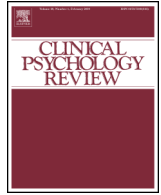




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# Clinical Psychology Review



Review

## The role of sleep dysfunction in the occurrence of delusions and hallucinations: A systematic review



Sarah Reeve, Bryony Sheaves, Daniel Freeman \*

Department of Psychiatry, University of Oxford, UK

### HIGHLIGHTS

- The review assesses the link between sleep dysfunction and psychotic experiences, particularly delusions and hallucinations.
- A systematic review is undertaken of 66 papers that assessed sleep and individual psychotic experiences.
- Sleep dysfunction and psychosis clearly co-occur and sleep dysfunction may predict later psychotic experiences.
- The effect of improving sleep on psychotic experiences remains to be tested in an adequately powered trial.
- The mechanisms linking sleep dysfunction to psychotic experiences require testing.

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### ABSTRACT

*Background:* Sleep dysfunction is extremely common in patients with schizophrenia. Recent research indicates that sleep dysfunction may contribute to psychotic experiences such as delusions and hallucinations.

*Objectives:* The review aims to evaluate the evidence for a relationship between sleep dysfunction and individual psychotic experiences, make links between the theoretical understanding of each, and highlight areas for future research.

*Method:* A systematic search was conducted to identify studies investigating sleep and psychotic experiences across clinical and non-clinical populations.

*Results:* 66 papers were identified. This literature robustly supports the co-occurrence of sleep dysfunction and psychotic experiences, particularly insomnia with paranoia. Sleep dysfunction predicting subsequent psychotic experiences receives support from epidemiological surveys, research on the transition to psychosis, and relapse studies. There is also evidence that reducing sleep elicits psychotic experiences in non-clinical individuals, and that improving sleep in individuals with psychosis may lessen psychotic experiences. Anxiety and depression consistently arise as (partial) mediators of the sleep and psychosis relationship.

*Conclusion:* Studies are needed that: determine the types of sleep dysfunction linked to individual psychotic experiences; establish a causal connection between sleep and psychotic experiences; and assess treatments for sleep dysfunction in patients with non-affective psychotic disorders such as schizophrenia.

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\* Corresponding author at: Oxford Cognitive Approaches to Psychosis, University Department of Psychiatry, University of Oxford, Warneford Hospital, Oxford OX3 7JX, UK.  
 E-mail address: [daniel.freeman@psych.ox.ac.uk](mailto:daniel.freeman@psych.ox.ac.uk) (D. Freeman).

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## 1. Introduction

Psychotic disorders such as schizophrenia have been associated with sleep dysfunction since first clinically described. In case study descriptions Kraepelin (1919) frequently refers to disturbed sleep and suggests that in treatment “Rest in bed, supervision, care for sleep and food, are here the most important requisites” (p. 279). Bleuler (1950) also noted that sleep disturbances were common in psychosis: “Sleep is habitually disturbed... Many patients do not want to sleep because they want to know what goes on during the night, or because they fear some violence to themselves while asleep” (p. 59). Patient accounts similarly show awareness of an interaction between their psychotic experiences and their sleep: “They [the voices] keep me from going to sleep”; “the more tired I am the worse they get” (Waite et al., 2015). However, it is only in the last few years that a research agenda has emerged concerning sleep dysfunction as a putative contributory causal factor and therapeutic target in the occurrence of psychotic experiences (Freeman, Pugh, Vorontsova, & Southgate, 2009; Freeman & Waite et al., 2015; Harvey & Murray, 2011; Wulff, Gatti, Wettstein, & Foster, 2010).

Outside of the clinical realm a literature exists showing the effects of sleep deprivation on individuals in the general population. Small studies carried out in the 1950s and 1960s reported that sleep deprivation in otherwise healthy individuals leads to emergence of psychotic-like experiences, such as hallucinations, with the frequency and severity of these experiences increasing with time spent awake (Bliss, Clark, & West, 1959; Brauchi & West, 1959; Katz & Landis, 1935; Luby, Frohman, Grisell, Lenzo, & Gottlieb, 1960; Pasnau, Naitoh, Stier, & Kollar, 1968; Ross, 1965; West & Janszen, 1962). Illustrative descriptions from these studies include: “He saw a fine smoke begin to rise from the floor....as he stared at the floor more closely, fine jets of water appeared to be rising” (Bliss et al., 1959) and: “During the course of the vigil Z [attributed] persecutory intent to one of the experimenters. He became more and more certain that this experimenter was personally interested in making life disagreeable for him” (Katz & Landis, 1935) Intriguingly, one experimental study found that 100 h of wakefulness was associated with a resurgence or exaggeration of psychotic symptoms in a small sample ( $n = 6$ ) of inpatients with schizophrenia (Koranyi & Lehmann, 1960).

In this review we revisit the link between disrupted sleep and individual psychotic experiences, in particular delusions and hallucinations. We set out to answer the question of whether psychotic experiences and sleep dysfunction are related, and if so, how. After reviewing the existing research addressing these questions we will then integrate its findings into the theoretical literature of psychosis and sleep, in the process highlighting priorities for future research.

### 1.1. Psychotic experiences

This review is intended to cover the relationship between sleep dysfunction and the main positive psychotic experiences – hallucinations and delusions. The empirical research indicates that non-affective psychotic diagnoses such as schizophrenia actually contain multiple independent experiences, including paranoia, grandiosity, and hallucinations (Peralta & Cuesta, 1999; Ronald et al., 2014; Vazquez-Barquero, Lastra, Nu, Castanedo, & Dunn, 1996; Wigman et al., 2011). Heritabilities of each type of psychotic experience have been found to vary (Zavos et al., 2014).

Whilst the individual psychotic experiences are typically studied in psychotic disorders such as schizophrenia, they are also common in the general population, with the prevalence of hallucinations and delusions estimated from epidemiological studies to be in the region of 7–11% (Linscott & van Os, 2013). In clinical groups, the association of the individual psychotic experiences is inflated, due to Berkson's bias, whereby individuals with multiple problems are more likely to come into contact with clinical services (Bak, Drukker, van Os, & Delespaul, 2005; Maric et al., 2004). The individual psychotic experiences exist on spectra of severity in the general population; in other words, like emotional disorders (Plomin, Haworth, & Davis, 2009), they exist as quantitative traits in the general population, with clinical populations experiencing the severe end of the continua. A focus on individual psychotic experiences has allowed development of detailed theoretical models, for example for paranoia (Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002) accompanied by corresponding innovations in treatment (Freeman & Garety, 2014).

The evidence is threefold supporting the idea that non-clinical and clinical psychotic experiences exist on the same continuum: in both groups they are associated with similar environmental (e.g. trauma, cannabis use) and psychological factors (e.g. anomalous experiences, worry) (Freeman, Pugh, Vorontsova, Antley, & Slater, 2010; Johns & van Os, 2001); milder psychotic experiences are more common in families of individuals with psychotic disorders than families without such a history (e.g. van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009); and adolescents who report psychotic experiences are at greater risk of developing psychotic disorders in adulthood (e.g. Fisher, Caspi, & Poulton, 2013).

Therefore, in contrast with existing reviews linking sleep and schizophrenia (Benson, 2006, 2008; Cohrs, 2008; Lunsford-Avery & Mittal, 2013; Monti & Monti, 2004; Pritchett et al., 2012; Waters & Manoach, 2012; Zanini et al., 2013), this article will particularly focus on research that investigates the association of sleep dysfunction with individual psychotic experiences, with attention also paid to studies that jointly assess delusions and hallucinations as positive symptoms. We will

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