Esc Anna Nery 2015;19(1):33-39

Napping on the night shift among nursing staff: potential benefits for workers' health

Cochilos durante o trabalho noturno em equipes de enfermagem: possíveis benefícios à saúde dos trabalhadores

La siesta durante el trabajo nocturno entre equipos de enfermería: posibles beneficios para la salud de los trabajadores

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Abstract

Objective: To characterize naps during night shifts in terms of duration, allocation, quality, and sleep efficiency among nursing professionals. Cross-sectional study conducted in 2009. Professionals working the night shift for more than one year and reporting no sleep complaints answered a questionnaire, wore an actigraph (device to monitor human sleep-wake cycle) and completed an activity protocol (n = 49). **Results:** 87% of participants napped during night shifts and the mean duration of naps was 136 minutes (SD = 39.8). Longer naps at work were observed among those napping between 12:00am-3:00am, compared to those napping between 3:00am-6:00am. The efficiency of on-shift sleep was similar to nighttime sleep at home on days off. **Conclusion:** Similarity between sleep efficiency at work and at home suggests there is a beneficial effect of napping. Discussion concerning the management of the workforce during the night shift should consider not only aspects concerning work organization, but also aspects concerning human physiology.

Keywords: Nursing; Sleep; Night work; Health.

Resumo

Objetivo: Caracterizar o cochilo durante plantões noturnos em termos da duração, eficiência, alocação e qualidade entre trabalhadores de enfermagem. Estudo transversal realizado em 2009. Trabalhadoras, que atuavam há mais de um ano em plantões noturnos e, que não referiram queixas de sono utilizaram instrumento de registro de atividade-repouso (actímetro) e preencheram protocolo de atividades e questionário (n = 49). **Resultados:** 87% das participantes cochilaram todas as noites de trabalho, com duração média de 136 (DP = 39,8) minutos. Maior duração do cochilo foi encontrada entre as que cochilaram entre 00h00min-03h00min, quando comparadas àquelas que cochilaram entre 03h00min-06h00min. A eficiência do sono no trabalho foi semelhante a do sono noturno em casa na folga. **Conclusão:** A eficiência dos cochilos no trabalho semelhante ao sono noturno em casa sugere efeito benéfico do cochilo. Discussões sobre a gestão da força de trabalho nos horários noturnos devem considerar não só aspectos da organização do trabalho, mas também da fisiologia humana.

Palavras-chave: Enfermagem; Sono; Trabalho noturno; Saúde.

Resumen

Objetivo: Caracterizar la siesta durante turnos nocturnos en cuanto a duración, eficiencia, asignación y calidad del trabajo de enfermeros. **Métodos:** Estudio transversal, realizado en 2009 con enfermeros que trabajaron durante más de un año en horario nocturno y que no reportaron problemas de sueño. Se utilizaron el registro de actividad-descanso (actimetro) y el protocolo de actividad (n = 49). **Resultados:** El 87% de los participantes dormían durante el trabajo nocturno y la duración media fue 136 (SD = 39,8) minutos. El mayor tiempo de siesta fue encontrado entre 00:00-03h00min, en comparación con aquellos que dormían 03h00min-06h00min. **Conclusión:** La eficiencia del sueño en el trabajo fue similar a la noche de sueño en casa, lo que sugiere efecto beneficioso de la siesta. Las discusiones sobre gestión de la fuerza de trabajo en horario nocturno deben tener en cuenta aspectos de la organización del trabajo y de la fisiología humana.

Palabras-clave: Enfermería; Sueño; Trabajo nocturno; Salud.

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Submitted on 08/26/2013.
Accepted on 07/05/2014.

DOI: 10.5935/1414-8145.20150005

INTRODUCTION

Sleep deprivation during the night among night workers implies displacing sleep to daytime hours. Due to interaction of physiological and environmental factors, however, daytime sleep is usually shorter and of poorer quality, when compared to nighttime sleep[1]. Chronobiological and physiological factors such as increased secretion of cortisol, reduced melatonin release and increased core temperature by the morning[2], as well as socio-environmental factors such as light, noise, and social demands[3], are among the diverse aspects associated with difficulties sleeping during the day and having adequate sleep quality and duration[2].

Compared to the daytime sleep, nighttime sleep is more restorative since it is generally longer and of better quality[1]. This is so because trying to sleep in an inappropriate phase of the circadian cycle (e.g. during the day there is reduced melatonin release and a concomitant increase in core temperature) usually results in a greater number of awakenings (reducing efficiency of sleep) and possibly shorter periods of sleep[2].

Among nursing professionals working on the night shift, long working hours may contribute to a greater number of sleep-related complaints with significant implications for one's professional and personal life[4]. There is a significant deficit of sleep hours with increased sleepiness, which in the long term may lead to fatigue[5] and possibly compromise the quality of care delivery.

According to Brazilian law, an interval of one to two hours to rest or eating is mandatory when work is continuous (within 24 hours), and the work hours of which exceeds six hours (Article 71, C.L.T.). Informally, however, workers from the nursing staff of public hospitals are usually allowed to sleep or rest up to three hours during the night shift[3].

Among the benefits of sleeping during the night shift is reduced sleepiness[6], which is observed among Brazilian nurses. The benefits of napping at work have also been observed in other countries. One study with nurses and physicians reports that naps during the night shift improved performance and reduced sleepiness and fatigue at the end of the working hours[7]. Additionally, naps can ease readjustment of circadian rhythms to day times when the worker is off, based on the fact those who did not nap during the night complained more frequently of poor quality of sleep during their days off when compared to those who napped[8]. The definition of nap proposed by Dinges[9] was adopted in this study, i.e., any period of sleep less than 50% of the average nighttime sleep of a person may be considered a nap, which applies to the informal time of up to three hours that is allowed in public hospitals.

Given the previous discussion, this study's aim was to characterize naps during night shifts in terms of sleep duration, sleep efficiency, allocation, and subjective quality of sleep to deepen understanding of this practice among nursing staff and support discussion concerning regulation of naps during the night shift.

METHOD

This cross-sectional study was conducted in a university hospital in 2009. It was approved by the Institutional Review Board at the University of São Paulo, Faculty of Public Health (protocol Nº 1828) and also by the Hospital. The nursing professionals invited to participate signed free and informed consent forms developed in accordance with the ethical principles established by Resolution 196/96, Brazilian Ministry of Health.

Study population

Female nursing workers providing care to patients during the night shift of a public hospital in São Paulo, SP, Brazil were included in the study. The hospital adopted the 12-hour scheme (7pm to 7am), followed by 36 hours off. We chose to investigate only women. The reduced number of male nursing workers in this hospital would not permit a separate group analysis and analyzing both sexes together would potentially lead to an incorrect interpretation of results due to gender-related sleep differences.

The workers were selected from a list of names provided by the hospital (N = 206), including nursing auxiliaries, technicians and nurses working on the night shift. All the hospitalization wards were considered in the study, with the exception of the Neonatal Intensive Care Unit and Surgical Center, where individuals are not allowed to use any object on their arms or hands, which would impede the use of a device to record activity and sleep periods among the participants. Of the 206 workers, 11 refused to participate and 6 were on sick leave during the data collection. Therefore, 189 workers answered questions regarding sleep complaints[10] and length of time working on the night shift; 127 were excluded. Thus, a total of 62 people working more than one year on night shifts and who did not report sleep complaints composed the eligible population. The inclusion criterion adopted (absence of sleep complaints) enabled us to eliminate an important confounding factor in the study of naps at work. All the eligible workers (n = 62) were invited to answer a questionnaire and wear an actigraph, a device that records both activity and rest. Of these, 13 were losses due to sick leave or refusals to wear the actigraph. The final sample was composed of 49 workers.

Data collection

Eligible workers who agreed to participate in the study were first familiarized with the use actigraph and on how to complete the daily activities protocol. Additionally, the

participants completed a questionnaire addressing information on socio-demographic aspects (age, education, marital situation, family income and duration of house chores, and children), working conditions (profession, time on nursing activities, number of jobs, working hours per week, number of night shifts, and the possibility of sleeping or resting during work), and health-related habits (smoking, alcohol, exercise, and overall satisfaction with sleep quality) to characterize the profile of the population under study[11].

Actigraph

The actigraph was placed on the non-dominant wrist and used to monitor activity-rest. The model adopted was the Mini-Motionlogger Actigraph - Basic 32C (Ambulatory Monitoring, Inc., Ardsley, USA) and the algorithm used was the Cole & Kripke. This algorithm has a precision of approximately 90% of agreement when compared with polysomnography, which is recognized as the gold standard for validating algorithms[12]. The participants used the actigraph for a period of up to 10 consecutive days, including working days and days off. Concomitantly with the daily activities protocol, data concerning activity and rest recorded by the device were adjusted to obtain greater precision of sleep duration recorded during the period of data collection[11]. In addition to the duration of sleep episodes, the use of this device enabled analyzing the following variables: (i) Sleep efficiency: percentage of total sleeping hours out of the total hours on beds with lights off (time of sleep x 100/time in bed)[12], and (ii) temporal allocation of sleep that took place at work, based on the time when the sleeping episodes initiated and ended.

Visual analogue scales were used to analyze the daily quality of each sleeping episode. Each scale of 10 cm was preceded with the question: "How was the quality of your sleep yesterday? The workers assigned with a vertical trace their perception in regard to the sleeping episode. The scale was initiated with the expression "very poor" (zero) and ended with the expression "very good" (ten). The Visual Analog Scale (VAS) to assess sleep quality and the activities protocol were completed for up to 10 consecutive days. Data were simultaneously collected from the actigraph, daily activities protocol and analog scales.

Analysis

After the coding of questions, information contained in the questionnaire was transcribed into the spreadsheets. The digitized data were reviewed to exclude any possible typos. Actigraph data were also added to the spreadsheet to compose the general database, which was the object for statistical treatment. Adherence of the population distribution to the normal curve was tested using the Shapiro-Wilk test. Since non-parametric procedures were used to make comparisons among groups, the Mann-Whitney and Wilcoxon tests were used. The level of significance used in all analyses was $\alpha = 0.05\%$. SPSS version 17.0 was used to perform the statistical analyses.

RESULTS

The study population was 40 (SD = 10.2) years old on average. Most of the group was composed of nursing auxiliaries and technicians (73.5%). The workload was 49.7 (SD = 19.1) hours/week and the average number of nights worked was 6.6 nights/two weeks; more than 40% of the group had another job in the nursing field (Table 1).

Nap characterization

In this study, napping at work was also called "On-shift nap" (OSN).

A total of 94% of the participants reported they were authorized by the hospital to sleep or rest during the night shift. The temporal allocation of OSN showed that the workers were divided into two groups. Naps among 64% of the workers took place in the early hours of the shift (12:00am-3:00am), while the remaining workers sleep in the last hours of the shift (3:00am-6:00am). The average sleep efficiency of OSN was of 92%. OSN lasted 136 (SD = 39.8) minutes on average and its quality, as measured on the visual analog scale, was 5 cm (SD = 3.7).

As presented in Table 2, the statistically significant results concerning OSN were restricted to its duration and efficiency. Those who napped during the first hours slept longer (147.5 minutes) when compared to those who slept the last hours (112.0 minutes) of the shift. On the other hand, the average efficiency of OSN measured among those who slept in the early hours (90.9%) was significantly lower when compared to those who slept in the last hours (94.5%).

In regard to the OSN duration, statistically significant results were found in regard to the duration of daytime sleep at home. The participants whose naps were short during the night shift slept for longer periods (203.7 minutes) during the day (morning and/or afternoon) after work compared to those who napped longer at work. OSN episodes longer or shorter than 136 minutes (average duration) did not significantly differed in regard to nighttime sleep at home after work (Table 3).

OSN efficiency (92%; SD = 5%) did not present significant differences when compared with efficiency of nighttime sleep at home (90%; SD = 6.3%) and morning sleep at home (91.9%; SD = 6.9%). Nonetheless, the efficiency of afternoon sleep at home (87.7%; SD = 9.0%) was significantly lower than OSN efficiency (Figure 1).

OSN subjective quality (5.0; SD = 2.5 cm) was statistically lower than the quality of nighttime sleep at home (8.3; SD = 1.6 cm) and the subjective quality of morning sleep at home (6.6; SD = 2.0 cm). No significant difference was found in regard to afternoon sleep at home (Figure 2).

Table 1. Description of the nursing workers' profile. São Paulo, SP, Brazil 2009

Variable	Category	n	%
Profession	Nurse	13	27
	Nursing technician	36	73
Number of jobs	1 job	28	57
	2 jobs	21	43
Education	High school/technical high school	26	53
	College	23	47
Marital status	Married	23	47
	Separated/widowed	12	24
	Single	14	29
Children	Yes	32	35
	No	17	65
Exercise	Yes (1 to 6 hours/ week)	9	18
	No	40	82
Smoking	Yes	4	8
	No	45	92
Alcohol consumption	Yes (1 to 5 days/two weeks)	11	22
	No	38	78
Satisfaction with sleep quality	Yes	43	88
	No	6	12
Family income (R$)	Up to 1,500,00	4	8
	1,501.00 to 2,500.00	12	24
	2,501.00 to 4,000.00	16	33
	4,000.00 or more	17	35
		Mean (SD)	Median
Time working in nursing (years)		12.9 (7.5)	10
Workload (hours/week)		49.7 (19.1)	48
Night shift (No./ two weeks)		6.6 (2.1)	6
Age (years)		40 (10.2)	38
House chores (hours/week)		23.3 (15.5)	21

Table 2. On-shift nap and duration of sleep at home according to OSN allocation. São Paulo, SP, Brazil 2009

Variable	N	Mean (SD)	*p*
OSN duration (min)			
12:00am-3:00am	28	147.5 (28.2)	0.007
3:00am-6:00am	16	112.0 (45.5)	
OSN efficiency (%)			
12:00am-3:00am	28	90.9 (5.3)	0.026
3:00am-6:00am	16	94.5 (3.3)	
OSN quality (cm)			
12:00am-3:00am	25	5.2 (1.7)	0.241
3:00am-6:00am	15	4.6 (3.4)	
Duration of daytime sleep at home after work (min)			
12:00am-3:00am	28	165.2 (105.9)	0.874
3:00am-6:00am	16	172.8 (100.9)	
Duration of nighttime sleep at home after work (min)			
12:00am-3:00am	28	298.6 (262.6)	0.765
3:00am-6:00am	16	331.4 (228.3)	

DISCUSSION

In Brazil, permission to sleep up to three hours during the night shift is not a matter of law or policy, though it is common practice, especially in public hospitals[3,6,13]. One study based on questionnaires applied to nursing workers of public hospitals suggests that the practice of allowing workers to sleep during night shifts is common, with low percentages of workers reporting otherwise[4]. Napping at work should compensate for the negative effects on sleep of working at night. Given the possibility of napping during night shifts, the workers organized themselves into two periods of time according to the preference of each. The same scheme of organization of naps has been described in other Brazilian studies[6,13,14].

Table 3. On-shift nap and duration of sleep at home according to the duration of NSW. São Paulo, SP, Brazil 2009

Variable	N	Average (SD)	*p*
OSN efficiency (%)			
Up to 136 minutes	23	92.3 (4.5)	0.820
More than 136 minutes	22	91.8 (5.6)	
Duration of daytime sleep at home after work (min)			
Up to 136 minutes	23	203.7 (97.5)	0.019
More than 136 minutes	22	132.8 (98.4)	
Duration of nighttime sleep at home after work (min)			
Up to 136 minutes	23	330.9 (247.3)	0.669
More than 136 minutes	22	291.8 (246.1)	
OSN quality (cm)			
Up to 136 minutes	23	4.8 (2.9)	0.387
More than 136 minutes	22	5.1 (1.9)	

Figure 1. Efficiency of Sleep at Work, compared to the efficiency of episodes of sleep at home (mean and standard deviation) - N = 45. São Paulo, 2009.

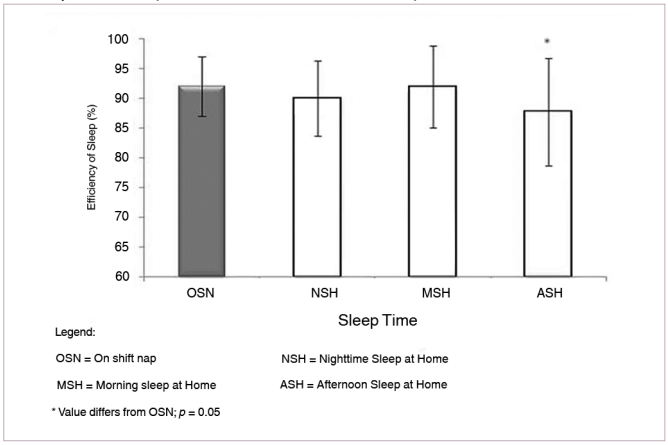
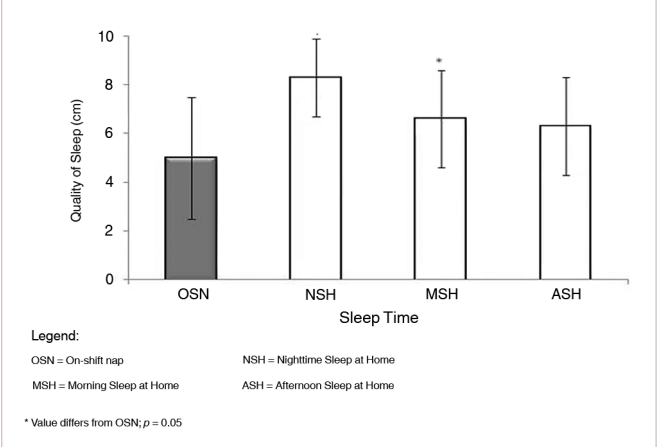


Figure 2. Nighttime Sleep at Work quality compared to the quality of sleep episodes at home (mean and standard deviation) - N = 40. São Paulo, SP, Brazil 2009.



The average duration of naps in this study was about 2 hours, similar to the 138 minutes observed in another Brazilian study[6]. In different studies, the duration of naps varied: 150 minutes[8], 141 minutes[13] and from 120 to 180 minutes[4].

Sleeping fewer hours during the day after night work among those who napped longer at work is also in agreement with the findings of one study conducted with nurses[13]. According to the authors, the nursing professionals napping during night shifts slept less during the day at home when compared to those who did not nap during the night shift. These data suggest that napping at work may partially compensate sleep deficit among nursing professionals working on night shifts. Association between long-duration naps and the short duration of daytime sleep could be a strategy to facilitate readjustment of daytime hours during days off[8].

Napping during night shifts could work as "anchor sleep: a strategy based on 4-hour sleep in regular times would favor the synchronization of the rhythms of individuals who experience irregular sleep routines[15]. It is, however, important to note that sleep inertia, a negative effect on individuals' performance immediately after awakening, should be assessed in the context of strategies related to naps during the night shift.

Shorter naps among those napping in the last hours of the night shift (3:01am to 6:00am) have many possible explanations. The change-of-shift report takes place at 7am and medical procedures are performed prior to it, possibly increasing the level of noise and interrupting the nap of those who would still be within the "resting time". Because maintaining multiple jobs[4] is a common practice, also observed in this study, getting ready to leave to another job could also reduce napping duration among those napping in the last hours of the shift.

Similar to this study's findings, less efficient nighttime sleep at work among those napping in the earlier hours was also observed in an experimental study simulating working conditions[16]. This result may be related to the fact that the efficiency of nighttime sleep at work varies according to the time the nap begins. Because the maximum level of melatonin release and lower core temperature are observed approximately between 3am and 4am, the tendency of sleeping in this hour is greater[2]. This may explain the efficiency of nighttime sleep at work among those napping from 3am on. Further studies, however, are required to better investigate this variable in light of the time at which the nap is initiated.

The similarity of efficiency between NSW and nighttime sleep at home may be explained by the sleep regulation circadian pattern[2], which favors the occurrence of sleep during the night. One study conducted with bus drivers working in day and night shifts[17] shows, through polysomnographic data, that daytime sleep was shorter and less efficient when compared to

nighttime sleep. In regard to the efficiency of NSW, this study's results indicate the importance of napping at work in agreement with other studies in which napping was beneficial to alleviating complaints of fatigue among nursing workers and physicians[7], as well as in raising alertness levels among workers of an oil refinery[16].

Despite the potential benefits of nighttime napping at work, the environmental and organizational conditions are not always favorable[14] and, possibly because of it, the perception of quality of nighttime sleep at work was significantly worse than the quality of sleep at home on days off. The absence of private rooms contributes to interrupted sleep. Additionally, the fact of being on duty hinders one from properly relaxing and having good quality sleep. In other words, resting during the night shift is conditioned to intercurrences that may lead to interruptions in sleep, a situation that one does not expect when sleeping at night at home. Qualitative studies conducted in Brazil[14] and Canada[18] show that those working on the night shift reported being tired but, even though they were allowed to nap, they were afraid to do so. Therefore, the fact that naps during the night shift are informally authorized is another aspect that should be taken into account when analyzing the quality of naps.

As proposed in the other aforementioned studies, there is no doubt that having the opportunity to nap during the night shift is an important organizational procedure that improves working conditions. This benefit was reported by workers at the time of the fieldwork and was also explained in the study based on environmental and organizational conditions of naps among the nursing staff[14]. Aspects, such as rooms designated for night rest, regulated duration of sleep, light, noise, and ventilation, were reported by the nursing workers in this study as important factors in the planning and organization of naps at work[14]. Working at night requires considerable effort since it conflicts with the standard and natural sleep-wake cycle of human beings, as widely shown in the scientific literature[2]. According to the reports of nursing workers napping during the night shift is beneficial when these organization/regulation aspects of naps are taken into account[14].

Therefore, this study's results confirm the benefits of napping during the night shift among the nursing staff and strengthen evidence from the literature in regard to the importance of appropriate times and places for naps to occur during the night shift. It is important to note that potential effects of sleep inertia not assessed in this study may limit the implementation of this practice and deserves future investigation. Despite limitations in regard to the reduced sample, the description of naps through the actigraph, together with the day activities protocol, provided more precise results when compared to studies that used only data obtained through questionnaires. Hence, this study's results can support occupational health policies in regard to the regulation of naps.

CONCLUSION

The efficiency of sleep at work in regard to similarity with nighttime sleep at home suggests there was a beneficial effect of naps among this study's participants. It is worth noting that permission to nap during the night shift is not officially presented to the nursing staff and, therefore, there are no specific places to sleep. This is a controversial issue because nursing professionals deliver continuous care to patients, while the number of workers is usually reduced during the night shift since working demands are lower at night. Nonetheless, aspects favorable to On-shift nap among nursing workers listed in the literature and in this study encourage discussions concerning the regulation of naps at work. In this context, the discussion of the management of workforce during day and night shifts should take into account not only working organization aspects, but also aspects concerning human physiology.

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