

## ORIGINAL RESEARCH

## Relationship between sleeping on the night shift and recovery from work among nursing workers – the influence of domestic work

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Accepted for publication 13 November 2010

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SILVA-COSTA A., ROTENBERG L., GRIEP R.H. & FISCHER F.M. (2011) Relationship between sleeping on the night shift and recovery from work among nursing workers – the influence of domestic work. *Journal of Advanced Nursing* 67(5), 972–981. doi: 10.1111/j.1365-2648.2010.05552.x

**Abstract**

**Aim.** This paper is a report of a study on the association between sleep patterns during work nights and recovery from work among nursing workers, considering domestic work hours.

**Background.** Several hospitals allow nursing workers to sleep during the night shift, but this is rarely evaluated from the workers' health perspective. The need for recovery from work concept can be useful for testing the impact of night work on sleep. Recovery is not a problem if workers have enough time to recover between periods of work. Therefore, domestic work would be likely to interfere in the recovery process.

**Methods.** This cross-sectional study was carried out at three hospitals in 2005–2006, through a comprehensive questionnaire. All nursing teams engaged in assistance to patients were invited to participate. Analyses included female night workers with no incidence of insomnia. Participants ( $n = 396$ ) were classified into those who did not sleep during night shifts, those who slept for up to 2 hours and those who slept for 2–3 hours.

**Results.** Binomial logistic regression analysis showed that sleeping on the job for 2–3 hours during night shifts is related to a better recovery from work provided the workers do not undergo long domestic work hours.

**Conclusions.** Being allowed to sleep at work during night shifts seemed to contribute to, but was not enough to guarantee, a good recovery from work in the studied population. Recommendations to deal with sleep-deprivation among night workers should consider the complexity of gender roles on the recovery process.

**Keywords:** gender, night work, nursing, recovery from work, sleep

**Introduction**

Work schedules in hospitals are usually organized in shifts, since health services have to be offered on a 24-hour basis. Night shifts are known to be linked to sleep deprivation and

circadian disruption (Akerstedt 1998), with important implications for patients as well as nursing workers' own safety (Landrigan *et al.* 2007, Surani *et al.* 2008). Sleeping for a time during the night shift is viewed as a practice that can help night workers to deal better with sleep deprivation

(Takeyama *et al.* 2005). The present study focuses on the sleep pattern during night work and the need for recovery from work among nursing workers, considering the hours they spend doing domestic work, as they are likely to influence the time available for recovery (Jansen *et al.* 2003).

## Background

The sleep of night workers generally is of a shorter duration and lower quality in comparison with that of day workers, since nocturnal sleep is more restful and restorative (Akerstedt 1998). Problems of daytime somnolence and fatigue, the consequences of inadequate sleep and/or nocturnal work, contribute to an increase in the risk of accidents and human errors and have a high social cost and economic impact (NCSDR 2003). An intervention proposed in the worldwide literature to reduce problems resulting from nocturnal work is to allow workers to sleep or rest during the night shift (Matsumoto & Harada 1994, Sallinen *et al.* 1998, Takeyama *et al.* 2005). Studies in hospital settings have shown that sleep during the night shift may contribute to reduced sleepiness (Borges *et al.* 2009), improved performance, reduced fatigue (Smith-Coggins *et al.* 2006), and partially compensates for sleep loss among both nursing personnel (Ribeiro-Silva *et al.* 2006) and physicians (Arora *et al.* 2006).

A possible explanation for the beneficial effects of sleep during the night shift is related to the restorative features of nocturnal sleep, due to the chronobiological characteristics of the sleep–wake cycle (Takeyama *et al.* 2005). According to this hypothesis, night workers who are allowed to and can manage to sleep during the night shift would be more likely to recover from work, as compared with those who do not sleep at work.

The concept of the *need for recovery*, defined as the need to recuperate from work-induced fatigue (Jansen *et al.* 2002), can be useful in this context as it considers ‘the extent that the work task induces a collection of symptoms, characterized by temporary feelings of overload, irritability, social withdrawal, lack of energy for new effort, and reduced performance’ (Van Veldhoven 2008, p. 3). Those early signs of fatigue correspond to the short-term effects of work, which are mostly experienced during or immediately after work (Sluiter *et al.* 1999). The need for recovery from work is not viewed as a problem if workers have enough time to recover between periods of work (Kiss *et al.* 2008). From this perspective, domestic work would be likely to interfere in the recovery process, as this may influence the time available for recovering (Jansen *et al.* 2003).

According to the theoretical model presented by Sluiter *et al.* (2003), the need for recovery would function as a

work-related fatigue variable, which has an intermediate position between work demands and future health status. It is a concept that would reflect an initial stage of a continuum process of fatigue (Jansen *et al.* 2002). In this sense, the influence of domestic work on the relationship between sleep at work and recovery may be related to the so-called *gender-coded factors* (Musschauser *et al.* 2006), i.e. variables that differ between women and men due to their socially attributed roles. In a qualitative–quantitative study about the sleep of factory-floor workers who worked at night, women pointed out the priority given to domestic work, in contrast to men who emphasized the relevancy of sleep and rest after night work (Rotenberg *et al.* 2001).

In fact, preliminary data on nursing teams showed significantly higher scores for the need for recovery from work among female workers who reported high levels of domestic work, as compared with those with less domestic work (Pessanha *et al.* 2008), although data based on other formulations of recovery do not support this association (Sonnentag & Zijlstra 2006, Winwood *et al.* 2006).

Taking into consideration the relevance of this subject (Sallinen *et al.* 1998, Takeyama *et al.* 2005, Landrigan *et al.* 2007), we hypothesized (i) that sleeping on the night shift can contribute to recovering from work, but (ii) the relationship between sleep behaviour on the night shift and the recovery pattern is influenced by the magnitude of work performed in the domestic sphere.

## The study

### Aim

The aim of the study was to test the association between the sleep pattern during working nights and nursing workers’ recovery from work, considering the influence of domestic work hours in this association.

### Design

A cross-sectional design was adopted, using questionnaires for data collection.

### Participants

The study was carried out in three public hospitals in Rio de Janeiro, Brazil, that are known to allow nursing workers to sleep during working nights, when work demands are not too high. All nursing teams engaged in assistance to patients (nurses and nursing aides/assistants) at the three hospitals were invited to participate and composed the eligible group.

Considering the aims of the paper, the analysis described here refers exclusively to female workers who work night shifts. We considered that sleep complaints reported by workers could play a relevant role in the sleep behaviour on the job and/or in their recovery; hence, we excluded from the analysis those who reported any sleep complaint (i.e. those who answered 'almost always' or 'always' to questions on difficulty falling asleep, difficulty maintaining sleep or early morning awakening). The initial sample comprised 1595 female workers. A total of 288 were lost (sick leaves or refusals). The sample comprised 1307 nursing workers (participation rate: 81.9%) of whom 619 were night workers. The group was reduced to 467 workers after excluding data from women who reported sleep complaints ( $N = 152$ ). The final sample comprised 396 workers after the exclusion of data corresponding to workers who had different sleep patterns at different work places or who had *missing data* on any of the studied variables.

In relation to the tasks carried-out by nursing workers, the nursing aides and assistants perform activities involving participation in nursing help, hygiene care and patient comfort. According to Brazilian legislation, the nursing aides and assistants can only carry out their activities under the orientation and supervision of a professional nurse who, in general, perform administrative functions, manage personnel and procedures, assist seriously ill patients including those in a situation requiring knowledge of the scientific basis as well as more complex procedures and those needing immediate decisions.

### Data collection

Data collection took place from June 2005 to March 2006. Data were collected during work hours at the studied hospitals, through a comprehensive questionnaire that was divided into two parts. The first one provided detailed information on the number of jobs in nursing care, work schedule in the studied hospital and in other jobs, number of hours devoted to professional and domestic works, permission to sleep at work among night workers, whether or not they slept during the shift and, if applicable, how long. Trained interviewers recorded this information from participants as a means to increase the accuracy of the data. The second part of the survey was a self-report and included the items concerning the Need for Recovery from Work Scale (see below) and difficulties concerning night sleep at home. The instrument used for data collection was based on three rounds of pre-tests ( $n = 50$ ) to improve the clarity of the survey items. To evaluate the test-retest reliability of the instrument, it was filled twice (10- to 20-day interval) by nurses and nursing aides/assistants ( $n = 80$ ) from a public

hospital with a profile similar to that of the target population. Reliability of scales and variables were assessed by the Intraclass Coefficient of Correlation.

### Ethical considerations

The study was approved by the appropriate committees and officials. Approval to conduct the research was granted by the ethics committee from each of the hospitals. The study was briefly explained to participants and they were informed that involvement was completely voluntary and that they could withdraw at any time with no negative ramifications. Participants signed consent forms.

### Definition of variables

#### *Classification of workers as night workers*

This classification was based on the question: 'Do you work regularly (at least once a week/4 times a month) at night shifts in nursing assistance in some place?' Those workers who answered 'Yes' were considered 'current night workers' as previously described (Rotenberg *et al.* 2009), a classification which is similar to the one adopted by Marquié and Foret (1999), whose criteria considered those who worked at night at least 50 days/year to be night workers. Those workers who answered 'No' were classified as day workers.

#### *Sleep pattern during the night shift*

To confirm previous data on permission to sleep (Ribeiro-Silva *et al.* 2006), nursing workers were asked if they had permission to sleep during night work. For this data, the following question was used: 'When you work nights at this hospital, are you permitted to sleep or rest?'

After this, the following question was applied: 'In relation to your hours sleeping or resting during the nightshift, would you say that most of the time you: just rest (can't sleep), sleep for about \_\_\_\_ h \_\_\_\_ minutes, neither sleep, nor rest'. The occurrence and amount of sleep or rest in work were studied taking into account each professional's number of jobs. To analyse sleep patterns during the night shift, workers were divided into three groups: (i) do not sleep (includes those who only rest and those who neither sleep nor rest), here considered as the *reference group*, (ii) sleep for up to 120 minutes and (iii) sleep for 121–180 minutes. The last two groups are classed as those who sleep for up to 2 hours and those who sleep for 2–3 hours, respectively.

#### *Recovery from work*

In the present study, we used the need for recovery from work scale as a tool for analysing the short-term effects of night

work on fatigue, as this scale is supposed to reflect both the effects of work and the recovery time (Jansen *et al.* 2003). We analysed the *recovery from work* (instead of the *need for recovery from work*), on the assumption of a positive influence of sleep on the job during the recovery shift. This variable was analysed by means of the need for recovery from work scale (Sluiter *et al.* 1999, Van Veldhoven & Broersen 2003), which consists of 11 dichotomized questions, such as: 'At the end of a working day I am really feeling worn-out' and 'I find it hard to relax at the end of a working day'. This scale leads to a score that varies from 0 to 11, which is recoded to a range between 0 and 100 (Jansen *et al.* 2003).

### Test-retest reliability of the scale

The scale was adapted to Portuguese from the English version of the Need of Recovery from Work Scale described by Sluiter *et al.* (1999). The adaptation was based on the translation and retranslation, evaluating the stability of the test-retest from the pilot study previously described. The coefficient of intraclass correlation (CCIC) and the respective confidence interval was 0.80 (95% CI = 0.70–0.87), showing a substantial stability (Landis & Koch 1977).

Workers were classified into two groups corresponding to those who reported good recovery and poor recovery. As our hypothesis is related to a good recovery among those who sleep at work during night shifts, we defined the good-recovery group as being in the first quartile according to procedures concerning the cut-off point for poor recovery from work (Jansen *et al.* 2003, Van Amelsvoort *et al.* 2004).

### Domestic work

The analyses concerning domestic work were based on the number of hours dedicated to domestic activities (home chores, such as, cooking, ironing, washing, cleaning and taking care of family members) according to a daily record with information on activities carried out the week before the interview (Rotenberg *et al.* 2008). The cut-off point for dichotomizing this variable into short and long domestic work hours was based on median values.

### Data analysis

Descriptive analyses of socio-demographic variables as well as other variables related to work were based on the chi-square and the Kruskal–Wallis tests for categorical and continuous variables, respectively (significance at  $P = 0.05$ ). These analyses included information concerning comparisons between nurses and nursing aides/assistants as regards socio-demography (age, income, children and domestic work

hours), work variables (professional work hours) and health (physical activity). In the descriptive analyses, the nurses workers were compared with the other workers of the nursing team (nursing aides/assistants) in terms of sleeping at work and recovery from work, using chi-square tests ( $P = 0.05$ ) so as to verify the need to perform the analysis separately according to the professional category. If non-significant difference were observed as regards both sleeping at work and recovery from work, the analyses would be based on the combination of workers into one group.

Binomial logistic regression was used to evaluate the association between the sleep pattern and the recovery from work. The tested hypothesis was that workers who slept during the night shift had higher chances of recovering from work, as compared with workers who did not sleep during the night shift. Variables related to socio-demography (age, income, presence of children up to 14 years of age), work (professional category) and health (physical activity) were considered potential confounding variables if associated with both the outcome and the exposure variable with significance at  $P < 0.20$ . Professional category was included in the model as a confounder variable, considering expected differences between professional nurses and nursing aides/assistants as to socio-demography and work variables. Stratified analyses were carried out for workers exposed to long and short domestic work hours.

The data were analysed using SPSS version 13 (IBM Corporation, Chicago, IL, USA).

### Results

Most workers were nursing aides/assistants (70.5%). The professional nurses were younger than the nursing aides/assistants (33.6 years vs. 38.1 years old, respectively;  $P = 0.001$ ) and had a higher income (USD563 vs. USD281, respectively;  $P < 0.001$ ), a longer professional work hours ( $61.8 \times 52.4$  hours/week, respectively;  $P < 0.001$ ) and a shorter domestic work hours (8.7 hours vs. 17.3 hours, respectively;  $P < 0.001$ ). Professional nurses and nursing aides/assistants were not significantly different as regards the presence of children ( $P = 0.910$ ) and physical activity ( $P = 0.660$ ). Neither sleep duration on the night shift ( $P = 0.675$ ) nor recovery from work was significantly different between professional nurses and nursing aides/assistants ( $P = 0.096$ ). Therefore, workers were combined into one group for all analyses. In the studied group, 41.4% were married and 40.4% were single, mean age was 36.7 (SD = 12.0 years); 48.0% had two nursing care jobs and 4.8% had three such jobs.

Reported sleep duration during the night shifts was concentrated on 3 hours (50.4%) and 2 hours (25.7%). The

reported sleep/rest patterns on working nights were: 149 (37.6%) do not sleep, 81 (20.5%) sleep for up to 2 hours, and 166 (41.9%) sleep for 2–3 hours. The three groups were similar as to most studied socio-demography data (an exception is the presence of children up to 14 years old: workers who sleep for 2–3 hours were more likely to have more children at this age). As to variables related to work, workers who sleep for 2–3 hours were more likely to have more than one job, whereas those who do not sleep showed

longer domestic work hours as compared with other groups (Table 1).

Table 2 shows the results of logistic regression analyses stratified for workers with short and long domestic work hours. The odds for reporting a good recovery from work among workers who reported usually sleeping for 2–3 hours on the night shift were more than double as compared with those who did not sleep (OR = 2.69), after adjustment for professional category, age and weekly

**Table 1** Socio-demography and work characteristics of the studied group. Comparisons were based on chi-square and Kruskal–Wallis tests for categorical and continuous variables, respectively

	Sleep pattern during night shifts			
Variable	Do not sleep (N = 149)	Sleep for up to 2 hours (N = 81)	Sleep for 2–3 hours (N = 166)	P value
<i>Socio-demographic data</i>				
Age (mean; SD)	37.9; 1.0	35.1; 1.4	37.0; 0.9	0.162
Marital status, <i>n</i> (%)				
Single	58 (39.2)	35 (43.2)	66 (40.0)	0.061
Married/living with partner	65 (43.2)	39 (48.1)	61 (36.4)	
Divorced/separated/widowed	26 (17.6)	7 (8.6)	39 (23.6)	
With children up to 14 years old (%)	35.0–23.5	24.7	34.9	0.055
Monthly family income (mean; SD) in USD	373; 24	375; 24	349; 21	0.308
<i>Data concerning work variables</i>				
Professional category, <i>n</i> (%)				
Registered Nurses	46 (30.9)	26 (32.1)	45 (27.1)	0.675
Nurse assistance/aides	103 (69.1)	55 (67.9)	121 (72.9)	
Time on nursing activities (mean; SD)	12.9; 0.9	10.0; 1.2	12.8; 0.8	0.161
Engaged on two or more jobs, <i>n</i> (%)	66 (44.3)	44 (54.3)	96 (57.8)	0.050
Number of working nights per 2-week span (mean; SD)	5.13; 1.53	5.56; 1.62	5.56; 2.08	0.175
Type of contractual employment, <i>n</i> (%)				
Permanent job	59 (39.6)	27 (33.7)	49 (29.7)	0.181
Precarious job	90 (60.4)	54 (66.3)	117 (70.3)	
Weekly professional work hours (mean; SD)	52.6; 1.7	54.5; 2.4	58.3; 1.8	0.077
Weekly domestic work hours (mean; SD)	18.0; 1.6	12.3; 1.6	12.9; 1.1	0.028
Need for recovery from work (0–100 score) (mean; SD)	55.94; 1.74	56.78; 2.49	50.43; 1.73	0.048

USD, US Dollars.

**Table 2** Results of regression analysis for the association between the sleep pattern on night shifts and workers' recovery for female nursing personnel without sleep complaints, considering the level of domestic work

Sleep pattern during night shifts	Workers group considering domestic work					
	Short domestic work hours (N = 214)			Long domestic work hours (N = 182)		
	n	Cr OR (95% CI)	Adj OR (95% CI)	n	Cr OR (95% CI)	Adj OR (95% CI)
Do not sleep	64	1.00	1.00	85	1.00	1.00
Sleep for up to 2 hours	50	1.41 (0.55–3.58)	1.57 (0.60–4.14)	31	1.01 (0.39–2.60)	1.02 (0.39–2.70)
Sleep for 2–3 hours	100	2.51 (1.16–5.44)	2.69 (1.20–5.99)	66	1.26 (0.62–2.59)	1.27 (0.61–2.65)

N, total number of respondents for workers with short and long domestic work hours; n, total number of respondents in each category of sleep or rest pattern during the night shifts; Cr OR (95% CI), Crude odds ratios (95% confidence intervals); Adj OR (95% CI), Odds ratios (95% confidence intervals), after adjustment for professional category, age and weekly professional work hours, considering all jobs.



professional work hours, provided that they were categorized as those with short domestic work hours. No other significant association was detected.

## Discussion

### Limitations of the study

The results identified in the present study should be viewed with caution due to limitations inherent in cross-sectional studies that identify exposition and outcome at the same time. Besides, no information is available as regards non-respondents and therefore the influence of their absence on results here presented is not known. The size of the sample generated instability of estimates, observed through confidence intervals. Therefore, the results presented here need to be confirmed through longitudinal studies with larger samples, relating to two main issues: the beneficial effects of sleeping at work for nursing personnel working at night and the influence of domestic work on their recovery from work.

### Discussion of results

The association between sleeping at work and a good recovery from work was restricted to women who reported a 2- to 3-hour sleep at work and short domestic work hours. Thus, for the female nursing personnel studied here, sleeping for 2–3 hours during the night shift was related to a better recovery from work, provided they were not subjected to high levels of domestic work.

Beneficial effects of on-night shift sleep here described confirm results of previous studies on the health sector settings, such as the investigation on sleepiness among nursing workers (Borges *et al.* 2009), performance, alertness and humour in nurses and physicians (Smith-Coggins *et al.* 2006) and on the readjustment to daytime hours on days-off among nurses (Daurat & Foret 2004). According to Landrigan *et al.* (2007), preventing sleep deprivation among healthcare provider could be an extremely powerful means of reducing medical errors. Sleeping during the shift could be viewed as a strategy towards the reduction of errors also for other professionals in the health sector such as physicians and residents.

The relevance of naps at work to the psycho-physiological needs of workers has been recognized by many authors (Saito & Sasaki 1998, Smith-Coggins *et al.* 2006, Borges *et al.* 2009). Nursing teams working at night in Brazilian hospitals usually perform 12-hour shifts, with no consecutive working nights. This peculiarity favours the holding of more than one

job, which contributes to increasing the time spent working (Portela *et al.* 2005), with repercussions for workers' sleep and health (Fischer *et al.* 2006).

As stated by Takeyama *et al.* (2005), there can be no doubt that the possibility of taking a nap is an effective tool for improving working conditions during night shifts. Concerning our data on recovery, not only the presence of sleep but also the amount of sleep has to be considered as sleeping for up to 2 hours was not related to a good recovery from work. The most usual duration of sleep mentioned in the present study was 180 minutes. Other studies on night sleep among nursing teams revealed average sleep time of 150 minutes (Daurat & Foret 2004), 141 minutes (Ribeiro-Silva *et al.* 2006) and 138 minutes (Borges *et al.* 2009). Those values – derived from documented or reported sleep episodes during working nights at hospitals – may be considered long, if compared with nap length used in studies on nap opportunity (Purnell *et al.* 2002, Smith-Coggins *et al.* 2006, Signal *et al.* 2009). Concerning nap duration, a field study on nurses submitted to 12-hour night shifts showed that long naps during working nights were associated with a short daytime sleep, sometimes followed by a late afternoon nap, a strategy that could favour the maintenance of a diurnal orientation, probably contributing to nap benefits from the chronobiological point of view (Daurat & Foret 2004).

In Brazil, permission to sleep or rest during night shifts is not regulated, although it is a common practice at public hospitals. The high frequency of workers who reported usually sleeping on night shifts reveals that given permission, most workers take advantage of it. Other studies at Brazilian hospitals revealed that nursing staff usually organize sleep time between themselves, dividing into two groups: those who sleep from midnight to 03:00 AM and those who sleep from 03:00 to 06:00 AM (Soares *et al.* 2005, Borges *et al.* 2009). In a qualitative study on nursing workers' perception of environmental and organizational conditions favourable or unfavourable to sleep or rest during night shifts, the lack of regulation on rest and sleep was questioned by nursing workers, who claimed that by not being formalized, napping causes constraint, even though beneficial from physical and mental points of view (de Araújo *et al.* 2009). Moreover, as napping is not endorsed officially by hospital managers, there is a great diversity among hospitals as to specific places and conditions for nursing teams to sleep, as can be seen in studies by de Araújo *et al.* (2009) and Rotenberg *et al.* (2003). Actually, the permission to sleep or rest during night shifts is still a controversial matter because nursing teams are a working group that deals with continuous patient care. As work demands on night shifts are lesser, in general, the

### What is already known about this topic

- The sleep of night workers generally is of shorter duration and lower quality in comparison with day workers, as nocturnal sleep is more restful and restorative.
- An intervention proposed in the worldwide literature to reduce problems resulting from nocturnal work is to allow workers to sleep or rest during the night shift.
- Studies in hospital settings showed that sleep during the night shift may contribute to reduced sleepiness, improved performance and reduced worker fatigue.

### What this paper adds

- Sleeping during the night shift for up to 2 hours is not related to a better recovery from work regardless of the level of domestic work.
- Sleeping for 2–3 hours during night shifts is related to a better recovery from work provided female nursing workers do not undergo high levels of domestic work.
- Being allowed to sleep at work during night shifts can contribute to, but is not enough to guarantee, a better recovery from work among female nursing workers.

### Implications for practice and/or policy

- Recommendations to deal with sleep-deprivation among night shift nursing workers should consider the complexity of gender roles on workers' recuperation from work.
- Aspects of the workforce's organization (number of nursing workers per shift) should be considered to adjust the regulation of sleep during night shifts.
- Recovery from work can be used as an indicator of the importance of napping during night shifts.

number of workers in this shift is reduced (Gonçalves *et al.* 2001). Such a reduction in staff makes it more difficult to organize nap schemes during these working hours. That is why aspects of organization of the workforce should be pondered together with these results, to inform discussions about the regulation of sleep time of nursing staff during night shifts.

The influence of domestic work on the association between sleeping at work and recovery amongst women could be associated with a direct effect of domestic work on the availability of time for recovering. As commented by Demerouti *et al.* (2009) and Sonnentag and Zijlstra (2006),

the recovery process is fulfilled when people have enough time and opportunity to satisfy their need for recovery by means of rest and/or leisure activities. Accordingly, an overload may develop when insufficient opportunities to recover from exertions during work are encountered as usual practice (Sluiter *et al.* 2003). Despite these comments in the literature, a recent review of this topic did not confirm the detrimental effect of household and child-care activities on recovery (Demerouti *et al.* 2009). Two explanations may have played a role in these contradictory results: (i) either the instrument here used for analysing recovery – the need for recovery scale – was more 'sensitive' to the effect of domestic work as compared with other formulations of recovery, namely the one used by Winwood *et al.* (2006) and Sonnentag and Zijlstra (2006) and/or (ii) there are important differences between the nursing teams studied here and workers analysed by other authors as to occupational characteristics related to work demands (work schedule and weekly professional work hours, for instance), which are known to influence recovery (Demerouti *et al.* 2009).

In the present study, the high levels of responsibility for domestic work could contribute to reducing women's possibility of recovering from work in such a way that despite the opportunity to sleep during the night shifts, their chances of reporting a good recovery are not significantly different from the chances observed for workers who reported no sleep at work. This is particularly worrying, taking in account the high level of fatigue generally associated with night work and with long working schedules practised by these women, especially as a great number of these nursing workers have more than one job.

The scores of the need for recovery from work studied here, with an average between 50.4 and 56.8 (Table 1), were high in relation to the values described by other authors. In prospective and sectional studies with different occupations, the average score amongst male nurses – around 43 – was the highest of all the occupations studied, such as drivers (bus, truck, ambulance) and construction workers (Sluiter *et al.* 2003). Yet, in the cohort study about work fatigue (the Maastricht Cohort), scores adjusted from the regressions varied between 34 and 47 amongst women who worked alternate or irregular shifts (Jansen *et al.* 2003). In another study with male workers of four Dutch companies, the average need for recovery was 33.55 (Sluiter *et al.* 2001). The results of the present study may differ from some characteristics of this population, especially as to what constitutes 'night work' and to what are 'long working hours'. They are night workers, for whom fatigue effects are expected. Besides, the population of the present study has as a characteristic, a high professional workload (more than 50 hours a week), a

characteristic associated with a higher need for recovery from work (Jansen *et al.* 2003).

A number of recent studies have benefited from the scale of need for recovery to analyse temporal aspects of work, such as the direction of shift rotation, overtime work or other factors associated with work in shifts (Van Amelsvoort *et al.* 2004, Van der Hulst *et al.* 2006, De Raeve *et al.* 2007). In the present study, this scale was used in a different way, in the sense of exploring to what extent recovery from work could be influenced by nursing workers' sleep patterns during their working nights so that an increase in the recovery linked to sleep at work could be expected.

## Conclusion

Recovery from work can be used as an indicator of the importance of napping during night shifts. Aspects of a workforce's organization (number of nursing workers per shift) should be considered to adjust the regulation of sleep during night shifts. These recommendations are valid for all countries given the necessity of work on a 24-hour basis in hospitals. Also, objective measurement of sleep patterns, such as actimetry monitoring would clarify particular aspects of sleep during the night shift (duration and allocation of sleep episodes) and their potential benefits in the health sector settings like reduction of medication errors, for instance.

In sum, allowance to sleep at work during night shifts seemed to contribute to, but was not enough to guarantee, a good recovery from work in the studied population. We observed that it is not only sleeping or not sleeping that matters, as both duration of sleep and domestic work showed relevance in recovery. Clearly, recommendations to deal with sleep-deprivation among nursing workers should consider the complexity of gender roles on workers' recovery from work. Moreover, the present study confirms how much domestic work understood as 'feminine' may constitute a part of the so called social production of the health-illness process (Walters *et al.* 1996), reinforcing how gender equity policies directed to health should involve the whole of male and female life, including the domestic scope.

## Funding

The authors acknowledge the financial support from National Counsel of Technological and Scientific Development (CNPq) and FAPERJ. L.R. and F.M.F. are Irving Selikkoff International Fellows of the Mount Sinai School of Medicine ITREOH Program. Their work was supported in part by Grant 1 D43 TW00640 from the Fogarty International Center of the National Institutes of Health.

## Conflict of interest

No conflict of interest has been declared by the authors.

## Author contributions

ASC, LR and RHG were responsible for the study conception and design, and performed the data analysis. ASC performed the data collection. ASC, LR, RHG and FMF were responsible for the drafting of the manuscript and made critical revisions to the paper for important intellectual content. LR & RHG provided statistical expertise. LR obtained funding and supervised the study.

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