Nightmare Science

5

> I took hold of a wild bull of the wilderness. He bellowed and kicked up earth; dust made the sky dark. I ran from him. With terrible strength he seized me and tore into my flank - a second dream: a mountain toppled. It laid me low and took hold of my feet. The glare was overpowering. A man appeared, the handsomest in the land…From under the mountain he pulled me out, gave me water to drink - a third dream, in every way frightening: the heavens cried out; earth roared. Daylight vanished and darkness issued forth. Lightning flashed, fire broke out, clouds swelled; it rained death. The glow disappeared, the fire went out, and all that had fallen turned to ashes.
>
> (The Epic of Gilgamesh – 4000 BCE))

Nightmares are different from other dreams. They are almost always significant, impactful, and remembered, not just at waking, but into our extended personal futures. Nightmares are frightening dreams that include distressing negative emotions – particularly fear. Few of us, if we are lucky, will ever experience an actual waking negative experience as profound and distressing as those in our nightmares, the overwhelming fear, the sensation of danger, entrapment, and impending death, from which the only escape is transcendence – into waking. Yet the nightmare is something routinely experienced; 70% of us experience at least one nightmare each month (Table 5.1). We will continue to have these frightening and distressing dreams even into the extremes of old age (Fig. 5.1). Archeology and history indicate that since the dawn of records, the visions and stories of nightmare have been intrinsic to the human experience (see initial chapter quote).

There are disturbing and negative dreams reported from all stages of sleep; however, almost all nightmares take place in REM sleep. REM sleep reports are longer and include more words than dream reports from the other sleep stages so that a disproportionate number of the long dreams reported in literature are likely REM sleep dreams [22]. Due to their length, complexity, and organizational requirements for presentation, REM sleep dreams are usually reported on awakening as narrative stories. The content, just like the content of dreams from other stages of sleep, is most often based on waking experience. Long REM sleep dream content includes interactive, self-organized narratives of our daily life and experience that resembles

J. F. Pagel, *Post-Traumatic Stress Disorder*,
https://doi.org/10.1007/978-3-030-55909-0_5

Table 5.1 Reported dream and nightcall frequency per questionnaire from three sleep laboratory studies (1999–2003) (*N*# = 1150)

Recall	Never	Monthly	Weekly	3 x/week	Nightly
Dreams	9.6%	27.7%	42.2%	16.5%	3.48%
Nightmares	29.4%	34.7%	26.8%	7.57%	1.34%

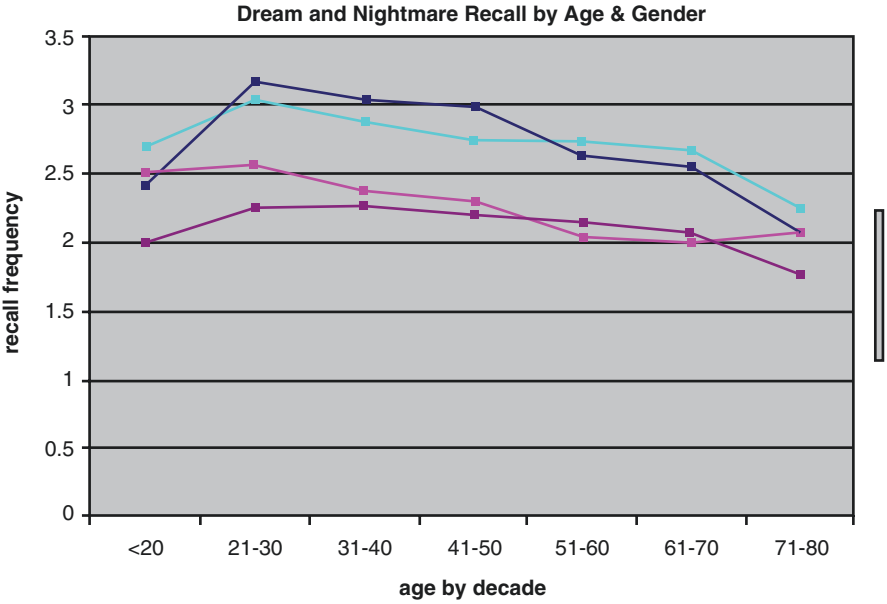

Fig. 5.1 Reported dream and nightcall frequency per AGe and gender from three sleep laboratory studies (1999–2003) (N# = 1150) [upper two lines are female]

the narrative genre of the "soap opera" [21]. Nightmares are the "Dark Shadows" version of this genre, typically beginning as a seemingly real and coherent dream sequence, becoming increasingly more disturbing as they unfold. The negative emotions in nightmares include anxiety, fear or terror, as well as, anger, rage, embarrassment, and disgust. The content and story present during a nightmare most often focuses on imminent physical danger (e.g., threat of attack, falling, injury, death). Common and distressing themes include aggression toward others, potential personal failures, as well as being trapped drowning and suffocation [4]. The visual imagery of the nightmare is more likely than in other dreams to be experienced as an unmitigated perception of external reality [25].

While most of us can agree on what is and is not a nightmare, experts and scientists have done much to confuse the definition. Freud redefined frightening sleep experiences as "anxiety" dreams. In his era, anxiety was defined as the experience of all-pervasive and unfocused fear. Through the intervening years, the definition for anxiety has morphed into one of generalized and unfocused agitation and discomfort [24]. Rather than being a nightmare, today's "anxiety" dream is most often a dream of frustration, difficulty, and stress reflecting the difficulty of waking life experience.

Recently, some dream scientists have attempted to "clarify" the definition for nightmares by including objectively measurable aspects of the state. Some dream scientists require that a nightmare occur in REM sleep. This has turned out to be a particularly difficult criterion, since for individuals with PTSD, nightmares often occur outside of REM sleep [20]. Others behaviorally define the nightmares as a negative dream that leads to awakening, differentiating nightmares from "bad dreams" from which the dreamer never fully awakens [25]. It is unclear, however, whether these forms of negative dreams are actually different. For individuals experiencing nightmares, negative daytime symptoms are based on the dreamer's level of distress rather than their frequency or how often the dreamer awakens [8].

Most of us have at least the occasional nightmare; however, we have these experiences at a lower frequency than other dreams. Far more individuals report never having experienced nightmares than report never having dreamed (Table 5.1). Most individuals reporting frequent nightmares also report higher dream recall [11]. Factors that can induce nightmares include febrile illness, neurological diseases such as epilepsy and Parkinson's disease, mental illness, stress that involves feelings of helplessness, and a wide variety of medications. The prescription medications most likely to induce nightmares are SSRI antidepressants (most commonly Paxil) and antihypertensives (primarily beta-blockers). Type 1 antihistamines such as the ubiquitous diphenhydramine (Tylenol PM, Benadryl, etc.) are the agents most likely to induce nightmares due to their over-the-counter use for allergies and inducing sleep [15] (Table 5.2).

Both age and gender affect nightmare frequency. Adolescent females report nightmares at the highest frequency and older males at the lowest rate [10]. Nightmares are reported by individuals who score high on psychological tests for anxiety, neuroticism, and general distress; however, the only personality types clearly documented to have a higher incidence of nightmares are those sharing the characteristic of "thin borders" [5]. Thin-bordered individuals tend to experience life as a series of shades of gray rather than in black and white. Wake and sleep, day and night, and dark and light are viewed as a continuum rather than clearly different states. Right and wrong are viewed as relative rather than concrete. Such individuals can be unusually sensitive, open, undefended, and expressive. They may describe their dreams and daydreams as unusually real. At the extreme, some individuals with thin borders have difficulty differentiating waking life from dreaming and experience periods of depersonalization, déjà vu, and extrasensory experiences. While some psychiatric disorders such as schizotypal personality are more likely, the clearest behavioral correlate for thin borders is one of creativity. Individuals with thin borders are more likely to invest themselves in the creative experience, produce creative products, and assume creative roles in society [4].

Not having nightmares is not necessarily a good thing. Insomniacs report a significantly higher frequency of nightmares [14]. However, this does not reflect the objective data of how long or little an individual actually sleeps. Nightmare frequency is actually higher for those with the best sleep: longer sleep time, increased REM sleep time, increased light sleep (Stages 1 and 2), better sleep efficiency, and lower amounts of wake during sleep. Nightmare recall is lowest in

Table 5.2 Medications reported to induce nightmares or disordered dreaming by >1% of individuals in clinical trials (CT) and large case studies (CS) [15]

Affected neuroreceptor drug	Evidence base
Norepinephine – Beta-blockers	
Atenolol	CT [3/20 patients]
Bisoprolol	CT [3/68 patients]: CR [1] – de-challenge
Labetalol	CT [5/175 patients]
Oxprenolol	CT [11/130 patients]
Propranolol	CT [8/107 patients]
Norepinephrine effecting agents	
Guanethidine	CT [4/48 patients]
Antidepressants	
Serotonin specific reuptake inhibitor [SSRI]	
Fluoxetine	CT [1–5% – greater frequency in OCD and bulemic trials]: CR [4] – de- and rechallenge
Escitalopram oxalate	CT [abnormal dreaming – 1% of 999 patients]
Nefazodone	CT [3% (372) versus 2% control]
Paroxetine	CT [4% (392) versus 1% control] – statistically significant difference
Agents effecting serotonin and norepinephrine	
Duloxetine	CT [>1% report of nightmare/abnormal dreaming – 23,983 patients]
Risperidone	CT [1% increased dream activity – 2607 patients]
Venlafaxine	CT [4% (1033) versus 3% control]
Agents effecting serotonin, acetylcholine, norepinephrine, and histamine	
Doxepine	CT [altered dreaming common at low doses]
Amitriptyline	CT [nightmares less than 0.1%], case reports
Agents effecting norepinephrine and dopamine	
Bupropion	CT [13/244 – dream abnormality]
Dopamine – agonists	
Amantadine	CT [5% report abnormal dreams]: CR [1]
Levodopa	CT [2/9 patients]
Ropinirole	CT [3% (208) report abnormal dreaming versus 2% placebo]
Selegiline	CT [2/49 reporting vivid dreams]
Amphetamine-like agents	
Bethanidine	CT [2/44 patients]
Fenfluramine	CT [7/28 patients]: CR [1] de- and rechallenge
Phenmetrazine	CT [3/81 patients]
GABA	
Gaba hydroxybuterate	CT [nightmares >1% 473 patients]
Triazolam	CT [7/21 patients]
Zopiclone	CT [3 – 5/83 patients]
Orexin – antagonists	
Suvorexant	CT {nightmares 2% – 1% for placebos]; sleep paralysis and hypnagogic hallucinations reported
Nicotine agonists	
Varenicline	CT [abnormal dreams 14/821 patients]
Nicotine patches	CS [disturbed dreaming in up to 12%, affects tendency to use treatment]
Anti-infectives and immunosupressants	
Amantadine	CT [5% reporting abnormal dreams]: CR [1]
Fleroxacin	CT [7/84 patients]
Gusperimus	CT [13/36 patient]
Antipsychotics – histamine effects	
Clozapine	CT [4%]
Olanzapine	CT [abnormal dreaming 1-10%]

Table 5.2 (continued)

Affected neuroreceptor drug	Evidence base
Antihistamine	
Chlorpheniramine	CT [4/80 patients]
ACE inhibitors	
Enalapril	CT [0.5–1% abnormal dreaming – 2987 patients]
Losartan potassium	CT [>1% dream abnormality – 858 patients]

those who have the most difficulty getting to sleep and in those who slept for less than 65% of the night. Among insomniacs, the report of nightmares can be a marker for better objective sleep since in order for nightmares to occur, an individual needs to have a framework of sufficient sleep including at least some REM sleep. As sleep objectively deteriorates, fewer nightmares are reported. Clinically, for most individuals with insomnia, insomnia is a symptom, a complaint of poor, non-restorative sleep rather than an objective lack of sleep that can be demonstrated in the sleep laboratory. It is the complaint of poor-quality sleep rather than the actual objective and measured amount and quality of sleep that is associated with increased nightmare frequency. Among patients being evaluated for sleep apnea, those with worst apnea, as determined by the number of respiratory events during sleep, are those who report the lowest incidence of nightmares. Just like those with severe insomnia, individuals with severe sleep apnea (>30 events/hour) have very few nightmares [16].

Nightmare Disorder

Psychiatry and sleep medicine have historically confounded those PTSD patients with nightmares with individuals reporting frequent nightmares that have no history of trauma. In some cases, particularly in adolescents, therapists would hypothesize that unremembered trauma had occurred during the childhood of anyone presenting with the complaint of frequent nightmares. Twenty-five percent of adolescent girls have more than two nightmares per week, a finding that has led some to suggest that those 25 percent of young women are victims of childhood sexual abuse [23]. Some individuals and their families have been subjected to extensive investigations and therapeutic interventions in situations in which there was no evidence that abuse had ever occurred [2]. In 2005 a new diagnosis, nightmare disorder, was added to the diagnostic lists. This alternative diagnosis can be applied to individuals without a history of trauma who present with the complaint of recurrent, distressing nightmares that disrupt their sleep [13]. As noted above, such individuals often have thin borders and creative personalities. In 2013, the DSM-V added the category of iatrogenically induced PTSD to describe situations in which providers induce the trauma in therapy that leads to a diagnosis of PTSD [1].

PTSD Nightmares

Recurrent, repetitive nightmares are the most commonly reported symptoms of PTSD. Nightmare frequency, easily assessed with questionnaires or simple queries, has become the marker most commonly used to assess patient response to PTSD treatment. A decline in nightmare frequency is often associated with an overall improvement in other subjectively reported PTSD symptoms that are more difficult to assess. PTSD nightmares differ from other nightmares in that they often include trauma-associated content. For up to 50% of patients, this content is an apparent re-experience of the traumatic event, though many individuals will have metaphoric nightmares in which the association with trauma can be inferred or interpreted. Many PTSD nightmares include the negative emotions of fear and dread of death. Dream content turns out to be, however, quite difficult to assess. A century of psychoanalytic focus on dream interpretation has, if nothing else, clarified the huge number of variables affecting dream content. Dream content is altered by sleep stage of origin, time since dream experience, time since awakening, the site of collection, the type of recording, distraction, personal relationship to the individual collecting the information, as well as their gender, ethnicity, age, attitude, and perspective toward, definition of, and interest in dreams, bias, beliefs, and expectations [17]. It is often impossible to attain consistently repeatable results when dream content is collected and assessed by other humans. Modern content analysis is often based on computer-assisted analysis of individually submitted dreams. Despite the huge volume of studies from the psychoanalytic era purported to demonstrate personality, psychiatric illness, and other factors affecting dream content, studies using these computer-assisted protocols have found only a few variables that consistently affect dream and nightmare content. Those variables are waking experience or continuity and gender [3]. Some descriptions of complex PTSD and the proposed diagnoses of trauma-induced psychiatric disorder require in their criteria that the patient has recurrent, repetitive nightmares of the actual traumatic experience. The seemingly straightforward criteria of dream trauma re-experience is subject to these many variables affecting content and is quite difficult to consistently and rationally apply.

Other Frightening Dreams

Sleep Onset Hypnagogic Hallucinations and Sleep Paralysis

Powerful, emotionally negative dream experiences are reported from all of the stages of sleep. Sleep onset (Stage 1) parasomnias can be even more bizarre and discombobulating than the classic REM sleep nightmare. These sleep onset dreams are most often intensely visual with little thought and “story” content. Sleep onset dreams, even in otherwise normal people, can include “hypnagogic” hallucinations,

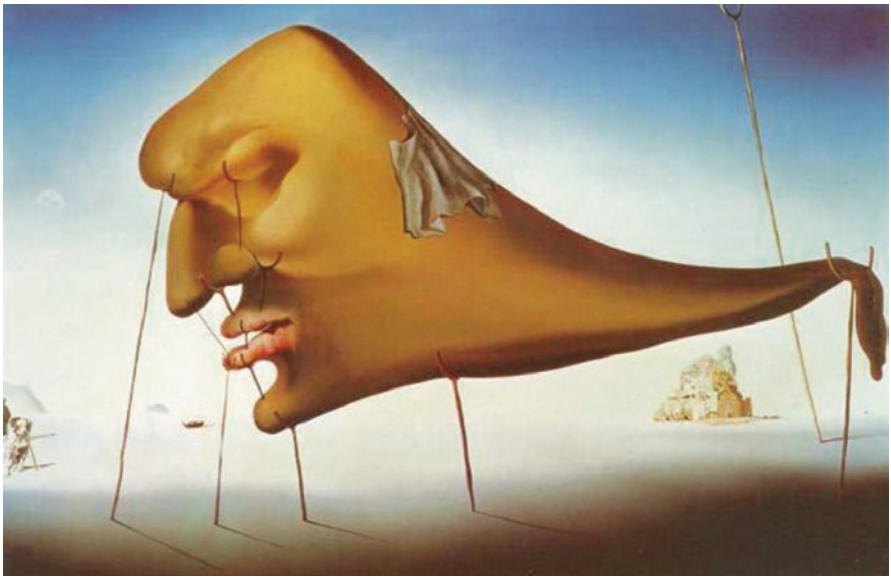

Fig. 5.2 Sleep – Salvador Dali

true hallucinations most often visual, but sometimes auditory, that are seemingly real to the dreamer. These experiences can be quite bizarre and frightening, ranging from the milder experience of the sounds of a dog barking, a baby crying, or an alarm ringing, to extreme and disturbing experiences such as a dreamer's suffocation at the hands of a succubus. Surrealist painters were known to induce such hypnagogic images. Salvador Dali would fall asleep while sitting in a chair and holding a coin between thumb and index finger. With sleep onset, his hand would relax, and as the coin fell into a dish set beside the chair, he would be startled awake. There are those who insist that such sleep onset dreams are less bizarre than REMS dreams [6]. The bizarre and nightmarish images that he derived using this technique argue otherwise (Fig. 5.2).

Episodes of sleep paralysis, a parasomnia most commonly associated with REM sleep, can also occur at sleep onset in normal individuals. These experiences in which the awakened dreamer is unable to move can feature agonizing dread, a sense of oppression, and a conviction of helpless paralysis. Like sleep onset hallucinations, these dreams can even feature the definitional motif of nightmare – the succubus sitting on your chest and sucking out the essence of your soul. It is suggested that an experience of sleep paralysis may be the basis for Fuseli's famous painting "The Nightmare." Both hypnagogic hallucinations and sleep paralysis are associated with the neurological disease of narcolepsy; however, these parasomnias are also quite common among otherwise normal individuals. Up to half of Americans report having experienced either sleep paralysis or hypnagogic hallucinations [9].

Light Sleep (Stage 2): Panic Attacks

We spend a majority of our sleep (approximately 70%) in light sleep. This Stage 2 sleep includes all sleep that cannot be fit into the other stages. Dream recall is lower than from REM sleep and Stage 1, and the dreams tend to be an often uninteresting reworking of waking experience [19]. Yet, it is during light Stage 2 sleep that we are most likely to experience the brief but frightening moments of terror that are nocturnal panic attacks. Panic attacks in sleep occur most often in individuals who have such experiences when awake.

Deep Sleep (Stage 3): Disorders of Arousal

The frightening dreams of Stage 3 (deep sleep) are the most bizarre and disconcerting of all dreams [17]. The pathememonic symptom of the night terror is a "blood-curdling" scream. That scream is accompanied by autonomic discharge: sweating, flushing, and the terrorizing sensation of impending doom and personal danger. On arousal, individuals experiencing another of the deep sleep parasomnias – confusional arousals – are typically disoriented. They can have slow speech, diminished mentation, and sometimes vigorous, highly resistive, and violent inappropriate behaviors [7]. Sleepwalking is the most common of the deep sleep arousal parasomnias, an inspiration for the zombies of literature and film. The dreamer sometimes exhibits remarkably complex automatic behavior: ambulating, opening doors and windows, turning on stoves, loading bullets into firearms, as well as running from or chasing perceived threats, complicated behaviors occurring without the subject's conscious waking knowledge. Night terrors, confusional arousals, and somnambulism (sleepwalking) often include intensely negative dream content, associated with confusion and cognitive dysfunction that persists for minutes and even hours after arousal from deep sleep. These arousal disorders reported by at least 4% of children often diminish or disappear with the onset of adolescence. They are considered normal developmental experiences for children, but in adults are sometimes associated with psychiatric or medical disorders [12].

Special Nightmares

Frightening dreams are remarkable cognitive experiences. Many are significant, the kind of dream that we remember years later, the kind of dream that artists and writers use in their work [18]. Night terrors, hypnagogic hallucinations, and the dreams of sleep paralysis are exceedingly frightening and bizarre. Nightmares can be terribly disturbing and seemingly real, leading to long episodes of nighttime waking and disrupted sleep. They can be used as a marker for an individual's status as to the activity and discomfiture associated with their PTSD. Surprisingly, perhaps, they are among the easiest of PTSD associated symptoms to treat. Imagery rehearsal therapy (IRT), a form of cognitive behavioral therapy (CBT) focusing on changing nightmare storylines, has had extraordinary success in reducing nightmares and

their associated distress even in patients with diagnosed PTSD (Chap. 13). EMDR and other CBT therapies used to treat PTSD such as prolonged exposure are rated as to their effectiveness based on their ability to reduce nightmare frequency (Chaps. 11 and 12). Even some of the medications used to treat the stress response have shown an excellent efficacy in reducing nightmares (e.g., the alpha-agonist antihypertensives) (Chap. 14). While these treatments can work to reduce or eliminate nightmares, it is sometimes a clinical question as to whether nightmares should actually be treated. Some individuals will have minimal waking distress from their nightmares. Others might successfully use nightmares in their creative work. Almost all of us have nightmares, experiences that are likely to have a function in processing stress and trauma. It may not always be appropriate to help to make something go away, even something distressing like the nightmare, when it is an aspect of normal life experience.

References

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Arlington, VA: American Psychiatric Publishing; 2013. ISBN 978-0-89042-555-8.
2. Dallam S. Crisis or creation: a systematic examination of false memory claims. J Child Sex Abus. 2002;9(3/4):9–36. https://doi.org/10.1300/J070v09n03_02. PMID 17521989.
3. Domhoff GW. The scientific study of dreams: neural networks, cognitive development, and content analysis. Washington DC: American Psychological Association; 2003.
4. Hartmann E. The nightmare. New York: Basic Books; 1984.
5. Hartmann E. Nightmares and other dreams. In: Kryger M, Roth T, Dement W, editors. Principles and practice of sleep medicine. 2nd ed. London: W. B. Saunders; 1994. p. 407–10.
6. Hobson J, Hoffman S, Helfand R, Kostner D. Dream bizarreness and the activation synthesis hypothesis. Hum Neurobiol. 1987;6:157–64.
7. ICD-11. The arousal disorders in the international classification of sleep disorders – diagnostic and coding manual. Westchester, Il: American Academy of Sleep Medicine; 2005. p. 137–47.
8. Levin R, Nielsen T. Disturbed dreaming, posttraumatic stress disorder and affect distress: a review and neurocognitive model. Psychol Bull. 2007;133:482–528.
9. Ohayon MM, Priest RG, Caulet M, Cuilleminault C. Hypnagogic and hypnopompic hallucinations: pathological phenomena? Br J Psychiatry. 1996;169(4):459–67.
10. Pagel JF, Vann B. The effects of dreaming on awake behavior. Dreaming. 1992;2(4):229–37.
11. Pagel JF, Kwiatkowski CF. Creativity and dreaming: correlation of reported dream incorporation into awake behavior with level and type of creative interest. Creat Res J. 2003;15(2&3):199–205.
12. Pagel JF. Sleep disorders in children, oxford textbook of primary care. In: Jones R, Grol R, Britten N, Mant D, Culpepper L, Silagy C, Gass D, editors. Clinical management, vol. 2: Oxford University Press; 2004. p. 1030–3.
13. Pagel JF, Nielsen T. Parasomnias: recurrent nightmares – the international classification of sleep disorders – diagnostic and coding manual (ICD-10): American Academy of Sleep Medicine; 2005.
14. Pagel JF, Shocknasse S. Dreaming and insomnia: polysomnographic correlates of reported dream recall frequency. Dreaming. 2007;17(3):140–51.
15. Pagel JF. Drugs, dreams and nightmares, in dreaming and nightmares, sleep medicine clinics 5(2) June 2010. Philadelphia: Saunders/Elsevier; 2010.

16. Pagel JF. The nightmares of sleep apnea: nightmare frequency declines with increasing apnea hypopnea index (AHI). J Clin Sleep Med. 2010;6(1):69–74.
17. Pagel JF. Dream science: exploring the forms of consciousness. Oxford: Academic Press (Elsevier); 2014.
18. Pagel JF (2016) The creative nightmare, dreamtime.
19. Schredl M, Kronenberg G, Nonnell P, Heuser I. Dream recall, nightmare frequency, and nocturnal panic attacks in patients with panic disorder. J Nev Ment Dis. 2001;189:559–62.
20. Singareddy RK, Balon R. Sleep in posttraumatic stress disorder. Ann Clin Psychiatry. 2002;14(3):183–90.
21. States BO. Authorship in dreams and fictions. Dreaming. 1994;4(4):237–53.
22. Stickgold R, Pace-Schott E, Hobson J. A new paradigm for dream research: mentation reports following spontaneous arousal from REM and NREM sleep recorded in a home setting. Conscious Cogn. 1994;3:16–29.
23. Van der Kolk B. The body keeps the score: brain, mind, and body in the healing of trauma. New York, NY: Penguin Books; 2014.
24. Weissberg M. In: Lee-Chiong T, editor. Anxiety disorders and sleep in sleep a comprehensive handbook (ED.). Hoboken, NJ: Wiley-Liss; 2006. p. 845–50.
25. Zadra A, Donderi D. Nightmares and bad dreams: their prevalence and relationship to well being. J Abnorm Psychol. 2000;109:273–81.