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Original Article

Epidemiology of sleep and sleep disorders in The Netherlands

Gerard A. Kerkhof [a, b, *, 1]

[a] Department of Psychology, University of Amsterdam, Amsterdam, The Netherlands
[b] Sleep Disorders Center MCH, The Hague, The Netherlands

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ABSTRACT

Objective: There is a surging public interest in The Netherlands concerning sleep, sleep disorders and associated health. For a proper perspective, it is necessary to have reliable information on the prevalence of sleep characteristics at the national level. This study set out to assess prevalence rates and key characteristics of sleep and sleep disorders in The Netherlands.
Methods: In 2012, a nationally representative sample of 2089 individuals, aged 18–70 years, responded to a set of 48 questions, including the Holland Sleep Disorders Questionnaire, a validated questionnaire based on the International Classification of Sleep Disorders.
Results: Prevalence rates were: 32.1% for a general sleep disturbance (GSD), 43.2% for insufficient sleep, 8.2 for insomnia, 5.3% for circadian rhythm sleep disorder, 6.1% for parasomnia, 5.9% for hypersomnolence, 12.5% for restless legs disorder and limb movements during sleep, 7.1% for sleep related breathing disorder, and 12.2% for the presence of comorbidity, ie, the presence of two or more concurrent sleep disorders. In addition, sleep onset time as well as sleep duration showed U-shaped relationships with GSD prevalence rates, with respectively the 22:00–24:00 period and seven to 8 h as optimal associates.
Conclusions: Sleep disorders and insufficient sleep have a high prevalence. As matter of concern, female adolescents reached the highest prevalence rates for most sleep disorders, insufficient sleep and daytime malfunctioning.

1. Introduction

The annual number of papers on the epidemiology of sleep is rising rapidly [1,2]. This upsurge in scientific interest is flanked by a gradual increase in public receptivity to knowledge about the potential impact of insufficient and disturbed sleep on human error, health and disease [3–5]. These developments stress the need for valid and reliable data on the prevalence of sleep disorders, as well as answers to questions about the nature of the associations between epidemiological data and public health.

Figures on the prevalence of sleep disorders in The Netherlands are scarce and of limited validity. The most recent results were derived from health interviews with nearly 20,000 patients (aged 12 years and over) from general practices [6]. For positive responses to the single question: 'During the last two weeks, did you have complaints about insomnia or any other sleep disturbance?,' an overall prevalence rate of 27.3% (males 21.2% vs females 33.2%) was reported. Spoormaker and van den Bout [7] administered the validated SLEEP-50 sleep disorders questionnaire to 402 adults that were selected quasi-randomly from the 12 provinces of the Netherlands. Overall, 23.5% of the respondents were diagnosed with at least one sleep disorder (no information on gender differences). Other reports have (also) been limited by biased population samples and/or non-validated questions or questionnaires [8–10].

The present study intended to assess the prevalence of sleep disorders in a representative population sample of the Dutch population, using a validated sleep disorders questionnaire, based on the International Classification of Sleep Disorders (ICSD-2; [11]). In addition, information was collected about the habitual timing and duration of sleep. This information was deemed clinically relevant as 1. Sleep timing acts (mainly through the associated exposure to light) as a powerful synchronizer for the circadian system [12,13], impacting structure and quality of sleep [14,15], and 2. Both short and long sleep may hint at an increased risk of daytime sleepiness, fatigue, and/or ill health [4].

* Department of Psychology, UvA, Nieuwe Achtergracht 129-B, 1018 WT, Amsterdam, The Netherlands.
E-mail address: gkerkhof@gmail.com.
[1] Present address: Krabbescheer 6, 2481CK Woubrugge, The Netherlands.

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2. Methods

2.1. Sample

The database of the present study consists of 2089 individuals, sampled from an ISO 26362-certified online research panel (www.motivaction.nl/en/specialties/stempuntnu) of over 80,000 citizens of The Netherlands (total population in 2012: 16,730,000). An internet panel is unlikely to give an accurate representation of the total population, however, as specific groups are liable to be either under- or overrepresented. Therefore, a widely-accepted remedy, ie, the propensity weighting technique [16] was applied to the present database, thereby correcting for standard demographic, socio-economic and/or cultural characteristics, characteristics of non-internet users, and also for non-responders. Propensity weighting scores were derived from the 'Golden Standard' defined by Statistics Netherlands (CBS). As a result, a nationally representative sample of 2089 individuals aged 18–70 years was obtained (as a consequence of the applied weighting procedure, analyses may slightly differ in the number of subjects included). In November 2012, data were collected in response to 48 questions coming from three self-report questionnaires (see assessment).

2.2. Assessment

Participants completed the following three sets of questions.

1. A set of seven questions about demographic (age and gender), socio-economic (education, work, income), and psychosocial (partnership and children) characteristics.

2. The Holland Sleep Disorders Questionnaire (HSDQ; [17]) is a clinically validated questionnaire that is composed of ICSD-based clusters of sleep complaints/symptom descriptions that are specific to six main sleep disorders, and allows the clinician to determine whether the respondent meets the diagnostic criterion/criteria for one or more of these sleep disorders. This diagnostic approach implies that subthreshold or ICSD-unspecified combinations of symptoms may pass unnoted, although they can be associated with significant distress and dysfunction. The chance of slipping through the ICSD-net of sleep disorder diagnoses is enhanced by the high prevalence of comorbidities, as also evidenced by the results of the present study (cf. Section 3.4.7). Inspired by the recent literature on transdiagnostic processes (eg, [18,19]), an attempt was made to capture not only the six distinct sleep disorders, but also the cross-cutting, comorbid aspects of disturbed sleep by calculating a General Sleep Disturbance (GSD) index, ie, the overall mean value of the 32 rating responses on the HSDQ. Thus, the GSD-index may be considered a global, 'transdiagnostic' index of disordered sleep[2]. The clinical relevance of the GSD-index is evidenced by its more than satisfactory discriminative validity, ie, its power to distinguish clinically diagnosed patients from individuals without sleep complaints [17].The HSDQ items are listed in Table 1, together with their factor loadings (strength of association) on the particular sleep disorder. Diagnostic accuracy [P(A) = 0.95], internal consistency (Cronbach's α = 0.90) and overall accuracy (88%) are satisfactory. In responding to the 32 items (rated on a five-point scale ranging from 'not at all applicable' to 'applicable'), subjects were asked to consider the past three months. Thus, scoring of the HSDQ yields 1) a mean score (GSD) that can be evaluated against a clinically validated criterion value (Cronbach's α for this study = 0.94), and 2) factor scores for six subscales, corresponding with: Insomnia (α = 0.92), Parasomnia (α = 0.85), Circadian Rhythm Sleep Disorder (CRSD; α = 0.84), Hypersomnolence (α = 0.78), Restless Legs Syndrome-/Limb Movements during Sleep (RLS/LMS; α = 0.81), and Sleep-related Breathing Disorder (SBD; α = 0.62). Comorbidity was scored if a participant met the criteria for two or more specific sleep disorders.Considering their special relevance for an assessment of daytime functioning, the following two HSDQ items were also analyzed as separate variables: 'During the day, I suffer from fatigue,' referred to Daytime fatigue, and 'Because of insufficient sleep, I don't function as well during the day,' referred to Daytime dysfunction (both items load on the Insomnia factor score of the HSDQ).

3. The third set consisted of nine additional sleep-related variables, as specified in Table 2. The scores for the two morningness–eveningness variables were combined into one five-point scale. In addition, the variable 'sleep deficit' was calculated by subtracting individual values of habitual sleep duration from individual values of subjective sleep need. The presence of 'insufficient sleep' was defined as a sleep deficit of 1 h or more [20].For the analyses of sleep onset times, shift workers (defined as working in rotating shifts or permanent shifts outside the traditional day shift from 9:00 a.m. to 5:00 p.m.) [21], were filtered out of the database, leaving 1779 (85.2%) cases.

2.3. Analyses

Continuous variables were analyzed by using analyses of variance (ANOVA) or analyses of covariance (ANCOVA) with covariates as mentioned in the Results section, followed by post-hoc Bonferroni-adjusted comparisons if a statistically significant main effect was present. In case of ANCOVAs, uncorrected means and standard deviations (M ± SD) are displayed in the figures and tables. Categorical variables were analyzed by using χ^2 tests, followed by Bonferroni-adjusted pairwise z-tests. Where appropriate, point prevalence ratios (PR) and their 95% confidence intervals (95%CI) are presented. Multiple regression analyses were applied to gain insight into the relation between criterion variables (eg, sleep onset times and sleep duration), and predictor variables (age, gender, chronotype, sleep need, partnership, children at home, work, and education level). Binary logistic regression analyses were applied to determine whether this set of predictor variables (plus sleep duration and weekday sleep onset) contributed to the risk of a general sleep disturbance and six specific sleep disorders, and to compare the size of the statistically significant risk factors.

SPSS 23 for Windows was used for all statistical analyses.

3. Results & discussion

3.1. Sleep timing

Under natural conditions, the circadian system optimizes the timing of sleep to perform its restorative and adaptive functions [22,23]. However, humans in particular do not always align their time domain with the earth's rotation. Imposed (eg, shiftwork) and self-chosen (eg, weekend vs weekdays) sleep shifts cause frequent circadian mismatches, which deteriorate sleep quality and increase the risk of a wide variety of health problems [3,24]. Thus,

[2] Consistent with this view, a suprathreshold GSD score does not necessarily go together with suprathreshold score (-s) for one or more specific sleep disorders. That is, a general sleep disturbance can have clinical significance in the absence of a distinct sleep disorder. For the present study, this applies to 9.6% of the population sample, whereas 22.5% obtained suprathreshold scores for both the GSD-index and one or more specific sleep disorders.