Sleep Hypn 2016;18(1):8-18
http://dx.doi.org/10.5350/Sleep.Hypn.2016.180103

Sleep and Hypnosis

ORIGINAL ARTICLE

Sleep Problems and the Phenomenological Factors of Dreaming

Calvin Kai-Ching Yu[1*] and Nigel S. Thompson[1]

[1]Department of Counselling and Psychology, Hong Kong Shue Yan University, Hong Kong

ABSTRACT

This study aims to provide a preliminary overview of how specific sleep problems might have differential impacts on the phenomenological properties of dreaming. The sample contained 186 upper secondary school students, whose subjective intensity of dream experiences, thematic dream content, and sleep disturbances were assessed using the Dream Intensity Scale, Dream Motif Scale, and Sleep Habits Questionnaire, respectively. The overall evidence suggests that most sleep problems, except sleep bruxism, sleepwalking, and snoring, can amplify various aspects of dreaming, with the effects of sleep paralysis being the most robust and extensive. Although both sleep onset insomnia and hypersomnia may increase the overall intensity of dreaming, the elevated dream intensity in sleep onset insomnia is primarily reflected by stronger dream distortion and paramnesia whereas that in hypersomnia is more contributed by vivid perceptual sensations during dreaming.

Keywords: dream themes, dream intensity, narcolepsy, sleep disorders, sleep disturbances

INTRODUCTION

Sleep problems can be roughly divided into dyssomnias and parasomnias. The former, the exemplars of which include insomnia, hypersomnolence, and disrupted circadian rhythm, are disorders of the amount, quality, or timing of sleep. The latter are signified by unusual behaviors or events occurring during sleep. Some parasomnias – including nightmare disorder, rapid eye movement (REM) sleep behavior disorder, and non-rapid eye movement (NREM) sleep arousal disorders, such as sleepwalking and sleep terror – are formally defined as disorders in the Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association, 2013); some others, such as sleeptalking and bruxism, are not necessarily considered to be abnormal. Because dreaming takes place during sleep, problems that affect sleep might also alter dream experiences.

Nightmare disorder of its own accord is a problem of dreams – that is, the recurrence of frightening dreams that time and again awaken the sleeper in the second half of the night. Nightmares are also a clinical feature of REM sleep behavior disorder (RBD) (American Psychiatric Association, 2013). Some studies have been conducted to compare dreams reported by patients suffering RBD and those reported by healthy controls (Fantini, Corona, Clerici, & Ferini-Strambi, 2005), Parkinson's disease patients without RBD (Valli et al., 2015), and patients with sleepwalking or sleep terror (Uguccioni et al., 2013). They

***Correspondence:** calvinkcyu@ymail.com
Calvin Kai-Ching Yu, Department of Counselling and Psychology, Hong Kong Shue Yan University, 10 Wai Tsui Crescent, Braemar Hill Road, North Point, Hong Kong.

consistently demonstrated that RBD patients' dreams were more negatively toned and contained more aggressive threats posed by human or animal characters. Accordingly, motor manifestations during RBD episodes can be understood as the acting-out behaviors that correspond with fight or flight reactions to the threats in dreams (Valli et al., 2012).

Narcolepsy is another sleep disorder which has direct connections with REM sleep and dream experiences. Narcoleptics tend to have higher dream recall frequency (Schredl, 1998), more negative and bizarre dreams (Schredl, 1998), more nightmares (Pisko, Pastorek, Buskova, Sonka, & Nevsimalova, 2014), and more lucid dreams (Lequerica, 1999) in comparison with ordinary people. They are even more vulnerable to confusing dreamed events with reality possibly because of the salience of dream memories (Wamsley et al., 2014). As suggested by their unusually long and complex mentation reports for the first REM cycle of the night, dream mechanisms might reach their optimal functioning earlier in narcoleptics (Cipolli et al., 2008; Mazzetti et al., 2010). This might explain why they experience magnified dream intensity.

Although dream activities mostly transpire within REM epochs with an incidence rate of over 90% (Yu, 2014a, 2015), less elaborate forms of mentation can be retrieved from NREM sleep (Nielsen, 2000; Oudiette et al., 2012; Takeuchi, Ogilvie, Murphy, & Ferrelli, 2003). This leads to the conjecture that similar to RBD, NREM arousal behaviors might also represent the enactment of dreamed behaviors. Some evidence indicates that sleep terrors and sleepwalking are sometimes accompanied by mentation made up of a single, unpleasant visual scene, such as being a victim of aggressive acts (Fisher, Kahn, Edwards, Davis, & Fine, 1974; Oudiette et al., 2009). Zaharna (2014) even reported a case in which a male sleepwalker acted out complex dreamlike mentation – tied his daughter to the clothesline in the attic of his house. This occurs despite the clinical feature that most sleepwalking episodes involve daily, simple routine behaviors, such as simply sitting up in bed, leaving the bed, using the bathroom, and leaving the apartment (American Psychiatric Association, 2013). Dreams of these behaviors are indeed quite common – namely, "dreams of convenience" or "dreams of impatience," which are thought to protect sleep from interruption by presenting needs and obligations as fulfilled such that the sleeper no longer needs to wake up to satisfy them (see Yu, 2012a).

Sleep problems defined neither by sleep stages nor by sleep mentation also indirectly influence dream experiences. Insomnia often manifests with elevated frequencies of dream recall and nightmares (Ohayon, Morselli, & Guilleminault, 1997; Schredl, 2009a; Schredl, Schäfer, Weber, & Heuser, 1998), which can be accounted for by frequent nocturnal awakenings and waking-life concerns in accordance with the arousal-retrieval model of dream recall and the sleep-wake continuity hypothesis (see Schredl, 2009b, 2010), respectively. In a similar vein, de Groen et al. (1993) found that snoring, especially snoring with respiratory pauses, was associated with more anxiety dreams. They attributed this association to autonomic-vegetative arousal resulting from sleep apneatic episodes of heavy snoring. Schredl (2008) also documented somewhat similar finding that nightmare frequency increased with breathing pauses but not with snoring. Furthermore, Krakow et al. (2000) demonstrated that treatment for sleep-disordered breathing in chronic nightmare sufferers not only improved their sleep quality but also reduced their nightmares.

In stark contrast to the findings reviewed above, there are indeed antithetical findings, which run counter to the proposition that sleep problems intensify dream experiences. These include the non-significant difference in dream content between RBD patients and healthy controls (D'Agostino et al., 2012), non-significant relationship between snoring and disturbing dreams (Hicks & Bautista, 1993), non-significant differences in the frequencies of dream recall and unpleasant dreams between low-risk and high-risk groups for sleep apnea (Khazaie, Masoudi, Khoshbakht, & Ghadami, 2014), lower dream recall frequency and nightmare frequency in patients with sleep-disordered breathing as compared to healthy controls (Schredl & Schmitt, 2009), non-significant difference in dream recall frequency between patients with restless legs syndrome and healthy controls (Schredl, 2001), negative correlation between dream recall

frequency and the number of periodic leg movements with arousal (Schredl, 2001), and lower dream recall frequency in insomniac patients as compared with non-insomniac patients (Pagel & Shocknesse, 2007).

The contradictory findings allude to the existence of some interfering variables; for certain sleep problems not directly involving sleep mentation, it is perhaps the distress or awareness of sleep problems rather than the sleep problems per se that changes dream experiences. Gross and Lavie (1994) studied REM mentation in patients with sleep apnea. They demonstrated that 1) dream reports after REM periods with apneas were longer than those after REM periods without apneas, 2) dream reports after apneic REM periods were more negative than dream reports after healthy REM periods, and 3) no apneic stimuli were systematically incorporated into dream content. They therefore argued that dream experiences are influenced only in a global fashion by the stress relating to the breathing difficulty – that is, the secondary symptom of sleep apnea.

MacFarlane and Wilson (2006) investigated how waking somatic concerns and somatic stimuli associated with different sleep disorders might affect dream content. Their findings seem to lend further support to the argument put forth by Gross and Lavie. In their study, patients complaining of excessive perspiration were more likely to dream about sweating. Apneics did not dream choking and suffocation more frequently than nonapneics while patients who reported difficulty breathing during wakefulness dreamed more about being smothered. In a similar vein, narcoleptic patients were more likely to dream of paralysis, while patients suffering periodic leg movements rarely dreamt of this theme. As with Gross and Lavie, MacFarlane and Wilson concluded that dream content does not necessarily incorporate somatic stimuli pertaining to specific sleep disorders but reflects waking stressors.

It is noteworthy that MacFarlane and Wilson employed questionnaires to measure somatic concerns and dream content. Since dreaming has a tendency to deal with events that are of emotional significance (Yu, 2007a, 2014c, 2015), a condition unknown to the sleeper, as is often the case for snoring, is unlikely to be carried over into dream consciousness. Accordingly, asking participants to indicate, in a questionnaire, whether they suffer sleep disturbances, probably constitutes a parsimonious, yet effective way for testing the relationship of sleep problems with dream experiences.

In addition to the awareness of sleep problems, the inconsistent findings between studies can be also ascribed to the different measures of dreams adopted by researchers. A single-probe measure of dream recall or nightmare frequency (e.g., Schredl & Schmitt, 2009) and content analysis of dreams obtained with a sleep diary or by the REM awakening method (e.g., D'Agostino et al., 2012) are the major approaches to dream research. However, the extent to which the dream recall frequency quantified by a single-probe scale or a few samples of dream content can represent a person's dream attributes is contentious. Yu (2007b, 2008, 2010) argued that dream inventories, the psychometric properties of which can be effectively evaluated by statistical procedures, best suit the purpose of assessing the subjective intensity of nocturnal mentation as a psychological attribute, while day-to-day variations in dream activities should be more pertinently assessed by the journal or REM-awakening method. He (Yu, 2010, 2011, 2012c) demonstrated, furthermore, that compared with a single-probe scale, a profile comprising an assortment of dream variables is more sensitive to the variations in external parameters, such as emotional stability. Accordingly, a retrospective profile that characterizes an individual's nocturnal mentation activities appears to be a proper method for investigating the chronic effects of sleep disturbances on dream experiences.

With the exception of RBD and narcolepsy, research findings concerning the association between sleep problems and dreaming are meager and not entirely consistent. There have been very few, if any, systematic studies examining whether disrupted circadian rhythm, hypersomnolence, sleepwalking, sleeptalking, and sleep bruxism modulate dream experiences. Given that multiple daytime naps, fragmented nighttime sleep, and insomnia are the common clinical features of circadian rhythm sleep-wake disorders, for example, it can be surmised that people whose circadian rhythm is disrupted would recall more dreams. Similarly, hypersomniacs' longer sleep

duration might enhance the occurrence of dreaming. In filling the gap, the study presented here was geared toward providing a panoramic overview of how specific sleep problems might have differential impacts on the phenomenological properties of dreaming. The Dream Intensity Scale and Dream Motif Scale, which are distinguished by their good psychometric properties, broad coverage of dream activities, and sensitivity to psychological parameters, including a wide range of psychopathological traits (Yu, 2008, 2010, 2012a, 2012c, 2013a, 2013b, 2014b, 2014c), were utilized to assess dream experiences.

In light of the high comorbidity between sleep problems, such as nightmares in insomniacs, RBD and sleepwalking in narcoleptics, and restless legs syndrome in apneoics (American Psychiatric Association, 2013), it was hypothesized that a global score for sleeping problems, as well as scores for dyssomnias and parasomnias in particular, would be positively correlated with scales assessing the intensity and thematic content of participants' dreams. Additionally, 11 specific hypotheses were generated based on three major assumptions: 1) sleep problems, as evidenced by sleep fragmentation and a greater number of awakenings, alter the level of arousal during sleep, 2) the sensory and physiological conditions at sleep can be converted into dream images (see Yu, 2012b) or conversely, dream behaviors are acted out, and 3) dreams reflect the emotions associated with sleep problems. The 11 hypotheses are enumerated as follows:

1. Both sleep onset insomniacs (difficulty initiating sleep) and late insomniacs (waking up in early morning with an inability to return to sleep) would have an overall more intense experience of dreaming.
2. Hypersomniacs would have an overall more intense experience of dreaming.
3. People suffering disrupted circadian rhythm were expected to show an overall more intense experience of dreaming.
4. In addition to anoverall stronger dream intensity, people with sleep paralysis would experience more paramnesia, altered dream episodes (e.g., lucid dreaming, exerting control over dream content), and persecution, sensorimotor activities, unusual creatures, paralysis, and difficulty breathing in dreams.
5. The experience of night terrors would be associated with a greater number of bad and persecutory dreams.
6. People with snoring or sleep-related respiratory pauses would experience difficulty breathing in their dreams.
7. People with bruxism would experience more anxiety or aggression in dreams.
8. People with potential REM sleep behavior (violent behaviors during sleep, such as punching and kicking) were expected to experience more aggressive dreams or dreams involving vigorous movements.
9. People showing restless, jerking leg movements during sleep were expected to experience more aggressive dreams or dreams involving vigorous movements.
10. Sleepwalkers were expected to have more dreams of convenience.
11. Sleeptalkers would experience more autosuggestive episodes during which they talk themselves into certain dream images.

METHOD

Participants

A total of 186 upper secondary school students constituted the sample. Ninety one (48.9%) participants were male and 95 (51.1%) were female. The mean age was 17.75 years (SD= 1.22, range= 16-22). Participation was voluntary and without payment.

MATERIALS

The Dream Intensity Scale (DIS), Dream Motif Scale (DMS), and Sleep Habits Questionnaire (SHQ) were used to examine participants' subjective intensity of dream experiences, thematic dream content, and sleep disturbances.

DIS. The DIS (Yu, 2012c), which assesses the subjective magnitude of dream experiences, contains four scales and eight subscales. The Dream Quantity scale is composed

of variables that measure the quantitative aspect of regular dream activities shared by most people, including the frequencies of dream awareness, recalling the main content of dreams, nightmares, and multiple dreams in a single night. The Dream Vividness scale is made up of the Major Modalities and Minor Modalities subscales, which encompass variables concerned with sensory experiences during dreaming (e.g., smelling something, feeling emotions in dreams). The Diffusion scale comprises the Dream Work and Paramnesia subscales, both of which measure the cognitive distortion that entails the transference of psychical values (e.g., condensation, dream-reality confusion). The Paramnesia subscale, for instance, measures the frequency with which people experience the difficulty distinguishing between memories of dreamed and real-life events, implying the breakdown in boundaries and the invasion of material between the two conscious systems. The Altered Dream Episodes scale, which consists of the Lucid Dreaming and Autosuggestion subscales, assesses dream lucidity based on the incidence of altered forms of dream experiences (e.g., awareness of being in a dream, re-experience of wishful dreams). The sum of the four-abovementioned scales generates a DIS global score.

DMS. The DMS (Yu, 2012a) evaluates the intrinsic predispositions that modulate the fabrication of dream narratives. It consists of 100 dream themes, various combinations of which can form 14 scales, each gauging a dream predisposition. The Delusion predisposition, which encompasses a variety of classic themes characteristic of psychosis, delusional disorder, and paranoid personality, is the largest DIS scale. Themes pertaining to the Persecution predisposition, such as "being tracked and "some people plotting against you," can be largely compared to those persecutory delusions observed in schizophrenia. Themes subsumed under the Paranoia category are concerned with paranoid suspiciousness, such as "blaming others for blaming you wrongly" and "others not giving you proper credit for your achievements." The Fight scale consists of themes featuring aggressive activities and weapons, such as "killing someone" and "knives, swords, or daggers."

SHQ. The SHQ (Gau, 2000) comprises 13 brief descriptions similar to the DSM criteria for sleep disorders. Respondents are required to indicate whether they have experienced each sleep problem over the past six months (current prevalence) and six months ago (lifetime prevalence). In the study presented here, the original item "frequent leg movements during sleep" was changed to "frequent leg movements, jerking legs, or leg pain during sleep." Moreover, two new items were added to assess potential REM sleep behavior and hypersomnia: "frequently and vigorously moving arms and legs, even punching and kicking, during sleep" and "This happens three times a week or more often and lasts for at least one month: Sleeping more than 10 hours at night, being very difficult to wake up from sleep in the morning."

The 15 sleep problems can be categorized as dyssomnias and parasomnias (see Table 1). The sum of all 30 SHQ item scores gives a total score, which indicates the diversity and chronicity of the sleep problems. The Cronbach's alpha value for the internal consistency of the SHQ global scale was .772, those for the Dyssomnias and Parasomnias subscales being .707 and .672, respectively. Besides the 15 sleep problems, participants' sleep patterns and the impacts of sleep disturbances on daytime functioning were also examined (see Tables 2 & 3). Since the problem of recurrent nightmares by itself is a dream experience and overlaps with some items of the DIS and DMS, this sleep problem was not analyzed in the study presented here.

RESULTS

Table 1 shows the prevalence rates of dyssomnias and parasomnias within the sample. The lifetime prevalence of sleepwalking was almost five times more than its current counterpart. Restless legs and disrupted circadian rhythm were the most common sleep problems. More than 50% of participants were late sleepers (see Table 2). The average duration of sleep was 6.31 (SD= 1.54) hours, which was shorter than the average of 8.05 (SD= 1.87) hours of sleep that participants reckoned as enough. More than a third of the sample experienced drowsiness, sleep attack, and other sleep-related functional

Table 1: Current and lifetime prevalence of sleep problems

	%	
	Past six months	Six months ago
Dyssomnias		
Sleep onset insomnia	20.8	22.8
Late insomnia	11.5	14.1
Hypersomnolence	20.7	27.9
Sleep paralysis	15.8	24.0
Cataplexy	8.7	7.1
Snoring	15.2	16.4
Sleep-related respiratory pauses	3.8	2.7
Disrupted circadian rhythm	34.8	38.8
Parasomnias		
Recurrent nightmares	21.9	26.2
Sleep terror	17.4	22.5
Sleep bruxism	10.9	17.5
Potential REM sleep behavior (punching and kicking during sleep)	10.9	14.3
Restless, jerking, painful legs	40.4	48.1
Sleeptalking	21.2	35.0
Sleepwalking	2.2	9.8

Table 2: Sleep patterns

Sleep Patterns	%
Regular sleeping pattern	42.4
Late sleep, late rise	32.1
Late sleep, early rise	23.4
Early sleep, early rise	2.2

Table 3: Functional consequences of sleep

Functional consequences	%
Not refreshed after sleep more often than not	34.4
Experience daytime drowsiness and sleep attack	35.9
Doze off during lessons or reading	72.1
Doze off when travelling in a vehicle	64.2
Doze off while working or doing homework	50.6
Difficulty concentrating on work or learning half the time or more often	52.7
Daytime napping habit	33.7

consequences during the daytime for at least three consecutive months (see Table 3).

Both the DIS global score and the DMS Delusion score were positively correlated with the SHQ total scores as well as the Dyssomnia and Parasomnia subscale scores (see Table 4). The Bad Dreams, Autosuggestion, Convenient Dreaming, Animal Symbolism, and Unusual Creature scores varied significantly with the Parasomnia score but not with the Dyssomnia score, which exhibited a relatively strong correlation with the Grandiosity, Persecution, and Sensorimotor Excitement scores.

The following analysis tested for the 11 hypotheses concerning the lifetime effects of specific sleep problems on dream characteristics by comparing participants who had ever suffered a particular sleep disturbance (in the recent six months, six months before, or both) and who had not.

Hypothesis 1: Both sleep onset insomniacs and late insomniacs would have an overall more intense experience of dreaming.

Compared with participants without sleep onset insomnia, sleep onset insomniacs exhibited a significantly larger score on both the DIS global ($z= 2.717$, $p<.01$, Cohen's $d= 0.433$) and DMS Delusion scales ($z= 2.565$, $p<.05$, Cohen's $d= 0.352$). The significance of the difference in the DIS total score was primarily contributed by the larger Diffusion score ($z= 3.406$, $p<.001$, Cohen's $d= 0.563$). Compared with participants without late insomnia, late insomniacs scored significantly higher on the DMS Delusion scale ($z= 3.200$, $p<.01$, Cohen's $d= 0.624$) but not on the DIS global scale ($z= 1.746$, $p>.05$, Cohen's $d= 0.325$).

Hypothesis 2: Hypersomniacs would have an overall more intense experience of dreaming.

Compared with participants without hypersomnia,

Table 4: Spearman's rho correlations between the SHQ and dream scales

	Total SHQ score	Dyssomnia score	Parasomnia score	SHQ score (past six months)	SHQ score (six months ago)
DIS					
Dream intensity	.332***	.289**	.268*	.324**	.280**
Dream quantity	.235	.187	.207	.235	.188
Regular dreams	.178	.143	.141	.154	.151
Bad dreams	.273*	.187	.284**	.310**	.205
Dream vividness	.157	.252	.054	.161	.135
Major modalities	.124	.236	.011	.138	.104
Minor modalities	.187	.197	.145	.179	.159
Diffusion	.306**	.260*	.260*	.268*	.285**
Dream work	.196	.190	.144	.148*	.189*
Paramnesia	.273*	.232	.239	.277**	.238**
Altered dream episodes	.317**	.244	.274**	.305**	.275**
Lucid dreaming	.237	.183	.183	.193	.228
Autosuggestion	.319**	.210	.329***	.346***	.245
DMS					
Delusion	.437***	.398***	.360***	.364***	.439***
Ego ideal	.390***	.326***	.345***	.351***	.374***
Grandiosity	.359***	.329***	.286*	.291**	.373***
Persecution	.450***	.403***	.362***	.401***	.437***
Paranoia	.421***	.363***	.372***	.340***	.437***
Erotomania	.363***	.318**	.300**	.287**	.383***
Appetite-instinct	.372***	.322***	.316**	.291**	.395***
Sensorimotor excitement	.426***	.394***	.336***	.365***	.425***
Sex	.203	.217	.147	.200	.196
Fighting	.244	.233	.209	.196	.260*
Animal symbolism	.298**	.249	.295**	.249	.306**
Unusual creature	.327***	.244	.308**	.247	.344***
Object relation	.374***	.330***	.333***	.293**	.396***
Convenient dreaming	.319**	.224	.340***	.253	.326***

Note. *Bonferroni adjusted significance level for 0.05 = 0.000617 (0.05 / 3 SHQ scales x 27 dream scales), **Bonferroni adjusted significance level for 0.01 = 0.000123, *** Bonferroni adjusted significance level for 0.001 = 0.000012

hypersomniacs had a larger score for the DIS global (z= 2.507, p<.05, Cohen's d= 0.425) and DMS Delusion scales (z= 3.225, p<.01, Cohen's d= 0.425). The effect sizes for the differences in the DIS Dream Vividness (z= 2.987, p<.01, Cohen's d= 0.506), DMS Appetite-Instinct (z= 4.111, p<.001, Cohen's d= 0.679), DMS Object-Relation (z= 4.119, p<.001, Cohen's d= 0.613) scores were relatively large.

Hypothesis 3: People suffering disrupted circadian rhythm were expected to show an overall more intense experience of dreaming.

Participants whose circadian rhythm was disrupted scored higher on the DIS global (z= 2.522, p<.05, Cohen's d= 0.418) and DMS Delusion scales (z= 2.218, p<.05, Cohen's d= 0.292). In addition, their DIS Diffusion score was significantly larger than that for participants without the same problem (z= 2.358, p<.05, Cohen's d= 0.356).

Hypothesis 4: In addition to an overall stronger dream intensity, people with sleep paralysis would experience more paramnesia, altered dream episodes (e.g., lucid dreaming, exerting control over dream content), and persecution, sensorimotor activities, unusual creatures, paralysis, and difficulty breathing in dreams.

Compared with participants without sleep paralysis, participants with sleep paralysis showed a larger score on the DIS global (z= 1.975, p<.05, Cohen's d= 0.317), DMS Delusion (z= 3.232, p<.01, Cohen's d= 0.437), Altered Dream Episodes (z= 3.215, p<.01, Cohen's d= 0.456), Persecution (z= 3.391, p<.001, Cohen's d= 0.535), Sensorimotor (z= 3.428, p<.001, Cohen's d= 0.590), and Unusual Creatures scales (z= 2.679, p<.01, Cohen's d= 0.348). They also scored higher on the DMS items "being frozen with fright" (z= 4.144, p<.001, Cohen's d= 0.715), "being tied, unable to move" (z= 2.655, p<.01, Cohen's d= 0.489), "being killed" (z= 2.676, p<.01, Cohen's d= 0.391),

"vividly sensing (but not necessarily seeing or hearing) a presence in the room" (z= 2.515, p<.05, Cohen's d= 0.449), "encountering a devil in some form" (z= 3.067, p<.01, Cohen's d= 0.449), and "being smothered, unable to breathe" (z= 4.052, p<.001, Cohen's d= 0.677). However, the between-group difference for the Paramnesia score was not significant (z= 1.184, p>.05, Cohen's d= 0.160).

Hypothesis 5: The experience of night terrors would be associated with a greater number of bad and persecutory dreams.

Participants with sleep terror exhibited a larger score on the Bad Dreams (z= 3.454, p<.001, Cohen's d= 0.540) and Persecution (z= 3.816, p<.001, Cohen's d= 0.618) scales than did participants without sleep terror.

Hypothesis 6: People with snoring or sleep-related respiratory pauses would experience difficulty breathing in their dreams.

Snorers and non-snorers did not show any differences across all DIS and DMS scales (all ps>.05) and the DMS Item "being smothered, unable to breathe" (z= 0.285, p>.05, Cohen's d= -0.170). Compared with participants without sleep-related respiratory pauses, participants suffering sleep-related respiratory pauses scored higher on the DMS Item "being smothered, unable to breathe" (z= 2.726, p<.01, Cohen's d= 1.124).

Hypothesis 7: People with bruxism would experience more anxiety or aggression in dreams.

Participants with bruxism did not show a larger or smaller score for any DIS or DMS scales, including the Persecution and Fighting scales (all ps>.05).

Hypothesis 8: People with potential REM sleep behavior were expected to experience more aggressive dreams or dreams involving vigorous movements.

Participants with vigorous sleep behavior scored higher on the Persecution (z= 2.644, p<.01, Cohen's d= 0.451) and Sensorimotor (z= 2.038, p<.5, Cohen's d= 0.324) scales but not on the Fighting scale (z= 1.303, p>.05, Cohen's d= 0.282).

Hypothesis 9: People showing restless, jerking leg movements during sleep were expected to experience more aggressive dreams or dreams involving vigorous movements.

Participants with restless, jerking legs had a larger score on the Persecution (z= 2.873, p<.01, Cohen's d= 0.358), Sensorimtor (z= 2.160, p<.05, Cohen's d= 0.302), and Fighting (z= 2.325, p<.05, Cohen's d= 0.269) scales. Nevertheless, the effect sizes for all these three scales were smaller than those for the Paranoia (z= 4.544, p<.001, Cohen's d= 0.634) and Delusion (z= 4.370, p<.001, Cohen's d= 0.529) scales and a significant between-group difference in the Autosuggestion score was found (z= 2.204, p<.05, Cohen's d= 0.341).

Hypothesis 10: Sleepwalkers were expected to have more dreams of convenience.

Sleepwalkers did not score higher on the Convenient Dreaming scale (z= 0.889, p>.05, Cohen's d= -0.204) in comparison with non-sleepwalkers.

Hypothesis 11: Sleeptalkers would experience more autosuggestive episodes during which they talk themselves into certain dream images.

Sleeptalkers showed a larger Autosuggestion score than did the non-sleep talkers (z= 2.238, p<.05, Cohen's d= 0.298).

DISCUSSION

This study was carried out in view of the scanty and incongruous findings concerning the relationship between sleep problems and dream experiences. The phenomenon of dreaming has been operationalized and measured by sleep researchers in various ways. This not only renders direct comparisons between different studies and between sleep problems difficult but might also cause seemingly incompatible findings. On the other hand, the DIS and DMS have been demonstrated to be effective for assessing the subjective intensity of dream experiences as a trait of consciousness and sensitive to other psychological variables. This study, therefore, investigated the differential impacts of specific sleep

problems on the phenomenological properties of dreaming by using these two measures to profile participants' dream experiences.

Sleep problems were common among the participants; the lifetime prevalence for disrupted circadian rhythm was very high – almost 40% in this sample. A sizable number of participants were late sleepers, who slept less than the amount desired and suffered sleep-related functional consequences in the daytime. Overall, the weight of evidence is in favor of the notion that sleep disturbances can magnify dream experiences. The total SHQ severity score, as well as the Dyssomnias and Parasomnias subscale scores, positively varied with both the DIS global score and the DMS Delusion score. Furthermore, most sleep problems – including those rarely investigated by researchers, such as disrupted circadian rhythm, hypersomnia, and sleeptalking – were shown to have significant effects on both the intensity and thematic content of dreams. Sleep bruxism, sleepwalking, and snoring were the only three problems that did not display any associations with dream variables. It should be noted, however, that many participants who had once been sleepwalkers or sleep bruxists no longer sustained these problems when they completed the SHQ. Accordingly, the present findings can merely demonstrate that sleepwalking and sleep bruxism do not have chronic effects on a person's dream characteristics; that is, the possibility that sleepwalking and sleep bruxism in their active phases might alter dream activities cannot be ruled out.

The study presented here highlights that different sleep problems affect different aspects of dreaming. Dyssomnias, as indicated by its associations with the major predispositions of Grandiosity, Persecution, and Sensorimotor Excitement, seem to moderate dream content across the board, whereas paramsomnias may increase dreaming of sleep disturbing stimuli, animal symbols, and unusual creatures. Consistent with previous findings, the current findings indicate that dreaming of the theme "being smothered, unable to breath" most probably results from sleep-related respiratory pauses rather than from snoring. Of the 15 sleep problems; sleep paralysis is most strongly and extensively connected with dream experiences, especially altered dream episodes and vivid dreams about unusual creatures. This resonates with the hypothesis that the mechanisms of dreaming for narcolepsy are abnormally optimized in the early phase of sleep. On the other hand, the present findings do not substantiate the previous evidence that sleep paralysis predisposes people to dream-reality confusion.

Each sleep problem appears to have a distinct pattern of associations with the phenomenological factors of dreaming. Both early insomnia and disrupted circadian rhythm reinforce the global intensity and delusional content of dreaming, dream distortion, and the confusion between dreamed and real-life events. By contrast, late insomnia enhances the delusional content of dreaming but not the overall dream intensity. As with people sustaining early insomnia or disrupted circadian rhythm, hypersomniacs also undergo some intense dream episodes, which are, however, more characterized by their colorful percepts, sensual feelings, and appetitive gratifications. By the same token, although persecutory dreams are common for the conditions of night terrors, violent sleep behaviors, and restless legs, the non-significant relationship between night terrors and sensorimotor dreams might imply that unlike people with vigorous sleep behaviors or restless legs, people suffering from night terrors are not inclined to take fight-or-flight actions in those persecutory dreams. Last, but not least, although both sleeptalkers and restless leg sufferers might induce changes in their own nocturnal mentation, more than merely autosuggesting themselves dream experiences, restless leg sufferers might fall into a vicious cycle ensuing from their autosuggestive propensity, which dramatizes the paranoid anxiety and preoccupations about leg spasm and pain. The study presented here provides some preliminary evidence for the differential associations of sleep disturbances with dream experiences. Follow-up studies may be undertaken to replicate the patterns of associations summarized above.

References

Cipolli, C., Bellucci, C., Mattarozzi, K., Mazzetti, M., Tuozzi, G., & Plazzi, G. (2008). Story-like organization of REM-dreams in patients with narcolepsy–cataplexy. Brain research bulletin, 77(4), 206-213.

D'Agostino, A., Manni, R., Limosani, I., Terzaghi, M., Cavallotti, S., & Scarone, S. (2012). Challenging the myth of REM sleep behavior disorder: no evidence of heightened aggressiveness in dreams. Sleep medicine, 13(6), 714-719.

De Groen, J. H., Op den Velde, W., Hovens, J. E., & Falger, P. R. (1993). Snoring and anxiety dreams. Sleep: Journal of Sleep Research & Sleep Medicine.

DSM-5 American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders. Arlington: American Psychiatric Publishing.

Fantini, M. L., Corona, A., Clerici, S., & Ferini-Strambi, L. (2005). Aggressive dream content without daytime aggressiveness in REM sleep behavior disorder. Neurology, 65(7), 1010-1015.

Fisher, C., Kahn, E., Edwards, A., Davis, D. M., & Fine, J. (1974). A psychophysiological study of nightmares and night terrors: III. Mental content and recall of Stage 4 night terrors. The Journal of nervous and mental disease, 158(3), 174-188.

Gau SF. Neuroticism and sleep-related problems in adolescence. Sleep 2000; 23: 495–502.

Gau, S. F. (2000). Neuroticism and sleep-related problems in adolescence. Sleep, 23(4), 495-502.

Hicks RA, Bautista J. Snoring and nightmares. Perceptual and Motor Skills 1993; 77: 433-434.

Hicks, R. A., & Bautista, J. (1993). Snoring and nightmares. Perceptual and motor skills, 77(2), 433-434.

Krakow, B., Lowry, C., Germain, A., Gaddy, L., Hollifield, M., Koss, M., ... & Melendrez, D. (2000). A retrospective study on improvements in nightmares and post-traumatic stress disorder following treatment for co-morbid sleep-disordered breathing. Journal of Psychosomatic Research, 49(5), 291-298.

Lequerica, A. (1998). Dream cognition and rapid eye movement sleep in the narcolepsy syndrome. Journal of mental imagery-new york-international imagery association-, 23, 85-98.

MacFarlane, J. G., & Wilson, T. L. (2006). A relationship between nightmare content and somatic stimuli in a sleep-disordered population: A preliminary study. Dreaming, 16(1), 53.

Mazzetti, M., Bellucci, C., Mattarozzi, K., Plazzi, G., Tuozzi, G., & Cipolli, C. (2010). REM-dreams recall in patients with narcolepsy-cataplexy. Brain research bulletin, 81(1), 133-140.

Nielsen, T. A. (2000). A review of mentation in REM and NREM sleep:"covert" REM sleep as a possible reconciliation of two opposing models. Behavioral and Brain Sciences, 23(06), 851-866.

Ohayon, M. M., Morselli, P. L., & Guilleminault, C. (1997). Prevalence of nightmares and their relationship to psychopathology and daytime functioning in insomnia subjects. Sleep: Journal of Sleep Research & Sleep Medicine.

Oudiette, D., Dealberto, M. J., Uguccioni, G., Golmard, J. L., Merino-Andreu, M., Tafti, M., ... & Arnulf, I. (2012). Dreaming without REM sleep. Consciousness and cognition, 21(3), 1129-1140.

Oudiette, D., Leu, S., Pottier, M., Buzare, M. A., Brion, A., & Arnulf, I. (2009). Dreamlike mentations during sleepwalking and sleep terrors in adults. Sleep, 32(12), 1621-1627.

Pagel, J. F., & Shocknesse, S. (2007). Dreaming and insomnia: Polysomnographic correlates of reported dream recall frequency. Dreaming, 17(3), 140.

Pisko, J., Pastorek, L., Buskova, J., Sonka, K., & Nevsimalova, S. (2014). Nightmares in narcolepsy: underinvestigated symptom?. Sleep medicine, 15(8), 967-972.

Schredl, M. (1998). Dream content in narcoleptic patients: preliminary findings. Dreaming, 8, 103-107.

Schredl, M. (2001). Dream recall frequency and sleep quality of patients with restless legs syndrome. European Journal of Neurology, 8(2), 185-189.

Schredl, M. (2008). Snoring, breathing pauses, and nightmares 1. Perceptual and motor skills, 106(3), 690-692.

Schredl, M. (2009a). Nightmare frequency in patients with primary insomnia. International Journal of Dream Research, 2(2), 85-88.

Schredl, M. (2009b). Dreams in patients with sleep disorders. Sleep medicine reviews, 13(3), 215-221.

Schredl, M. (2010). Do sleep disorders affect the dreaming process? Dream recall and dream content in patients with sleep disorders. Sleep Medicine Clinics, 5(2), 193-202.

Schredl, M., & Schmitt, J. (2009). Traumerinnerungshäufigkeit und Alptraumhäufigkeit bei Patienten mit nächtlichen Atemregulationsstörungen Traumerinnerungshäufigkeit und Alptraumhäufigkeit bei Patienten mit nächtlichen Atemregulationsstörungen (Dream recall frequency and nightmare frequency in patients with sleep-disordered breathing). Somnologie 2009; 13: 12-17.

Schredl, M., SCHÄFER, G., Weber, B., & Heuser, I. (1998). Dreaming and insomnia: dream recall and dream content of patients with insomnia. Journal of sleep research, 7(3), 191-198.

Takeuchi, T., Ogilvie, R. D., Murphy, T. I., & Ferrelli, A. V. (2003). EEG activities during elicited sleep onset REM and NREM periods reflect different mechanisms of dream generation. Clinical Neurophysiology, 114(2), 210-220.

Uguccioni, G., Golmard, J. L., de Fontréaux, A. N., Leu-Semenescu, S., Brion, A., & Arnulf, I. (2013). Fight or flight? Dream content during sleepwalking/sleep terrors vs rapid eye movement sleep behavior disorder. Sleep medicine, 14(5), 391-398.

Valli, K., Frauscher, B., Peltomaa, T., Gschliesser, V., Revonsuo, A., & Högl, B. (2015). Dreaming furiously? A sleep laboratory study on the dream content of people with Parkinson's disease and with or without rapid eye movement sleep behavior disorder. Sleep medicine, 16(3), 419-427.

Wamsley, E., Donjacour, C. E., Scammell, T. E., Lammers, G. J., & Stickgold, R. (2014). Delusional confusion of dreaming and reality in narcolepsy. Sleep, 37(2), 419-422.

Yu, C. K. C. (2007). Dream recall and the dissociation between dream cessation and neurological memory disorders. Neuropsychoanalysis, 9(2), 213-221.

Yu, C. K. C. (2007). Emotions before, during, and after dreaming sleep. Dreaming, 17(2), 73.

Yu, C. K. C. (2008). Dream Intensity Inventory and Chinese people's dream experience frequencies. Dreaming, 18(2), 94.

Yu, C. K. C. (2010). Dream intensity scale: Factors in the phenomenological analysis of dreams. Dreaming, 20(2), 107.

Yu, C. K. C. (2011). The mechanisms of defense and dreaming. Dreaming, 21(1), 51.

Yu, C. K. C. (2012a). Dream Motif Scale. Dreaming, 22(1), 18.

Yu, C. K. C. (2012b). The effect of sleep position on dream experiences. Dreaming, 22(3), 212.

Yu, C. K. C. (2012c). Testing the factorial structure of the Dream Intensity Scale. Dreaming, 22(4), 284.

Yu, C. K. C. (2013a). Obsessive-compulsive distress and its dynamic associations with schizotypy, borderline personality, and dreaming. Dreaming, 23(1), 46.

Yu, C. K. C. (2013b). The structural relations between the superego, instinctual affect, and dreams. Dreaming, 23(2), 145.

Yu, C. K. C. (2014a). Toward 100% dream retrieval by rapid-eye-movement sleep awakening: A high-density electroencephalographic study. Dreaming, 24(1), 1.

Yu, C. K. C. (2014b). Normality, pathology, and dreaming. Dreaming, 24(3), 203.

Yu, C. K. C. (2014c). Psychopathological symptoms as a function of trauma, dreams, and inhibitions. Dreaming, 24(4), 309.

Yu, C. K. C. (2015). The vicissitudes of affective valence across the night: A high-density electroencephalographic study. Dreaming, 25(4), 274.

Zaharna, M. (2014). Nightmares and Dream-Enactment Behaviors. Sleep Medicine Clinics, 9(4), 553-560.

.