



Original Article

Insomnia in shift work

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ABSTRACT

Background: Shift work disorder involves insomnia and/or excessive sleepiness associated with the work schedule. The present study examined the impact of insomnia on the perceived physical and psychological health of adults working on night and rotating shift schedules compared to day workers.

Methods: A total of 418 adults (51% women, mean age 41.4 years), including 51 night workers, 158 rotating shift workers, and 209 day workers were selected from an epidemiological study. An algorithm was used to classify each participant of the two groups (working night or rotating shifts) according to the presence or absence of insomnia symptoms. Each of these individuals was paired with a day worker according to gender, age, and income. Participants completed several questionnaires measuring sleep, health, and psychological variables.

Results: Night and rotating shift workers with insomnia presented a sleep profile similar to that of day workers with insomnia. Sleep time was more strongly related to insomnia than to shift work per se. Participants with insomnia in the three groups complained of anxiety, depression, and fatigue, and reported consuming equal amounts of sleep-aid medication. Insomnia also contributed to chronic pain and otorhinolaryngology problems, especially among rotating shift workers. Work productivity and absenteeism were more strongly related to insomnia.

Conclusion: The present study highlights insomnia as an important component of the sleep difficulties experienced by shift workers. Insomnia may exacerbate certain physical and mental health problems of shift workers, and impair their quality of life.

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1. Introduction

Shift work is highly prevalent in industrialized societies, representing about 30% of the Canadian workforce [1]. This work schedule characterizes a wide variety of professions such as police officers, truck drivers, air traffic controllers, airline pilots, nuclear power plant operators, and nurses [2]. These professionals expose themselves and their society to significant risks that endanger human lives, as they are more likely to experience sleepiness and reduced alertness that negatively affect their work performance [3–5]. It is estimated that about 32% of night workers [6–8], 10% of day workers [8], and 8–26% of rotating shift workers [6] suffer from shift work disorder (SWD). The International Classification of Sleep Disorders-II (ICSD-II) [9] defines SWD as the presence of insomnia and/or

excessive sleepiness temporally associated with a habitual work schedule that overlaps usual sleep time. Both insomnia and excessive sleepiness are likely to occur among night shift workers and to interfere with their quality of life. These sleep difficulties are closely related to the sleep regulation system, and are explained mainly by the fact that the work schedule is out of phase with, and often in direct opposition to, the endogenous circadian rhythms [10,11].

Several negative consequences attributed to shift work schedules have been reported for workers, their employers, and society in general. Many studies on shift work populations have shown that shift and permanent night work may cause various problems for employees [12–15]. For instance, physical and mental health can be severely affected by stress and sleep deprivation [14]. Knutsson [13] reported that night work is strongly linked to disorders such as gastrointestinal and cardiovascular diseases, diabetes and metabolic disturbances, cancer, and complications in pregnancy. Other studies [12,15] have associated night work with a higher risk of developing breast and endometrial cancers, because exposure to light at night suppresses melatonin biosynthesis and deregulates circadian genes involved in cancer-related pathways [16]. Shift

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workers can experience difficulties in falling asleep, and report diminished sleep time and sleepiness during work hours [3,17]. Night workers often complain of family and social difficulties, as they are out of phase with activities that follow the diurnal rhythm of the general population [4,18]. Shift work seems to increase the risk of marital separations by 7–11% [19]. Further difficulties appear within the workplace: shift workers show chronic fatigue and anxiety that lead to work dissatisfaction [20]. Both productivity and safety may also be compromised, especially over successive night shifts [21]. These results all show that the negative consequences of shift work are far-reaching and widespread.

It is unclear whether shift work per se explains the consequences attributed to the work schedule, or whether they are the result of SWD. Most authors consider that the sleep difficulties are simply part of the overall negative consequences attributed to shift work. However, it is also well documented that sleep disorders such as insomnia have specific consequences that are independent of the context in which they appear. In the context of shift work, therefore, it may not be easy to parcel out the contributions of shift work per se and SWD (including insomnia), as these variables can be expected to produce similar symptoms, such as depression and anxiety [22], higher risk of motor vehicle accidents [4], work absenteeism, impaired work performance, and increased risk of work-related accidents [23–26]. Insomnia might also aggravate symptoms associated with the work schedule.

Some studies have attempted to more clearly identify the impact of SWD on the health of shift workers [4,6–8,27–29]. Workers with SWD seem to maintain a circadian phase similar to that of day workers [29]. SWD was shown to be related to an increased risk of depression, sleepiness, hypertension, anxiety, absenteeism, and road accidents, as well as decreased work performance. Workers with SWD also showed a severely impaired quality of life [7,8,28]. Which of these negative consequences of SWD can be attributed to the insomnia symptoms included in SWD? In order to tease out the negative impact of insomnia symptoms on shift workers, a two-by-two comparison needs to be made: shift workers with or without insomnia versus day workers with or without insomnia. Several studies have compared shift workers with day workers [6–8,11,27,30–32] but only two seem to have distinguished day workers according to presence or absence of insomnia [6,11]. In one of these studies [11], the authors concluded that shift workers without SWD are similar to day workers. The other study showed that rotating shift workers with both insomnia and sleepiness had more absenteeism, whereas rotating shift workers with only insomnia were absent more from family and social activities [6]. It would appear that the negative consequences attributed to shift work may be confounded with those related more specifically to insomnia.

The present study specifically addresses the negative impacts of insomnia on the perceived physical and psychological health of shift workers by comparing them to day workers. Second, the study investigates the impact of insomnia on the quality of life, work, and lifestyle habits of shift workers.

2. Methods

2.1. Study context

Data analyzed in this study were derived from a larger epidemiological study conducted in Canada. The goals of the original study were to estimate the prevalence of insomnia symptoms and insomnia syndrome in the general population, and to describe the types of consultation initiated for insomnia and products and strategies used to promote sleep. Furthermore, the initial study aimed at evaluating incidence rate and risk factor for insomnia. The first step was a telephone survey to document the prevalence of

insomnia [33]. Inclusion criteria yielded a sample composed of English and French speaking residents of Canada, aged ≥ 18 years. Two sampling procedures were employed: the random digit dialing method, which generates geographically stratified phone numbers, and the Kish method [34], which designates the person to be interviewed in the household. At the conclusion of the telephone interview, participants were asked if they would agree to take part in the longitudinal phase of the study. Seven mail-in evaluations were scheduled over the 5-year longitudinal phase, the first evaluation to be sent 1 month after the telephone interview, the second evaluation at 6 months, and the remaining evaluations scheduled every 12 months. This research was approved by the ethical committee of the Université Laval.

2.2. Measures

Participants completed French versions of the validated self-report measures at each assessment period. Measures retained for the present study covered four general domains: sleep, psychological symptoms, physical health, and work and lifestyle habits.

2.2.1. Sleep measures

2.2.1.1. Insomnia Severity Index (ISI). This seven-item questionnaire assesses the severity of problems related to sleep onset, sleep maintenance, and early-morning awakening, as well as satisfaction with sleep, perceived interference of sleep problems with daytime functioning, noticeability of sleep problems by others, and stress [35]. A five-point Likert scale, where 0 represents 'not at all' and 4 represents 'extreme', is used to rate each of these items, yielding a total score ranging from 0 to 28; higher scores indicate more severe insomnia. Guidelines for scoring were classified into four categories: no clinically significant insomnia (0–7); subthreshold insomnia (8–14); moderately severe clinical insomnia (15–21); severe clinical insomnia (22–28) [36]. The ISI has been shown to have adequate psychometric properties for day workers [36].

2.2.1.2. Pittsburgh Sleep Quality Index (PSQI). This 19-item questionnaire evaluates sleep quality and disturbances over a 1-month period [37]. The first four items are open questions, whereas items 5–19 are rated on a four-point Likert scale. Component scores include subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep-promoting medication, and daytime dysfunction. A total score, ranging from 0 to 21, is obtained by adding the seven component scores. A score > 5 indicates poor quality of sleep. The psychometric properties of the PSQI are adequate, especially with respect to diagnostic sensitivity (89.6%) and specificity (86.5%). The French-Canadian version has been validated and has adequate psychometric properties [38].

2.2.1.3. Epworth Sleepiness Scale (ESS). This scale comprises eight items evaluating sleepiness on a Likert scale from 0 to 3; total scores vary between 0 and 24, a higher score indicating substantial sleepiness, which increases the risk of unexpectedly falling asleep [39]. This questionnaire is widely used with shift workers.

2.2.1.4. Pre-Sleep Arousal Scale (PSAS). This 16-item questionnaire measures the intensity of somatic (eight items) and cognitive (eight items) arousal [40]. Participants rate each item on a 1–5 Likert scale. Scores indicate the intensity of arousal experienced while going to sleep the previous night. The PSAS has adequate psychometric properties, notably high internal consistency and an adequate stability [40].

2.2.1.5. Dysfunctional Beliefs and Attitudes about Sleep Scale, 30-item version (DBAS-30). This scale measures sleep-related cognitions: participants rate each item on a 0–10 Likert scale, where 0

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