

Sleep-laughing – Hypnogely

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ABSTRACT: *Objective:* To explain relatively common phenomenon of laughing during sleep and help to better define criteria for differentiating between physiological and pathological sleep-laughing. *Methods:* Observational study of patients who underwent a sleep assessment in a referential tertiary health facility. *Results:* A total of ten patients exhibited sleep laughing, nine of whom had episodes associated with rapid eye movement (REM) sleep. Also, in one of the patients sleep-laughing was one of the symptoms of REM sleep Behaviour Disorder, and in another patient sleep-laughing was associated with NREM sleep arousal parasomnia. *Conclusion:* The collected data and review of literature suggests that hypnogely in majority of the cases presents as a benign physiological phenomenon related to dreaming and REM sleep. Typically, these dreams are odd, bizarre or even unfunny for a person when awake. Nevertheless, they bring a sense of mirth and a genuine behavioural response. In a minority of cases, sleep-laughing appears to be a symptom of neurological disorders affecting the central nervous system. In these patients the behavioural substrate differs when compared to physiological laughing, and the sense of mirth is usually absent.

RÉSUMÉ: *Rire en dormant – hypnogélie. Objectif :* Le but de l'étude était d'expliquer le phénomène relativement fréquent du rire en dormant et d'aider à mieux définir les critères pour différencier le rire en dormant physiologique de celui qui est pathologique. *Méthode :* Nous avons effectué une étude d'observation de patients qui ont subi une évaluation du sommeil dans une institution de soins tertiaires. *Résultats :* Dix patients ont présenté le phénomène du rire en dormant, dont 9 chez qui les épisodes étaient associés au sommeil paradoxal. De plus, chez un des patients, le rire en dormant était un des symptômes d'un trouble du comportement en sommeil paradoxal et chez un autre patient il était associé à une parasomnie, un trouble de l'éveil en sommeil profond. *Conclusion :* Les données de ces patients et la revue de la littérature suggèrent que, dans la majorité des cas, l'hypnogélie se présente comme un phénomène physiologique bénin relié au rêve et au sommeil paradoxal. Typiquement, ces rêves sont étranges, bizarres et ne sont même pas drôles pour la personne lorsqu'elle est éveillée. Néanmoins, ils provoquent de l'hilarité et une réponse comportementale authentique. Chez une minorité de cas, le rire en dormant semble être un symptôme de certains troubles neurologiques du système nerveux central. Chez ces patients, le substrat comportemental diffère de celui du rire physiologique et l'hilarité en est absente.

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*(Macbeth: There's one did laugh in's sleep,
and one cried "Murder!"*

*That they did wake each other: I stood and heard them
But they did say their prayers and address'd them
Again to sleep.*

from 'Macbeth' by William Shakespeare)

In spite of the steady progress in the sleep research area, sleep-related laughing, a relatively common phenomenon, has not, as yet, been fully investigated.

Aside from the classic literature, sleep laughing has been anecdotally mentioned in some early scientific works discussing broader aspects of paroxysmal nocturnal behaviours. Relatively known is Freud's description of sleep laughter based on the 1916 letter¹ written to him by his friend, colleague and a long-time pen-pal, Hungarian psychiatrist Sandor Ferenczi. In this report Ferenczi describes an elderly gentleman who, while asleep, bursts into a hearty laughter that rouses his wife. The startled wife woke her husband, who proceeded to describe a silly dream in which he was unable to react in an embarrassing situation. It seems that this early description of sleep-laughing served also as an archetype for this sleep phenomenon (silly dream-awakening-recall-amusement).

Ferenczi, Freud, and later Grotjahn² and other psychoanalysts regarded sleep-laughing, from the psychoanalytic point of view, as an unconscious manifestation of primal instincts and fears

(dying, sex, impotence, incest, etc.), which presents in its uncensored, unbarred and unrestricted form. However, the phenomenon of sleep-laughing was at the fringe of psychoanalysts' interest. They often made no distinction between dreaming of laughing, dreaming funny dreams and laughing out of dreams.

Half a century ago the technology of sleep research improved and the results of the first polysomnographic (PSG) studies became available. In earlier scientific works that included sleep recordings, there was almost no distinction between sleep-talking (somniloquy) and sleep-laughing. As an illustration for this, in a seminal work on somniloquy, Arkin's³ participants reportedly exhibited sleep-laughter mostly during or out of rapid eye movement (REM) sleep. In those instances when it was documented in association with non-REM (NREM) sleep, it was usually accompanied by dream mentation (see p. 466)³. The

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standard classifications of sleep disorders do not mention sleep-laughing either as a separate condition, variant of other parasomnia or a symptom of another disorder. Sleep laughter, on the other hand, became a topic of interest for neurologists relatively early when it was discovered that it may be a sign of tumour, epilepsy or other pathologic central nervous system (CNS) processes. Seizures characterized by unprovoked laughing fits were first described as early as the late 19th century (Gower 1881, Fere 1898).

In our previous study⁴, a sample of nine patients with confirmed sleep laughing (age range 27-72, five males) was evaluated in the sleep laboratory. Four patients had exhibited sleep-talking in addition, and three had had a history of sleepwalking emerging in childhood (however, none had sleepwalking present at the time of the study). The frequency of reported sleep-laughing episodes ranged from once or twice every week, to once every few months. The majority of patients described episodes of sleep-laughing associated with dreams or dream mentation that occurs during the last half of the night and often results in awakening. The level of awareness for these events was significantly higher when compared to their sleep talking. Patients were often able to recall content of a dream preceding sleep laughter, typically describing it as bizarre and mostly not disturbing. The general consensus was that the same content would not incite much laughter if they were awake. All of the polysomnographically recorded sleep laughing episodes occurred associated with REM sleep.

Importantly, in one patient (M, 72), sleep-laughter and mild loss of atonia were recorded in REM sleep on the first night that he spent in the sleep laboratory. On the second night, the patient exhibited marked loss of atonia in REM sleep, with acting out of dreams (and also another episode of sleep-laughing). In this case, were it not for the second night sleep assessment, one could have easily overlooked the presence of REM sleep Behaviour Disorder by dismissing an isolated episode of REM-related sleep laughing associated with mild loss of atonia.

As a sequel to the previous study, an observational study was carried out. The purpose of the present study was to confirm or refute the previous finding that sleep-laughing typically arises from REM sleep as a phenomenon sufficiently separate from sleep-talking.

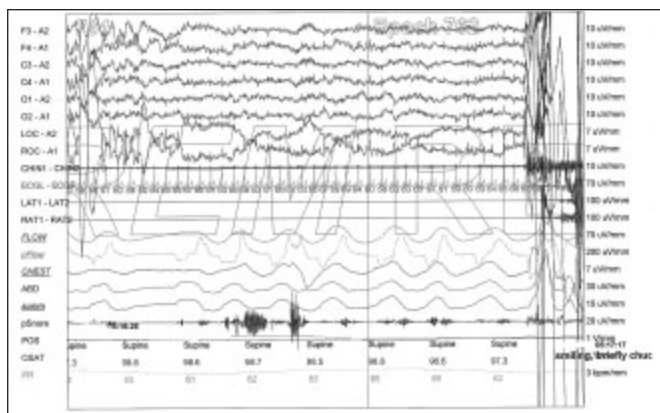


Figure 1: Typical non-pathological hypnogelic episode during REM sleep, episode lasting <10 seconds (condensed 40-second view).

METHODS

The case series study involved patients from a general pool of patients referred for a variety of reasons (insomnia, non-restorative sleep, sleep apnoea, parasomnia) to the tertiary clinic over the period of three years (nine-bed sleep clinic operating seven days a week). During this period, sleep technologists were instructed to submit a short post-hoc query to all patients in whom sleep laughing was observed during the night. The patients were specifically asked whether they remembered laughing in their sleep and if they remembered dreaming before those episodes. They were also questioned whether they had incidents of sleep-laughing at home. At the end of the observational period, the collected sample included a further ten cases of hypnogeny for whom the information about sleep laughing episodes was provided. Further cases of sleep-laughing, who were incidentally recorded in the laboratory and where this information was not available, were not taken into consideration.

RESULTS

In total, nine out of ten patients (age range 18-79, six males) had episodes of sleep-laughing in association with REM sleep, typically at the end of a late REM episode. One of the patients had an episode of sleep-laughing during NREM stage 2 sleep (this patient, however, reported loose dream mentation that was likely related to this episode, and sleep laughing associated with dreaming at home). Similarly to the previous sample, one of the ten patients exhibited sleep-laughing as part of REM sleep Behaviour Disorder (RBD), but in this case it was not an isolated phenomenon (other RBD features were also noted). None of the patients had multiple episodes during the overnight sleep recording, nor had they reported experiencing multiple episodes when sleeping at home. The sleep-laughing episodes were short in duration (<10 seconds), distributed in the second half of the night, presenting as either a brief frank laughing or as chuckling. None of the patients reported negative emotional load after the study, or disturbing dreams during the night.

A total of three out of ten patients used an selective serotonin re-uptake inhibitor (SSRI) at the time of their respective studies. None of these three patients showed typical markers that would

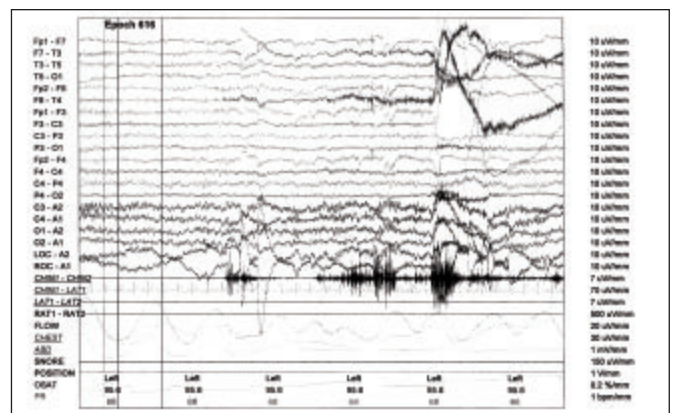


Figure 2: Isolated sleep-laughing in REM parasomnia – RBD, the episode lasting >10 seconds.

Table: Descriptively summarises the findings

n=10	hypnogeny sleep stage	comorbid condition	associated condition	comment
58 f	REM	mild insomnia		SSRI
38 f	REM	mild primary snoring		
79 m	REM	OSA		
40 m	REM	primary snoring		
35 m	REM	mild OSA, EDS		mild loss of atonia in REM
59 f	REM	OSA, PLMs, insomnia		
18 m	REM	PLMs, TS	RBD?	SSRI
72 m	REM	Parkinson's	RBD	bupropion
29 f	NREM		NREM arousal parasomnia	SSRI, also mumbling
46 m	REM	mild primary snoring		

(EDS – Excessive Daytime Sleepiness, TS – Tourette's Syndrome, RBD – REM sleep Behaviour Disorder, SSRI – Selective Serotonin Re-uptake Inhibitor)

be suggestive of RBD, including phasic loss of atonia measured in the submentalis and anterior tibialis muscles, or excessive movements during REM sleep. A single patient, male, age 18, showed isolated brief bursts of EMG activity in REM sleep.

Figure 1 (non-pathological hypnogeny) and Figure 2 (hypnogeny/somnirismus* in RBD, solitary finding) illustrate typical PSG findings in respective situations.

DISCUSSION

The study confirms previous findings that the hypnogeny is in essence a benign physiological sleep phenomenon, with the caveat that in rare cases it may be a pathognomonic sign of a more sinister medical disorder. Also, in the majority of cases, sleep laughter arises as a derivative of dreaming and, as such, is closely related to (polysomnographically defined) REM sleep, while in the minority of cases it appears to be associated with NREM sleep. We have seen only one example of sleep laughing and sleep-talking association during NREM sleep in our patients (19 patients in two studies). The association of dreaming and REM sleep is a tenant of sleep physiology, however, the existence of NREM dreaming and dream mentation is also a relatively well-known phenomenon⁵⁻⁸, which could be an explanation for the rare example of NREM sleep laughing.

In the case of REM-related hypnogeny, the parasomnic episode may result in either partial awakening (arousal) or complete awakening, which typically determines the level of the awareness of the event. The content of such a dream could be bizarre, odd, embarrassing, archetypal or lucid, often funny or silly (one of the ten patients described a dream where he was stopped by a highway patrolman and asked if he could dance – the patient, who inexplicably turned to wear a tutu at that point, said 'But of course' and made a pirouette in front of the policeman, triggering the laughter which woke him up). A number of patients actually described that the content of such dreams would not elicit laughter if they were awake (something that Freud observed, referring to 'dream-jokes' as bad jokes)^{1,9}. It has also been reported that the very sound of laughter may awaken a person. Sometimes, chuckling or giggling is seen rather than frank laughter. The polysomnographic recordings showed that the vast majority of sleep-laughing events did not

have association with a PSG manifestation of any of the "classical" sleep disorders, although a majority of the patients were diagnosed to be suffering from concomitant sleep disorder(s) (see Table). Unlike the profound anxiety and the negative emotional load that are associated with nightmares, hypnogeny stems from dreaming that is usually perceived as a positive emotional experience (at least in the case of the non-pathological sleep-laughing).

In terms of the prevalence, sleep-laughing seems to be fairly frequent. In a study of middle school children (parental report), sleep-laughing was reported to occur in 33-44% of the sample (with minor gender and age differences) at least once in a six-month period¹⁰. In a non-clinical sample, a total of 73% of undergraduate students report being aware of at least one such event annually (only fear and sexual arousal being reported more frequently). In this self-report study of dream-related behaviours, females reported sleep-laughing more often.¹¹

In a minority of patients sleep laughter could be a sign of (sleep) pathology. Notably, sleep-laughing is known to be associated with REM parasomnia (REM sleep Behaviour Disorder)^{4,12-14}. In one of our patients in the first series, a sleep-laughing episode undoubtedly helped in making such diagnosis to the extent that it was a sole symptom leading to an eventual diagnosis of RBD. However, in another case it was not as convincing or helpful in establishing a diagnosis - this patient, with reported use of SSRI medication, had an episode of sleep-laughing with only an isolated and brief loss of atonia on one night, but none of the core PSG symptoms of RBD on two other nights in our sleep lab, and had no anamnestic information that would corroborate possible RBD. This patient was, however, scheduled for further follow-up. Considering all of the available information regarding sleep laughter in connection with RBD, and, as such, with the myriad of neurodegenerative disorders¹⁵, it is evident that there may be a strong connection between two, but the isolated hypnogeny in the absence of supporting clinical symptoms and signs (apart from the loss of atonia on PSG) cannot be relied upon to definitely diagnose the presence of RBD. This is particularly true for the cases involving use of SSRIs (or similar actuating factors), where there is a range of clinical grades between mild loss of atonia on PSG and fully blown clinical RBD.

In addition, pathological laughter is often seen in a number of neurological disorders¹⁶⁻¹⁸, mostly in those that affect the cerebello-pontine region. A special case of pathological sleep laughter is clival chordoma, a cranial malignant slow-growing neoplasm of the embryonic remnant tissue. These patients on occasion exhibit non-provoked laughing, in rare cases confined only to the sleep period. Such laughter is usually paroxysmal, unmotivated, devoid of emotional component and lacking diurnal pattern¹⁹⁻²⁶. Sleep dissociation and loss of REM atonia reported in a patient with clival chordoma who exhibited pathological laughter exclusively during sleep suggest the role for the locus coeruleus and other pontine structures²². In other neurological and psychiatric disorders pathological laughter does not usually appear solely during sleep, which helps to differentiate a diagnosis.

Limitations of the present study are mostly determined by the elusive nature of these paroxysmal events and resulting small study sample. Hypnogely is often overlooked during the sleep study or during study scoring by sleep technologists, particularly when being brief or relatively silent (e.g. chuckling). In cases when they were detected after the fact (i.e. during scoring or a physician's review) it was often difficult to post-festum gather relevant information. Further studies with greater number of patients undergoing PSG are needed to support present claims and, in particular, explain some of its rare variants such as non-REM hypnogely and asymptomatic frequent episodes of hypnogely. When possible, such studies should reduce any biases that result from investigators' or subjects' interpretations and provide for a long-term follow-up in order to truly confirm a benign nature of this sleep phenomenon.

CONCLUSION

As a physiological phenomenon, sleep-laughing or hypnogely* appears not to be a mere by-product or derivation of sleep-talking, as was suggested by early sleep researchers^{2,3}. It is a relatively common and fairly separated entity that is closely associated with REM sleep. While it may be driven by a content of a dubious entertaining quality, the appropriate emotional response and a sense of mirth is present nevertheless. A benign phenomenon in a majority of cases, it may also be a pathognomonic sign of a CNS disorder. When associated with different neurological or sleep disorders, it is specifically seen in either REM sleep (such is the case with RBD), NREM sleep (NREM arousal parasomnia) or irrespective of sleep stage (for example seizures or stroke).

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* To discriminate between the non-pathological sleep laughter (hypnogely – Ancient Greek 'hynpos' – sleep and 'gely' - laughter) and pathological laughter, we propose a term somnrisus (somni – Latin prefix for "sleep" and risus – "laughter") for the later for a simple and a non-scientific reason, as it seems to have a stronger resonance when describing a CNS disorder.