Schizophrenia Research xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Schizophrenia Research

journal homepage: www.elsevier.com/locate/schres

Sleep disturbances are associated with psychotic experiences: Findings from the National Comorbidity Survey Replication

Hans Y. Oh [a,b,*], Fiza Singh [c], Ai Koyanagi [d], Nicole Jameson [e], Jason Schiffman [e], Jordan DeVylder [e]

[a] University of California, Berkeley, School of Public Health, 50 University Hall #7360, Berkeley, CA 94720-7360, USA
[b] Pacific Institute for Research and Evaluation, 180 Grand Avenue Suite #1200, Oakland, CA 94612, USA
[c] University of California, San Diego, Department of Psychiatry, 9500 Gilman Drive, La Jolla, CA 92093-0810, USA
[d] Parc Sanitari Sant Joan de Déu/CIBERSAM, Research and Development Unit, Universitat de Barcelona, Fundació Sant Joan de Déu, Sant Boi de Llobregat, Barcelona, 08830, Spain
[e] University of Maryland, Baltimore, School of Social Work, 525 West Redwood Street, Baltimore, MD 21201, USA

ARTICLE INFO

Article history:
Received 30 November 2015
Received in revised form 7 January 2016
Accepted 10 January 2016
Available online xxxx

Keywords:
Sleep
Insomnia
Psychotic experiences
NCS-R

ABSTRACT

Sleep disturbances have been linked to psychotic experiences in the general adult populations of multiple countries, but this association has yet to be confirmed in the United States using robust diagnostic measures. We analyzed a subsample (n = 2304) of the National Comorbidity Survey Replication, and found that when compared with those who did not report any sleep problems, individuals with sleep disturbances lasting two weeks or longer over the past 12 months were significantly more likely to report at least one psychotic experience during that same time frame. Specifically, difficulty falling asleep, waking up during the night, early morning awakenings, and feeling sleepy during the day were each associated with greater odds of reporting psychotic experiences over the past year after controlling for socio-demographic variables. However, only difficulty falling asleep and early morning awakenings were still significant after adjusting for DSM comorbid disorders. Reporting three or four types of sleep disturbances was especially predictive of psychotic experiences. Our findings underscore the importance of detecting and reducing sleep problems among individuals who report PE.

1. Introduction

Psychotic Experiences (PE) occur in approximately 7.2% of the general population (Linscott and van Os, 2013), and have been associated with perceived need for help (DeVylder et al. 2014b), poor functioning and distress (Kelleher et al., 2015), co-occurring psychiatric disorders (DeVylder et al., 2015), and suicidality (DeVylder et al., 2015; Kelleher et al., 2012, 2013). While most PE are transitory, they might also signal the onset of psychotic disorder in some individuals (Fisher et al., 2013; Werbeloff et al., 2012). Sleep dysfunction has been correlated with the entire psychosis continuum – from sub-threshold PE to full psychotic disorders – and this relation has been replicated using different methodologies, measures, and samples (Reeve et al., 2015). However, there have only been a few large epidemiological studies of general adult populations that examined the association between sleep disturbance and PE.

Freeman et al. (2010) analyzed a national epidemiological survey of households in England, Wales, and Scotland (British National Survey of Psychiatric Morbidity) and examined the extent to which sleep problems as defined by the Clinical Interview Schedule Revised (CIS-R; Lewis et al., 1992) were associated with persecutory ideation as defined by the Psychosis Screening Questionnaire (Bebbington and Nayani, 1995). The authors found that sleep dysfunction at three different levels of severity (sleep difficulties, moderately severe insomnia, and chronic insomnia) were all associated with increased risk for paranoia, with the more persistent and severe sleep disturbances having larger effects. A subsample of participants were assessed 18 months later, and a longitudinal analysis showed that insomnia predicted the persistence and new inception of paranoia after adjusting for socio-demographic variables (Freeman et al., 2012). Freeman et al. (2011) found similar effect sizes in another survey of households in England (Adult Psychiatric Morbidity Survey), which also used the CIS-R, but only used one definition of insomnia (problems getting or trying to stay asleep in the past week, where it took at least a quarter of an hour to get to sleep, and the problem occurred for at least 6 months). A limitation of these studies is that they did not control for co-occurring psychiatric disorders, though Freeman et al. (2010) did conduct a mediation analysis and found that the association between insomnia and paranoia was partially explained by anxiety, worry, depression, irritability, and to a lesser extent, cannabis use. However, the authors only used symptoms and not clinical diagnoses, and only examined cannabis use instead of substance or alcohol dependence.

The most recent and largest analysis of non-clinical adult populations was conducted by Koyanagi and Stickley (2015), who analyzed

* Corresponding author at: University of California, Berkeley, School of Public Health, 50 University Hall #7360, Berkeley, CA 94720-7360, USA.
E-mail addresses: hansoh@berkeley.edu (H.Y. Oh), fsingh@ucsd.edu (F. Singh), a.koyanagi@pssjd.org (A. Koyanagi), schiffma@umbc.edu (J. Schiffman), jdevylder@ssw.umaryland.edu (J. DeVylder).

http://dx.doi.org/10.1016/j.schres.2016.01.018
0920-9964/

data from the World Health Organization's World Health Survey (WHS). In this survey, respondents were asked one question to assess the severity of their sleep problems over the past 30 days in terms of falling asleep, waking up frequently during the night, and waking up too early in the morning, to which respondents could answer: *none*, *mild*, *moderate*, *severe*, or *extreme*. Respondents who answered *severe* and *extreme* were coded as having sleep problems, and were almost two and a half times more likely to report at least one psychotic symptom when compared with those who did not have sleep problems [odds ratio (OR): 2.41; 95% confidence interval (CI): 2.18–2.65]. This effect diminished after controlling for anxiety and depression, but remained significant (OR: 1.59; 95% CI: 1.40–1.81).

Koyanagi and Stickley's study confirmed the relation between sleep disturbance and PE across 56 mostly middle- and low-income countries; however, their results should be interpreted bearing in mind certain limitations. First, the study did not examine whether specific types of sleep disturbances had variable associations with PE. Second, the 30-day assessment of sleep problems left considerable room for the possibility that the sleep problems occurred after the onset of PE. Third, the PE measure excluded events that occurred within the context of sleep, alcohol, and drugs for hallucinations only, and not for delusional ideation; therefore, the PE measure was inherently confounding. Finally, the authors could not control for comorbid conditions using strong diagnostic measures.

To our knowledge, there are no studies that examine the relation between sleep disturbance and PE in the general US adult population, and so in this paper, we aim to fill this gap in the literature. We will also address the limitations of previous studies by examining four different types of sleep disturbances that lasted two weeks over the past 12 months (difficulty initiating sleep, difficulty maintaining sleep, early morning awakenings, and feeling sleepy during the day), and by using a measure of PE that excludes sleep-related and substance-induced experiences. Further, we will control for several comorbid conditions using DSM diagnoses, including several mood, anxiety, and substance use disorders. We hypothesize that all four kinds of sleep disturbances will be associated with PE after controlling for comorbid psychiatric disorders.

2. Methods

2.1. Sample

We analyzed data from the National Comorbidity Survey Replication (NCS-R). The sample designs and sampling methods have been described in detail elsewhere (Kessler and Merikangas, 2004). In brief, the NCS-R is a nationally representative survey of 9282 adults residing in households within the 48 contiguous states, selected through a multi-stage sampling design. Most respondents were White (73%), reflecting the general population of the US. The survey investigators provided survey weighting, stratification, and cluster sampling variables to account for the complex sampling techniques used in the NCS-R. The survey consisted of an expanded version of the World Health Organization's Composite International Diagnostic Interview (WHO CIDI), which draws from DSM-IV diagnostic criteria, and uses organic exclusions and diagnostic hierarchy rules. All respondents completed a 'Part I' diagnostic interview, and a probability subsample of 5692 respondents completed an additional 'Part II' interview that elicited more diagnostic and background information. A random subsample of Part II respondents ($n = 2322$) completed the psychosis screen. Respondents who were missing any of the variables of interest were excluded from the analysis ($n = 18$), resulting in a final analytic sample of 2304. Five respondents in our analytic sample self-reported that at some point in their lives they had talked to a doctor or mental health professional about receiving help in dealing with schizophrenia/psychosis. We re-ran our analyses after excluding these individuals, but since results did not vary significantly, we decided to retain these individuals in our sample.

2.2. Psychotic experiences (past 12 months)

PE were assessed using the WHO-CIDI 3.0 Psychosis Screen (Kessler and Ustun, 2004), which has been used to measure PE across the globe (McGrath et al., 2015) and has been validated through associations with hospital admissions and the development of full psychotic disorder in a dose–response fashion (Kaymaz et al., 2012). The WHO-CIDI psychosis screen can be found in the supplemental materials. Respondents were asked to report the lifetime presence of six specific PE, including: (1) visual hallucinations, (2) auditory hallucinations, (3) thought insertion, (4) thought control, (5) telepathy, and (6) delusions of persecution. Endorsing at least one of these experiences during one's lifetime constituted a positive endorsement of lifetime PE. Responses were not considered PE if the experience took place in the context of falling asleep, dreaming, or substance use. Respondents who endorsed lifetime PE were asked whether any of these experiences occurred within the past 12 months. We only used PE over the past year to be consistent with the sleep variables.

2.3. Sleep disturbance (past 12 months)

Sleep disturbance items were derived from DSM-IV criteria, but were asked outside of the context of psychiatric diagnoses. Respondents were asked whether or not (yes/no) they had sleep problems that lasted at least two weeks over the past year. Sleep problems were measured using four separate variables, including: getting to sleep when nearly every night it took the respondent 2 h or longer to fall asleep (difficulty initiating sleep); staying asleep when the respondent woke up nearly every night and took an hour or more to get back to sleep (difficulty maintaining sleep); waking too early when the respondent woke up nearly every morning at least 2 h earlier than desired (early morning awakening); and feeling sleepy during the day.

2.4. Control variables

Self-reported socio-demographic variables that had the potential to confound the analyses were included as covariates. These variables included race (White, Black, Asian, Latino, Other), sex, age (18–29, 30–44, 45–59, 60+), marital status (married, previously married, never married), education level (less than high school, high school, some college, college and beyond), income-poverty ratio (0 = poor, 1–2 near poor, 3+ nonpoor), and work status (employed, unemployed, out of workforce). Since psychiatric disorders can co-vary with sleep and psychosis (Reeve et al., 2015; DeVylder et al., 2015; Schierenbeck et al., 2008), we created a dummy variable to indicate the presence of any one or more of the following co-occurring disorders that occurred within the past 12 months: mood disorders (major depressive, dysthymia, bipolar), anxiety disorders (general anxiety, panic, social phobia, agoraphobia with and without panic attacks), post-traumatic stress disorder, and substance use disorder (alcohol dependence, drug dependence).

2.5. Analysis

We estimated standard errors through design-based analyses that used the Taylor series linearization method to account for the complex multistage clustered design, with US metropolitan statistical areas or counties as the primary sampling units. We used sampling weights for all statistical analyses to account for individual-level sampling factors (i.e. non-response and unequal probabilities of selection). We used STATA SE to compute Wald χ^2 tests, comparing sleep disturbance variables between those who reported PE and those who did not. We then examined the relation between sleep disturbance and PE adjusting for potential socio-demographic confounders in the first block, and

Please cite this article as: Oh, H.Y., et al., Sleep disturbances are associated with psychotic experiences: Findings from the National Comorbidity Survey Replication, Schizophr. Res. (2016), http://dx.doi.org/10.1016/j.schres.2016.01.018