parametric binomial test, $p < .01$).

There were high correlations between the daily and the weekly form of the NITE considering nightmare frequency, $r(10) = .92$, $p < .001$, tiredness at getting up, $r(10) = .83$, $p < .001$, and tiredness during the day, $r(10) = .92$, $p < .001$.

Table 1: Correlations of self-report (NITE-weekly) with polysomnographic data

Self report	SWS [a]	REM [b]	REM latency	Arousal
Tired at getting up	–.06	.72 **	–.24	–.29
Tired during day	–.54 *	–.14	–.15	.20
Nightmare frequency	.41	–.08	.49 *	–.56 *

[a] SWS, slow wave sleep
[b] REM, rapid eye movement
* $p < .05$
** $p < .01$

Table 1 shows that several self-report data correlated moderately with polysomnographic sleep data. Surprising was the negative correlation of nightmare frequency with number of arousals. Nightmare distress did not correlate significantly with any polysomnographic sleep data, but did correlate with other self-report data: there was a moderately positive correlation with tiredness at getting up, $r(10) = .57$, $p < .05$, and a strikingly high negative correlation with tiredness during the day, $r(10) = -.96$, $p < .001$.

Table 2: Sleep characteristics

	Mean	SD
Total Sleeping Time (minutes)	310.2	67.9
Sleep efficiency (%)	74.1	12.6
Sleep latency (minutes)	15.2	10.8
Number of awakenings	1.4	1.4
Number of arousals	9.2	6.4
Number of movements	5.8	4.5
SWS [a] (minutes)	58.6	34.3
SWS (%)	14.1	6.9
REM [b] latency (minutes)	123.7	78.8
REM sleep (minutes)	57.4	26.8
REM sleep (%)	14.0	6.2

[a] SWS, slow wave sleep
[b] REM, rapid eye movement

The sleep efficiency (74.1 %) and the REM percentage (14.0 %) were both low and indicate disturbed sleep. The same applies to a REM latency of 123.7 minutes. There were

indicators of healthy sleep as well, such as the relatively normal percentage SWS and number of arousals.

Discussion

Before discussing the results, it should be stated that the present study has several limitations. Patients were not drug-free during the study. Although this was probably irrelevant considering the polysomnographic influence on nightmare frequency, the polysomnographic data itself could have been influenced. Another limitation considers the relatively small amount of participants and their high mean age. The findings might be only attributable to PTSD-inpatients of an old age. Furthermore, the traumatic events of the participants all happened a long time ago: more than fifty years, during the Second World War and / or the independence struggle of Indonesia (former Dutch East Indies).

Yet, significantly fewer nightmares than expected were recorded with ambulant polysomnography. It seems that polysomnography alone – i.e. being observed by a professional – is sufficient to decrease nightmare frequency: sleeping in the sleep laboratory is not necessary. This applied to PTSD-patients who had suffered from nightmares for over ten years and had an average incidence of one nightmare per three nights.

Self-report data seem to be a better way of assessing nightmare frequency. As the diary and questionnaire data correlated very highly, the questionnaire is the preferred option since it has to be filled out only once. The underestimation of nightmare frequency by a questionnaire (Wood & Bootzin, 1990) was not found in this study, possibly due to the relative short-term duration of the questionnaire (past seven days).

Why polysomnographic recordings inhibit nightmares remains unclear. Knowing that one is being observed may elicit a feeling of security that causes fewer nightmares. This finding strengthens the suggestion that nightmares seem to be a function of learned behavior, over which nightmare sufferers have more control than imagined (Krakow et al., 2001). Future studies could investigate this speculation by telling the participants that breathing patterns or other sleep characteristics are subject of the study, or by conducting polysomnographic recordings for a longer period in order to check for a possible habituation-effect.

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3 | Initial Validation of the SLEEP-50 Questionnaire

Abstract

Initial psychometric properties of the SLEEP-50 questionnaire, designed to detect sleep disorders as listed in the DSM-IV-TR, were examined. The sample consisted of 377 college students, 246 sleep patients, 32 nightmare sufferers, and 44 healthy volunteers. The internal consistency was high (Cronbach's alpha = .85); test-retest correlations fell between .65 and .89. Principal Component Analysis with a Direct Oblimin Rotation revealed a factor-structure that closely matched the designed structure. Sensitivity/specificity scores were promising for all sleep disorders; the agreement between all clinical diagnoses and SLEEP-50-classifications was substantial (kappa = .77). These initial findings indicate that the SLEEP-50 seems able to detect a variety of sleep disorders. The SLEEP-50 can aid in screening for common sleep disorders in the general population.

Keywords: Polysomnography, Sleep disorders, Sleep questionnaire, Validity, Reliability.

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Introduction

Although highly prevalent, sleep disorders are generally underdiagnosed in the adult population (Kupperman et al., 1995). This can possibly be overcome by the use of short sleep questionnaires, which could work as a screening device for sleep disorders (Kapuniai, Andrew, Crowell, & Pearce, 1988; Roth et al., 2002).

Sleep questionnaires are often designed to measure different aspects of sleep: quality of sleep, sleepiness during the day, impact of sleep problems on daily functioning, one specific sleep disorder, or two or more sleep disorders.

Questionnaires that assess the quality of sleep, such as the Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1992), are not designed to detect one or more specific sleep disorder(s). The same applies to questionnaires that assess the daytime sleepiness, e.g. the Epworth Sleepiness Scale (ESS; Johns, 1991) and the Stanford Sleepiness Scale (SSS; Hoddes, Zarcone, Smythe, Philips, & Dement, 1973). Questionnaires like the Insomnia Impact Scale (IIS; Hoellscher, Ware, and Bond, 1993) and the Quality of Life of Insomnia (QLI; De Sousa, 1996) are aimed at identifying the impact of sleep problems on daily functioning.

Other sleep questionnaires are directed at one sleep disorder. Sleep apnea can be assessed by the Survey Screen for Sleep Apnea (SSSA; Maislin et al., 1995), the Sleep and Health Questionnaire (SHQ; Kump et al., 1994), and the Hawaii Sleep Questionnaire (HSQ; Kapuniai et al., 1988). Insomnia can be assessed by questionnaires such as Spielman's Insomnia Symptom Questionnaire (SISQ; Spielman, Saskin, & Thorpe, 1987) and the Insomnia Severity Index (ISI; Bastien, Vallières, & Morin, 2001), although the latter scale is designed for outcome rather than prevalence studies.

The Berlin Questionnaire (BQ; Netzer, Stoohs, Netzer, Clark, & Strohl, 1999) and the Basic Nordic Sleep Questionnaire (BSNQ; Partinen & Gislason, 1995) can detect two groups of sleep problems, whereas the Sleep Disorders Questionnaire (SDQ; Douglass et al., 1994) is able to assess four groups of sleep disorders. Due to its length, however, the latter scale is not a practical instrument to screen for sleep disorders in the general population. The Dutch version of the SDQ (Sweere et al., 1998) is somewhat shorter (and the only validated sleep questionnaire in the Netherlands) but this questionnaire has other limitations such as unknown reliability coefficients and a correct prediction for less than a third of the healthy participants.

Recently the Global Sleep Assessment Questionnaire (GASQ; Roth et al., 2002) has been validated. It proved to measure and predict the most common sleep disorders, such as sleep apnea, insomnia, insomnia associated with a mental disorder, restless legs, PLMD, and parasomnias. However, there were few healthy participants in this study so that conclusions about its ability to correctly predict persons without any sleep disorder are still preliminary. Moreover, narcolepsy was not included.

At this time there is no short sleep questionnaire that can adequately predict the sleep disorders as listed in the DSM-IV-TR (American Psychiatric Association, 2000) and that can effectively distinguish these sleep disorders from sleep complaints. Therefore the SLEEP-50 was developed.

Methods

Instrument

The SLEEP-50 is a self-administered questionnaire (see Appendix) about the intensity of a person's subjective sleep complaints. It was designed to detect both the sleep complaints and the sleep disorders as listed in the DSM-IV-TR, as well as factors influencing sleep. The first version of the SLEEP-50 was designed by the first author and followed the descriptions and criteria from the DSM-IV, leading to nine subscales:

Subscales

Sleep apnea (items 1-8); Insomnia (items 9-16); Narcolepsy (items 17-21); Restless Legs / Periodic Limb Movement Disorder (PLMD) (items 22-25); Circadian Rhythm Sleep Disorder (items 26-28); Sleepwalking (items 29-31); Nightmares (items 32-36); Factors influencing sleep (items 37-43); and the Impact of sleep complaints on daily functioning (items 44-50).

Note that item 32 checks whether frightening dreams are present. If not, persons should not fill out the items 33-36. Item 33 is required for checking the DSM-IV definition of nightmares, where waking up is a necessary criterion. Items 34 and 35 are necessary to distinguish nightmares (vivid memory and quick orientation) from night terrors (amnesia and slow orientation), whereas item 36 could also aid in distinguishing these two parasomnias.

The impact-subscale was necessary for all the diagnoses of sleep disorders since the first seven subscales ask about sleep-complaints only. According to the DSM-IV a sleep disorder, like any other mental disorder, can only be diagnosed if there are significant impairments in daily functioning. The SLEEP-50 checks for sleep-complaints with the subscales of items 1-36 and detects a sleep disorder with the impact-subscale.

Time-frame, item-format, and interpretation guidelines

The questionnaire starts with this statement: "Please respond to what extent a statement (item) has been applicable to you during the past four weeks." Each item is scored on a four-point-scale: 1 (*not at all*), 2 (*somewhat*), 3 (*rather much*), and 4 (*very much*). This intensity-scale was preferred over a frequency-scale, because several items (such as the items 1, 3, and 4) could provide invalid answers with a frequency-scale. For example, people that snore may not adequately respond to item 1 (*I am told that I snore*) on a frequency-scale because it need not be said to them several times a week/month. Yet, if a person has been told that he/she snored only once or twice during the last four weeks, he/she can judge that item to be very applicable.

Moreover, a sleep questionnaire is not an objective way of assessing sleep complaints, and therefore the (subjective) judgment of the participants is important as well. One can have only one nightmare a month that is highly distressing or four nightmares a month that are not distressing. Additionally, the frequency may very well differ from the intensity for

several items, e.g. falling asleep on a social occasion twice a month can be very distressing whereas waking up with a dry mouth twice a month may not be equally distressing. With a frequency-scale the scores on these two items would not differ because they are equally frequent, thus complicating the interpretation guidelines.

As a quick check, a score of 3 (*rather much*) or 4 (*very much*) on an item would indicate the presence of a sleep symptom of a specific sleep disorder, a procedure also used with other questionnaires with the same answering-format (Hovens, Bramsen, & van der Ploeg, 2000). To check for the presence of a sleep disorder, at least one item on the impact-scale should also be endorsed with a score 3 or 4.

Moreover, scores on the items could be summed as well, leading to a total-score for each subscale. With no items endorsed a subscale would get the minimum-score of 'amount of items * 1'; with all items endorsed a subscale would get the maximum-score of 'amount of items * 4'. The sum of a specific subscale then determines the final prediction whether a certain sleep disorder is present (depending on the optimal cut-off value). Note that for diagnosing a sleep *disorder* not only the specific subscale (e.g. insomnia) needs to exceed a certain cut-off point, but also the impact-subscale. If the score on the impact-subscale is below that certain cut-off value, no sleep disorder can be diagnosed (then sleep complaints are present without significant impairments in daily functioning).

Initial testing

The initial testing started with contacting five Dutch sleep researchers/clinicians who were asked to comment on the SLEEP-50. This led to the inclusion of three items (22, 42, and 43) and a revision of item 20 ('with intense emotions' was added to make it more recognizable for persons with narcolepsy).

Afterwards the questionnaire was filled out by two groups: 56 college students (Bachelor Psychology) who were contacted via two statistics-classes and 30 participants with various confirmed sleep disorders who where selected via snowball sampling (a sampling method that consists of identifying participants who are then used to refer researchers on to other participants). Both groups could comment on the questionnaire in an informal setting or by (e-)mail. This led to the rephrasing of several items (e.g. for items 1, 3, and 4 "I am told" rather than "My bed partner has told me" as not everyone had a bed partner) and the exclusion of one item (everyone scored high on 'drinking tea or coffee during the evening' as this is a very common habit in the Netherlands). Moreover, the last two items were renamed as additional questions to clarify the distinction in answer-format. Also, item 32 included a second answer-format where participants could estimate the amount of frightening dreams a week. This estimation was excluded because it led to some confusion and because the correlation between this estimation and the answer on item 32 was very high, $r(84) = .94$, $p < .001$.

After analyzing the results of the sleep patients it was found that the sum of the scores on a particular sleep-subscale combined with the sum of the scores on the impact-subscale resulted in better predictions than the quick check (number of items endorsed on a specific sleep-subscale and on the impact-subscale). With the summed scores, not only the endorsement of an item counted but also the relative intensity. The quick check yielded no

better predictions when a different score was used for the endorsement of an item (e.g. 2, 3, or 4 versus 1 or score 4 versus 1, 2, or 3).

Participants and procedures

College students

As part of determining the internal consistency and construct-validity, 500 questionnaires were handed out to psychology students (no inclusion criteria) who were approached via lectures of three different bachelor-courses at Utrecht University. In a ten-minute speech the purpose and relevance of the study were explained (sleep disorders, although highly prevalent, are not often detected. A questionnaire that is able to screen for sleep disorders might be helpful in recognizing sleep disorders. This study is about how well this sleep questionnaire detects sleep disorders). Afterwards, the SLEEP-50 was handed out. Respondents were asked to send it back together with the written consent. Of the 500 students who received a questionnaire 336 returned the SLEEP-50 (response-rate 67%, mean age = 22.1 years, SD = 4.2, 56% was female). This response-rate is moderate, but students did not receive any incentive.

For determining the test-retest reliability, the same procedure was followed during another lecture with Master students, except that after three weeks the students were asked to fill out the same questionnaire. Fifty questionnaires were handed out; these students received a small monetary incentive (ten euro). The response-rate was higher (41 filled out the SLEEP-50 twice: response-rate 83%, mean age = 22.3 years, SD = 3.4, 85% was female).

Sleep patients

Three-hundred consecutive patients were approached during the intake at the Center for Sleep and Wake disorders Kempenhaeghe at Heeze, the Netherlands (no inclusion criteria, all patients were approached). They received the SLEEP-50 by mail together with a letter stating the purpose and the relevance of the study. They were asked to return the sleep questionnaire and the written consent at the sleep clinic. Two-hundred-fifty-two participants returned the SLEEP-50. As six persons dropped out during the intake at the sleep clinic, 246 useful questionnaires were returned (response-rate 82.3%, mean age = 47.6 years, SD = 12.2, 44 % was female).

Polysomnographic measures were conducted at the sleep center of Kempenhaeghe, where polysomnography is not indicated for the routine evaluation of insomnia. Insomnia is diagnosed primarily with a detailed medical, psychiatric, and sleep history (the latter one measured with a sleep log and unstructured sleep questionnaires). Polysomnography is indicated for insomnia when a co-morbid sleep disorder or sleep state misperception (SSM) is suspected or the initial diagnosis is uncertain. Of the 65 sleep patients with insomnia as the primary diagnosis, 42 did not receive polysomnography. Of the 30 sleep patients with an affective disorder as the primary diagnosis, 19 did not receive polysomnography. All other sleep patients did (n = 185).

Nightmare sufferers

Another group consisted of nightmare sufferers who had experienced nightmares (DSM-IV-TR definition) for more than a year. The rationale for including a group with this specific sleep disorder is two-fold. Although nightmares are prevalent in the general population (estimates around 3-7%) (Hublin, Kaprio, Partinen, & Koskenvuo, 1999; Ohayon, Guilleminault, Caulet, 1996), nightmare sufferers do not often seek help. Of all sleep patients in this study, none had a nightmare disorder as the primary diagnosis. Moreover, research indicates that polysomnographic recordings tend to decrease nightmare frequency (Fisher, Byrne, Edwards, & Kahn, 1970) and are not the method-of-choice for assessing nightmares (Spoormaker et al., submitted manuscript).

Thirty-eight nightmare sufferers who volunteered in a treatment-study on nightmares were asked to participate in the current study. They received the SLEEP-50 by mail together with a letter stating the purpose and the relevance of this study. They were asked to return the questionnaire with the written consent and to schedule an appointment with the first author for a one-hour unstructured interview about their sleep (e.g. complaints, hygiene, and daily functioning). They would receive a monetary incentive (twenty-five euro). Thirty-two nightmare sufferers returned the SLEEP-50 and came to their appointment (response-rate 89%, mean age = 25.8 years, SD = 6.2, 84% was female). The interview took place before any treatment. At the interview, all 32 participants reported suffering from nightmares and daily functioning limitations. The high response-rate can be explained by the incentive and participants' motivation to do anything possible to overcome their nightmares.

Healthy volunteers

The healthy volunteers were recruited via an advertisement in a local newspaper. It said that participants who were satisfied with their sleep could participate in a study on sleep. They could register by telephone or e-mail. A total of 178 registered (58 by telephone, 120 via e-mail). One hundred participants were randomly selected and received the SLEEP-50 by mail together with a letter stating the purpose and the relevance of the study. They were asked to return the questionnaire with the written consent and to schedule an appointment with the first author for a one-hour unstructured interview about their sleep (e.g. complaints, hygiene, and daily functioning). They would receive a monetary incentive as well (twenty-five euro). Forty-four healthy volunteers returned the questionnaire and came to their appointment (response-rate 44%, mean age = 41.4 years, SD = 14.5, 55.4 % was female). The effort that was asked of participants (and the possible lack of motivation) may explain the low response-rate.

The one-hour appointment was necessary for minimizing the chance that any of these healthy volunteers had a sleep disorder, although diagnoses from the sleep clinic would have been more informative. Yet, none of the participants reported any sleep complaint, inadequate sleep hygiene or problems with daily functioning during the interview. These data were important in order to check whether the SLEEP-50 can adequately distinguish people with a sleep disorder from people with no sleep disorder, next to adequately predicting *which* disorder is present.

Statistical Analyses

The internal consistency was measured by Cronbach's alpha (all participants including the test-retest group's first assessment); for the test-retest reliability Pearson correlation coefficients (*r*-values) were determined for all subscales and the total-score of the SLEEP-50. These *r*-values were tested for significance with Pearson's *r*-test (one-tailed).

Principal Component Analysis with a Direct Oblimin Rotation was used for the construct-validity analysis (all participants including the test-retest group's first assessment). We preferred this oblique rotation to an orthogonal rotation (e.g. Varimax) because several factors could be interrelated. For example, the impact of sleep complaints was expected be related to various other factors (such as insomnia). However, an oblique rotation could also result in independent factors if that provides a better fit. Note that the factors influencing sleep (items 37-43) were excluded since they were not theoretically related to one factor or another subscale. Moreover, the nightmare items 33-36 were only filled out by a minority (participants with nightmares) and therefore also excluded.

To investigate the predictive validity, sensitivity (proportion correctly predicted with a sleep disorder) and specificity scores (proportion correctly predicted without that sleep disorder) were established with optimized cut-off scores. The starting point for a specific sleep disorder was the mean of the relevant subscale (e.g. the mean score of sleep apnea patients on the SLEEP-50 subscale 'apnea'). All values lower than this mean were analyzed on the sensitivity and specificity of that particular value. The value where both the sensitivity and specificity were highest would be chosen as the optimal cut-off point. For example, for classifying sleep apnea cut-off values for the apnea subscale were (a) ≥ 14 (sensitivity .89, specificity .82), (b) ≥ 15 (sensitivity .85, specificity .88), and (c) ≥ 16 (sensitivity .79, specificity .90). Here (b) was chosen as the optimal cut-off value.

Kappa was computed to evaluate the agreement between the primary clinical diagnoses and the primary classifications of the SLEEP-50.

Results

Reliability

The internal consistency for the entire scale – minus additional nightmare items 33-36 and factors influencing sleep 37-43 – was high (Cronbach's alpha = .85). Deletion of any item did not increase or decrease the alpha with more than .02. Alpha's were low for several subscales due to the small amount of items, except for sleepwalking since these items were rarely endorsed.

The general test-retest reliability, tested in the student sample with an interval of three weeks, was good: $r(39) = .78$, $p < .001$. Adequate scores were found for all designed subscales except for sleepwalking. Closer examination revealed that there was no variance in the scores on item 30 (evidence of action performed during the night); no participant endorsed this item. Exclusion of this item increased the test-retest correlation of the sleepwalking-scale: $r(39) = .65$, $p < .001$.

Table 1: Test-retest reliabilities (n = 41) and Cronbach's alpha's (N = 699) for the SLEEP-50 subscales and the total-score

Scale:	Apnea	Insomnia	Narcolepsy	RLS/PLMD	Circadian	Sleepwalking	Nightmares	Factors	Impact	TOTAL
Items:	1-8	9-16	17-21	22-25	26-28	29-31	32	37-43	44-50	1-32 & 44-50
Cronbach's	.51	.85	.52	.70	.47	.84	–	–	.86	.85
Pearson's r	.81*	.77*	.71*	.74*	.81*	-.07	.89*	.73*	.76*	.78*

Note: Cronbach's alpha was not computed for the subscales 'Nightmares' and 'Factors' as the first scale consisted of one item only and the latter scale did not consist of theoretically related items. The Cronbach's alpha for the entire scale (TOTAL) consisted of all subscales except for the additional nightmare items (33-36) and the items of 'Factors influencing sleep' (37-43). Items 33-36 were only filled out by a minority whereas items 37-43 where not theoretically related to each other.
* $p < .001$

Not all items had a good item-total correlation (see Table 2). Only the insomnia and impact-items showed relatively high item-total correlations; whereas about half of apnea, narcolepsy, restless legs-items showed an item-total correlation of > .20. This is, however, not problematic since the questionnaire was designed to detect and distinguish different sleep disorders. The scores on the subscales are important, not the total-score (e.g. endorsing a sleepwalking-item does not necessarily mean that one endorses items measuring other sleep complaints).

Construct Validity

A Principal Component Analysis with a Direct Oblimin Rotation (Table 2) revealed 10 factors that were able to explain 67.5% of the variance. The factors did not correlate more than .30 with another, most correlations fell between .00 and .20.

The factor-structure fits the originally designed structure accurately. Only the narcolepsy subscale is problematic, with item 19 (*sleep attacks*) loading on the factor impact of sleep complaints, and item 17 (*hypnagogic hallucinations*) loading on both narcolepsy and nightmares, although the latter loading was somewhat lower. It was also surprising that the insomnia-items 10 and 11 (*disturbing thoughts* and *worrying / unable to relax*) also loaded on this nightmare factor. Negative thoughts and anxiety / tension may induce nightmares, although item 49 (*worrying about sleep*) did not load on the nightmare-factor. Item 49 loaded on circadian rhythm, insomnia, and impact, but highest on the last factor. Item 50 (*sleeping badly in general*) loaded on the insomnia-factor but not on impact of sleep complaints. Subsequently, item 19 was included in the impact-scale, while item 50 was included in the insomnia-scale. For item 17 the factor with the highest loading was chosen: narcolepsy.

Furthermore it is worth noticing that the Apnea subscale was split up into three factors, which did not correlate more than .20 with another. One factor consisted of breathing problems (headache at waking up included), one other consisted of a dry / sour mouth at waking, and the third consisted only of the apnea item 2 (*sweating*) together with a loading of item 25 (*difficulty keeping legs still*). Although item 2 can still be seen as an apnea-item, it may focus on more than sleep apnea alone. About 39 of 52 women aged 45-55 years endorsed this item with a score of two or higher, indicating that it may have measured a menopausal sleep complaint as well.

Table 2: Pattern matrix of the item-loadings (≥ .30) on various factors. Principal Component Analysis with Direct Oblimin Rotation.

FACTOR:	Insomnia	Impact	Apnea I breathing	Sleepwal-king	RLS/ PLMD	Circadian Rhythm	Narco-lepsy	Apnea II mouth	Nightmares	Apnea III sweating	item-total correlation
EIGENVALUE:	7.06	3.80	2.72	2.18	1.88	1.65	1.48	1.29	1.15	1.06	
Apnea											
1. Snoring			.38								.13
2. Sweating										.76	.14
3. Holding breath			.70								.07
4. Waking up gasping for air			.84								.27
5. Dry mouth								.75			.15
6. Waking up short of breath			.63								.32
7. Sour taste								.73			.39
8. Headache			.48								.26
Insomnia											
9. Difficulty falling asleep	.54										.58
10. Disturbing thoughts	.43								.37		.62
11. Worrying / unable to relax	.59								.34		.53
12. Waking up	.84										.60
13. Not able to sleep again	.92										.54
14. Difficulty continuing sleep	.90										.32
15. Sleeping lightly	.75										.55
16. Sleeping too little	.79										.53
Narcolepsy											
17. Hypnagogic hallucinations							.56		.44		.39
18. Sleeping on social occasions							.65				.13
19. Sleep attacks		.70									.19
20. Cataplexy			.32				.47				.50
21. Sleep paralysis							.66				.21

FACTOR:	Insomnia	Impact	Apnea I breathing	Sleepwal-king	RLS/ PLMD	Circadian Rhythm	Narco-lepsy	Apnea II mouth	Nightmares	Apnea III sweating	item-total correlation
RLS/PLMD											
22. Kicking legs while sleeping					.43						.09
23. Cramp / pain in legs					.86						.13
24. Shocks in legs					.65						.25
25. Difficulty keeping legs still					.80					.42	.27
Circadian Rhythm											
26. Wanting a different rhythm						.58					.12
27. Going to bed on different times						.56					.20
28. Doing shift work						.66					.21
Sleepwalking											
29. Sleepwalking				.86							-.13
30. Waking up elsewhere				.87							-.07
31. Prove of nightly action				.86							.00
Nightmares											
32. Frightening dreams									.87		.19
Impact of sleep complaints											
44. Tired at getting up		.78									.50
45. Difficulty staying alert		.50									.52
46. Wanting more energy		.78									.59
47. Easily irritated		.54									.39
48. Difficulty concentrating		.50									.54
49. Worrying about sleep	.31	.57				.35					.56
50. Sleeping badly in general	.78										.66

Table 3: SLEEP-50 subscale scores for sleep patients, nightmare sufferers, and healthy participants

SLEEP-50 SCALE:		Apnea	Insomnia	Narcolepsy	RLS/ PLMD	Circadian Rhythm	Sleep-walking	Nightmares	Impact
Range (min-max):		8-32	9-36	4-16	4-16	3-12	3-12	1-4	7-28
SLEEP DISORDER									
Apnea	(n = 81)	16.9 (3.1)	14.0 (4.5)	4.8 (1.3)	6.2 (2.3)	5.6 (2.4)	3.1 (0.2)	1.3 (0.7)	18.9 (5.1)
Insomnia	(n = 65)	11.4 (2.6)	23.0 (4.9)	4.8 (1.7)	5.2 (1.7)	7.5 (1.8)	3.0 (0.0)	1.3 (0.7)	19.2 (3.4)
Affective Dis	(n = 30)	12.6 (3.5)	19.3 (4.9)	5.6 (2.4)	5.3 (1.6)	7.4 (2.5)	3.2 (0.5)	1.7 (1.1)	19.4 (4.4)
SSM	(n = 8)	10.0 (1.6)	25.8 (6.2)	5.3 (1.9)	6.0 (1.8)	7.4 (0.5)	3.3 (0.4)	1.5 (0.5)	19.5 (2.9)
Narcolepsy	(n = 3)	12.3 (2.5)	11.7 (1.5)	6.7 (0.6)	6.0 (0.5)	6.7 (1.7)	3.0 (0.0)	1.0 (0.0)	17.7 (1.2)
RLS/PLMD	(n = 29)	12.1 (3.2)	18.7 (6.4)	4.6 (1.0)	9.1 (2.3)	5.9 (2.9)	3.1 (0.3)	1.1 (0.2)	16.4 (4.8)
Circadian	(n = 23)	12.3 (2.2)	15.5 (4.5)	5.1 (1.9)	6.5 (2.9)	9.7 (2.8)	4.1 (2.3)	1.0 (0.0)	17.2 (3.5)
Sleepwalking	(n = 4)	10.4 (1.4)	11.5 (2.8)	5.0 (1.4)	5.0 (1.4)	6.8 (1.7)	10.5 (2.1)	2.0 (1.4)	15.3 (2.4)
Nightmares	(n = 32)	11.7 (3.4)	17.9 (5.1)	6.0 (2.1)	6.5 (1.5)	5.7 (1.5)	3.0 (0.2)	3.2 (0.4)	16.6 (4.7)
Hypersomnia	(n = 3)	10.7 (1.8)	16.7 (3.2)	5.3 (1.3)	5.7 (1.9)	5.3 (2.2)	3.0 (0.0)	1.3 (0.2)	20.3 (3.9)
Healthy	(n = 44)	9.9 (1.5)	10.7 (1.5)	4.8 (0.6)	4.6 (0.8)	4.0 (1.3)	3.0 (0.0)	1.2 (0.6)	8.4 (1.3)

Predictive validity

Table 3 shows that participants with a specific sleep disorder scored highest on the SLEEP-50 subscale designed to measure that sleep disorder. However, three distinct diagnoses were not specifically measured by the SLEEP-50: hypersomnia, affective disorder, and sleep state misperception (SSM). Table 3 shows that the three participants with hypersomnia scored low to medium on all subscales except on the impact subscale. Moreover, the thirty participants with an affective disorder did not score highest on any of the subscales of the SLEEP-50, so the amount and intensity of sleep complaints could not predict this diagnosis. However, the items 10 (*disturbing thoughts*), 11 (*worrying and unable to relax*), 42 (*feeling sad*), and 43 (*no interest in daily occupations*) could, as participants with affective disorders scored significantly higher on these four items than participants with insomnia, $t(93) = 2.1$; $p < .05$, and participants with other sleep disorders, $t(276) = 3.8$, $p < .001$.

Participants with SSM scored highest on the insomnia subscale, although not significantly higher than participants with insomnia, $t(71) = 1.5$, $p > .10$. These two groups could be distinguished by the two additional items A (*rating of own sleep*) and B (*amount of hours slept*) as participants with SSM reported a lower amount of hours slept, $t(71) = 3.9$, $p < .001$, and rated their sleep lower, $t(71) = 2.7$, $p < .01$, than participants with insomnia. All eight participants with SSM reported sleeping less than five hours a night whereas seven reported sleeping less than four hours.

A sleep disorder was present if the score on the impact scale was fifteen or higher (see Table 4). For the optimized cut-off points the value was taken where both the sensitivity and specificity were highest. Optimal sensitivity-specificity scores were lowest for insomnia and highest for sleepwalking. For restless legs / PLMD two optimized cut-off scores were found, one where the sensitivity was higher (≥ 7) and one where the specificity was higher (≥ 8).

Lastly, the primary clinical diagnoses were compared to the primary classifications of the SLEEP-50 (Table 5). The SLEEP-50 correctly predicted 80% of all participants. The kappa for the entire scale (the measure of agreement controlled for chance) was .77, indicating a substantial agreement between the clinical diagnoses and the SLEEP-50 classifications. Distinguishing insomnia from affective disorders was difficult as eleven participants with insomnia were predicted to have an affective disorder; five participants with an affective disorder were predicted to have insomnia. It was surprising that almost all of the incorrectly classified participants with apnea were predicted to be healthy. Moreover, almost ten of the healthy participants were predicted to have a sleep disorder, although three of them were predicted to have an affective disorder.

Table 4: Optimized cut-off values and scoring procedures.

Sleep disorder	optimized cut-off value	sensitivity	specificity
Apnea	≥ 15 on apnea	.85	.88
Insomnia	≥ 19 on insomnia	.71	.75
Affective disorder	≥ 12 on items 10, 11, 43, and 44	.77	.73
SSM	≥ 19 on insomnia and estimated amount of hours slept < 4	.88	.92
Narcolepsy	≥ 7 on narcolepsy	.67	.86
RLS/PLMD	≥ 7 on RLS/PLMD [a]	.83	.72
Circadian Rhythm	≥ 8 on circadian rhythm	.83	.69
Sleepwalking	≥ 7 on sleepwalking	1.00	1.00
Nightmares	≥ 3 on item 32 and ≥ 9 on items 33-35	.84	.77
Hypersomnia	none of the above and ≥ 15 on impact	1.00	.79
All sleep disorders	≥ 15 on impact	.84	.77

[a] ≥ 8 on RLS/PLMD showed a sensitivity of .72 and a specificity of .82

Discussion

Before discussing the results, several limitations should be mentioned. Test-retest reliabilities were obtained in a small and healthy student sample. The sample sizes of sleep state misperception (SSM), narcolepsy, hypersomnia, and sleepwalking were too low for valid conclusions considering the predictive validity. Moreover, the majority of insomnia patients did not receive polysomnography. The same applies to healthy participants and nightmare sufferers: their diagnoses were not obtained in the sleep center. It is possible that some of the healthy participants actually had a sleep disorder. But if that were so, then the kappa would probably become higher (ten of the healthy participants were incorrectly classified with a disorder, yet this could have been the correct prediction for some of them). In addition, polysomnography is not the method of choice for diagnosing nightmares because nightmares tend to occur less often in the sleep laboratory (Fisher et al., 1970).

Yet, this initial validation study showed promising results. The SLEEP-50 had a high internal consistency and good test-retest reliabilities. A factor-structure that closely resembled the originally designed structure indicated an acceptable construct-validity. Sensitivities and specificities were promising for all sleep disorders. Moreover, the agreement between SLEEP-50 classifications and clinical diagnoses was substantial.

Table 5: Number of correctly (bold) and incorrectly classified participants

	Clinical Diagnosis										
	Apnea	Insomnia	Affective Disorder	SSM	RLS/ PLMD	Circadian Rhythm	Nightmares	Narco-lepsy	Sleepwalking	Hyper-somnia	Healthy
SLEEP-50 classification											
Apnea	**69**	1	1	0	1	0	0	0	0	0	2
Insomnia	1	**46**	5	1	3	1	1	0	0	0	4
Affective Disorder	0	11	**23**	0	0	1	1	0	0	0	3
SSM	0	4	0	**7**	0	0	0	0	0	0	0
RLS/PLMD	0	0	0	0	**24**	2	0	0	0	0	0
Circadian Rhythm	0	2	1	0	1	**19**	0	0	0	0	0
Nightmares	0	1	0	0	0	0	**27**	0	0	0	0
Narcolepsy	0	0	0	0	0	0	3	**2**	0	0	1
Sleepwalking	0	0	0	0	0	0	0	0	**4**	0	0
Hypersomnia	0	0	0	0	0	0	0	0	0	**3**	0
Healthy	11	0	0	0	0	0	0	1	0	0	**34**
TOTAL	81	65	30	8	29	23	32	3	4	3	44

Whereas the predictive validity of the SLEEP-50 for SSM, narcolepsy, sleep walking, and hypersomnia is promising but very preliminary, the SLEEP-50 seems able to adequately predict sleep apnea, insomnia, restless legs / PLMD, circadian rhythm sleep disorder, and nightmares. In addition, the majority of healthy participants was classified correctly. In other studies on global sleep disorder questionnaires with comparable sensitivity-scores there were either very few healthy participants (Roth et al., 2002) or many healthy participants that were incorrectly classified with a sleep disorder (Sweere et al., 1998).

Insomnia was hardest to predict, especially since it was difficult to distinguish insomnia from affective disorders. Because the SLEEP-50 focuses on sleep problems and not on affective complaints, additional questionnaires should be used to check for co-morbid mental complaints or disorders.

For restless legs / PLMD two cut-off values with different specificities were provided. It may be important that a sleep disorder like restless legs / PLMD or sleep apnea uses a cut-off point with a high specificity (i.e. low number of false positives) since this classification would typically result in a polysomnography or another costly laboratory test (Roth et al., 2002). This does not apply to insomnia where the specificity need not necessarily be higher than the sensitivity, because persons with insomnia are more likely to be treated without further costly testing (Roth et al., 2002).

In addition, the results suggest that the SLEEP-50 may be able to detect sleep state misperception (SSM). Both the reported amount of hours slept and the rating of the sleep was significantly lower in participants with SSM than in participants with insomnia. As these findings can aid in recognizing SSM, future research needs to examine these findings in a larger sample.

In conclusion, these initial findings suggest that the SLEEP-50 is able to detect the most prevalent DSM-IV-TR sleep disorders: sleep apnea, insomnia, restless legs / PLMD, circadian rhythm sleep disorder, and nightmares. The SLEEP-50 is a practical global sleep questionnaire addressing the *intensity* of sleep complaints, whereas another practical global sleep questionnaire (GASQ; Roth et al., 2002) addresses the *frequency* of sleep complaints. The findings indicate that the SLEEP-50 can distinguish sleep complaints from sleep disorders and that the SLEEP-50 may be able to detect less common sleep disorders as well. The SLEEP-50 can aid in recognizing sleep disorders in the general population.

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--- Part Two ---

Prevalence and Associated Mental Complaints

4 | The Prevalence of Sleep Disorders in the Netherlands

Abstract

Goal of this study was to assess the prevalence of sleep disorders in the Netherlands. Eight-hundred randomly selected adult persons received a sleep questionnaire with adequate predictive validity for a broad range of sleep disorders. Four-hundred-and-two filled out these questionnaires completely. Forty-one percent reported sleep complaints, 23.5% had a sleep disorder, and 2.7% had two sleep disorders. Prevalences were: insomnia: 8.5%, restless legs / PLMD: 5.2%, sleep apnea: 4.0%, nightmares: 2.2%, circadian rhythm sleep disorder: 1.7%, hypersomnia: 1.2%, and narcolepsy: 0.7%. About 25.3% of the participants with a sleep disorder had a co-morbid affective disorder, which was significantly higher than the incidence of affective disorders in participants without a sleep disorder (16%). Sleep disorders were highly prevalent in this sample and linked with depressive and anxiety disorders. Future research needs to determine the prevalence of sleep disorders in the Netherlands with a larger sample.

Keywords: Prevalence, Epidemiology, Sleep, Sleep Disorders.

Spoormaker, V.I., & van den Bout, J.

Submitted manuscript

Introduction

As sleep disorders seem to be highly prevalent in the American and Western European adult population [1-3], research on the prevalence on various sleep disorders listed in the DSM-IV is needed. As sleep disorders affect the general health and daily functioning [4-5] with serious economical and health costs [4, 6], it is strongly desirable to conduct prevalence research on sleep disorders with a validated instrument. This study aims to assess the prevalence of sleep disorders in the Netherlands.

Methods

Eight-hundred adult persons in the Netherlands were randomly approached by mail. Four-hundred-and-thirty returned the questionnaires. Twenty-eight questionnaires were filled out incompletely and were excluded from analysis (response-rate = 50.3%).

Mean age was 56.4 years (SD = 16.2). Forty-eight percent were female. Most respondents had a high education: 54.2 % had followed at least one year at a university or a college. Compared with the latest Dutch population data of the Central Bureau of Statistics there was a response-bias for older and higher educated people, a bias also found in former epidemiological studies [7].

Sleep complaints and disorders were measured by the SLEEP-50 [8]. The internal consistency was relatively high with a Cronbach's alpha of .85. The test-retest correlations fell between .65 and .89 with a general test-retest correlation of .78. Principal Component Analysis with a Direct Oblimin Rotation revealed ten factors that were relatively independent (all inter-factor correlations lower than .30); the factor-structure closely matched the designed structure. Sensitivity/specificity scores, compared with clinical diagnoses from a sleep clinic, were good for all sleep disorders: apnea (.85/.88), insomnia (.71/.75), narcolepsy (.67/.86), restless legs / PLMD (.72/.82), circadian rhythm (.83/.69), sleepwalking (1.00/1.00), and nightmares (.84/.77). Moreover, sleep state misperception (SSM – .88/.92) and hypersomnia (1.00/.79) could be predicted. The agreement between clinical diagnoses and SLEEP-50 classifications was good (kappa = .77).

Several affective complaints were measured to check for co-morbid affective disorders. Depression and anxiety complaints were measured by the Dutch version of the SCL-90, a frequently used questionnaire for several psychological complaints with good reliability and validity [9].

PTSD-complaints were measured by the Self-Rating Inventory for PTSD (SRIP) [10]. The reliability of the scale was good (Cronbach's alpha's varying from .90 to .94 and a test-retest reliability of .92). A sensitivity of .86 and a specificity of .71 were found in relation to the Clinician-Administered PTSD scale. For all questionnaires, cut-off scores from the manual were used.

The target population consisted of all Dutch residents aged 18 years or above. Eight-hundred addresses from the phonebook were randomly selected from the twelve provinces of the Netherlands according to the geographical distribution. The address would receive the questionnaires by mail; an adult person (of which the first letter of the name was closest to the letter A) was asked to fill out the questionnaires and return them. A reminder-mail

was sent tot non-responders after six weeks. Written informed consent was obtained after the procedure had been fully explained.

Correlations were tested (two-tailed) for significance with Pearson's R-test or Spearman's Rho-test.

Results

Women had more insomnia-complaints than men, $t(397) = 3.1$, $p < .001$. Circadian rhythm complaints were correlated with age, $r = .42$, $p < .001$, and with education, $r_s = -.23$, $p < .001$.

Insomnia was the most prevalent sleep disorder (8.5%), sleep apnea was found in 4.0%, restless legs / PLMD in 5.2%, and nightmares in 2.2%. Post-hoc analyses were conducted to test for differences between participants that responded without a reminder-mail (n = 323) and participants that responded after a reminder-mail – the initial non-responders (n = 81). There were no significant differences in prevalences for any sleep disorders.

Table 1: Percentages (and number) of participants with sleep complaints and sleep disorders (n = 402)

	Complaints	Disorder
Apnea	5.7% (23)	4.0% (16)
Insomnia	13.4% (54)	8.5% (34)
Narcolepsy	2.7% (11)	0.7% (3)
Restless legs / PLMD [1]	6.2% (25)	5.2% (21)
Circadian Rhythm [2]	3.5% (14)	1.7% (7)
Sleepwalking	0.2% (1)	0% (0)
Nightmares	7.2% (29)	2.2% (9)
Hypersomnia	2.0% (8)	1.2% (5)
TOTAL	41.0% (165)	23.5% (95)

[1] Restless legs / Periodic Limb Movement Disorder
[2] Circadian Rhythm Sleep Disorder
Note: About 2.7% (n = 11) of the population had two sleep disorders. For this table the sleep disorder with the subscale with the highest z-score was chosen.

Eleven participants (2.7%) suffered from two sleep disorders. All three participants with narcolepsy also had insomnia; five participants with sleep apnea also suffered from insomnia; and two participants with restless legs suffered from insomnia as well. Since insomnia had lower z-scores in these cases Table 1 displays the other sleep disorder only. One participant had both nightmares and sleep apnea, and for him the z-score was higher for sleep apnea.

A total of 25.3% (n = 24) of the participants with a sleep disorder had a co-morbid affective disorder, whereas 16.0% (n = 49) of the participants without a sleep disorder had an affective disorder. This difference was significant (Chi-square = 4.22, $p < .05$). Participants with insomnia, circadian rhythm sleep disorder, and narcolepsy had the highest incidence of a co-morbid affective disorder, although the number of participants with the latter two sleep disorders was too small for valid conclusions.

Table 2: Percentages of participants with an affective disorder

Sleep Disorder		Depressive Disorder	Anxiety Disorder	Mixed	TOTAL
Apnea	(n = 16)	0% (0)	12.5% (2)	6.3 % (1)	18.8% (3)
Insomnia	(n = 34)	17.6% (6)	11.8% (4)	14.7% (5)	44% (15)
Narcolepsy	(n = 3)	33.3% (1)	0% (0)	33.3% (1)	66.7% (2)
Circadian Rhythm [1]	(n = 7)	43% (3)	0% (0)	0% (0)	43% (3)
Hypersomnia	(n = 5)	20% (1)	0% (0)	0% (0)	20% (1)

[1] Circadian Rhythm Sleep Disorder
Note: Participants with restless legs / PLMD or nightmares did not have a co-morbid affective disorder

Discussion

One limitation of the current study considered the low response-rate; non-responders may have had fewer sleep complaints. The response-bias for highly-educated and older people diminishes the generalizability of the results. However, no differences were found between responders and initial non-responders.

About one fourth of the sample suffered from at least one sleep disorder, with insomnia, sleep apnea, and restless legs / PLMD being the most prevalent. Previous reports on the epidemiology of sleep disorders showed a huge variation in the prevalence of insomnia (ranging from 6 to 33%) [3, 11], sleep apnea (ranging from 1 to 16.5%) [2, 12], and restless legs / PLMD (ranging from 5.5 to 10%) [13-15]. One study showed that these differences depended more on the criteria used (e.g. whether insomnia *complaints* or the sleep disorder insomnia was measured) than on real international differences [11].

The same applies to nightmares: the prevalence for nightmares (2.2%) found in the present study was lower than the prevalence found in prior studies [1-2]; the percentage 'occasionally' suffering from nightmares was closer to the prevalence found in these previous studies. Again, the criteria seem crucial. Future research should investigate the epidemiology of sleep disorders with clear criteria and valid instruments.

The present study worked with DSM-IV defined criteria for sleep disorders and used a sleep questionnaire with good predictive validity. As this sample was relatively small in size, future research needs to determine the prevalence of sleep disorders in the Netherlands with a larger sample. As sleep disorders seem to be highly prevalent, general practitioners,

psychiatrists, and psychologists need to learn more about sleep disorders for adequate assessment, referral, and treatment.

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5 | Depression and Anxiety; Relations with Sleep Disturbances

Abstract

Goal was to assess the relations of various sleep complaints with depressive and anxiety complaints in a non-clinical population. Four-hundred-and-two randomly approached adults returned three questionnaires. Results showed a high interrelatedness between sleep and depressive / anxiety complaints. Both assessment and treatment of depressive and anxiety complaints should address sleep problems.

Keywords: Depression, Anxiety, PTSD, Sleep.

Spoormaker, V.I., & van den Bout, J. (2005).

European Psychiatry, in press

Introduction

There has been scant research regarding the epidemiological comorbidity of mental disorders and sleep disorder symptomatology in the general population [8]. However, sleep disorder symptomatology and mental disorders / complaints seem to be highly interrelated [3, 7]; in a study by Üstün et al. [12] it was found that 51.5% of those with sleep problems had a well-defined mental disorder. Moreover, 14.9.% had a subthreshold mental disorder whereas 29.2% had mental complaints, leaving only 4.5% of those with sleep problems without any mental complaints.

In the general population, both anxiety and depression complaints have been associated with insomnia complaints [3,7,8,12]. PTSD-complaints have been associated with insomnia, sleep apnea, and nightmares [9]. Other relations of sleep complaints (e.g. restless legs and sleepwalking complaints) with mental complaints remain undocumented. Therefore, the current study aims to explore the relations of various sleep complaints with depressive and anxiety complaints in the general population.

Methods

The target population consisted of all Dutch adult residents (≥18 years). Eight-hundred addresses were randomly selected from the twelve provinces of the Netherlands according to the geographical distribution. The address would receive the questionnaires by mail; an adult person (of which the first letter of the name was closest to the letter A) was asked to fill out and return the questionnaires. A reminder-mail was sent to non-responders after six weeks. Written informed consent was obtained after the procedure had been fully explained. Four-hundred-and-thirty returned the questionnaires. Twenty-eight questionnaires were filled out incompletely and were excluded from analysis (response rate: 50.3 %).

Mean age was 56.4 years (SD = 16.2). Forty-eight percent was female. Most respondents had a high education: 54.2 % had followed at least one year of education at a university or a college. Compared with the latest Dutch population data of the Central Bureau of Statistics there was a response-bias for older and higher educated people, a bias also found in former epidemiological studies [11].

Sleep complaints were measured by the SLEEP-50 [Spoormaker et al., submitted manuscript], a Dutch sleep questionnaire with good reliability outcomes (Cronbach's alpha = .85, test-retest reliability $r(41) = 0.78$, $p < .01$). The SLEEP-50 provides subscales for the impact of sleep complaints on daily functioning, insomnia, sleep apnea, circadian rhythm, restless legs, sleepwalking, and narcolepsy. Factor-analysis revealed a structure that closely matches the a priori designed structure. It showed good predictive validity for a broad range of sleep disorders in relation to diagnoses based on polysomnographic recordings in a sleep clinic: the overall agreement was substantial (kappa = .77).

Depression and anxiety complaints were measured by the Dutch version of the SCL-90, a frequently used questionnaire for several psychological complaints with good reliability and validity [2].

PTSD-complaints were measured by the Self-Rating Inventory for PTSD (SRIP) developed by Hovens et al. [5]. The items follow the PTSD-symptoms as described in the DSM-IV [1] without special reference to a traumatic event. Sum scores for intrusion, avoidance, and hyperarousal can be derived. The reliability of the scale was good (Cronbach's alpha's varying from .90 to .94 and a test-retest reliability of .92). A sensitivity of .86 and a specificity of .71 were found in relation to the Clinician-Administered PTSD scale.

Correlations were tested (two-tailed) for significance with Pearson's R-test or Spearman's Rho-test.

Results

Women had more insomnia-complaints than men, $t\ (397) = 3.1$, $p < .001$. Circadian rhythm complaints were correlated with age ($r = .42$, $p < .001$) and with education ($r_s = -.23$, $p < .001$). Both anxiety and PTSD-complaints correlated with most sleep complaints. Restless legs complaints did not correlate with any mental complaint, and nightmares only correlated with the intrusion-cluster of PTSD. This correlation (.22) was surprisingly weak since nightmares are part of the intrusion-cluster; controlled for the SRIP-item 'disturbing dreams' the correlation of nightmares with intrusion lost significance ($r = .08$, $p > .05$). Intrusion correlated moderately with insomnia (.43) and sleepwalking (.46).

Depression was correlated to narcolepsy, circadian rhythm, and insomnia complaints. The latter correlation (.52) was about the same as the correlation of anxiety with insomnia complaints (.53).

Table 1: correlations of sleep complaints with mental complaints (n= 402)

	Apnea	Insomnia	Nightmares	Narcolepsy	Circadian[1]	Sleepwalking	RLS[2]
SCL-90:							
Anxiety	.24 **	.53 **	.11	.52 **	.28 **	.25 **	.10
Depression	.05	.52 **	.12	.42 **	.38 **	.09	.05
SRIP:							
Intrusion	.17 **	.43 **	.22 **	.29 **	.13	.46 **	.08
Avoidance	.15 *	.38 **	.08	.29 **	.41 **	.21 **	-.02
Hyperarousal	.25 **	.73 **	.03	.33 **	.36 **	.11	.12

1 Circadian Rhythm complaints, controlled for age and education
2 Restless Legs / Periodic Limb Movement Disorder
* $p < .01$
** $p < .001$

Discussion

Before discussing the results, it should be stated that there are limitations to the generalizability. The response-rate was only fifty percent; non-responders may have had more or – more probably – fewer sleep complaints. There was a response-bias for highly-educated and older people; it is possible that the relations are different for younger people and for people with a lower education. Moreover, although the reliability and validity measures for the SLEEP-50 were promising, they are still preliminary.

Yet, the broad range of sleep complaints being correlated with anxiety complaints indicates a high interrelatedness between anxiety and sleep complaints, which is highly relevant for both assessing and treating anxiety complaints. Anxiety complaints such as worrying and rumination are named to be important in both insomnia and narcolepsy [4]; those complaints may affect more sleep complaints and should therefore be a focus of sleep research and practice.

PTSD-complaints were also related to most sleep complaints. This indicates that not only PTSD-patients have a perception of bad sleep [4], but also people with PTSD-complaints (without having the *disorder*). Furthermore, PTSD-patients tend to underestimate the amount of slept hours and overestimate the sleep latency [4]. Future research should investigate whether people with PTSD-complaints could have the same biases.

Depressive complaints were associated with insomnia, narcolepsy, and circadian rhythm but not with apnea complaints. The relation of depression with apnea found in former research [10] was not replicated and might not be applicable to the general population; apnea tended to correlate more with anxiety and hyperarousal complaints.

It was surprising that nightmares were not correlated with any mental complaints. Nightmares seem to be an independent and idiopathic complaint – not merely a nightly symptom of anxiety. The relation of sleepwalking with intrusion needs further attention, as sleepwalking might be a nightly dissociative state associated with posttraumatic stress.

In conclusion, the current study provided evidence for the interrelatedness of sleep and depressive and anxiety complaints. Anxiety / PTSD complaints seem to be related to most sleep complaints; whereas depression was also related to several sleep complaints. Sleep complaints are highly distressing and can interfere with treatment. Moreover, since sleep problems are not frequently expressed as a main complaint [6], both assessment and treatment of mental complaints in the general health care need to focus more on sleep problems.

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6 | Direct Awakening from a Nightmare is not Associated with Increased Distress

Abstract

Direct awakening from a bad dream is a criterion for the DSM-IV definition of nightmares that may be superfluous. Forty-eight nightmare sufferers filled out questionnaires regarding their nightmares, sleep, and mental complaints. Direct awakening was not related to any mental complaint or general psychopathology with the exception of agoraphobia. Moreover, only 22.9 percent reported to always wake up from a nightmare. The DSM-IV definition of nightmares is apparently too narrow and needs to be refined with an extra code: nightmares *with* or *without* direct awakening.

Keywords: nightmares, nightmare frequency, nightmare distress.

Spoormaker, V.I., & van den Bout, J.

Submitted manuscript

Introduction

The *Diagnostic and Statistical Manual for Mental Disorders, edition IV-TR* [1] defines a nightmare as an "extremely frightening dream" from which a person wakes up directly. After a nightmare orientation is fast and the nightmare leaves a detailed memory "usually involving threats to survival, security, or self-esteem".

In the literature, however, various definitions have been used as 'waking up' is not always seen as a necessary criterion. One study found no relations of 'waking up' from a frightening dream with associated distress [2]. Another study, however, found that disturbing dreams from which persons woke up were more strongly related to several psychopathology and well-being measures than negative dreams from which persons did not wake up [3]. Schreuder et al. [4] found that waking up from a disturbing dream resulted in higher scores on SCL-90 total-scores (psychoneuroticism) and on several posttraumatic complaints. Yet, most participants – posttraumatic stress disorder (PTSD) patients – in this study had both types of frightening dreams, making 'waking up' a less valid criterion for the clinical diagnosis.

Recently Blagrove et al. [5] suggested that disturbing dreams from which the dreamer wakes up may be more intense, but that disturbing dreams with and without waking up are confounded by the same negative emotional tone. Indeed, they found that the frequency of dreams with a negative affect is a better index of low well-being than nightmare frequency.

The current study aimed to test whether awakening from a nightmare is associated with more distress. In addition, other characteristics of nightmares are investigated as well to refine the definition of nightmares.

Methods

Via advertisements in a local newspaper nightmare sufferers were asked to cooperate; 76 possible respondents provided their addresses via the telephone or e-mail. All of them had had nightmares (no night terrors or nocturnal panic) for over a year. These respondents received a questionnaire-packet. Fifty-nine questionnaires of nightmare-sufferers were returned; eleven were filled out incompletely and were excluded from analysis. Written informed consent was obtained after the procedure had been fully explained. Mean age of the 48 participants was 32.9 year (SD = 12.8), 29 were female (60.4%). Fifty-two percent reported to have experienced a traumatic event.

Nightmare complaints were measured by the SLEEP-50 [Spoormaker et al., submitted manuscript], a Dutch sleep questionnaire with good reliability outcomes (Cronbach's alpha = .85, test-retest reliability $r(41) = 0.78$, $p < .01$). The SLEEP-50 provides subscales for the impact of sleep complaints on daily functioning, insomnia, sleep apnea, circadian rhythm, restless legs, sleepwalking, and narcolepsy. Factor-analysis revealed a structure that closely matched the designed structure. It showed good predictive validity for nightmares compared with clinical diagnoses: the sensitivity was .84, the specificity .77.

In addition, nightmare characteristics were measured by six questions about symptoms during the last seven days, which could be scored on a four-point *intensity* scale (1 – not at all; 2 – a little; 3 – rather much; 4 – very much). The questions were: 1 – Did you have frightening dreams? 2 – Did you wake up from these dreams? 3 – Did you remember the

content of these dreams? 4 – Was your orientation fast after these dreams? 5 – Did you experience the dream-event in real life? 6 – Did you have any physical arousals during these dreams (e.g. sweating, palpitations)?

Depression and anxiety complaints were measured by the Dutch version of the SCL-90, a frequently used questionnaire for several mental complaints with good reliability and validity [6].

PTSD-complaints were measured by the Self-Rating Inventory for PTSD (SRIP) developed by Hovens et al. [7]. The items follow the PTSD-symptoms as described in the DSM-IV [1] without special reference to a traumatic event. Sum scores for intrusion, avoidance, and hyperarousal can be derived. The reliability of the scale was good (Cronbach's alpha's varying from .90 to .94 and a test-retest reliability of .92). A sensitivity of .86 and a specificity of .71 were found in relation to the Clinician-Administered PTSD scale.

Correlations were tested for significance with Pearson's R-test (two-tailed).

Results

Table 1: Frequencies (percentages) of various characteristics of nightmare sufferers

	Not at all	**A little**	**Rather Much**	**Very Much**
Did you:				
Have anxiety dreams?	0 (0%)	11 (22.9%)	19 (39.6%)	18 (37.5%)
Wake up afterwards?	10 (20.8%)	12 (25%)	15 (31.3%)	11 (22.9%)
Remember these dreams at waking?	1 (2.1%)	10 (20.8%)	21 (43.8%)	16 (33.3%)
Have a quick orientation afterwards?	2 (4.2%)	12 (25%)	18 (37.5%)	16 (33.3%)
Experience the dream event in real life?	28 (58.3%)	15 (31.3%)	2 (4.2%)	3 (6.3%)
Have any physical arousals?	15 (31.3%)	19 (39.6%)	10 (20.8%)	4 (8.3%)

A total of 37 (77.1%) reported that waking up after a nightmare was not always present (see Table 1). One participant reported to never remember the content of his frightening dreams, and two persons reported to never have a quick orientation after a frightening dream. As amnesia and a slow orientation are characteristics of night terrors and not nightmares, we checked for the person who reported to never remember the nightmare-contents at waking up. His orientation, however, was quick at waking up, which indicates that he did not have night terrors. The same applied to the two persons who reported to never have a quick orientation; they reported a good memory of the content of their nightmares.

Although the modus of 'having experienced the dream event in real life' lies at "1 – not at all", a percentage of 41.7% reported to have experienced the dream event in real life, indicating that some of their nightmares are consequences of a distressing, possibly traumatic event. Physical arousals like sweating and heart palpitations were present in two-thirds of the sample.

Participants also had to estimate the amount of nightmares they had last week. This estimation correlated very highly with the first question 'Did you have frightening dreams' ($r = .92$, $p < .01$) making the latter question a reasonable estimation of nightmare frequency as well. This nightmare frequency correlated positively with 'having experienced the dream event in real life' ($r = .31$, $p < .05$) and with 'physical arousals' ($r = .62$, $p < .001$). Nightmare frequency also correlated positively, but weakly, with daily functioning limitations (nightmare distress), $r = .29$, $p < .05$, but not with any mental complaints.

Nightmare distress did correlate with various mental complaints: anxiety (.61), agoraphobia (.39), depression (.67), hostility (.54), intrusion (.42), avoidance (.55), hyperarousal (.64), and with the total-score of the SCL-90, an indicator of general psychopathology (.74 – all p's < .01).

'Waking up' was not correlated with any other nightmare characteristic, nightmare distress, or mental complaint. One exception, however, was the surprising and positive correlation of 'waking up' with agoraphobia. Agoraphobia also correlated strongly with 'physical arousals'. This nightmare characteristic was correlated with the most (three) mental complaints. Naturally, the 'real event' item correlated with posttraumatic intrusion and total complaints.

It was striking that the correlation of 'waking up' with intrusion became significantly negative when controlled for the other two nightmare characteristics.

Table 2: Correlations of nightmare characteristics with mental complaints

Characteristics:	'waking up'	'real event'	'physical arousals'
<u>Complaints</u>			
Anxiety	.15	.16	.43 *
Agoraphobia	.66 **	-.08	.83 **
Sensitivity	.27	.15	.40 *
Intrusion	.02 [a]	.76 **	.33
PTSD-total	.30	.44 *	.34

Note: There were no significant correlations of nightmare characteristics with any sleep or mental complaints not provided in Table 2.

[a] When controlled for the items 'real event' and 'physical arousal' this correlation became significant at the .01-level: $r = -.44$.

* $p < .01$

** $p < .001$

This indicates that waking up from nightmares is not associated with more, but with less posttraumatic distress. In particular the SRIP-intrusion-items 'having recurrent unpleasant memories' (r with 'waking up' = -.45, $p < .01$) and 'having intruding unpleasant memories' (r with 'waking up' = -.38, $p < .01$) seemed to have caused this unexpected correlation.

Discussion

Waking up from a nightmare was not related to nightmare distress, mental complaints, or general psychopathology. Moreover, less than twenty-five percent of the sample reported to always wake up from a nightmare. It seems that the DSM-IV-criterion 'direct awakening from a nightmare' is too narrow. The distinction between nightmares (from which people wake up) and bad dreams (from which they do not wake up immediately) seems to be arbitrary. Considering the associated distress, physical arousals accompanying nightmares would have been a better criterion for the DSM-IV definition.

Interestingly though, waking up from frightening dreams was related to agoraphobia. This may lead to speculation about the nature of the fear that wakes up nightmare sufferers; if that were the same fear as experienced in agoraphobia (e.g. panic) it may very well be that waking up from a nightmare is caused by an 'exploding' fear that grows out of control fast. If the fear in nightmares differs from the fear in bad dreams there may yet be a reason to distinguish these two phenomena.

Therefore, research on the definition should not only focus on associated distress and well-being. For example: a dysthymic disorder may correlate similar with low well-being as a depressive disorder, but that does not necessarily mean that these two disorders are the same phenomenon. The same applies to nightmares; bad dreams and nightmares may still be two different phenomena, or two different types of the same phenomenon. Yet, rather than excluding bad dreams or redefining nightmares in the DSM-IV, a code should be used to distinguish disturbing dreams with and without direct awakening. These two types of disturbing dreams need to be studied with polysomnography.

The negative relation of waking up from nightmares with intrusion, in particular with having unpleasant memories, is puzzling. The role of nightmares and repeated awakenings in memory consolidation need to be further investigated.

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--- Part Three ---

A Cognitive Perspective on Nightmares

Treatment and Theoretical Implications

7 | Lucid Dreaming Treatment for Nightmares: a Series of Cases

Abstract

Goal of this series of cases was to investigate lucid dreaming treatment for nightmares. Hypotheses were that lucid dreaming treatment would decrease nightmare frequency and state / trait anxiety, and improve the quality of sleep. Eight participants received a one-hour individual session, which consisted of lucid dreaming exercises and discussing constructive solutions for the nightmare. Nightmare frequency and sleep quality were measured by a sleep questionnaire, anxiety was measured by the Spielberger State and Trait Anxiety Inventory. At the follow-up two months later the nightmare frequency had decreased, while the sleep quality had increased slightly. There were no changes for state and trait anxiety. Lucid dreaming treatment seems to be effective in reducing nightmare frequency, although the effective factor remains unclear.

Keywords: nightmares, lucid dreaming, treatment.

Spoormaker, V.I., van den Bout, J., & Meijer, E.J.G. (2003).

Dreaming, 13, 181-186

Introduction

About 5 to 10 % of the American adult population experiences nightmares frequently (American Sleep Disorders Association, 1990; Bixler et al., 1979; Nielsen & Zadra, 2000). Nightmares are one of the major complaints of the posttraumatic stress disorder, a mental disorder that may develop after confrontation with a traumatic event (American Psychiatric Association, 2000; Blaustein, 1991; Jordan et al., 1991; Kessler et al., 1995).

Nightmares are associated with distress (Berquier & Ashton, 1992; Zadra & Donderi, 2000) and sleep disturbances (Kales, Soldatos, & Caldwell, 1980), like sleep related breathing disorder (sleep apnea) and insomnia (Engdahl et al., 2000; Mellman et al., 1995a; 1995b). In addition, nightmares elicit anxiety, sometimes producing a 'fear of going to sleep' (Hayes & Mooney, 1975).

Although nightmares seem to be a lifelong complaint (Hublin, Kaprio, Partinen, & Koskenvuo, 1999), research on treatment for nightmares has been rare. Some cognitive-behavioral techniques like monitoring, relaxation, and desensitization were able to reduce nightmare frequency (Celluci & Lawrence, 1978; Miller & DiPilato, 1983). These techniques, however, did not change the content of the nightmare and some subjects even thought of their nightmares as being more intense afterwards.

A technique that does change the content of a nightmare is imagery rehearsal. Nightmare sufferers are asked to write down one of their nightmares and to make up a different (more positive) ending for the nightmare. They have to imagine this new ending several times a day, and can work on about two nightmares a week. In several randomized controlled trials imagery rehearsal significantly reduced nightmare frequency (Krakow et al., 1995; 2000; 2001).

A serious flaw was the high dropout rate for the treatment group. In one study the imagery rehearsal group lost almost significantly more participants than the waiting-list group at follow-up ($p = .07$) (Krakow et al., 2001). A lack of imagery skills might explain this high dropout rate. Moreover, the significant reduction in nightmare frequency might be partly due to the exceptionally high baseline. In the same study, the baseline exceeded six nightmares a week.

Several authors have suggested that lucid dreaming (realizing in a dream that one is dreaming) could be effective in reducing nightmares (Halliday, 1987; LaBerge & Rheingold, 1990; Zadra, Donderi, & Pihl, 1992). As it is a learned cognitive skill (Purcell et al., 1986; Zadra, Donderi, & Pihl, 1992), nightmare sufferers should be able to learn this skill in order to become lucid in a nightmare. With lucidity the nightmare can be changed in a more pleasant dream.

Some case-studies have been conducted to investigate the effects of this technique; most of them reduced nightmare frequency and changed the content of the nightmare (Halliday, 1987; Zadra, 1996; Zadra & Pihl, 1995). In one study with five cases, four out of five participants did not experience any nightmares at all at the one-year follow-up (Zadra & Pihl, 1995). It is unfortunate that these studies lacked systematic measurements.

The current study aims to replicate the former results – with systematic measurements. We plan to assess nightmare frequency, state / trait anxiety and sleep quality. We hypothesized that lucid dreaming treatment would reduce both nightmare frequency and state / trait anxiety, and improve sleep quality.

Methods

Participants were recruited by advertisements in several public buildings (e.g. library, university buildings). As opposed to previous research, no minimum level of nightmares a week was required (Krakow et al., 1995). This is in line with the DSM-IV-TR, which no longer uses this diagnostic criterion (American Psychiatric Association, 2000). All participants had suffered from nightmares for over one year. They signed a written consent, and received a small monetarily incentive for completing the treatment. One participant refused to conduct the exercises of the treatment, and was excluded. None of the participants suffered from sleep terrors.

Nightmare frequency was measured by a self-constructed sleep questionnaire. Participants had to estimate the amount of nightmares a week for the last four weeks. Nightmares were defined as anxiety provoking dreams; in line with previous research waking up was not a necessary criterion (Krakow et al., 1995; Neihardt et al., 1992). Although in the DSM-IV-TR waking up is a necessary criterion (American Psychiatric Association, 2001), no correlation has been found between waking up from nightmares and nightmare intensity or distress (Kellner, Neidhardt, Krakow, & Pathak, 1992; Neidhardt, Krakow, Kellner, & Pathak, 1992).

Subjective sleep quality was measured by rating scale ranging from 1 (very bad) to 10 (very good). Although more objective, polysomnography is an intensive and expensive method of assessing the quality of sleep that does not take into account the subjective experience.

State and trait anxiety were measured by the Dutch version of the Spielberger State and Trait Anxiety Inventory, a reliable and valid questionnaire (van der Ploeg, 2000).

The individual treatments were conducted by the first author. After filling out the questionnaires, participants described one of their nightmares. They were asked to think about common features in their nightmares, which could range from specific (recurrent nightmare) to broad (a common theme such as being chased).

Then the concept of lucid dreaming was introduced; it was unfamiliar to all participants. In the Netherlands, many persons are not acquainted with lucid dreaming. Only one book on lucid dreaming has been published (Den Blanken, 1990). The participants were told that lucid dreaming is a learned cognitive skill, and that it might be applicable to nightmares.

The treatment consisted of two key elements: 1) conducting exercises in order to become lucid in a dream; 2) changing the nightmare in a constructive manner. The participants had to conduct the exercises at home. They had to intend before going to bed that the next time they would be in the frightening situation (recurrent situation or common theme), they would realize that it could all be dream. After close examination of the situation, they should realize that the frightening situation is not real, but a dream. A related exercise was imagining the frightening situation while thinking that it is only a dream.

The participants were told that anything could be changed in a lucid dream. Solutions of the nightmare situation were discussed. They had to answer questions like: what would you like to change? How are you going to change it? Imagine everything is possible, what else could you do? A constructive solution (e.g. talking to or fighting the attacker) was to be

preferred over a less constructive reaction (e.g. fleeing away by using lucidity) (Zadra, 1996).

It was discussed that changing the nightmare might be difficult even if full lucidity is achieved. This is because the nightmare story or script (e.g. starting with a shadow and ending with being chased) gets stronger every time a nightmare has been experienced. Such a strong expectation pattern may be hard to alter, and therefore participants were told they should then try to make a minor change – preferably in a background object. If accomplished, they could pick a more important object, gradually extending this to the whole dream.

At all stages participants could ask questions. Finally, homework assignments (the exercises) were handed out with a short summary of the treatment.

Participants could contact the first author by phone or e-mail. Only one did, she received more specific instructions by e-mail twice. Participants filled out the same questionnaires at follow-up two months later.

Results

The mean age was 27.8 (SD = 12.2); two were male, six were female. This female-male ratio lied within the range 2-4:1 as described in the DSM-IV-TR (American Psychiatric Association, 2000). The response-rate at follow-up was 100 %. All participants suffered from anxiety provoking dreams. Three participants 'almost always' woke up after an anxiety provoking dream, three subjects 'often', one 'sometimes', and one 'almost never'. One suffered from recurrent nightmares, five had nightmares with a common theme, and two had both.

Table 1: Means and standard deviations of nightmares a week, subjective sleep quality, and state and trait anxiety before (1) and two months after the treatment (2), n = 8.

	1	2
MEAN nightmares a week	2.31	0.88
SD	3.56	1.13
MEAN subjective sleep quality	6.00	6.50
SD	2.20	1.51
MEAN state anxiety	45.88	45.38
SD	6.42	8.96
MEAN trait anxiety	46.63	45.25
SD	7.67	9.24

Due to the small sample size no significant results were found. The mean for nightmares a week decreased from 2.31 to 0.88, which is a reduction of more than 60 %. The subjective sleep quality increased slightly, and there were no changes for state and trait anxiety.

Seven participants reported that the treatment had helped them, while six actually had fewer nightmares. Only four participants were able to become lucid in one of their nightmares, and three were able to alter the nightmare lucidly. The nightmares of three other participants changed by itself (i.e. without lucidity). The nightmare content or frequency did not change for two participants, although one of these reported an increase in nightmare frequency in the weeks after the treatment, gradually decreasing to her baseline level.

We will describe one participant's experiences to illustrate how a nightmare was changed lucidly. This participant had nightmares in which she was chased in the dark by an unknown attacker. As she ran away, she could hardly move her legs. The attacker came closer. At the moment he reached her, she would wake up terrified. After the treatment, she was able to become lucid in her nightmare: "I was able to fight and beat the attacker. I don't think that I can talk to him, but now that I know I am stronger, I feel less frightened." She still had some nightmares after the treatment, but with a lower frequency. The nightmares were less anxiety provoking and distressing.

Discussion

Lucid dreaming treatment seems to reduce nightmare frequency. It altered the content of the nightmare for six participants, making the nightmare less frightening and weakening the nightmare-script. In addition, there was a slight improvement in subjective sleep quality. Unexpected were the unchanged state and trait anxiety scores: lucid dreaming treatment is probably too symptom-specific for decreasing anxiety levels.

It is worth noting that this study had a 0 % dropout rate at follow- up, as opposed to other nightmare studies with dropout rates of about 25 % (Krakow, 1995; 2001). The obtained results have therefore not been influenced by an exclusion of participants for whom the treatment did not work.

Although it seems that lucid dreaming treatment is effective in reducing nightmare frequency, it is hard to explain how the treatment works. Six participants (75 %) reported fewer nightmares, but only three of them were able to lucidly alter the nightmare. For the other three the nightmare changed by itself. Several studies report similar findings: participants that were not able to lucidly alter the whole nightmare reported both a change and reduction in their nightmares (Zadra & Pihl, 1995; Zadra, 1996; Halliday, 1987).

This could be caused by a sense of mastery participants experienced when realizing that nightmares can be overcome (Bishay, 1985; Krakow et al 1995; 2000; 2001; Zadra, 1996; Zadra & Pihl, 1995). To know that one can control the nightmare is possibly equally as important as actually controlling it.

Further research is needed in order to compare the treatment-group with a control-group in a larger sample. More questionnaires should be included to investigate the effective factors of the treatment. Since mastery seems to be important in treating nightmares, one of these questionnaires should address nightmare self-efficacy.

In short, lucid dreaming seems to be an effective treatment for reducing nightmares, and an efficient one as well: the treatment-sessions lasted one hour only. Lucid dreaming can be incorporated in almost any psychotherapy, whether cognitive-behavioral or psychodynamic. Therapists should therefore learn more about lucid dreaming to effectively treat persons that suffer from nightmares.

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8 | Lucid Dreaming Treatment for Nightmares: a Pilot-study

Abstract

Background: Nightmares are prevalent and cause distress. Goal of this pilot was to evaluate the effects of the cognitive-restructuring technique lucid dreaming treatment (LDT) on chronic nightmares. Becoming lucid (realizing that one is dreaming) in a nightmare allows persons to alter the nightmare-storyline in the nightmare itself. ***Methods:*** After having filled out a sleep and a PTSD-questionnaire, twenty-three nightmare sufferers were randomly divided into three groups; eight participants received one two-hour individual LDT-session, eight participants received one two-hour group LDT-session, and seven participants were placed on the waiting-list. LDT consisted of exposure, mastery, and lucidity exercises. The same questionnaires were filled out twelve weeks after the intervention. ***Results:*** At follow-up the nightmare frequency of both treatment groups had decreased. There were no significant changes for sleep quality and PTSD-symptom-severity. Lucidity was not necessary for a reduction in nightmare frequency. ***Conclusions:*** LDT seems effective in reducing nightmare frequency. Pointing out to clients that a change in the nightmare-storyline is possible may be the key-component of this and other cognitive-restructuring techniques.

Keywords: dream, nightmare, lucid dreaming, psychotherapy**.**

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Introduction

An estimated percentage of 3-8 % of the adult population suffers from nightmares [1-4], although prevalence estimates vary with different thresholds for and definitions of nightmares. For example, the prevalence of *primary* sleep disorders, of which nightmares are part, was less than 1% in a systematic study on the prevalence of mental disorders [5]. The need for prevalence studies on mental disorders [6] especially applies to nightmares.

Nightmares disturb the sleep [7, 8], produce daily distress [9, 10], induce physical complaints [11], and may elicit a 'fear of going to sleep'[12]. Chronic insomnia and sleep-disordered breathing (sleep apnea) are related to nightmares as well [2, 13]. Moreover, nightmares can occur as part of a posttraumatic stress disorder (PTSD) or a posttraumatic stress reaction (without complete PTSD) after experiencing a traumatic event [14]. Both posttraumatic [15] and non-posttraumatic (so-called idiopathic or chronic) nightmares [4, 7] seem to be very persistent if not treated properly.

Several cognitive-behavioral techniques are effective in reducing nightmare frequency. Monitoring nightmares [16], relaxation [17, 18], and exposure / systematic desensitization [18-20] all reduced nightmare frequency, although exposure has shown the best outcomes [20]. In the latter study a self-help manual was mailed that instructed participants to write down the nightmare on waking and re-experience it in imagination. Exposure reduced nightmare frequency significantly better than relaxation alone (no reduction in the waiting-list group). However, there were high numbers of dropouts (almost sixty percent in the self-exposure group and forty percent in the relaxation group).

Exposure is also a major therapeutic factor of cognitive-restructuring techniques that, in addition, focus on the alteration of the nightmare-storyline (mastery). Imagery Rehearsal Treatment (IRT) [21], its mechanisms first described by Marks in a case-study [22], is a cognitive-restructuring technique in which participants are instructed to write down one specific nightmare, create a different ending, and rehearse the nightmare with its different ending 'mentally' during the day.

IRT has shown good results in randomized controlled trials, with effect sizes from over 1 for nightmare frequency reduction [21] and posttraumatic nightmare frequency reduction [23, 24]. Accordingly, IRT improved sleep quality and decreased PTSD-symptoms. Although a highly promising technique, all studies had a high dropout rate from 25% to 40%.

An alternative cognitive-restructuring technique is based upon lucid dreaming. In a lucid dream a person is aware that he or she is dreaming. Lucid dreaming has been verified by volitional eye-movements in the sleep laboratory [25] and studies have shown that lucid dreaming is a cognitive skill that can be learned [26, 27]. Moreover, since several studies have found a moderate relation between spontaneous lucid dream frequency and nightmare frequency [3, 28] it seems plausible that nightmares trigger lucid dreaming [28] as reported by lucid dreamers [29].

With Lucid Dreaming Treatment (LDT), nightmare sufferers are taught to become lucid in their nightmare through various daily exercises. They can perform actions in the nightmare itself that alter the nightmare and its storyline (e.g. confront the attacker instead of fleeing away). Although the beneficial effects on nightmares of exposure and IRT have been documented, reports on the effects of LDT have been scant. Only some case-studies have been conducted, yet they have shown promising results [30-32].

A randomized controlled trial is necessary to evaluate LDT in a larger sample. This pilot-study planned to do so in a sample of chronic nightmare sufferers, and to evaluate the effects of LDT in an individual and a group session.

Methods

A nightmare was defined as a frightening dream that led to direct awakening [14].

Participants

Thirty nightmare sufferers were recruited by advertisements in newspapers. Seven participants were excluded; three because they suffered from night terrors, two because they suffered from hypnagogic hallucinations, and two because they were on medication.
Seventeen participants were female, six were male. This is compatible with the finding that more women than men report to suffer from nightmares [33]; the DSM-IV describes the ratio within 2-4:1 [34]. However, women also have a higher dream recall [3, 35], which inevitably leads to a higher recall of nightmares. Mean age of the sample was 28.4 years (SD = 7.3). Seven participants had a university degree; all had a high school degree. No financial incentive was provided.

All 23 participants had suffered from nightmares for over one year (mean duration 12.4 years; SD = 4.7, at least once a week), and thirteen (57%) reported having experienced at least one traumatic event in their life. Only four of them had nightmares related to a traumatic event, and one had been in psychotherapy for Posttraumatic Stress Disorder (PTSD) for 8 months (discontinued 5 months before LDT) but still reported to suffer from frequent posttraumatic nightmares. Based upon a validated sleep questionnaire [36], nine participants had a co-morbid sleep disorder: six had co-morbid insomnia, two had co-morbid sleep apnea, and one had co-morbid restless legs / periodic limb movement disorder (PLMD). Medical and psychiatric history revealed no co-morbid mental disorders, except for the one participant with PTSD.

Measurements

Nightmare frequency was measured by the SLEEP-50 [36], a new self-report instrument for assessing various sleep complaints and disorders that showed good reliability outcomes (Cronbach's alpha = .85 and general test-retest reliability r (41) = 0.78; $p < .01$). The SLEEP-50 provides subscales for the impact of sleep complaints on daily functioning, insomnia, sleep apnea, circadian rhythm, restless legs / PLMD, sleepwalking, narcolepsy, and nightmares. Factor-analysis revealed a structure that closely matched the a priori designed structure. It showed good predictive validity for a broad range of sleep disorders when compared with polysomnographic and/or clinical diagnoses obtained in a sleep clinic: sensitivities fell between .67 en .85 and specificities between .69 and .88. For nightmares, the sensitivity was .84 and the specificity was .77. The overall agreement between clinical

diagnoses and SLEEP-50 classifications was good (kappa = .77). The total-score of the SLEEP-50 can be used as an indication of sleep quality.

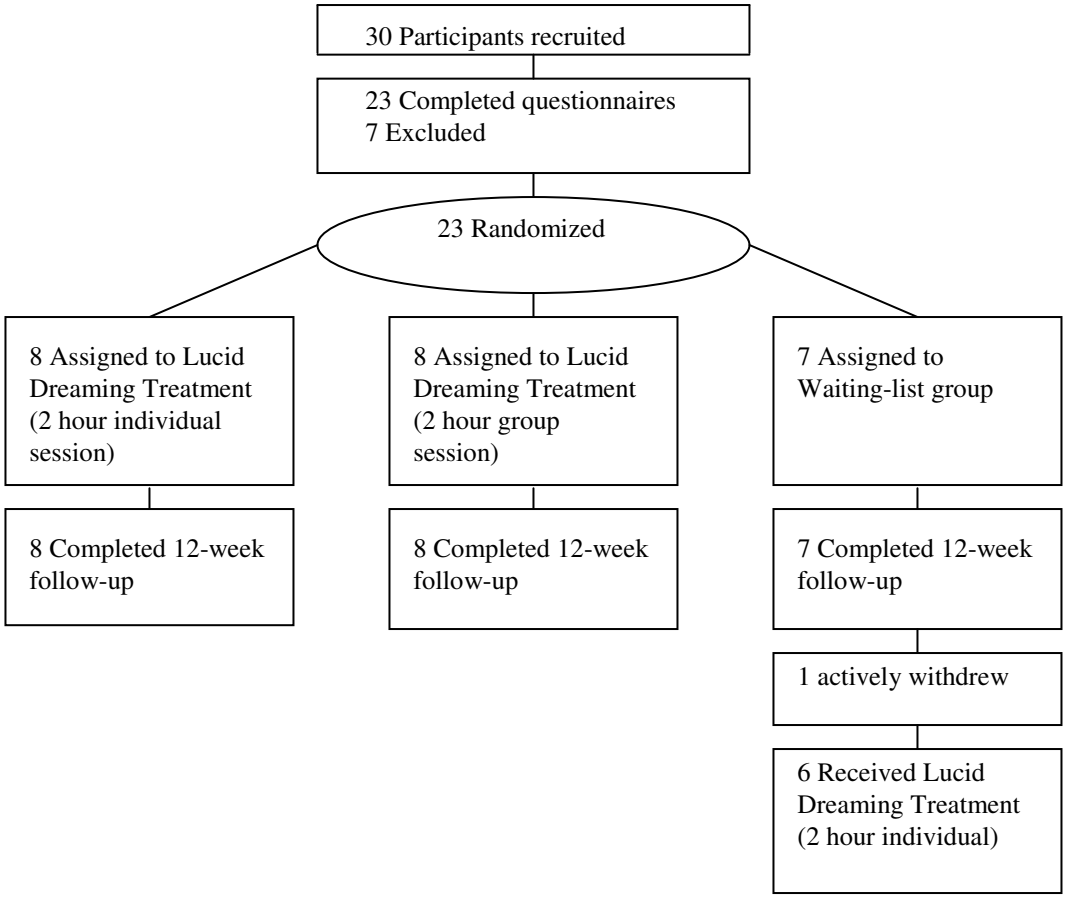
The assessment of nightmare frequency, however, yields several problems. Polysomnographic recordings seem to decrease nightmare frequency [37] and cannot measure the subjective sleep quality. Retrospective methods for nightmare frequency with a relatively long-term duration (i.e. the last month/year) underestimate the frequency of nightmares [38], whereas nightmare sufferers may feel reluctant to keep prospective logs [16]. One study did not find an underestimation of nightmare frequency using a retrospective questionnaire with a shorter duration (i.e. last seven days) in comparison to a daily log [39]. Therefore, this study used the SLEEP-50 with a relatively short duration (last seven days).

PTSD-complaints were measured by the Self-Rating Inventory for PTSD (SRIP) developed by Hovens et al. [40]. The 22 items follow the PTSD-symptoms as described in the DSM-IV [14] without special reference to a traumatic event. Sum scores for intrusion, avoidance, hyperarousal, and the total amount of PTSD-symptoms can be derived. The reliability of the scale was good, with Cronbach's alpha's varying from .90 to .94 and a test-retest correlation of .92. Moreover, a sensitivity of .86 and a specificity of .71 were found in relation to the Clinician Administered PTSD scale [40]. The optimal cut-off score for PTSD is 52 (range SRIP: 22-88). However, SRIP item 2 (*having distressing dreams*) was left out of the total score so that a reduction in nightmare frequency would not automatically result in a reduction in (other) PTSD-symptoms.

Procedure

Participants received the questionnaires by mail before randomization. The order in which the questionnaires were returned determined the number (e.g. the first returned questionnaire received # 1). These numbers were entered into a computer that randomly assigned the numbers to one out of three groups: group A (eight participants received one two-hour individual LDT session); group B (eight participants received one two-hour group LDT session with a group size of four participants); and group C (seven participants were placed on the waiting-list and were told that they would receive treatment in twelve weeks). Written consent was obtained after the procedure had been fully explained. At follow-up twelve weeks after the treatment, participants filled out the same questionnaires and additional questions. In addition, participants had to estimate their average number of nightmares per week of the last twelve weeks.

Figure 1: Study Flow Chart



Treatment

All treatments (one two-hour session) were conducted by the first author, and consisted of a short introduction, a description of the participants' nightmare(s), and general information about the prevalence and associated features of nightmares. Participants were asked to name common features in their nightmares, which could range from specific (e.g. replication of a traumatic event) to broad (e.g. a common theme such as 'being chased').

After this, the first component of the treatment was introduced: becoming lucid in a nightmare. Specific cognitive and behavioral exercises were explained in order to associate the common features in the nightmares with a reality-check: "Is this really happening or am I dreaming?" With this reality-check participants could become lucid in their nightmares. Participants had to *intend* before going to bed that the next time they would be in the frightening situation (recurrent situation or common theme), they would realize that it could all be a dream. After close examination of the situation, they should conclude that the

frightening situation is not real, but a dream. A related exercise was imagining the frightening situation while thinking that it was only a dream. This part of the treatment is comparable to exposure. Yet, reality-testing is an additional feature necessary for increasing self-awareness and inducing lucidity.

The second component of the treatment targeted what to do next – when one is lucid in a dream. Various new endings were discussed and eventually each participant was encouraged to choose the ending that they preferred. A constructive ending, also referred to as a 'triumphant ending' [41], (e.g. talking to or fighting the attacker [42]) was to be preferred over a less constructive ending (e.g. fleeing away) since confrontation tends to make threatening situations less intense [43]. Yet, in the end every participant could choose the ending they wished for. This part of the treatment is comparable to the alteration of the nightmare-storyline as conducted with IRT (mastery). A difference is that this new ending was not rehearsed mentally but should rather be actively conducted in the nightmare itself. Moreover, practicing with pleasant imagery (a relaxation exercise of IRT) was not part of LDT.

It was also discussed that changing the nightmare might be difficult even if full lucidity is achieved. Participants were told they had to make a minor change first – preferably in a background object. If accomplished, they could pick a more important object, gradually extending this to the whole dream.

At all stages participants could ask questions. Finally, homework assignments (the exercises) were handed out with a short summary of the treatment.

Statistical Analyses

The effects of the treatment were analyzed with paired t-tests (one-tailed).

Results

There were no statistical differences between the three groups after randomization for age, gender, education, nightmare frequency, sleep distress, and overall PTSD-complaints. There were no dropouts in any of the groups. The estimation of the average nightmare frequency per week (of the last twelve weeks) correlated highly with the reported nightmare frequency of the last seven days, $r(21) = .89$, $p < .001$, although this twelve-week average led to a significantly lower nightmare frequency: $t(22) = 2.2$, $p < .05$. Therefore, we used the reported number of nightmares in the last seven days at both pre-intervention and follow-up.

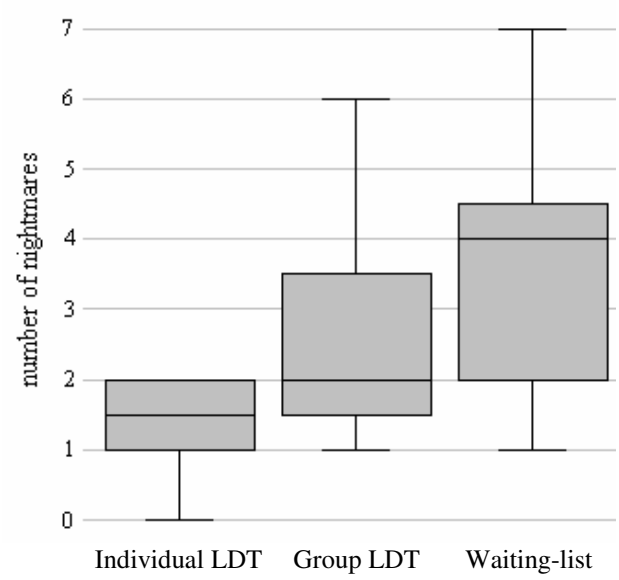
Table 1: Means (SDs) at pre-intervention (T1) and follow-up (T2) by group.

		nightmares a week		**sleep-complaints**		**PTSD-complaints**	
	N	T1	T2	T1	T2	T1	T2
Group							
A: Individ. LDT	8	3.5 (1.7)	1.4 (0.7) [2]	52.3 (9.9)	53.1 (9.2)	28.9 (4.8)	26.4 (4.2)
B: Group LDT	8	3.1 (2.0)	2.6 (1.7) [1]	51.0 (8.3)	49.7 (8.9)	26.7 (5.1)	26.1 (4.9)
C: Waiting-list	7	3.7 (2.4)	3.6 (2.1)	54.6 (8.8)	52.1 (10.2)	29.4 (5.3)	29.7 (5.6)

[1] T1-T2 change significant at the .05 level
[2] T1-T2 change significant at the .01 level

A paired t-test showed a significant reduction in nightmare frequency for participants who received one individual session, $t(7) = 4.1$, $p = .002$. A significant reduction was also found in nightmare frequency for participants who received one group session, $t(7) = 2.6$, $p = .017$. No differences were found for the waiting-list group, $t(6) = 0.6$, $p = .30$. There were no significant changes between pre-intervention and follow-up for sleep quality and overall PTSD-symptoms for any of the groups, see Table 1.

Figure 2: Boxplots of the nightmare frequency at follow-up (number of nightmares in the last seven days)



Of the participants who received an individual LDT session, one had no change in nightmare frequency and seven had fewer nightmares at follow-up. Only four of the participants had become lucid in a nightmare and had thus been able to lucidly alter the nightmare. For the other three participants, the nightmare content changed by itself. Here all participants reported at follow-up to have conducted the exercises at home for at least a month.

Of the participants who received a group LDT session, four participants had no change in nightmare frequency and four had fewer nightmares at follow-up. Only two of them had been able to lucidly alter the nightmare. For the other two, the nightmares were less frequent. Here two persons reported at follow-up that they had not conducted the exercises at home.

Lucidity was absent in the waiting-list group, although one nightmare sufferer reported a spontaneous decrease in nightmare frequency.

Discussion

Limitations of the current study

The current study was a pilot-study with a small sample size and sufficient statistical power was therefore lacking. Moreover, follow-up data with a longer time-period (e.g. six months, one year) were absent. The use of a waiting-list group as a control-group is debatable, as the effects of other therapeutic factors (e.g. amount of professional attention) were not controlled for. Lucid dreaming treatment (LDT) consists of several components (exposure, mastery, and lucidity) and the unique feature of LDT (i.e. lucidity) was not found to be necessary for a change in the nightmare-script or for a decrease in nightmare frequency.

Discussion of the results

LDT seems effective in reducing nightmare frequency. Yet, participants who received individual LDT showed a higher decrease in nightmare frequency than participants who received group LDT. This suggests that other non-LDT factors (e.g. personal/professional attention) may contribute to a reduction in nightmares as well.

Moreover, LDT targeted nightmares only and no other complaints. The sleep quality of the participants did not improve and the PTSD-symptoms stayed at the same level for all groups. Here LDT differs from Imagery Rehearsal Treatment (IRT) since IRT has shown a reduction not only for nightmare frequency, but also for PTSD-complaints while it improved the sleep quality as well [18, 20, 21]. The low baseline of PTSD-symptom-severity in this study could explain the absence of a reduction in PTSD-symptoms. This low baseline (comparable to norm values of healthy persons) was a surprising finding because more than half of the participants indicated that they had experienced at least one traumatic event. Only four participants had trauma-related nightmares and just one had a diagnosis of PTSD. This finding is supported by a recent study on the general population that found nightmares to be unrelated to any mental complaints, including the PTSD-intrusion-cluster [44].

The role of lucidity in treating nightmares is unclear, since only six out of sixteen participants were able to become lucid in a nightmare and then alter the nightmare. For five other participants, the reduction and possible changes in the nightmares came without lucidity. This strange finding has been reported in former studies as well [31, 32]. Lucidity is a unique component of LDT: IRT and LDT consist both of exposure and mastery exercises although in a different form. Whether one discusses changes in the nightmare during a session and plans to take active control over the nightmare *in the nightmare itself* (LDT) or takes control somewhat more indirectly through daily imagery rehearsal exercises (IRT) does not seem to matter. Rather, *changing* the nightmare-storyline seems crucial.

When a change in the nightmare-script is imagined or discussed and a change in the actual nightmare seems possible, nightmare sufferers may experience an increased feeling of mastery over their nightmares that is hardly compatible with the usual feelings of anxiety and helplessness that accompany nightmares. Various authors have suggested that mastery is the clue to treating nightmares [21-24, 31, 32]. A confronting attitude towards nightmares and a high nightmare self-efficacy may be sufficient for a significant reduction in nightmare frequency.

It would therefore be interesting to compare the effects of IRT and LDT with each other in a randomized controlled trial, with exposure (and/or relaxation) as a control-group. Alternatively, an attention-control group where different nightmare endings are discussed (or drawn, or written down) without rehearsal or lucidity exercises would be very informative. In addition, IRT and LDT could be compared with a mailed self-help format as used in a study on exposure [20]. A nightmare self-efficacy scale should be developed and used in treatment-studies to check for possible mastery effects. In this way, the effective factors of cognitive-restructuring techniques can be examined more closely and thus provide a baseline for an integrated cognitive-behavioral theory about nightmares.

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9 | A Cognitive Model of Recurrent Nightmares

Abstract

Occasional nightmares occur in most people, but 3-8% of the general population suffers from frequent and recurrent nightmares. A cognitive model of the origin and persistence of nightmares is proposed. It suggests that recurrent nightmares are represented in a script. Nightmare-scripts can originate from experiencing a traumatic event in real-life or a highly adverse event in a dream, with neuroticism as a mediating variable. It is suggested that nightmares persist via several cognitive-behavioral factors. Activation of the nightmare-script occurs via neutral dream images that may be linked with elements of the nightmare-script, resulting in a recurrent nightmare. Nightmare treatment should therefore focus on alteration of the nightmare-script. The description of the model ends with several testable predictions that can aid and guide future studies on nightmares.

Keywords: nightmares, PTSD, neuroticism, script.

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Introduction

Nightmares are highly prevalent in the general population, with up to 70% suffering from occasional nightmares (Hublin, Kaprio, Partinen, & Koskenvuo, 1999). The prevalence of frequent nightmares is around 3-8% (Bixler, Kales, Soldatos, Kales, & Healey, 1979; Hublin et al., 1999; Klink & Quan, 1987; Stepansky et al., 1998). Nightmares disturb the sleep (Kales et al., 1980; Krakow, Tandberg, & Scriggins, 1995), produce daily distress (Berquier & Ashton, 1992; Zadra & Donderi, 2000), and induce physical complaints (Köthe & Pietrowsky, 2001). In addition, chronic insomnia and sleep-disordered breathing (sleep apnea) are related to both posttraumatic nightmares (Krakow, Melendrez, et al., 2001) and non-posttraumatic (idiopathic) nightmares (Klink & Quan, 1987; Stepansky et al., 1998).

Although it is still a common notion that nightmares are a symptom of a larger (anxiety) disorder, several findings suggest that nightmares are more than just that. In the general population, nightmares are unrelated to any mental complaint (Spoormaker & van den Bout, 2005). And posttraumatic nightmares rather seem to be a key-element of PTSD. For example, treatment of posttraumatic nightmares resulted not only in a reduction of nightmare frequency, but also in a reduction of PTSD-symptom severity, and an improvement of the sleep (Krakow, Hollifield, et al., 2001). Without specific treatment, both posttraumatic nightmares (Schreuder, Kleijn, & Rooijmans, 2000) and idiopathic nightmares (Cirignotta et al., 1983; Hublin et al., 1999; Kales et al., 1980) persist over decades as a life-long sleep disorder.

Surprisingly, studies focusing on the development of a cognitive framework for nightmares have been absent. This study presents a cognitive model of recurrent nightmares, and starts with discussing the possibilities of the involvement of cognitive processes in dream generation.

REM sleep versus dreaming

It is now widely accepted that REM sleep is controlled by the brain stem – a conclusion first drawn by Jouvet (1962). Especially pontine brain mechanisms seem involved, with hypothesized REM-on and REM-off cells (Hobson et al., 1998). The activation of cholinergic and/or cholinoceptive REM-on cells starts the Ponto-Geniculo-Occipital (PGO) waves associated with REM sleep (Hobson & McCarley, 1977; McCarley, Winkelman, & Duffy, 1983; Mikiten, Niebyl, & Hendly, 1961; Mouret, Jeannerod, & Jouvet, 1963). These waves originate in the Pons, which fires periodically to the lateral Geniculate bodies of the Thalamus that, in turn, activate the Occipital Cortex. REM sleep is terminated when the aminergic (noradrenergic and serotonergic) cells become activated and switch back the chemical mode of processing. Moreover, the mind-brain isomorphism as put forward by Hobson (1999) states that REM sleep and dreaming are the same phenomenon, with REM sleep as a brain state and dreaming as the subjective experience.

However, as Solms (2000) pointed out, REM sleep and dreaming are not completely related. Not all, but around 80% of REM awakenings lead to reported dreams (Aserinsky & Kleitman, 1957). Moreover, around 10% of non-REM awakenings lead to reported dreams that are very similar to REM dream reports (Hobson, 1988), whereas up to 50% of non-REM awakenings lead to reports of somewhat complex mentations (Foulkes, 1962;

Nielsen, 1999). Most importantly, over one hundred case-studies have been reported showing that lesions in the forebrain are associated with a cessation of dreaming – while REM sleep was preserved in these cases (for a review, see Solms, 2000).

It seems that the forebrain is more actively involved in dream generation than the brain stem / REM sleep theory would allow. Especially lesions in the region of the parieto-temporo-occipital (PTO) junction led to a loss of dreaming – a region that is named to be vital in mental imagery (Kosslyn, 1994).

The same applies to nightmares, which were found to not only occur during REM sleep, but also during non-REM stages (van der Kolk, Blitz, Burr, Sherry, & Hartmann, 1984; Hefez, Metz, & Lavie, 1987). Solms (2000) noted that in 22 of the 24 published cases of lesions affecting nightmares "recurring nightmares were caused by an unequivocally forebrain mechanism". Artificial frightening experiences (in the form of waking state dreamlike seizures) were created by stimulating the temporal lobe (Penfield, 1938; Penfield & Rasmussen, 1955). It thus seems that nightmare imagery is actively created through complex cognitive processes supported by forebrain mechanisms. But which complex cognitive processes are related to nightmares?

A cognitive model of recurring nightmares

Nightmares are represented in scripts

Expectations are thought to be important in the occurrence of nightmares (LaBerge & Rheingold, 1990; Zadra & Pihl, 1995; Spoormaker, van den Bout, & Meijer, 2003). The current model suggests that recurrent nightmares are represented in a script. A script can be viewed as a sequence of expectations, also referred to as an expectation pattern.

Nightmares tend to occur as (exact) replications of an original traumatic event (American Psychiatric Association, 2000) or in thematic stories (Spoormaker et al., 2003) in which the storyline – the script – is the same. Common thematic stories may be 'being chased', 'falling down', 'drowning', or 'losing a relative'. Nightmares are repetitive in the storyline but not in the detailed scenery, which varies in these recurrent non-posttraumatic (idiopathic) nightmares.

Traumatic events may cause exact replications in flashbacks (during the day) and posttraumatic nightmares (during the night). Yet, as scripts are general storylines, there will even be room for different details even in posttraumatic nightmares. This is supported by a recent study of Merckelbach, Dekkers, Wessel, and Roefs (2003) who found that 45% of all PTSD-patients (concentration camp survivors) in treatment denied that their nightmares 'possessed historical accuracy'. Another study found that the majority of PTSD-patients reported 'distorted elements' in their nightmares (Esposito, Benitez, Barza, & Mellman, 1999). A nightmare-script contains information about the general storyline (which is repetitive) that can be applied to a variety of situations.

A minority (about twenty percent) of people who witness or experience a traumatic event develops full and chronic PTSD (Kessler et al., 1995; Rothbaum, Foa, Riggs, Murdock, & Walsh, 1992). In PTSD-patients, a nightmare incidence of around 60% is common (Kilpatrick et al., 1998). For these posttraumatic nightmare sufferers it is beyond doubt that the nightmares originated from the trauma – an intense and highly adverse event. Posttraumatic nightmares are a replication of the traumatic event, and can either be exact replications or replications with distorted elements. Yet, the *storyline* of the original traumatic event is re-enacted in the posttraumatic nightmares. Thinking about this storyline during the day is highly distressing since it results in extremely negative emotions, physical arousal, and negative cognitive and behavioral responses. Therefore, for people with recurrent posttraumatic nightmares, the nightmare-script is very likely to remain an unaltered, intensive, highly negative script. This script can be re-enacted during the day, resulting in flashbacks, or during the night, resulting in nightmares.

However, nightmares need not be induced by a traumatic event in order to become recurrent. Most people have nightmares occasionally but only a small percentage (3-4%) suffers from recurrent and frequent idiopathic nightmares (Bixler et al., 1979; Hublin et al., 1999; Klink & Quan, 1987; Stepansky et al., 1998). Empirical evidence suggests that neuroticism may be the mediating variable in this relation. Neuroticism is the only personality factor repeatedly found to be related to nightmare frequency (Berquier & Ashton, 1992; Blagrove, Farmer, & Williams, 2004; Kales et al., 1980; Lang & O'Connor, 1984; Schredl, 2003; Zadra & Donderi, 2000). Moreover, neuroticism correlates strongly with the distress caused by nightmares (Belicki, 1992; Blagrove et al., 2004; Zadra & Donderi, 2000).

The current model suggests that when people who score high on neuroticism experience a nightmare, the nightmare is likely to make a deeper impact and to cause more distress. In this case, a nightmare is an intense and highly adverse event usually involving threats to survival, security, or self-esteem (American Psychiatric Association, 2000). The experience of a nightmare is then similar to a so-called mini-trauma – not an actual, real-life trauma involving threats to survival, security, or self-esteem but rather a *dreamed* trauma involving similar threats and accompanied by real images and emotions.

In the same manner as with a traumatic event, thinking about this storyline during the day is highly distressing since it will result in negative emotions and physical arousal, and will therefore be avoided. The storyline of the nightmare will thus very likely remain an unaltered, intensive, highly negative script. This script can only be re-enacted during the night, resulting in recurrent nightmares.

This model suggests that neuroticism may be a mediating variable for the development of recurrent idiopathic nightmares, but it may also be a mediating variable for the development of posttraumatic nightmares. People who score high on neuroticism may have a higher chance of developing PSTD (or PTSD-complaints without the full disorder) after the experience of a traumatic event than people who score low on neuroticism. Moreover, the occurrence of posttraumatic nightmares in PTSD-patients may also be mediated by neuroticism. According to this model, people who have developed PTSD (or PTSD-complaints) and score higher on neuroticism will develop nightly re-enactments of the traumatic event as recurrent nightmares whereas those who score lower on neuroticism will

not. Indeed, evidence indicates that neuroticism is a major personality risk factor for the development of PTSD (Engelhard, van den Hout, & Kindt, 2003; van Zelst, de Beurs, Beekman, Deeg, & van Dyck, 2003).

A nightmare is a learned behavior

Although nightmares may be trauma-induced, they also seem to be habit-sustained. Contrary to the common notion that nightmares eventually fade away and do not require direct treatment (Kaplan & Sadock, 1998), studies have indicated that nightmares are quite persistent.

In a large-scale twin study Hublin et al. (1999) found that about 80-90% of adults who had suffered from nightmares in childhood reported to still have nightmares 'at least sometimes'. Although this finding could have been affected by a recall bias because nightmares in childhood were measured retrospectively, two other studies are also indicative of a childhood onset and lifetime persistence of nightmares. In a study with thirty nightmare sufferers, a childhood or adolescence onset of nightmares was reported to be "usual" (Kales et al., 1980). In one large-scale epidemiological study on sleep disorders more than half of all frequent nightmare sufferers had had a nightmare before the age of ten (Cirignotta, Zucconi, Mondini, Lenzi, & Lugaresi, 1983).

Not only idiopathic but also posttraumatic nightmares seem persistent, as Schreuder, Kleijn, and Rooijmans (2000) pointed out with their finding that posttraumatic nightmares were still prevalent in PTSD-patients more than *forty years* after a traumatic event.

Several cognitive and behavioral responses have been associated with the persistence of nightmares as a sleep disorder: sleep unhygienic behaviors (e.g. irregular sleep schedules – Krakow et al., 2000), conditioned responses (e.g. fear of going to sleep or returning to sleep after a nightmare – Haynes & Mooney, 1975), and cognitive avoidance (Schredl & Palmer, 1998). With cognitive avoidance (e.g. "It was only a dream") nightmare sufferers avoid thinking about their nightmare, and a conscious alteration of the nightmare-script (key-element of cognitive-restructuring techniques for treating nightmares, see section 2.5) is highly unlikely. Nightmare-scripts seem to persist through the mechanism of cognitive avoidance, whereas the disruption of the sleep by nightmares tends to persist via conditioned behavioral responses.

Other findings also indicate that nightmares are a learned behavior. When assessed with polysomnography, nightmares fade (Fisher, Byrne, Edwards, & Kahn, 1970; Spoormaker, Schreuder, Kamphuisen, & Kleijn, 2004; Woodward, Arsenault, Murray, & Bliwise, 2000) This even applied to PTSD-patients who had an incidence of posttraumatic nightmares in about one-third of their nights, and had experienced nightmares for over ten years (Spoormaker et al., 2004). With polysomnographic recordings, their nightmare incidence significantly decreased to less than ten percent. Nightmare sufferers knew that they were being observed and may have felt more secure. This change in the environment (e.g. observing professional, polysomnographic materials, or in other studies: the sleep laboratory) makes the activation of a nightmare less likely.

In addition, cognitive-behavioral techniques are the most effective treatment for reducing nightmares (Blanes, Burgess, Marks, & Gill, 1993; Burgess, Marks, & Gill, 1998; Krakow et al., 1995; 2000; Krakow, Hollifield, et al., 2001; Spoormaker, Schredl, & van den Bout,

submitted review; Spoormaker, van den Bout, & Meijer, 2003). With specific behavioral and cognitive exercises nightmare sufferers can learn how to change and overcome their nightmares. This indicates that nightmares are a cognitive behavior that can be *un*learned. Just like other mental complaints (e.g. specific phobia's) nightmares seem to be a life-long complaint/disorder that can only be overcome with specific (cognitive-behavioral) treatment.

In short, the maintenance of nightmares via several conditioned cognitive and behavioral responses suggests that recurrent nightmares can be viewed as a habit: a learned behavior. Yet, as nightmares do not consist of overt but rather of covert behavior, they are a learned *cognitive* behavior. Or in cognitive terminology: recurrent nightmares are represented in *acquired scripts*.

Activation of the nightmare-script during sleep results in a nightmare

If the nightmare-script is activated, it will result in a nightmare. As discussed in the first section, the forebrain seems to actively generate nightmare-imagery. During a dream, the brain can be seen as a hyperactive film-projector: a dream machine (Hobson, 1999). Various stimuli (e.g. memories) become visual in a dream when activated. We suggest that the same applies to a whole series of related stimuli, in this case a script.

Due to the vivid visual 'mode' of the brain during dreaming the activation of a script will result in vivid visual imagery. As a script consists of a series of expectations, this process can be seen as a chain-reaction: one nightmare-image leads to the next, and so on. This is similar to the waking state when a recalled memory may be 'replayed' or 're-enacted' in the mind with waking imagery. A nightmare is also a 'replay' or 're-enactment' of a particular memory, but due to the highly visual nature of dreams accompanied by *real-life images.* The activation of the nightmare-script equals the replay of the nightmare.

Neutral dream images activate the nightmare-script through the mechanism of priming, also suggested to be important in triggering daytime-symptoms of PTSD (Ehlers & Clark, 2000). If the dream image is associated with a part of the script, the nightmare is more likely to start. Take as an example a person who was mugged at an alley in the dark and developed posttraumatic nightmares about this event afterwards. Several neutral images in a particular dream may become cues of the traumatic event (e.g. streets and/or dark images). These neutral images need not necessarily, but may very well trigger the nightmare-script. In this way, a replication of the original traumatic event is triggered and a posttraumatic nightmare occurs. Vague physical similarity would be sufficient in perceiving stimuli as similar to those of the nightmare-script (poor stimulus discrimination – Ehlers & Clark, 2000) since such implicit memory traces are not well discriminated from other memory traces (Baddeley, 1997). Neutral images like these would not lead to the activation of the nightmare-script in persons who have experienced other traumatic events with other reminders or cues, or who have experienced no traumatic event at all.

The same applies to non-posttraumatic (idiopathic) nightmares. If a person has nightmares about being chased, other neutral images in a dream may activate the nightmare-script. In this example, a dream with a fast moving object in the distance, a running person, or even an unknown person may activate the nightmare-script, and a new chase starts.

Idiopathic nightmare-scripts tend to occur in one theme but in different settings. Of course, this depends on the neutral images that trigger the nightmare-script. However, although posttraumatic nightmares also may have different scenes or other distortions, many posttraumatic nightmares are exact replications of the traumatic event. The possible mechanism in these latter nightmares might be shaping – in which the neutral images are automatically and actively shaped into the scenery of the original traumatic event, as described by Seligman and Yellen (1987).

Furthermore, the current model suggests that the activation of the nightmare-script is mediated by the current anxiety-level. If a person has high anxiety/stress-levels and subsequently experiences more anxiety during the day, the nightmare-script will be more easily accessible. For example, neutral images like a street or a running person are more likely to be linked with a specific nightmare-script if the current anxiety level is high, resembling a manner of emotional priming. In this case streets, and especially dark streets, are more easily connected with the mugging because negative emotions and negatively toned emotional scripts (such as the nightmare-script) are better accessible. One study found state anxiety to be related to nightmare frequency as a mediating variable in the relation neuroticism-nightmares (Schredl, 2003). This finding indicates that high state-anxiety-levels in people who score high on neuroticism are more likely to result in nightmares than in people who score low on neuroticism.

Alteration of the nightmare-script should be the primary focus of treatment

According to this model, cognitive-restructuring techniques are the treatment of choice for nightmares. With specific cognitive and behavioral exercises nightmare-sufferers are taught how to overcome their nightmares by changing the nightmare-script. Imagery Rehearsal Treatment (IRT; Marks, 1978) restructures the nightmare-script by mental rehearsal of the nightmare – with a different ending – during the day; Lucid Dreaming Treatment (LDT; LaBerge & Rheingold, 1990) restructures the nightmare-script by discussing the different ending in session and then acting it out in the nightmare itself. IRT (Krakow et al., 1995; 2000; Krakow, Hollifield, et al., 2001) and LDT (Spoormaker, van den Bout, & Meijer, 2003; Zadra & Pihl, 1997) have shown better effects for nightmare reduction, with lower dropout rates, than other cognitive-behavioral techniques such as exposure (Blanes, Burgess, Marks, & Gill, 1993; Burgess, Marks, & Gill, 1998), relaxation (Celluci & Lawrence, 1978), or simple self-monitoring (Neidhardt, Krakow, Kellner, & Pathak, 1992). Yet, a randomized controlled trial comparing cognitive-restructuring with other cognitive-behavioral techniques has not yet been carried out.

LDT seems effective in reducing nightmares, but not in improving sleep quality and reducing other complaints like anxiety or PTSD-complaints (Spoormaker, & van den Bout, submitted manuscript; Spoormaker, van den Bout, & Meijer, 2003). Previous studies have shown that IRT is effective in reducing nightmares and related complaints, and in improving the quality of sleep (Krakow et al., 1995; 2000; Krakow, Hollifield, et al., 2001). Why are the effects of IRT broader than the supposed effects of LDT?

The low baseline of PTSD-symptom-severity (comparable to normal scores) of the non-posttraumatic nightmare sufferers in the LDT-pilots might provide a partial explanation. In addition, cognitive-restructuring techniques for posttraumatic nightmares alter the script of

the traumatic event and may decrease PTSD-symptom-severity via this mechanism, and LDT has not yet been tested on PTSD-patients.

Moreover, relaxation could be helpful in understanding the broader effects of IRT. Relaxation is not part of LDT, but with IRT persons also practice with positive imagery during the day (Krakow, Hollifield, et al., 2001). This form of relaxation may decrease the general level of anxiety and thus the intensity of PTSD-complaints. Relaxation is also effective in treating insomnia and thus improving the quality of sleep (Morin et al., 1999).

Yet, relaxation alone does not alter the nightmare-script. The same applies to exposure via desensitization, which decreases the fear of threatening nightmare-images (Burgess, Marks, & Gill, 1998; Celluci & Lawrence, 1978; Miller & DiPilato, 1983) without altering the nightmare-script.

Cognitive-restructuring techniques may thus be very effective in reducing nightmare frequency (generally one to three sessions are sufficient) because they focus on changing the nightmare-script. For example, lucidity is not a necessary therapeutic factor of LDT; after a LDT session some nightmare sufferers experienced a change in the nightmare storyline without becoming lucid in their nightmare. Whether one takes active control over the nightmare *in the nightmare itself* (LDT) or takes control somewhat more indirectly through daily imagery rehearsal exercises (IRT) does not seem to matter. Rather, *changing* the nightmare-script seems crucial.

When a change in the nightmare-script is imagined or discussed and a change in the actual nightmares seems possible, nightmare sufferers may experience an increased feeling of mastery over their nightmares that is hardly compatible with the usual feelings of anxiety and helplessness that accompany nightmares. Various authors have suggested that mastery is the clue to treating nightmares (Krakow et al., 1995; 2000; Krakow, Hollifield, et al., 2001; Marks, 1978; Spoormaker, van den Bout, & Meijer, 2003; Zadra & Pihl, 1997). Future studies should address this by comparing the effects of IRT and LDT with a control-group where a change in the nightmare-script is obtained in another way (e.g. discussing or drawing it without actual cognitive-behavioral exercises). Moreover, the effects of cognitive-restructuring techniques should be compared with other cognitive-behavioral techniques to test whether script-altering techniques show better effects.

Predictions

1. Recurrent nightmares have the same storyline. (2.1)

2. Nightmare sufferers know exactly what to expect next in their nightmare. Elements of the nightmare-script are closely linked with each other and will lead to shorter reaction times in priming experiments. (2.1)

3. Recurrent nightmares will result in higher nightmare distress than non-recurrent nightmares. (2.2)

4. PTSD-patients with posttraumatic nightmares will have higher neuroticism-scores than PTSD-patients without posttraumatic nightmares. (2.2)

5. Recurrent nightmares do not fade. (2.3)

6. A recurrent nightmare is preceded by neutral dream images. (2.4)

7. Techniques that focus on alteration of the nightmare-script (cognitive-restructuring techniques such as LDT and/or IRT) will be more effective in reducing nightmares than techniques that do not alter the nightmare-script (exposure and/or relaxation) in a randomized controlled trial. (2.5)

8. Cognitive-restructuring techniques aimed at PTSD but not at posttraumatic nightmares specifically will also show a reduction in trauma-related nightmares. (2.5)

Conclusion

REM sleep and dreaming seem to be two separate brain states because dreams and nightmares can also occur in non-REM sleep. Moreover, case-studies on forebrain lesions have shown that a cessation of dreaming could be reported although REM sleep was still preserved, indicating that forebrain mechanisms and cognitive processes may be more actively involved in dream generation than was currently believed. The present cognitive model described the origin and maintenance of recurrent nightmares. Recurrent nightmares occur in themes (non-posttraumatic or idiopathic nightmares) or as replications of a traumatic event (posttraumatic nightmares). For both types of recurrent nightmares the storyline is repetitive. This storyline is represented in a highly adverse script evoking intensely negative responses. Recurrent nightmare sufferers have higher scores on neuroticism, and experience more distress from their nightmares – a nightmare makes a deeper impact. A deep impact of a nightmare increases the likelihood that it will be represented in a script (and evolves into a recurrent nightmare). Neuroticism was suggested to be a mediating variable for the development of non-posttraumatic (idiopathic) and posttraumatic recurrent nightmares. Several conditioned cognitive and behavioral responses were suggested to be of importance in the persistence of recurrent nightmares, which, contrary to the common belief, do not seem to fade. Several other studies have also indicated that nightmares are a learned cognitive behavior, or an acquired script. The activation of the nightmare-script during sleep was suggested to be caused by neutral dream images that may be linked with the nightmare-script, and this activation was thought to be mediated by current levels of anxiety, and to result in the replay of a recurrent nightmare. Nightmare-treatment should therefore focus on the alteration of the nightmare-script, which is the key-element of two effective cognitive-restructuring techniques for nightmares: Imagery Rehearsal and Lucid Dreaming Treatment. Several testable predictions were derived from this cognitive model of recurrent nightmares, pointing out new directions for future studies.

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10 | General Discussion

This dissertation started with a review on nightmares, and the main conclusion was that most findings on nightmares are indicative at best, and that this developing field of sleep medicine needs to be further investigated. One of the key-topics considers the clinical definition of nightmares: extremely frightening dreams from which the person wakes up (American Psychiatric Association, 2000). Anxiety or fear are the most frequent, but not the only negative emotions reported in nightmares – anger and sadness are reported in nightmares as well. Moreover, direct awakening from a negative dream is another criterion that has been contested – studies have shown mixed results considering the relationship between this direct awakening and well-being (Blagrove, Farmer, & Williams, 2004; Zadra & Donderi, 2000; chapter six). These two types of disturbing dreams (negative with or without direct awakening) should be investigated with polysomnographic studies and studies examining related characteristics of these two types of nightmares.

Moreover, assessment of nightmares is another topic of concern. Polysomnographic recordings of nightmares decrease nightmare frequency, retrospective questionnaires with a relatively long duration (past month or more) lead to underestimations of nightmare frequency, and prospective logs are not always filled out correctly. It has therefore been difficult to assess the prevalence of nightmares and the prevalence of nightmare *sufferers*, with the few studies conducted estimating prevalences from three to about eight percent in the general population (Bixler, Kales, Soldatos, Kales, & Healey, 1979; Hublin, Kaprio, Partinen, & Koskenvuo, 1999; Klink & Quan, 1987; Stepansky et al., 1998). In addition, findings on relations of nightmares with other mental complaints and personality factors have been conflicting (Berquier & Ashton, 1992; Blagrove et al., 2004; Chivers & Blagrove, 1999; Ohayon, Priest, Guilleminault, & Caulet, 1996; Schredl, 2003; Zadra & Donderi, 2000; chapter five). Addressing different methods of measurement and several mediating variables can aid in understanding these heterogeneous results.

And finally, a variety of cognitive-behavioral techniques have been found effective in treating nightmares (Blanes, Burgess, Marks, & Gill, 1993; Burgess, Marks, & Gill, 1998; Celluci & Lawrence, 1978; Miller & DiPilato, 1983; Krakow et al., 1995; 2000; 2001; chapter seven; chapter eight). A fruitful approach seems to distinguish techniques that target anxiety (e.g. relaxation and desensitization techniques) from cognitive-restructuring techniques (e.g. Imagery Rehearsal). All studies, however, had high dropout rates (up to sixty percent), which is very problematic. Moreover, theoretical developments on nightmares have been absent.

Therefore the current dissertation addresses the assessment of nightmares, prevalence, associated features, and definition of nightmares, treatment of nightmares, and a (cognitive-behavioral) framework for understanding the origin and persistence of nightmares. These areas will be discussed below.

Assessment

For assessing nightmare characteristics and nightmare frequency (relevant for e.g. effect-studies) three methods can be used: 1) polysomnographic recordings; 2) prospective measurements (daily logs); and 3) retrospective measurements (questionnaires). All methods seem to have serious limitations. It has been reported that polysomnographic recordings seem to decrease the frequency of nightmares (Fisher, Byrne, Edwards, & Kahn, 1970). Even posttraumatic stress disorder (PTSD) patients generally have a very low incidence of nightmares in the sleep laboratory (less than 10% of nightmares a night – Woodward, Arsenault, Murray, & Bliwise, 2000). However, this phenomenon had never been statistically tested and it was unsure whether it would occur when polysomnography was conducted in an ambulant setting. For example, the sleep laboratory causes dreams to be charged with less affect (Domhoff & Kamiya, 1964) – but is that due to the artificial setting or to the electrodes on the scalp?

Self-report data have other limitations. Questionnaires with a relatively long-term retrospective duration (one month or one year) were found to underestimate nightmare frequency. Prospective logs seemed the method-of-choice, but nightmare sufferers may feel reluctant to keep a log, and dropout rates in effect-studies on nightmares are already high (25-60% – Burgess et al., 1998; Krakow et al., 2000; 2001). Moreover, logs were found to increase the amount of dream recall (Schredl, 2002), and could also increase the amount of recalled bad dreams – and nightmares.

In chapter two we investigated these three methods. Participants were twelve PTSD inpatients who were asked to keep a log for seven consecutive days. After these seven days they had to fill out a retrospective questionnaire with a short duration – about the last seven days. Hereafter they were subject to 2 x 24 hour polysomnographic recordings *in the clinic* to test whether ambulant polysomnography would result in a reduction of nightmares as well.

Based on the logs, participants had nightmares in about one-third of their nights. When recorded with polysomnography, only one participant had nightmares. This was significantly lower than expected, the first statistical evidence of this well-known clinical phenomenon. Moreover, this finding applied to an ambulatory method; an artificial setting like a sleep laboratory is not necessary for reducing nightmares – a feeling of security induced by an observing professional seems to be sufficient. And even more important: even participants who had suffered from nightmares for decades suddenly did not have nightmares anymore. The self-report data correlated highly with each other, and the retrospective short-duration questionnaire did not lead to an underestimation of nightmare frequency. As questionnaires are more time-effective than logs they seem the method-of-choice for assessing nightmare frequency and nightmare induced distress. If polysomnographic recordings are used for measuring nightmare characteristics, it may be a more fruitful approach to tell participants that not their nightmares, but rather their breathing patterns or limb movements are subject of the study, or to give them a considerable habituation period (i.e. several days). It would be interesting to study these effects of polysomnography when conducted in the home-environment or when for example a single, less intrusive measurement such as actigraphy is conducted. And for improving the generalizability a larger, more heterogeneous sample should be used.

Chapter three focused on the development and validation of a sleep questionnaire for assessing nightmares. However, as nightmares are a sleep disorder and are often accompanied by other sleep disorders and sleep complaints (e.g. insomnia, sleep apnea, or periodic limb movements – Ohayon et al., 1996; Germain & Nielsen, 2003), a questionnaire measuring nightmares should also address other sleep complaints, as well as the limitations in daily functioning. These considerations led to the construction of the SLEEP-50. The SLEEP-50 was developed in cooperation with other sleep professionals (researchers and clinicians) to screen for nightmares and a broad range of other sleep disorders listed in the *Diagnostic and Statistical Manual for Mental Disorders, edition IV-TR*: sleep disordered breathing (sleep apnea), insomnia, narcolepsy, restless legs / periodic limb movement disorder (PLMD), circadian rhythm sleep disorder, sleepwalking, and nightmares (American Psychiatric Association, 2000). For correctly assessing sleep disorders, it also had to address the impact of sleep complaints on daily functioning, e.g. being tired, lacking energy.

The SLEEP-50 showed to be highly reliable (both considering internal consistency and test-retest reliability) and displayed good construct validity; factor analysis showed an internal factor-structure that closely matched the originally designed structure. In cooperation with the Sleep-Wake Center of Kempenhaeghe the scores of sleep patients on the SLEEP-50 were compared to the actual diagnoses made by the sleep center. These diagnoses were based on polysomnographic recordings or on an intake-procedure with a close monitoring of the sleep with logs and data from the medical and/or psychiatric history. The sensitivity/specificity scores were good for sleep apnea, insomnia, restless legs / PLMD, circadian rhythm sleep disorder, and nightmares, whereas these scores were promising but yet preliminary for the other sleep disorders (due to small sample sizes). The overall agreement between SLEEP-50-classifications and clinical diagnoses was good (kappa was .77). In addition, the SLEEP-50 could distinguish insomniacs from sleep patients with Sleep State Misperception (SSM – a sleep disorder where the sleep is not disturbed but patients perceive to sleep only a few hours per night). But, most importantly, the SLEEP-50 seemed to be adequate in 'diagnosing' nightmares.

Prevalence

With the SLEEP-50 an estimate of the prevalence of nightmares – and other sleep disorders – could be made in chapter four. Only one prevalence study has been conducted on nightmares with validated measurements (Ohayon et al., 1996), prevalence studies on all DSM-IV sleep disorders have been absent, and data on the prevalence of nightmares and other sleep disorders in the Netherlands were lacking. Eight hundred participants were randomly selected from several phonebooks (according to the geographical distribution) and approached via the mail. They received the SLEEP-50 with two accompanying validated questionnaires: one on a variety of psychiatric complaints (the SCL-90) and the other on PTSD-complaints (SRIP or ZIL).

One limitation considered the response rate. Only 40.4% responded, so after six weeks a reminder mail was sent to non-responders. This raised the final response-rate to 50.3%, but the sample had a higher mean age and higher level of education than the general Dutch population. The findings should therefore be interpreted with caution, although a

comparison of initial responders with initial non-responders (who responded after the reminder mail) revealed no significant differences in prevalence-estimates.

About one fourth of the sample suffered from at least one sleep disorder, with insomnia (8.5%), sleep apnea (4%), and restless legs / PLMD (5.4%) being the most prevalent. Nightmares were found in 2.2%, although 7.2% reported to have nightmares but did not suffer from their (occasional) nightmares. Other sleep disorders had a prevalence of lower than two percent; prevalences of these sleep disorders could not reliably be estimated, a larger sample is therefore needed. Moreover, about 2-3% suffered from more than one sleep disorder, with insomnia most frequently occurring as a co-morbid sleep disorder. This is not very surprising since apnea, limb movements, and nightmares lead to awakenings and a disrupted sleep. Moreover, about a quarter of the participants with a sleep disorder seemed to have a co-morbid affective disorder (depressive or anxiety disorder), which was significantly higher than the prevalence of affective disorders in non sleep disordered participants. Only nightmares and restless legs / PLMD were prevalent without any co-morbid affective disorder. Other sleep disorders can possibly lead to an increased risk on developing a mental disorder, but longitudinal studies are needed.

Although the response rate was low, the prevalences for sleep disorders found in this study fell within the ranges estimated by other studies (Bixler et al., 1979; Hublin et al., 1999; Klink & Quan, 1987; Lindberg & Gislason, 2000; Lavigne & Montplaisir, 1994; Ohayon, 2002; Ohayon & Roth, 2002; Ohayon & Smirne, 2002; Philips, Young, Finn, Asher, Hening, & Purvis, 2000; Stepansky et al., 1998). Yet, these prevalence-estimates for sleep disorders varied enormously depending on the criteria used (e.g., whether insomnia *complaints* or the sleep disorder insomnia was measured) and on whether the method of measurement was validated or not (Ohayon, 2002). Sleep disorders in the current study were established by a sleep questionnaire with good predictive validity for DSM-IV defined sleep disorders. And moreover, the high prevalence-estimates for nightmares found in previous studies (e.g. Klink & Quan) seemed to result from a difference in the intensity of nightmares. The prevalence of 'nightmare sufferers' in the current study was comparable to that of another study that distinguished occasional from frequent nightmares (Hublin et al., 1999).

Associated mental complaints

Chapter five examined the relations of sleep complaints with mental complaints more closely. For example, participants suffering from nightmares may not have had a co-morbid affective disorder, but could have had elevated levels of depressive and/or anxiety complaints. A correlational study evaluated these hypotheses, and found that there were no significant relations of nightmares with any other mental complaints (no SCL-90 or PTSD-complaint). This was highly surprising since nightmares are a part of PTSD (more specifically the intrusion-cluster of PTSD – American Psychiatric Association, 2000) and since nightmares are often viewed as a nightly symptom of anxiety (chapter one). The results indicated that nightmares are unrelated to specific mental complaints in the general population. The absence of any associations with mental complaints was only found for one other sleep complaint: restless legs / PLMD. All other sleep complaints – insomnia, apnea,

narcolepsy, circadian rhythm sleep disturbances, and even sleepwalking – were related to several mental complaints, mostly anxiety.

In conclusion, the current study provided evidence for the interrelatedness of sleep and depressive and anxiety complaints. This is important because sleep problems are not frequently expressed as a complaint (Lecrubier et al., 1996) whereas sleep complaints are highly distressing and can interfere with treatment. Therefore assessment, referral, and treatment of mental complaints in the general health care need to focus more on sleep problems.

Moreover, these results indicate that nightmares are not merely a nightly anxiety symptom, or a complaint caused by an underlying (anxiety) disorder. Nightmares are a sleep complaint and/or a sleep disorder that occurs relatively independent from other mental complaints / disorders. In addition, because nightmares tend to persist, they should not be neglected as suggested by Kaplan and Sadock in their *Synopsis of Psychiatry* (1998). This applies to both posttraumatic (Schreuder et al., 2000) and idiopathic nightmares (Hublin et al., 1999). Instead, nightmares should always be diagnosed, also if other disorders are present, because nightmares can be treated effectively with specific cognitive-behavioral techniques (see chapter seven, eight, and nine).

Yet, the low response rate was also a limitation for the study reported in chapter five, and the absence of relations of nightmares with other complaints in the general population may not apply to the clinical population of nightmare sufferers. Therefore we included chapter six, in which we studied the characteristics of a relatively homogeneous sample of chronic (idiopathic) nightmare sufferers. Chapter six focused on the definition of nightmares and characteristics of nightmare sufferers. The DSM-IV-TR definition of nightmares (waking up from an extremely frightening dream – American Psychiatric Association, 2000) is unnecessarily strict. Direct awakening from a bad dream does not seem to be related to well-being, although findings on this matter have been conflicting.

To test this, 48 nightmare-sufferers who were recruited via advertisements in local newspapers and magazines filled out the following questionnaires: the SLEEP-50, SCL-90, and the PTSD-checklist SRIP. Direct awakening from a bad dream was only related to agoraphobia – relationships with other mental complaints or general psychopathology were absent. The agoraphobia-scale of the SCL-90 contains an element of extreme anxiety: panic. It is possible, yet at this point very speculative, that the fear in nightmares (with direct awakening) is more catastrophizing, rapidly increasing beyond control, and explosive than the fear in bad dreams (without direct awakening). In addition, as only one quarter of the nightmare sufferers reported to always wake up directly from a bad dream, this DSM-IV criterion seems unnecessary strict. Considering the associations with mental complaints, the amount of physical arousal (e.g. sweating, palpitations) should have been a better criterion than the direct awakening criterion. We therefore suggest that the nightmare definition of the DSM-IV should be refined to include a code differentiating direct from non-direct awakening rather than exclude all negative dreams without direct awakening.

Additionally, this chapter concluded that distinguishing nightmare frequency from nightmare distress is indeed very helpful in understanding the relations of nightmares with other complaints. Nightmare distress correlated with most mental complaints, whereas nightmare frequency did not. These two concepts were only weakly related to each other, making it two different and independent constructs – a finding that has been repeatedly reported (Belicki, 1992; Blagrove et al., 2004; Zadra & Donderi, 2000).

Treatment

The chapters seven and eight explored a new cognitive-restructuring treatment for nightmares: Lucid Dreaming Treatment. Although the first chapter concluded that Imagery Rehearsal Therapy (IRT – rehearsing a new ending of the nightmare mentally during the day) was the treatment of choice for nightmares (Krakow et al., 1995; 2000; 2001; Marks, 1978), the high dropout rates in the treatment-groups of IRT-studies are definitely a concern. It seems warranted to search for alternative cognitive-restructuring techniques.

One such a technique is based upon lucid dreaming – in a lucid dream a person is aware that he or she is dreaming. Since several studies have found a moderate relation between spontaneous lucid dream frequency and nightmare frequency (Schredl & Erlacher, 2004; Stepansky et al., 1998) it seems plausible that nightmares trigger lucid dreaming as has been reported by lucid dreamers (Wolpin, Marston, Randolph, & Clothies, 1992). These findings suggest that Lucid Dreaming Treatment (LDT) might be a more appropriate technique than IRT. With LDT, nightmare sufferers are taught to become lucid in their nightmare through various daily exercises. They can perform actions in the nightmare itself that alter the nightmare and its storyline. When lucid in a dream, everything can be altered (LaBerge, Levitan, & Dement, 1986); the same applies to nightmares. By that rationale, if nightmare sufferers become lucid in a nightmare, they can change the frightening situation. The very few case-studies conducted on LDT showed these effects (Halliday, 1987; Zadra & Pihl, 1997).

In chapter seven the results of the study with eight participants were provided. This study was the second series of cases on LDT and the first that used systematic measurements (e.g. nightmare and sleep items and the Spielberger State / Trait Anxiety Inventory). Two months after a one-hour-session of LDT four participants had been able to become lucid in one of their nightmares (and to lucidly change the frightening situation) and accordingly had fewer and less intensive nightmares afterwards. Two persons reported a reduction in nightmare frequency and a change of the nightmare ending without lucidity, whereas two persons reported no change at all. On the whole LDT was found to be effective in reducing nightmare frequency, although it had no effects on the level of anxiety and on the quality of sleep. Moreover, lucidity itself did not appear to be necessary – the effective therapeutic factor remained thus unclear. The lack of a control-group was a serious threat to this study – after all one could say: was the reduction in nightmares caused by LDT or by a change over time?

Therefore a randomized controlled trial was conducted (chapter eight). Twenty-three participants were randomly assigned to one of the following three groups: one group of eight participants would receive LDT in a two-hour individual session, another group of eight participants would receive LDT in a two-hour group session, whereas seven persons were placed on a waiting-list.

The surprising finding was that although both treatment groups had a significant decrease in nightmare frequency twelve weeks after the session, the effects of the individual LDT session were larger than those of the group LDT session. Moreover, there were no changes in PTSD- or sleep-complaints for any of the groups. And most importantly – lucidity was not found to be a necessary element (again). Only six out of sixteen participants were able to become lucid in a nightmare and then alter the nightmare. For five other participants, the

reduction and changes in the nightmare-storyline came without lucidity, which was thought to be a key-element of LDT.

Imagery Rehearsal Treatment (IRT) and LDT both consist of exposure and mastery exercises although in a different form (e.g. with LDT there is no rehearsing of the changed nightmare mentally, but rather this change is discussed in session). Whether one takes active control over the nightmare *in the nightmare itself* (LDT) or takes control somewhat more indirectly through daily imagery rehearsal exercises (IRT) does not seem to matter. Rather, *changing* the nightmare-storyline seems crucial.

When a change in this nightmare-script is imagined or discussed and a change in the actual nightmare seems possible, nightmare sufferers may experience an increased feeling of mastery over their nightmares that is hardly compatible with the usual feelings of anxiety and helplessness that accompany nightmares. Various authors have suggested that mastery is the clue to treating nightmares (Krakow et al., 1995; 2000; 2001; Marks 1978; Spoormaker, van den Bout, & Meijer, 2003; Zadra & Pihl, 1997). A confronting attitude towards nightmares and a high self-efficacy may be sufficient for a significant reduction in nightmare frequency.

However, at this moment no randomized controlled trial on nightmares has included an attention control-group. As the current control-group (waiting-list) received no professional attention at all, it is hard to determine the effect of professional attention for one's nightmares. So, it would therefore be interesting to compare the effects of IRT and LDT with each other in a randomized controlled trial, with for example exposure (and/or relaxation) as a control-group. An alternative concerns a comparison of the effects of IRT and LDT via a mailed manual, in which case direct contact with a professional is prevented.

A cognitive model of nightmares

Studies on a theoretical framework for the origin and maintenance of nightmares have been completely absent. This dissertation provided a starting point with developing a cognitive-behavioral view on nightmares in chapter nine.

Cognitive processes may be more involved in dream generation than believed (Solms, 2000). REM sleep and dreaming seem to be two separate brain states because dreams (Foulkes, 1962; Hobson, 1988) and nightmares (van der Kolk, Blitz, Burr, Sherry, & Hartmann, 1984, Hefez, Metz, & Lavie, 1987) can also occur in non-REM sleep. Moreover, case-studies on forebrain lesions have shown that a cessation of dreaming could be reported although REM sleep was still preserved. Forebrain mechanisms and cognitive processes seem to be actively involved in dreams and nightmares. For nightmares, a model is proposed of a cognitive process based upon the activation of a script. Recurrent nightmares occur in themes or as replications of a traumatic event – both have a repetitive storyline. In both types of recurrent nightmares, the storyline is represented in a highly adverse script evoking intensely negative responses. A script will be developed if a person experiences a traumatic event during the day or a mini-traumatic event during the sleep – *in a nightmare*, as nightmares usually involve threats to survival, security or self-esteem. Yet, the impact of a nightmare is most important, as a higher impact will increase the likelihood of the development of a script that will lead to recurrent nightmares. People with high scores on neuroticism are more likely to experience intensely adverse reactions during and after a

nightmare, and are more likely to develop a nightmare-script and recurrent nightmares. Several conditioned cognitive and behavioral responses were found to be of importance in the persistence of recurrent nightmares (Haynes & Mooney, 1975; Schredl & Palmer, 1998), which, contrary to the common belief, do not seem to fade (Hublin et al., 1999; Kales et al., 1980; Cirignotta, Zucconi, Mondini, Lenzi, & Lugaresi, 1983). Several other studies (Fisher, Byrne, Edwards, & Kahn, 1970; Spoormaker, Schreuder, Kamphuisen, & Kleijn, 2004; Woodward et al., 2000) also indicated that nightmares are a learned cognitive behavior, or in cognitive terminology: an acquired script. The activation of the nightmare-script during sleep was suggested to be caused by neutral dream images that are linked with the nightmare-script, and this activation was thought to be mediated by current levels of anxiety, and to result in the replay of a recurrent nightmare. Nightmare-treatment should therefore focus on the alteration of the nightmare-script, which is the key-element of two effective cognitive-restructuring techniques for nightmares: Imagery Rehearsal and Lucid Dreaming Treatment. Several testable predictions were derived from this cognitive model of recurrent nightmares, pointing out new directions for future studies.

The development of a cognitive-behavioral framework for nightmares will aid in the recognition of nightmares as a separate sleep disorder. Nightmares are prevalent, cause distress, are unrelated to specific mental complaints or disorders and can be treated effectively. Nightmares should therefore receive more attention in the general health care.

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Samenvatting

(Summary in Dutch)

In de afgelopen tien tot vijftien jaar is het onderzoeksgebied van nachtmerries aanzienlijk gegroeid. Dat was een welkome ontwikkeling omdat het gebrek aan wetenschappelijke aandacht heeft geleid tot een gebrek aan kennis over nachtmerries bij psychologen, psychiaters en huisartsen. De gemiddelde Nederlander weet daardoor weinig over nachtmerries, en mensen die last hebben van nachtmerries weten zelden waar ze hulp kunnen zoeken, en wat voor hulp ze dan kunnen verwachten. Overigens geldt dit ook voor andere slaapstoornissen – geschat wordt dat slechts 15% van de mensen met een slaapstoornis, zoals insomnie of een ademhalingsgebonden slaapstoornis (o.a. snurken), de juiste behandeling krijgt. Bij nachtmerries ligt dit percentage waarschijnlijk nog lager.

De recente ontwikkelingen in het vakgebied zijn onder andere gestart door de invoering van de diagnose 'posttraumatische stress stoornis' (PTSS) in de DSM-III in 1980. PTSS is een stoornis die kan ontstaan na het meemaken van een traumatische ervaring, en nachtmerries zijn vaak een van de klachten (of een van de belangrijkste klachten) van PTSS. Het gevolg was helaas dat nachtmerries werden gezien als een 'symptoom van een groter syndroom': een nachtelijke angstklacht. Deze dissertatie laat zien dat deze manier van kijken naar nachtmerries niet alleen weinig functioneel is (nachtmerries worden dan immers niet apart gediagnosticeerd en behandeld), maar ook nog eens onjuist.

Een ander gevolg van de ontwikkelingen op dit onderzoeksterrein is dat de hoeveelheid onderzoek onevenwichtig verdeeld is over de subgebieden. Zo zijn er bijvoorbeeld talloze correlationele onderzoeken gedaan naar de verbanden tussen nachtmerries en persoonlijkheidskenmerken (zoals neuroticisme) en zijn er ook vele studies uitgevoerd in het slaap laboratorium waarin de slaap van PTSS-patiënten met nachtmerries werd bestudeerd met polysomnografie. Andere gebieden zijn onderbelicht gebleven omdat ze minder voor de hand lagen – terwijl ze niet minder belangrijk zijn. Die gebieden worden in deze dissertatie besproken. Het gaat dan om de juiste manier van nachtmerries meten, hoe vaak nachtmerries voorkomen en waar ze aan gerelateerd zijn, hoe mensen het beste van hun nachtmerries afgeholpen kunnen worden en hoe nachtmerries theoretisch te begrijpen zijn.

Meten van nachtmerries

In hoofdstuk twee werd gekeken naar drie methoden om nachtmerries te meten: 1) met polysomnografie (al dan niet in een slaap laboratorium); 2) met retrospectieve vragenlijsten; en 3) met prospectieve dagboeken. Alledrie de methoden leveren problemen op. Polysomnografische metingen in het slaap laboratorium zorgen ervoor dat mensen helemaal geen nachtmerries meer lijken te hebben. Misschien komt het doordat het slaap laboratorium zo'n kunstmatige setting is, of misschien komt het doordat er een professional bij is die voor een veilig gevoel zorgt (of misschien zijn het de elektrodes op het hoofd?). Vragenlijsten waarin vragen worden gesteld over een lange tijdsspanne (bijvoorbeeld: hoe

vaak had je het afgelopen jaar nachtmerries) leiden ertoe dat mensen de hoeveelheid nachtmerries onderschatten. Dagboeken lijken dan de optimale methode, maar veel mensen die last hebben van nachtmerries houden het bijhouden van een dagboek simpelweg niet vol. In hoofdstuk twee werden deze drie methodes met elkaar vergeleken. Twaalf PTSS-patiënten in de kliniek van Centrum '45 (behandelcentrum voor oorlogsslachtoffers en – veteranen) hielden zeven dagen achter elkaar een dagboek bij. Hierna vulden ze een vragenlijst over de laatste zeven dagen. Als dit was afgerond ondergingen ze in de kliniek twee keer 24 uur polysomnografische metingen. Alhoewel deze proefpersonen in de week voor de polysomnografie vaak nachtmerries hadden – ongeveer een per drie nachten – werden er in totaal tijdens de polysomnografie maar twee nachtmerries gemeten, allebei bij één proefpersoon. Dit was significant minder dan verwacht; de proefpersonen voelden zich waarschijnlijk al veiliger doordat ze wisten dat ze geobserveerd werden door een professional. De geschatte hoeveelheid nachtmerries was hetzelfde bij de dagboeken als bij de vragenlijst, en ook andere karakteristieken kwamen overeen. Omdat de vragenlijst eenvoudiger is om in te vullen, lijkt dit nu de optimale methode om de hoeveelheid nachtmerries te meten – zolang het maar over de afgelopen week gaat en niet over de afgelopen maand of maanden.

In hoofdstuk drie werd een dergelijke vragenlijst ontwikkeld voor nachtmerries. Aangezien nachtmerries vaak voorkomen met andere slaapstoornissen, werden meerdere slaapstoornissen opgenomen in deze vragenlijst, de SLEEP-50. De SLEEP-50, een compacte slaapvragenlijst met 50 items, werd ontwikkeld in samenwerking met andere slaaponderzoekers en slaapprofessionals – de bedoeling was om alle slaapstoornissen uit de DSM-IV te meten (Diagnostisch en Statistisch Handboek voor Psychiatrische Stoornissen) én om een onderscheid te kunnen maken tussen slaapklachten (bijvoorbeeld soms niet in kunnen slapen) en slaapstoornissen (bijvoorbeeld vaak slapeloosheid meemaken en daar ook echt last van hebben). Slaap apneu (o.a. snurken), insomnie, narcolepsie, het rusteloze benen syndroom, stoornis in de circadiane ritmiek (bijvoorbeeld een jetlag), slaapwandelen en natuurlijk nachtmerries werden gemeten, net zoals factoren die van invloed kunnen zijn op de slaap (lawaai, middelengebruik) en de *impact* van de slaapklachten op het dagelijkse functioneren (bijvoorbeeld moeite hebben met concentreren, oververmoeid zijn).

Onderzoek in samenwerking met het Centrum voor Slaap- en Waakstoornissen van Kempenhaeghe in Heeze wees uit dat de SLEEP-50 een hoge betrouwbaarheid heeft. Ook werd een interne factor-structuur gevonden die bijzonder leek op de ontworpen structuur. Op basis van de polysomnografische en klinische diagnoses van het slaapcentrum bleek dat de vragenlijst goed kon voorspellen of er een slaapstoornis aanwezig, en zo ja, welke. De aanwezigheid van de slaapstoornissen slaap apneu, insomnie, rusteloze benen, stoornis in de circadiane ritmiek en nachtmerries werd goed voorspeld, en de voorspellingen van andere slaapstoornissen waren veelbelovend (maar er waren slechts tien of minder proefpersonen per slaapstoornis). De overeenkomst tussen de classificaties van de SLEEP-50 en de diagnoses van het slaap centrum was goed. Kortom, uit Hoofdstuk drie bleek dat de vragenlijst gebruikt kon worden om nachtmerries – en andere slaapstoornissen – nauwkeurig en betrouwbaar te meten.

Prevalentie

Dit werd vervolgens gedaan in hoofdstuk vier. Gegevens over hoe vaak nachtmerries voorkomen zijn heel zeldzaam, en de gegevens die er zijn werden vaak gebaseerd op onnauwkeurige vragenlijsten. Ook niet onbelangrijk was dat de prevalentie van nachtmerries (en andere slaapstoornissen) in Nederland totnogtoe onbekend was. Achthonderd Nederlanders werden aselect aangeschreven en ontvingen deze vragenlijsten: de slaaplijst (SLEEP-50), een lijst voor PTSS-klachten (ZIL) en een lijst voor psychische klachten (SCL-90). Slechts 40.4% reageerde, en daarom werd de rest via een herinneringsbrief verzocht om alsnog te reageren. Hierdoor werd de totale respons 50.3%. Er reageerden relatief veel ouderen en mensen met een hoge opleiding. Dat geeft aan dat de gegevens uit deze steekproef niet zonder meer te generaliseren zijn naar de totale populatie.

Veel respondenten hadden slaapklachten (meer dan veertig procent) en één op de vier respondenten had een slaapstoornis. Insomnie kwam het meest voor (8.5%), het rusteloze benen syndroom kwam voor bij 5.4%, slaap apneu bij 4%, en nachtmerries bij 2.2% (alhoewel 7.2% wel nachtmerries rapporteerde maar hier verder niet zo veel last van had). Tien procent van de mensen met een slaapstoornis had een andere slaapstoornis, en 25% van de mensen met een slaapstoornis had een co-morbide affectieve stoornis (depressie of angststoornis). Dit was significant lager bij mensen die geen slaapstoornis hadden: daar had ongeveer 15% een affectieve stoornis. Het lijkt waarschijnlijk dat slaapstoornissen een risico vormen voor het ontwikkelen van een slaapstoornis, maar longitudinaal onderzoek is noodzakelijk. Opvallend was dat geen van de mensen met nachtmerries een co-morbide affectieve stoornis had.

Nachtmerries en psychische klachten

In hoofdstuk vijf werd de relatie tussen slaap en psychische klachten verder onderzocht. Uit deze correlationele studie met hetzelfde data-bestand bleek dat nachtmerries met geen enkele psychische klacht gecorreleerd waren, zelfs niet met het herbelevingscluster van PTSS. Slechts één andere slaapklacht liet hetzelfde patroon zien: het rusteloze benen syndroom. Alle andere slaapklachten (insomnie, slaap apneu, narcolepsie, circadiane ritmiek klachten, en zelfs slaapwandelen) correleerden wel met psychische klachten – vooral met angst maar ook met depressieve klachten.

Dit onderzoek wees uit dat slaap en psychische klachten innig met elkaar verbonden zijn. Dit is van belang voor de Geestelijke Gezondheidszorg (GGZ), waar slaapklachten weinig aandacht krijgen. Slaapklachten kunnen echter interfereren met de behandeling, zorgen voor extra stress en lijken een risico op te leveren voor het ontwikkelen van (meer) psychische klachten. Daarom dient er in de GGZ ook meer aandacht te komen voor het adequaat meten, diagnosticeren en behandelen van slaapklachten en –stoornissen. Ook is het van belang dat nachtmerries geen symptoom van een groter syndroom lijken te zijn, althans niet in de normale populatie.

Misschien zouden er andere verbanden gelden in klinische populatie. Daarom werden in hoofdstuk zes 48 mensen onderzocht die veel last hadden van hun nachtmerries. Ook hier gold dat nachtmerries niet correleerden met welke psychische klachten dan ook. Maar andere karakteristieken van nachtmerries werden ook onderzocht (bijvoorbeeld zoals

wakker schrikken uit een nachtmerrie, of er fysieke arousals zoals hartkloppingen waren en of de gebeurtenis in de nachtmerrie echt meegemaakt was of niet).

Wakker schrikken uit nachtmerries bleek niet gerelateerd te zijn aan een hoger klachtenniveau. Slechts één psychische klacht correleerde met wakker schrikken uit nachtmerries: agorafobie (een combinatie van pleinvrees en paniek). Het is goed mogelijk dat de angst in nachtmerries waaruit mensen wakker schrikken heftiger, explosiever en meer ongecontroleerd is dan de angst in nachtmerries waaruit mensen niet wakker schrikken. Verder stelde slechts een kwart van de nachtmerrie-lijders dat ze altijd wakker schrokken uit hun nachtmerries. De klinische definitie van nachtmerries zoals beschreven in de DSM-IV stelt echter dat wakker schrikken uit een nachtmerrie een noodzakelijk element is, maar deze definitie zou dus gezien deze bevindingen moeten worden aangepast. Dat kan gebeuren met een code die onderscheid maakt tussen nachtmerries waaruit mensen wakker schrikken of waaruit mensen niet direct wakker worden. Ook zouden nachtmerries niet alleen beperkt moeten worden tot angstige dromen – woede en verdriet worden ook vaak genoemd als negatieve emoties in nachtmerries.

Andere karakteristieken van nachtmerries correleerden sterker met een lager welbevinden, zoals de aanwezigheid van fysieke arousal tijdens een nachtmerrie. Ook nachtmerrie *distress*, de impact van een nachtmerrie, is sterker verbonden met het algehele klachtenniveau.

Behandeling

Hoofdstukken zeven en acht onderzochten een nieuwe cognitief-herstructurerende techniek voor nachtmerries: Lucide Dromen Therapie (LDT). In een lucide droom weet de persoon dat hij of zij aan het dromen is terwijl de droom ondertussen gewoon doorgaat en ook beïnvloed kan worden. Alhoewel hoofdstuk één concludeerde dat Imagery Rehearsal Treatment (IRT) momenteel de beste behandeling voor nachtmerries is, blijft de hoge uitval (25-40%) bij deze techniek erg problematisch. Dit rechtvaardigt onderzoek naar andere, verwante technieken.

Zeker omdat onderzoek het zeer waarschijnlijk heeft doen lijken dat mensen met nachtmerries vaak spontaan een lucide droom krijgen in hun nachtmerries (een nachtmerrie is dan een *trigger* voor een lucide droom) en omdat lucide dromen een vaardigheid is die kan worden aangeleerd, zou LDT wel eens een zeer goed toepasbare en effectieve behandeling voor nachtmerries kunnen zijn. Anekdotisch bewijs voor deze hypothese kan gevonden worden in enkele case-studies.

Hoofdstuk zeven beschrijft de eerste serie van case-studies met systematische metingen. De gebruikte vragenlijsten waren een voorloper van de SLEEP-50 en de Spielberger State / Trait Anxiety Inventory. Acht mensen die last hadden van nachtmerries kregen één sessie LDT (duur: één tot anderhalf uur). Na twee maanden bleek dat vier proefpersonen minder nachtmerries hadden doordat ze lucide waren geworden in een van hun nachtmerries en de nachtmerrie hadden kunnen veranderen. Twee proefpersonen werden niet lucide in een nachtmerrie, maar bij hen veranderden de nachtmerries uit zichzelf, een opvallende bevinding. De twee overige personen hadden geen verandering in of vermindering van hun nachtmerries. LDT leek dus effectief te zijn, maar het verminderde alleen de nachtmerries. Er werden geen veranderingen gevonden in de slaap kwaliteit en het angstniveau. Ook

bleek luciditeit dus niet noodzakelijk te zijn, iets dat vragen oproept over wat de werkzame therapeutische factor van LDT is. Maar aangezien deze case-serie geen controle-groep had, kon niet worden uitgesloten dat mensen minder nachtmerries hadden door andere factoren (bijvoorbeeld een spontane vermindering over de tijd heen, of een vermindering veroorzaakt door meedoen aan een onderzoek naar nachtmerries).

In hoofdstuk acht werd daarom LDT bestudeerd met een controle-groep (wachtlijst). Ook werden twee verschillende manieren van LDT bestudeerd, namelijk in een individuele sessie en in een groepssessie (één sessie van twee uur). Drie-en-twintig proefpersonen met nachtmerries werden willekeurig over deze drie groepen verdeeld (gerandomiseerd).

Na twaalf weken was de hoeveelheid nachtmerries verminderd in beide LDT groepen. De effecten van de individuele sessie waren echter groter dan de effecten van de groepssessie. Er werden overigens geen veranderingen gevonden in de slaap kwaliteit en de hoeveelheid PTSS-klachten (gemeten met de ZIL). En weer bleek dat luciditeit niet nodig was. Slechts zes van de zestien behandelde proefpersonen werden lucide in een nachtmerrie, bij vijf proefpersonen veranderde en verminderde de nachtmerries zonder luciditeit.

Over het algemeen lijken de technieken LDT en IRT erg op elkaar. Ze bestaan beide uit exposure en veranderen beide de verhaallijn van de nachtmerrie, het script. IRT doet dit door mensen overdag een nieuw (positiever) einde te laten verzinnen en in te laten beelden, LDT doet dit door mensen tijdens de sessie een alternatief einde te laten kiezen, dat ze dan uiteindelijk in de nachtmerrie moeten gaan uitvoeren. Het lijkt er nu dus op dat het niet uitmaakt of zo'n alternatief einde overdag wordt ingebeeld of in de nachtmerrie zelf actief wordt uitgevoerd. Wel belangrijk is *dat* de verhaallijn van de nachtmerrie wordt veranderd. Dat leidt waarschijnlijk tot een sterker gevoel van controle, een gevoel dat het tegenovergestelde is van de gevoelens van hulpeloosheid en intense angst die gepaard gaan met nachtmerries.

Minpunt was echter dat de controle-groep bestond uit mensen die op de wachtlijst voor LDT werden geplaatst. Zij kregen dus geen professionele aandacht voor hun nachtmerries, en die professionele aandacht zou ook al nachtmerries kunnen verminderen. Toekomstig onderzoek zou daarom beter een controle-groep kunnen gebruiken met dezelfde hoeveelheid professionele aandacht. Een andere optie is om LDT via bijvoorbeeld een zelfhulptekst te onderzoeken. Ook zou het interessant zijn om LDT en IRT te vergelijken, met exposure als een controle-groep.

Nachtmerries in een cognitief model

In hoofdstuk negen werd een begin gemaakt met de ontwikkeling van een cognitief model voor nachtmerries.

Uit onderzoek blijkt dat dromen en nachtmerries actief geconstrueerd worden door bepaalde structuren in de voorhersenen, iets dat ingaat tegen de heersende theorie op dit vakgebied. Deze theorie stelt dat REM slaap, gecontroleerd door de hersenstam, de hersenstaat is tijdens welke mensen dromen (de subjectieve ervaring). Maar mensen die een dwarslaesie opliepen in bepaalde plekken in de voorhersenen meldden nooit meer te dromen, terwijl ze nog wel REM slaap hadden. Ook komen dromen voor tijdens andere stadia dan REM slaap. Kortom, bij de vorming van nachtmerries lijkt er wel degelijk invloed te zijn van de voorhersenen in de vorm van actieve cognitieve processen.

Zo'n cognitief proces voor nachtmerries zou de activatie van een script kunnen zijn. Herhalende nachtmerries komen voor in thema's (idiopathisch) of als (exacte) herbelevingen van een traumatische gebeurtenis (posttraumatisch). In beide typen nachtmerries is de verhaallijn van de nachtmerrie steeds hetzelfde. Deze verhaallijn, het nachtmerrie-script, bevat informatie die zeer intense en negatieve reacties oproept. Een script kan ontstaan na het ervaren van een traumatische gebeurtenis overdag, maar ook na het ervaren van een mini-traumatische gebeurtenis *'s nachts in een droom.* Hoe meer impact een nachtmerrie maakt, hoe groter de kans dat het gerepresenteerd wordt in een script en dus een herhalende nachtmerrie wordt. Hoe neurotischer iemand is, hoe groter de kans dat een nachtmerrie een diepe impact maakt. Nachtmerries blijven bestaan doordat het nachtmerrie-script niet verandert dankzij meerdere vermijdende cognitieve en gedragsresponses (en verdwijnen daardoor niet vanzelf). De activatie van een nachtmerrie-script tijdens de slaap vindt plaats door neutrale droombeelden die worden geassocieerd met een element uit het nachtmerrie-script. Het gevolg is dat een nachtmerrie ontstaat: het script wordt opnieuw afgespeeld. De behandeling van nachtmerries moet zich daarom richten op het doorbreken van het script, en dit is precies wat herstructureringstechnieken zoals LDT en IRT doen. Uit dit model kunnen meerdere hypothesen worden afgeleid, die in toekomstig onderzoek getest kunnen worden.

De ontwikkeling van een cognitief model voor nachtmerries zal helpen bij de erkenning en hrkenning van nachtmerries. Nachtmerries komen vaak voor, zorgen voor veel stress, belemmeren het functioneren en kunnen effectief worden behandeld. Daarom moeten nachtmerries meer aandacht krijgen in de gezondheidszorg. Niet als symptoom van een onderliggend syndroom, maar als een aparte slaapstoornis.

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Victor

Curriculum Vitae

Victor Spoormaker was born in 1979 in Oud-Beijerland, the Netherlands. After the completion of his secondary school education (VWO) in 1997 he studied Psychology at Utrecht University. He majored in Clinical Psychology and studied a semester at the University of Florida at Gainesville. After studying for three and a half years, he received his master's degree 'cum laude' for a thesis on nightmares. In 2001, he applied for and received a VSB-grant to conduct research on nightmares and lucid dreaming with Stephen LaBerge at Stanford University.

Back at Utrecht University, where he had taught several courses in Statistics as a teaching assistant, his supervisor convinced him to apply for a Ph.D. grant at the Research Institute for *Psychology and Health*, which was sustained. During his first two years as a Ph.D. candidate he was active in the Ph.D. Network of the Netherlands, first as vice-president and later as president. He wrote a popular-scientific book about dreaming and gives lectures to the general public on this topic. He currently works as a lecturer at the department of Methodology and Statistics and the University College Utrecht and as a postdoctoral fellow at the department of Clinical Psychology – all at Utrecht University.

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