



Review

The association of panic and hyperventilation with psychogenic non-epileptic seizures: A systematic review and meta-analysis

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ABSTRACT

Introduction: Psychogenic Non-Epileptic Seizures (PNES) are events that appear epileptic but are instead thought to have a psychological origin. Increased rates of several psychiatric disorders have been reported in PNES, including anxiety and panic disorders. Some theories suggest panic and/or hyperventilation have aetiological roles in PNES, though these remain unproven.

Methods: We conducted a systematic review of associations of panic and hyperventilation with PNES using Ovid Medline and PubMed, and a meta-analysis where appropriate.

Results: We found eighteen studies reporting rates of panic in PNES and eight studies reporting hyperventilation. The reported rate of panic attacks in PNES ranged from 17% to 83%, with physical symptoms more commonly reported, and affective symptoms less so. 'Dizziness or light-headedness' was found to be more prevalent than 'fear of dying' by random-effects meta-analysis (68% vs. 23%). A proportion meta-analysis found a weighted occurrence of 20% of panic disorder in PNES. A pooled meta-analytic rate of PNES events following voluntary hyperventilation induction was 30%, while the clinically observed rates of peri-ictal hyperventilation in PNES without induction varied from 15 to 46%.

Conclusions: Previous studies have reported moderate rates of association of panic in PNES, though the proportions varied considerably across the literature, with physical symptoms more commonly reported than affective. Hyperventilation is an effective inducer of PNES events in a minority, and can be observed occurring in a minority of patients without induction. These results support an important, albeit not essential, role for panic and hyperventilation in the pathogenesis of PNES events.

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1. Introduction

Psychogenic non-epileptic seizures (PNES) are events that superficially resemble epileptic seizures but without evidence of typical epileptic discharges on electroencephalography (EEG), and which are thought to have a psychological origin [1]. PNES are a form of Conversion Disorder, which psychiatric orthodoxy holds results from the 'conversion' of intrapsychic stress into neurological symptoms, though the aetiology and mechanism of this are unclear. Psychological states are thought to play a role [2], as well as a history of trauma [3,4] and abuse [3,5], though by no means

invariably [6]. It is associated with a range of psychiatric comorbidities, including depression, anxiety and personality disorders [3,7], though these again are not always found.

Panic symptoms have been particularly commonly reported in PNES [8], and it has been claimed that panic plays a specific aetiological role in PNES events: Goldstein and Mellers speculated that the events occur as a response to heightened arousal in the absence of raised anxiety levels ('panic without panic') [9]. This is supported by reports of increased autonomic arousal in PNES [10], and by the use of hyperventilation, perhaps the cardinal feature of panic [11], to provoke non-epileptic events in EEG suites [12]. As the mechanisms of PNES remain elusive, the investigation of associated panic may potentially be informative as to their production or predisposition.

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This systematic review aims to capture the available literature on the associations between PNES and panic and panic symptoms, including hyperventilation, to allow appraisal of the evidence examining the possible role of panic in the aetiology of PNES.

2. Methods

2.1. Inclusion & exclusion criteria

We included any article presenting original data in a peer-reviewed journal that reported a specific rate of either panic, hyperventilation or panic symptoms with PNES. As the individual symptoms of panic (such as shaking) are very non-specific, we included studies of symptoms only if they were reported in a study of panic specifically. Studies were excluded if they were not in English, were not available in full text, were reviews or case studies.

2.2. Search strategy

A search was conducted with the terms (“panic” OR “panic disorder” OR “panic attack” OR “panic symptoms” OR “hyperventilation”) AND (“psychogenic seizures” OR “psychogenic non-epileptic seizures” OR “pseudoseizures” OR “functional seizures” OR “hysterical seizures” OR “non epileptic seizures” OR “functional epilepsy”). No date limits were specified, so the search would have covered from the start of each database to the date of the search,

which was conducted on February 6th, 2017. This yielded 153 results on Ovid covering Embase, Ovid Medline, and PsychINFO, and 42 results on PubMed. After duplicates were removed, there were a total of 99 results. The abstracts were then read and studies excluded if they were: reviews or meta-analyses, books or book chapters, articles in languages other than English, single-case studies, and studies without psychogenic non-epileptic seizures or its synonyms. This left a total of $n = 52$ studies for which full text was sought. Unavailable papers, such as conference proceedings, were then excluded, and the Methods and Results sections of available articles were screened to confirm inclusion of panic, panic symptoms, or hyperventilation in PNES. Of the remaining 25 papers, 13 were excluded after full-text review because they did not meet the inclusion criteria. A review of the references of the remaining 12 papers plus a recent review [13] was conducted, yielding a further seven studies meeting inclusion criteria. Seven additional papers meeting inclusion criteria were also found from consultation with experts, five of which were recommended by a reviewer, including two studies published after the search date. This gave a final total of 26 studies – 18 studies of panic and eight studies of hyperventilation – included in the qualitative review (see Fig. 1); the studies excluded after full-text review, as well as the reasons for their exclusion, are noted in Appendix A (Table 6.–Supplementary file 1); the two main reasons for exclusion were either that an association was reported without quantitative support, or that the rate reported was mixed with another condition or procedure (e.g. hyperventilation with photic

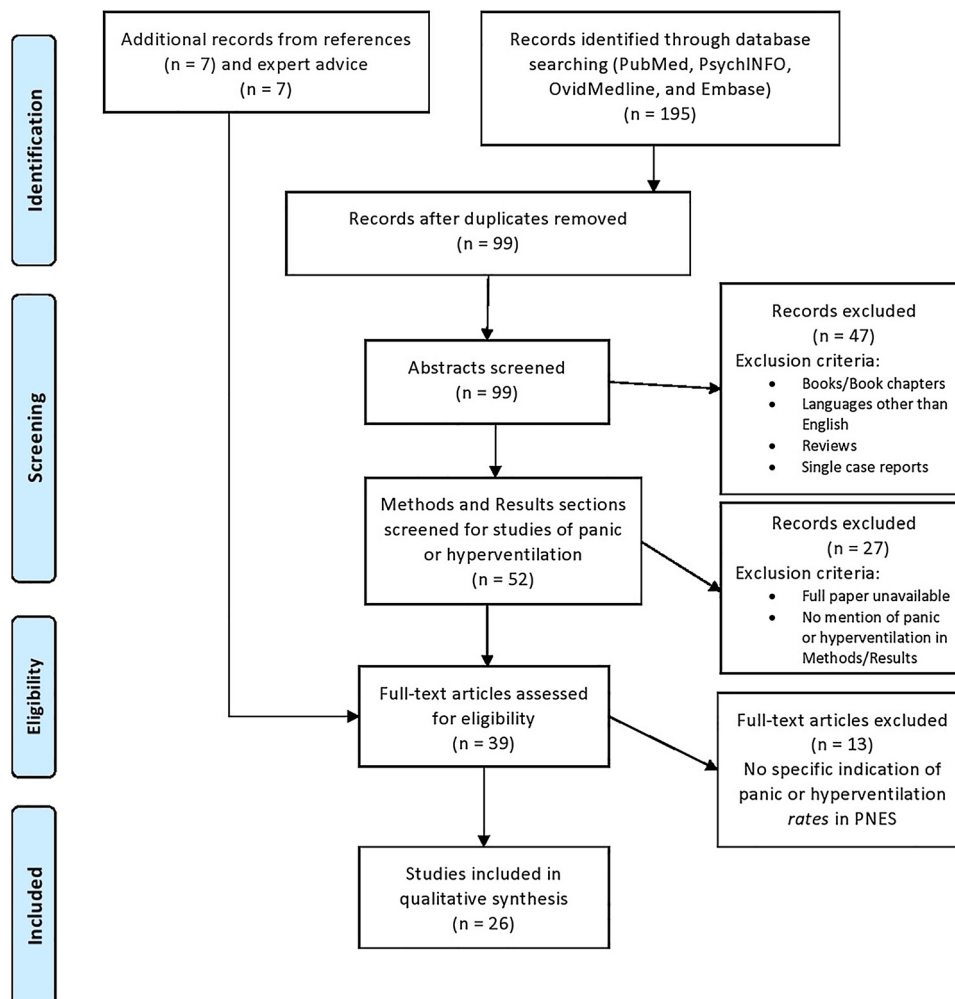


Fig. 1. PRISMA diagram of study selection.

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