



## CLINICAL REVIEW

## Exploding head syndrome

Brian A. Sharpless\*

Department of Psychology, Washington State University, 364 Johnson Tower, Pullman, WA 99163, USA



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## SUMMARY

Exploding head syndrome is characterized by the perception of abrupt, loud noises when going to sleep or waking up. They are usually painless, but associated with fear and distress. In spite of the fact that its characteristic symptomatology was first described approximately 150 y ago, exploding head syndrome has received relatively little empirical and clinical attention. Therefore, a comprehensive review of the scientific literature using Medline, PsycINFO, Google Scholar, and PubMed was undertaken. After first discussing the history, prevalence, and associated features, the available polysomnography data and five main etiological theories for exploding head syndrome are summarized. None of these theories has yet reached dominance in the field. Next, the various methods used to assess and treat exploding head syndrome are discussed, as well as the limited outcome data. Finally, recommendations for future measure construction, treatment options, and differential diagnosis are provided.

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## Introduction

*Exploding head syndrome* (EHS) is the provocative phrase used to describe perceptions of loud noises when going to sleep or awakening [1,2]. These noises have a sudden onset, are typically of brief duration, and are quite jarring for the sufferer. Though not often associated with pain, EHS episodes result in a great deal of fear, confusion, and distress. It is usually a benign and infrequent experience, but can manifest in more chronic forms and engender clinical consequences.

In spite of its frightening nature and memorable name, relatively little is known about EHS. Many sleep medicine texts either omit it altogether or only make brief mention of its core features. Perhaps not surprisingly, EHS is infrequently assessed in both practice and research and, as will be argued below, this lack of attention may result in misdiagnosis, unnecessary testing, and continued feelings of embarrassment for patients. Therefore, an up-to-date and comprehensive review of the existing theoretical and empirical literature on EHS was undertaken.

## Review method

The literature search began on October 31st, 2013 with key word searches of “exploding head,” “exploding head syndrome,” “sensory sleep starts,” and “snapping of the brain” using PubMed (88 results), PsycINFO (11 results), Google Scholar (626 results), and Medline (23 results). Reference lists of identified articles and chapters were searched for additional sources. Publications were selected on the basis of whether or not they reported empirical findings, provided background information, or contained relevant theoretical speculation. Many sources were therefore eliminated due to the fact that they made only brief reference to EHS symptomatology (e.g., in the context of differentiating EHS from other disorders such as headaches or tinnitus).

## A brief history of exploding head syndrome

The term *exploding head syndrome* was first coined by J.M.S. Pearce [3]. However, descriptions of this phenomenon are much older. Credit for the first clinical description of EHS is often given to Robert Armstrong-Jones, who described the phenomenon in detail and named it a “snapping of the brain” [4]. He identified this phenomenon in several patients suffering from early melancholia, neurasthenia, and psychasthenia, and further reported that the beginning of their illnesses could be traced to these frightening nocturnal experiences.

However, earlier descriptions can be found in the work of Silas Weir Mitchell [5]. Mitchell provided case studies of two male

Abbreviations: AASM, American Academy of Sleep Medicine; DSM, *Diagnostic and Statistical Manual of Mental Disorders*; EEG, electroencephalogram; EHS, exploding head syndrome; EMG, electromyogram; ICD, *International and Statistical Classification of Diseases and Related Health Problems*; ICSD, *International Classification of Sleep Disorders*.

\* Tel.: +1 509 335 3588; fax: +1 509 335 1030.

E-mail addresses: [basharpless@gmail.com](mailto:basharpless@gmail.com), [brian.sharpless@wsu.edu](mailto:brian.sharpless@wsu.edu).

### Glossary of terms

**Anxiety sensitivity** refers to the tendency to fear anxiety-related symptoms (e.g., tachycardia; perspiration) due to a belief that they will eventuate in a negative social or health-related outcome.

patients suffering from “sensory discharges” (pp. 778–780). Both men experienced the paradigmatic explosive sounds (e.g., pistol shot, loud bells), and one reported a preceding aura. Interestingly, Mitchell proposed both behavioral and substance-induced etiologies for these discharges (e.g., excessive mental labor and tobacco use).

### Classification

EHS formally entered psychiatric and medical nosology in the *International Classification of Sleep Disorders – 2nd Edition* (ICSD-2) [1]. Currently, EHS can be classified in the *International Statistical Classification of Diseases and Related Health Problems – 10th Edition Revised* (ICD-10) [6], or the *Diagnostic and Statistical Manual of Mental Disorders – 5th Edition* (DSM-5) [7] as either an “other specified sleep–wake disorder” (codes: 780.59 or G47.8) or “unspecified sleep–wake disorder” (codes: 780.59 or G47.9). However, EHS and relevant diagnostic criteria are only explicitly mentioned in ICSD-2 [1] and the more recently-released ICSD-3 [2]. In both versions, EHS is classified as a *sensory parasomnia*.

### Symptomatology

Vivid descriptions of EHS can be found in any number of published case studies [3]. The three main diagnostic criteria per ICSD-3 [2] are listed in Table 1. It is worth noting that, in many instances, complaints of pain during EHS are actually misperceptions of shock and fear. However, mild pain is occasionally reported. Regarding the specific auditory content of episodes, examples can be found in Table 2. Their perceived location appears to vary, with some patients hearing explosions in both ears [8] and others perceiving noises within the head [9]. More data are needed, as these perceptual differences may imply EHS subtypes, etiological variations, or merely individual patient variability.

Along with the paradigmatic auditory perceptions, several other symptoms may be present that are not currently required for diagnosis. Specifically, visual disturbances during EHS occur in approximately 10% of cases [10]. Some patients perceive lightning or more generic light flashes whereas others describe visual static [9]. Feelings of intense heat, as well as epigastric and precordial sensations are not uncommon. Finally, an aura of electrical sensations that ascends from the lower torso to the head (and immediately precedes the sensory explosions) has also been reported [11,12].

### Frequency and course

Both the frequency and the course of EHS appear to be fairly variable. Patients range from having one episode in a lifetime to upwards of seven episodes per night [10]. The course of EHS can be constant or irregular, and may go into a full or partial remission only to be followed by a seemingly unexpected recrudescence of attacks [11,13].

**Table 1**

ICSD-3 diagnostic criteria for exploding head syndrome.

- |    |  |
|----|--|
| A. | There is a complaint of a sudden loud noise or sense of explosion in the head either at the wake–sleep transition or upon waking during the night. |
| B. | The individual experiences abrupt arousal following the event, often with a sense of fright.   |
| C. | The experience is not associated with significant complaints of pain.  |

### The prevalence of EHS

Accurate prevalence rates for EHS are not currently available due to a predominance of case studies in the literature. It has been claimed that EHS is rare [9] but the limited data imply that this pronouncement may be premature. In the one study identified that allowed for rough prevalence estimates [14], 13.8% of psychiatric patients, 10.0% of patients with a sleep disorder, and 10.7% of healthy controls screened positive for EHS symptoms on a self-report measure (total  $N = 180$ ). A smaller ( $N = 36$ ), random subsample of these groups underwent a subsequent clinical interview, and an EHS rate of 11.1% was found. Similarly, a self-report internet-based study of 108 participants found a lifetime rate of 50.0%, but the author of the study admits that this high rate is likely an artifact of ambiguities in the phrasing of the question [15]. Although larger replications are clearly needed, these preliminary data do not appear to imply clinical rarity.

It is possible that the perceived rarity of EHS could be an artifact of at least two other factors. First, individuals rarely present for treatment with EHS as the sole complaint [3]. Relatedly, and similar to another parasomnia with perceptual abnormalities (i.e., isolated sleep paralysis) [16,17], patients with EHS may feel reluctant to disclose their more unusual symptoms for fear of personal embarrassment unless directly prompted by medical professionals.

Gender differences in EHS are also unclear, but some have observed a predominance of females with EHS [18,19]. Only one identified study allows for a calculation of prevalence rates according to gender (i.e., [14] where gender was assessed, but not reported in the original manuscript). They found a rate of 7.14% for men and 15.52% for women. The only other possibility for estimating EHS prevalence according to gender is through aggregating all known patients (i.e., all 112 cases from 1988 to present that reported these variables). These data indicate a 1.55:1 female predominance [3,8–11,18,20–25]. This figure should be interpreted with caution, however, as it was primarily derived from case studies and/or samples of relative convenience as opposed to more traditional methods of estimating prevalence.

**Table 2**

Sounds reported during exploding head syndrome.

Exploding head syndrome sounds	
Violent explosions [11]	Fireworks [21]
Noise like electric current [20]	Soughing sound (as if by fire) [10]
Enormous roar [9]	Cars driving by [32]
Beep [25]	Whiplash [9]
Door slam [9,13]	Someone yelling [32]
Crashing waves [8]	Clash of symbols [9]
Bangs on a tin tray [8]	Metallic noise [9]
Electric “jolt” [8]	Lightning crack [9,10,21]
Loud twang like a breaking guitar string [4]	Nearby thunder [2,7]
Buzzing [8]	Electric short circuit [32]
Crash of noise (something given way in the brain) [26]	Snap like a Christmas cracker [9]
Clap [7]	Blow to the head [4]
Video static [8]	A bell struck once [4]
Pistol or shotgun [4,9]	

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