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Prevalence and correlates of disturbed dreaming in children



Prévalence et corrélats des rêves dysphoriques chez les enfants

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ABSTRACT

Relatively little is known about nightmares and other forms of disturbed dreaming in children. This article reviews the literature on the prevalence and correlates of nightmares in children and highlights key methodological issues in the field. Results show that regardless of how they are defined and measured, nightmares affect a significant proportion of children of all ages and there is some evidence to suggest that nightmare frequency may peak around the age of 10. Gender differences in nightmare frequency, with girls reporting more nightmares than do boys, tend to appear between the ages of 10 and 15. Although nightmares are associated with a range of psychosocial difficulties (e.g., stress, behavioural problems), elevated anxiety and concomitant sleep-related disorders (e.g., sleepwalking) are among the most robust correlates of nightmares. Very few studies have examined nightmare treatment in children, but promising results have been obtained with imagery rehearsal therapy. Overall, research in the field has been hampered by inconsistent definitions for nightmares, by extensive variability in questionnaire items used to measure nightmare frequency, and by a lack of awareness of how using parents versus children as respondents may impact results. Longitudinal studies are needed to better understand how nightmares and their correlates evolve during childhood and adolescence, to delineate their clinical significance, and to develop effective and age-appropriate treatment strategies.

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RÉSUMÉ

Peu d'études se sont intéressées aux cauchemars chez les enfants. Nous proposons ici une recension de ces dernières afin d'en évaluer la prévalence et les corrélats chez l'enfant, tout en répertoriant les principaux problèmes méthodologiques. Les résultats démontrent que peu importe comment ils sont définis et mesurés, les cauchemars affectent une proportion significative d'enfants de tout âge, avec un pic de fréquence qui pourrait se situer autour de 10 ans. Des différences de genre dans la fréquence des cauchemars apparaissent entre l'âge de 10 et 15 ans, alors que les filles rapportent plus de cauchemars que les garçons. Bien que les cauchemars soient associés avec des difficultés psychologiques variées (e.g., stress, problèmes de comportement), une anxiété élevée et des troubles du sommeil concomitants (e.g., somnambulisme) font partie des corrélats les plus robustes des cauchemars. Bien que peu de travaux aient porté sur le traitement des cauchemars chez l'enfant, quelques résultats prometteurs ont été obtenus en utilisant un traitement par répétition de l'imagerie mentale. La recherche dans ce domaine a toutefois été ralentie par l'utilisation de définitions inconsistantes du cauchemar, par une grande variabilité des composantes des questionnaires utilisés pour en mesurer leur fréquence et par la méconnaissance de l'impact que peut avoir sur les résultats le fait d'utiliser un parent ou l'enfant lui-même comme répondant. Des études longitudinales seront nécessaires afin de mieux comprendre comment les cauchemars et leurs corrélats évoluent durant l'enfance et l'adolescence, pour préciser leur signification clinique, ainsi que pour développer des approches thérapeutiques efficaces et appropriées à l'âge.

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1. Introduction

Disturbing dreams, including nightmares and bad dreams, involve vivid dreams marked by upsetting imagery, intense negative emotions and typically involve themes centered around physical or psychological threats [1–3]. Although considerable progress has been made in the clinical conceptualization and treatment of nightmares in adults [3–5], there remains a paucity of information on nightmares and other forms of disturbed dreaming in children. This review examines the prevalence, correlates and treatment of nightmares in children while highlighting key methodological issues in the field.

The literature on nightmares, especially when it involves the study of children, often makes use of a variety of terms, which are used interchangeably, including nightmares, bad dreams, scary dreams and anxious dreams. Nightmares can be distinguished from bad dreams by the awakening they incur [3,6,7]. However, although some investigators and clinicians distinguish emotionally dysphoric dreams that awaken the individual from sleep (nightmares) from negatively toned dreams that do not awaken the dreamer (bad dreams) [7,8], the term disturbed dreaming has been used to include both forms of negatively-toned dream experiences [9–11]. Given the lack of consistency in how such terms are used and defined in the literature, studies relating to broader terms such as bad dreams and anxious dreams were included in the present review. However, it is important to keep in mind that these phenomena may represent variations on what clinicians and researchers consider to be nightmares and that they may have a differential impact on the child's quality of life, as well as on the perception that parents may have on the magnitude of the problem.

2. Overall prevalence of disturbing dreams

Table 1 presents a summary of studies having focused on the prevalence of nightmares in children. As can be seen from the table, there exists significant variability in results obtained across studies. To better understand the studies' prevalence estimates, we grouped them according to the time window over which nightmare frequency was investigated (e.g., last week, month or year) and according to the age of the groups investigated.

When children come from comparable age groups and when the time period examined is kept consistent across studies, relatively equivalent prevalence rates are obtained. According to frequency estimates provided by children's parents, the lifetime prevalence for children aged four to nine years old is 49% [29]. When prevalence rates are based on information provided by the children themselves, they increase to 75% to 81% between the ages of 4 and 12 [20,35] and 6% to 2% between the ages of 9 and 11 [17].

When studies assess the prevalence of nightmares in young children over the preceding six months of their lives, approximately 50% of children between the ages of three and eight are found to have nightmares [12,16,19,24], with percentages varying from 21% [12] to 61% [19].

For children that are a bit older, frequency rates for the past six months of their lives are more variable, ranging from 15% in children nine to 11 years old [12], to 44% in children seven to ten years old [24], and to 72% for bad dreams (a broader term than nightmares) in children eight and a half to 11 years of age [15]. These differences in nightmare frequency remain noticeable in older groups. Prevalence is at 23% in children aged 11–12 years old [24], 6% in children 12–14 years old [12], and oscillates around 67% in adolescents between the ages of 11 and 19 [15,26,27]. Part of the observed discrepancies may be due to the fact that estimates came from parents in some studies and from the children themselves in others.

Studies having examined self-reported frequency of nightmares over shorter time windows (e.g., past few weeks or past month) in children aged 9 to 18 reveal prevalence rates ranging between 30 to 60% [28,30,31,33,34].

Finally, several investigations focused on the proportion of children reporting "frequent nightmares" (as opposed to general prevalence estimates) with the term typically referring to more than one nightmare per month (ordinal scales) or having nightmares "often" or "very often" (nominal scales). These studies show that frequent nightmares are reported by 6% of 18-year-old boys [15], 44% of children aged 10 to 12 [33], 37% of 13-year-old girls [21], and 34% of adolescents between the ages of 12 and 18 [27]. If instances of children reporting more than one nightmare per week are taken as reflecting very frequent nightmares, we find prevalence rates for very frequent nightmares of 1.7% in children aged between five to 18 years [12], 3% in children five to seven years old [19], and 19% in children between the ages of nine to 11 [31].

3. Differences in nightmare prevalence as a function of gender and age

While gender-related differences in nightmare frequency are well-established in adult populations [3,36], the age at which this difference first becomes evident remains unclear. Several studies have found a significant gender effect with girls reporting more nightmares than boys [15,17,21,22,26–28,33,34], but this difference may not manifest until adolescence [15,28]. Gender-related differences in nightmare prevalence have been attributed to higher dream recall frequency in women and girls by some researchers [17] but others [21] have argued this gender difference may reflect women's greater vulnerability to stress and depression, two variables closely associated to nightmares. In addition, it should be noted that several studies of children did not find significant gender differences in nightmare frequency [12,14,24,29,30,32,35]. Thus, although the presence of a clinically significant gender difference in adults is well-documented [37–39], the age at which this difference first manifests itself and its developmental course in young children and adolescents remain unclear.

While some studies report a significant decrease in nightmares with age, others do not find such marked decreases [12,13] or note them only in boys [15,21], or point to an increase in girls [21,28]. Taken together, studies indicate that nightmare frequency reaches its peak between the ages of six and ten [14,33,40] with notable decreases (from 46% to 30%) occurring between the ages of 10 and 12 [33].

Taken as a whole, the aforementioned literature allows us to draw certain conclusions with respect to nightmare prevalence in children. First, nightmares appear to be common in children with approximately half experiencing some form of disturbed dreaming at least on occasion and with up to 40% of children reporting frequent nightmares. Second, although not consistently observed across studies, the frequency of nightmares tends to peak around the ages of 10–12 and then decreases during adolescence. However, the idea that nightmare prevalence peaks during childhood remains controversial. For instance, even if such a time point existed and represented a true variation in nightmare frequency as a function of age, it could be attributable to an increased facility for children to share their experiences with parents (especially for parent-based indices), followed by a decrease in their willingness to talk about such matters during adolescence. It is also possible that children, and boys in particular, experience growing embarrassment in admitting that they have nightmares as they get older. Finally, while gender differences in nightmare frequency are well-established in adults, girls may not report significantly more nightmares than do boys until they are 10 to 15 years old.

Table 1
Nightmare prevalence in children.

Studies	n	Age (years)	Respondents	Time period examined	% having nightmares Boys (M) and girls (F)	% with high nightmare frequency	Difference Boys/girls
Simonds and Parraga, 1982 [12]	309	5 to 18	Mothers	Past 6 months	17%	1.7% (one episode per week)	No
Salzarulo and Chevalier, 1983 [1]	208	2 to 15	Parents	N/A	28%	N/A	N/A
Velabueno et al., 1985 [13]	487	6 to 12	Parents	Past year	22%	N/A	Yes (more in boys but NS)
Fisher and Wilson, 1987 [14]	1695	5 to 18	Parents	Current	55%	16% (one or more per month)	No
Fisher et al., 1989 [15]	870	6 to 13	Parents	Past 6 months	Between 6 and 8.5 y: 65%; between 8.5 et 11.5 y: 72% older than 11.5: 65%	≤ 12% (often and very often)	Yes: between 8.5 and 11.5 y
Hawkins and Williams, 1992 [16]	163	3 to 5	Mothers	Past 6 months	33%	14% (minimum one per month)	N/A
Schredl et al., 1996 [17]	624	10 to 16	Children	Lifetime prevalence	62%	11% (many during the past week)	N/A
Smedje et al., 1998 [18]	378	5 to 6	Parents	Past 6 months	62%	3% (more than one per week)	N/A
Smedje et al., 1999 [19]	1844	5 to 7	Parents	Past 6 months	62%	3% (more than one per week)	Yes for frequent NMs
Muris et al., 2000 [20]	190	4 to 12	Children	N/A	81%	N/A	N/A
Nielsen et al., 2000 [21]	610	13 to 16	Children	Past year	13 y: 79% M, 90% F 16 y: 73% M, 90% F	13 y.o.: 25% M, 37% F 16 y.o.: 40% M, 20% F (sometimes and often)	Yes
Schredl et al., 2000 [22]	300	6.5 to 11.5	Children	N/A	40%	5% (one or more per week)	Yes
Smedje et al., 2001 [23]	635	6 to 8	Parents	Past 6 months	61%	5,4% (more than one per week)	N/A
Stein et al., 2001 [24]	472	4 to 12	Parents	Past 6 months	4 to 6 y: 38% 7 to 10: 43% 11 to 12: 22%	6% (more than one per week)	No
Mindell and Barrett, 2002 [25]	60	5 to 11	Parents and children	Lifetime prevalence	Lifetime according to children: 75% Current according to parents: 49%	According to children: 28% According to parents: 17% (one nightmare per month)	no
Bailly et al., 2004 [26]	652	13 to 19	Children	Past 5 months	57%	6% (often practically every night)	yes
Lui, 2004 [27]	1362	12 to 18	Children	Past month	49%	7% (often)	yes
Abdel-Khalek, 2006 [28]	6767	10 to 18	Children	Last few months	10 y: 46% M, 38% F 13 y: 53% M, 49% F 18 y: 51% M, 51% F	10 y: 9% M, 12% F 13 y: 18% M, 15% F 18 y: 6% M, 18% F (very much and very very much)	yes: around 15 y
Shang et al., 2006 [29]	1319	4 to 9	Parents	Past few weeks and lifetime	Past month: 8% lifetime: 49%	N/A	No
Schredl et al., 2008 [30]	252	9 to 13	Children	Past few months	54%	N/A	Yes
Schredl et al., 2008 [31]	95	9 to 11	Children	Past few weeks	61%	19% (one or more per week)	No
Simard et al., 2008 [32]	971	0.5 to 5	Parents	N/A	70%	N/A	No
Schredl et al., 2009 [33]	4531	8 to 11	Children and parents	N/A	According to parents: 29% According to children: 44%	According to children: 2.3% According to parents: 3.5% (often)	Yes
Schredl et al., 2009 [34]	808	8 and 13	Children and parents	N/A	According to children: 8 to 11 y: 47% 9 to 12 y: 37% 10 to 13 y: 30% According to parents: 8 to 11 y: 32% 9 to 12 y: 26% 10 to 13y: 22%	According to children: 8 to 11y: 3.3% 9 to 12 y: 1.1% 10 to 13 y: 0.6% According to parents: 8 to 11 y: 1.3% 9 to 12 y: 0.9% 10 to 13 y: 0.4%	Yes

4. Psychosocial correlates of nightmares in children

Studies of psychosocial correlates of nightmares in children have been largely inspired by results derived from adult populations. As shown in Table 2, variables having attracted the most interest include behavioural problems, anxiety, stress, as well as external causes such as exposure to violence on television.

4.1. Nightmares and behavioural problems

Most studies focusing on behavioural problems as possible correlates of nightmares in children have relied on scores on either the Child Behaviour Checklist (CBCL) or the Preschool Behaviour Checklist (PBC), thereby allowing for a direct comparison of results across studies.

One study [16] of preschool children with frequent nightmares found that they did not differ from children without nightmares in terms of behavioural problems as measured by the PBC, but the picture appears to change as children become old enough to attend school. Indeed, studies of children aged four to 12 [24] and four to nine [29] found a significant association between nightmare frequency and behavioural problems. In the study by Stein et al. [24], children reporting more parasomnias (including nightmares) obtained higher scores on CBCL measures of behavioural problems (i.e., timidity, somatic complaints, anxiety, depression, social problems, cognitive problems, attention problems, delinquent behaviours and aggressive behaviours) while a multiple regression analysis revealed that parasomnias were primarily predicted by anxiety and depression, cognitive problems, and social difficulties. Similarly, Shang et al. [29] found that all CBCL variables distinguished children who experience nightmares in the previous months from those who did not while their logistic regression model revealed that anxiety and depression were the only variables that significantly predicted nightmare occurrence.

Schredl et al. [33] found a significant positive relationship between nightmare frequency, as measured by parents and self-reported by children, and conduct problems, hyperactivity and inattention with the strongest association being between nightmares and emotional troubles. The children's self-reported frequency for nightmares (but not the parents' estimates) was also related to problems with peers. Schredl et al. [22] also found in a separate study that nightmares were associated with academic difficulties.

Smedje et al. [23] reported an association between nightmares and problems with pro-social behaviours as well as global difficulties encompassing hyperactivity, emotional symptoms, conduct problems, and problems with peers.

Finally, although Fisher and Wilson [14] reported a relation between nightmares and attentional difficulties, emotional excitability and being easily upset, their effect sizes were very small and none of the variables predicted more than 3.3% of the variance in nightmare occurrence.

4.2. Nightmares and anxiety

In addition to aforementioned studies in which anxiety was assessed as part of broader measures of behavioural problems [29], some research has specifically focused on the relation between nightmares and anxiety. One study [21] of 13- to 16-year-old teenagers found that anxiety scores reported by the mother distinguished 13-year-old children who had frequent nightmares from those who did not. At 16 years of age, self-reported indices of separation anxiety, hyper-anxiety disorder and generalised anxiety as well as hyper-anxiety disorder as reported by the mother differentiated those with and without frequent nightmares. A significant relation between nightmare frequency and trait anxiety was also reported by Schredl et al. [17].

Results from one of the rare longitudinal studies in field [32] suggest that children with difficult temperaments as early as five months of age tend to experience nightmares on a regular basis between the ages of five months and five years. Furthermore, at the age of 17 months, these children are more emotionally troubled and more anxious than children without nightmares.

Finally, while other studies have also reported associations between nightmares and anxiety in children, the nature of the results varies depending on whether or not nightmares were reported by the children's parents or by the children themselves [25,33]. For instance, Mindell and Barrett [35] found that levels of anxiety did not differ between children who reported having nightmares and those who did not but such a difference did emerge when measures were based on parent ratings.

4.3. Nightmares, stress and traumatic events

Although the general association between anxiety and nightmares in children could lead one to expect that stress would also be positively linked to nightmares, the nature of this relationship remains unclear.

Among preschool-aged children, stressful life events do not distinguish those who have nightmares from those who do not [16]. In school-aged children, however, self-reported social stress (e.g., being excluded from a group, parents separating, fighting with friends or siblings) was associated with self-reported nightmare frequency, although school-related stress (e.g., getting bad grades, homework, being called to the front of the class) was not [31]. Other stressful events associated with the concurrent experience of nightmares include having a loved one become physically ill or passing away as well as having one's parents divorce [22,31].

In adults, nightmares are strongly associated with post-traumatic stress disorder as well as with a variety of traumatic experiences [37,43–45]. A similarly strong relation exists in children. For example, one study of 15 years old having lived through a major traumatic event found that even six months after the event, 100% of them reported recurring dreams related to their trauma [46].

Some researchers have proposed that dreams may play an important role in working through the emotional and cognitive sequelae of traumatic experiences [45,47–50] and studies of children having lived through war-related traumas do tend to show increases in dream recall frequency following exposure to trauma [48,49]. Furthermore, these children's dreams contain more severe threats and with more significant consequences than do dreams of children who have not been traumatized [48–50]. What's more, dreams of children who have lived through a traumatic event can be distinguished from those of other children by their contents, including overall unpleasant atmosphere, high level of negative emotions, and the presence of hostility and anxiety [48].

4.4. Nightmares and maternal mental health problems

Several studies on sleep disorders in children have evaluated the relation between these disorders and deficient maternal attachment styles or the presence mental disorders in the mother [51–54]. However, few of these studies have focused specifically on nightmares. One such study [29] found that children of mothers who had scored high on measures of psychopathology (e.g., anxiety, depression, interpersonal difficulties, somatic concerns, sleep disorders) were more likely to have had nightmares in the past month and during their lifetime than did control children [29]. A more distal association was also reported between perinatal factors (e.g., mother taking non prescribed medications, vaginal bleeding during pregnancy) and nightmares in children.

Table 2
Nightmare correlates in children.

Studies	<i>n</i>	Age (years)	Respondents	Variables examined	Variables significantly associated with nightmares
Simonds et Parraga, 1982 [12]	309	5 to 18	Mothers	Chronic medical problems	None
Salzarulo et Chevalier, 1983 [40]	208	2 to 15	Families	Disturbance of wake-sleep cycle	None
Fisher and Wilson, 1987 [14]	1695	5 to 18	Parents	Sleepwalking, talking during sleep, enuresis, academic performance, degree of physical activity, problems of attention, emotional excitability, being easily upset	Sleepwalking, degree of physical activity, problems of attention, emotional excitability, being easily upset
Hawkins and Williams, 1992 [16]	163	3 to 5	Mothers	Sleep-related behaviours, behavioural problems, life events	Talking during sleep, snoring, night terrors, being afraid of going to bed, insisting on bedtime rituals, sharing a bedroom with another child
Schredl et al., 1996 [17]	624	10 to 16	Children	Trait anxiety	Trait anxiety
Smedje et al., 1999 [19]	1844	5 to 7	Parents	Other sleep disturbances	Serious health problems or disabilities, prior consultation for sleep disturbances, sleep disturbance linked to life events, agitated sleep, night-time awakening, night terrors, prolonged latency to sleep, resistance to going to bed, sleep deficit of more than one hour, bedtime anxiety, difficulty falling asleep
Schredl et al., 2000 [22]	300	6.5 to 11.5	Parents	Stressful events, personality traits, academic difficulties, other sleep disorders	Parents' divorce, academic difficulties, being serious and taciturn, night-time awakening, night terrors, sleepwalking
Smedje et al., 2001 [23]	635	6 to 8	Parents	Hyperactivity, emotional symptoms, problems of conduct, problems with peers, difficulty with pro-social behaviour, global difficulties (includes all previously mentioned difficulties except difficulty with pro-social behaviour)	Pro-social difficulties and global difficulties score
Stein et al., 2001 [24]	472	4 to 12	Parents	Nightmares encompassed in parasomnia variable: medical history, sleep-related behaviour, behavioural problems	Frequent falls, pica, medication, sleep disturbances prior to 2 y, problems of externalized and internalized behaviours
Mindell and Barrett, 2002 [25]	60	5 to 11	Children and parents	Trait anxiety, nightmare-induced distress	Parent measurements: anxiety and occurrence of nightmares; Child measurements: nightmare frequency and anxiety; nightmare-induced distress and anxiety
Shang et al., 2006 [29]	1319	4 to 9	Parents	Perinatal factors, parental mental distress, child behavioural problems, other sleep disturbances	Perinatal factors (non-prescription medications, vaginal bleeding); parental mental distress; problems of externalized and internalized behaviour, sleep disturbances: insomnia, waking up late, night-time awakening, talking during sleep, sleep walking, night terrors, enuresis, bruxism, snoring
Schredl et al., 2008 [30]	252	9 to 13	Children	Watching TV, computer games, police or criminal TV series, reading	Time allotted to reading
Schredl et al., 2008 [31]	95	9 to 11	Children	Academic stress, social stress, other stressors: moving, chronic illness, death of loved one, chronic illness of loved one	Social stress, death of loved one, chronic illness of loved one
Simard et al., 2008 [32]	971	0.5 to 5	Parents	Bedtime routine established by parents, child temperament, separation anxiety, emotional disturbances, anxiety, insomnia, agitation, looking for attention and crying, difficulty calming down	5months: difficult temperament and crying; 5 and 17 months: agitation; 17 months: emotional disturbances, anxiety, difficulty calming down
Schredl et al., 2009 [33]	4531	8 to 11	Children and parents	Nightmares during past year, problems of conduct, hyperactivity and inattention, emotional symptoms, problems with peers and pro-sociality	Nightmares during past year, problems of conduct, hyperactivity and inattention, emotional symptoms, problems with peers (only with child-rated nightmare frequency)
Schredl et al., 2009 [34]	851	8 to 13	Children and parents	Sleep disturbances, nightmares during past year, problems of conduct, hyperactivity and inattention, emotional symptoms, problems with peers and pro-sociality	Sleep disturbances and other parasomnias such as sleepwalking and night terrors, problems of conduct, hyperactivity and inattention, emotional symptoms, problems with peers
Coulombe et al., 2011 [41]	980	12–16	Adolescents and parents	Aggression, attention problems, anxiety/depression, and withdrawal	Aggression, attention problems, anxiety/depression, and withdrawal. When psychological comorbidity was entered in model nightmares was uniquely associated with symptoms of anxiety/depression
Stephan et al., 2012 [42]	3167	6 to 18	Children	Amount of TV viewing	None

Table 3
Comparison of nightmares and sleep terrors.

	Nightmares	Sleep terrors
Time of night	Last half of the sleep period	First third to half of the sleep period
Sleep stage	REM sleep	Slow-wave sleep
Associated activity	Movements are rare and limited	Sits, screams; agitated motor activity
Duration	3–20 min	1–10 min
Autonomic activation	None to moderate	Moderate to extreme
Recall for the event	Vivid and detailed dream recall	Variable amnesia for the event
Full awakening	Common	Uncommon
State after event	Fully awake and functional	Confused/disoriented
Arousal threshold	Low	High
Potential for injury/violence	No	Yes

4.5. Nightmares and suicidal ideation

Suicide and suicidal ideation constitute one extreme form of psychosocial adjustment difficulties and there has been an increasing interest on the study of disturbed dreaming in relation to suicidal ideation and behaviors in adults as well as in children. Amongst people having attempted suicide, disturbed dreaming has been found to be the sleep-related problem most strongly associated to suicidal risk [55], and similar results have been obtained in non-clinical adult populations [56–58].

Turning specifically to children, one study [59] of adolescents aged between 13 and 16 found that 13% of boys who had often thought about suicide reported frequent nightmares versus 4% of boys that had never thought about it. Among girls, 29% of those who had often thought about suicide reported frequent nightmare versus 10% of those who had not.

A subsequent study [27] of adolescents between the ages of 12 to 18 found that those who reported frequent nightmares during the past month also had an increased risk of suicidal ideation and attempt and these results remained significant after controlling for depression. A similar investigation [60] of 12-to 18-year-old subjects found that suicidal thoughts were associated to the intensity of emotions disturbing dreams as well as to nightmare-related distress but not to nightmare frequency.

Examining children specifically at risk for self-harm, one study [61] found that disturbed dreaming at ages 12 to 14 did not predict suicidal thoughts at ages of 15 and 17 when common risk factors and other sleep problems were for controlled for.

Finally, one recent longitudinal investigation of disturbed dreaming and suicidal ideation in young teenagers showed that by the age of 13, children who report having thought about suicide in the past year experience more disturbing dreams than children who have not thought about suicide. However, why the association between disturbed dreaming and suicidal ideation appears during adolescence and how it evolves over time remains to be elucidated.

In sum, although there is ample evidence for an association between nightmares and suicidal ideation, the direction of this relation remains unclear. It is possible that the repeated experience of nightmares accentuates ongoing distress that underlies suicidal thoughts or that disturbed dreaming merely reflects waking state turmoil.

4.6. Nightmares and other sleep disorders

Several sleep disorders show robust and stable associations with nightmares. These include other parasomnias such as sleepwalking [14,16,22,29,34] as well as sleep terrors (dramatic arousals from slow-wave sleep accompanied by a cry or piercing scream and autonomic nervous system and behavioral manifestations of intense fear) [16,22,23,34], although it should be noted that parents and children alike may confuse nightmares with sleep terrors (Table 3).

Children with frequent nightmares are also more likely to snore, to talk in their sleep, to be afraid of going to bed, to insist on night-time rituals, to wake up during the night, and to suffer from enuresis or bruxism [16,17,22,23].

4.7. Nightmares and exposure to violence in media and gaming

Many parents tend to intuitively link their children's nightmares with specific daytime experiences such as having watched scary movies [14]. However, nightmares in children do not appear to be linked to time spent watching television, exposure to violent shows, electronic games, and time allotted for reading although children may themselves report that things they saw on TV may give rise to negatively-tones dreams [30,42].

4.8. Summary of nightmare correlates

Many correlates have been examined in relation to nightmares and some show stronger and more consistent associations across different age-points. Thus, when compared to children with few or no nightmares, children with frequent nightmares are more anxious and this from the youngest age. Frequent nightmares are also related to suicidal ideation, even when controlling for depression. However, the link between nightmares and stressful life events appears weaker and is only found when stress is assessed by the children themselves. That being said, it is important to bear in mind the correlational nature of these findings when postulating mechanisms underlying such relations. Nightmares also show strong relations to the other sleep disorders, including sleepwalking and sleep terrors. These sleep-related experiences may have a common aetiology, be it genetic, related to personality, or attributable to shared life events. Additionally, the presence of frequent nightmares appears to be a stable occurrence during the childhood and adolescence of affected individuals [32,33], which parallels other sleep disorders in general [24].

5. Treatment of nightmares in children

Although considerable progress has been made in the treatment of various forms of nightmares and associated distress in adult populations [5,62–67], little is known about nightmare treatment in children. Addressing this lack of work in the area is all the more important, given that a notable proportion of adults with frequent nightmares trace the onset of their disturbing dreams back to childhood or adolescence [68–70].

Of the proposed treatments, interventions based imagery rehearsal therapy, a typically brief and relatively simple treatment [5] but adapted to children appear to be the most promising. Two controlled studies support the idea that such cognitive-behavioral approaches can be effective in children. The first study [71] showed that imagery rehearsal therapy significantly decreased nightmare

frequency in children aged nine to 11 suffering from chronic nightmares as compared to a no-treatment control group and that gains were maintained at a nine-month follow-up. Similar improvements were also observed in the control children once they too received the treatment. The second controlled study [72] involving children aged 6 to 11 found that being enrolled in the study itself had a positive impact on nightmare frequency as well as nightmare-induced distress even before treatment began. That said, imagery rehearsal of nightmare (in this case based on drawings rather than mental imagery) further decreased nightmare-induced distress but not nightmare frequency. However, since nightmare frequency was relatively low at the onset of the study, this result may be due to by a floor effect. It should be noted that imagery rehearsal therapy, as usually administered in adults, was also found to significantly reduce nightmare frequency and nightmare-related distress in a group of adolescent girls aged 13 to 18 suffering from nightmares related to sexual abuse [73]. Finally, although they have been subject to relatively few studies, other psychological approaches and even pharmaceutical options for the treatment of nightmares have been proposed [74,75].

6. Methodological issues and future directions

Several methodological issues make comparing and integrating results from different studies difficult. The three main problems are how nightmares are defined, the nature of instruments used to measure nightmare frequency, and the choice of using parents versus the children themselves as respondents.

While some researchers clearly define the term nightmare in their studies, others have not or have left nightmares to be defined by the subjects themselves. Moreover, this issue is further compounded by the use of other terms such as bad dreams and anxiety dreams which are themselves often poorly or vaguely defined. Finally, researchers don't always provide participants with a definition of sleep terrors and thus this psychologically and physiologically distinct sleep disorder can be confused with nightmares.

Since there are no standardized questionnaires to assess nightmare frequency in children, some researchers have adapted adult-based questionnaires while others relied on in-house instruments. Furthermore, these instruments show considerable differences in the scales used to determine nightmare frequency. Response scales can take different forms, including binary, nominal, ordinal and open-ended choices and variations exist even within each of these categories. The same variability is also found in interval scales whereas open-ended choices are relatively homogeneous (e.g., How many nightmares do you recall per month?). Furthermore, parametric tests are often used inappropriately to analyse data obtained using ordinal or nominal scales [3].

These differences in questionnaire formats are intimately associated to the issue of whether parents or the children themselves are selected to complete the instruments at hand. Although it may be difficult to question very young children about their nightmares, parents' estimates of nightmare frequency in their children may be biased, incomplete, or misguided (e.g., being unduly affected by their children's sleep terrors). In the case of older children, estimates provided by parents may be biased by the quality of the parent-child relationship (e.g., children may or may not tell their parents about their dreams). It is likely preferable to question children directly once they reach the age of ten with questionnaire items adapted to their comprehension level although some studies rely on parents to obtain information on nightmares in 15 year olds [40], and even 18 year olds [14].

Finally, studies [35,34] in which frequency values for nightmares were obtained from parents as well as their children suggest that parents tend to underestimate nightmare frequency in their children not only when it is low (e.g., one nightmare per six months) but also when it is high (e.g., one per month).

In sum, regardless of how they are defined and measured, nightmares clearly affect a significant proportion of children of all ages. Future investigations need to take the aforementioned methodological considerations into account and longitudinal studies of children are especially needed to provide a better picture of the evolution of nightmares and their correlates over time. Since nightmares affect a large number of children and are associated with a range of psychosocial difficulties, it appears important to further investigate their clinical significance at different age points as well as to better document ways in which affected children can be helped.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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