

Effect of day time napping on sleepiness, fatigue and short-term memory of the shift workers

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Abstract

Background: Daytime napping is one of the common coping mechanism that workers develop to adapt to the night shift work. Sleepiness, fatigue and reduced short term memory in nurses can increase the risk on patients safety. **Objectives:** The present study was undertaken to observe effect of day time napping in night shift and morning shift on sleepiness, fatigue and short term memory of the shift workers. **Materials and Methods:** 50 nurse working at various hospitals ICUs of Junagadh city, Gujarat were studied for the sleeping behavior and for their sleepiness, fatigue and short term memory span. **Results:** Nurses having habit of daytime napping experienced significantly less sleepiness near the end of night shift compared to those not having habit of daytime napping. However near the end of morning shift which starts early in the morning and finishes late in the afternoon, the nurses having habit of daytime napping experienced higher sleepiness, fatigue and reduction in short term memory span. **Conclusion:** Habit of daytime napping helps in maintaining the performance near the end of night shift however it can also affect the performance in the morning shift, starting early in the morning and finishing late in afternoon. Change in shifts throughout the week reduces the person's ability to develop effective coping mechanisms.

Key Words: Napping, Sleepiness, Fatigue, Short term memory, Shift worker.

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INTRODUCTION

People experience different levels of consciousness during the day. Short term memory and the fatigue changes at different times. Since the shift work off balances the circadian rhythm, Disturbed sleep and sleepiness are the major consequences of the shift work.^{1,2} There has been some contradictory results on the effect of napping on the subjective rating of fatigue, sleepiness, short term memory and reaction time. According to Taub *et al* the daytime naps have the positive effect on

sleepiness and short term memory.³ On the other hand Bertelson and Dinges have failed to demonstrate such effects.^{4,5} Dinges suggested that the “sleep inertia” explain these contradictory results. The duration of the nap does not seem to affect the reduction in sleepiness.³ Nurses have to note down patient’s health variables such as temperature, pulse pressure, fluid output, breathing rate, heart rate, spO₂ etc. at regular intervals. Decrease in short term memory because of increased sleepiness and fatigue due to the night shift can put Patient’s Safety at risk.⁶ Aim of the present study was to understand the correlation between the daytime napping and the short term memory, fatigue and sleepiness of the nurses working in hospital during the night shift and morning shift.

MATERIALS AND METHODS

Between June and July 2019, 50 nurses working for mix of day and night shift at various hospitals ICUs of Junagadh city, Gujarat were evaluated. Written informed consent was obtained from all the participants.

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Confidentiality of the data was ensured. Participants were provided with a sleep logs about the sleeping and napping behavior which they will have to fill out throughout the week as per their convenience. This data of the sleeping behavior helped us to divide the group between day time nappers and non nappers. Field measurements of both the groups were taken at the start, middle and end of their night shift and morning shift. Night shift in this Hospital started at about 10:00 p.m. and finished at about 8:00 a.m. morning shift started at about 8:00 a.m. and finished at about 3:00 p.m. If the participants were taking a nap during their shift then they were not disturbed for the field measurements. Field measurements included Karolinska Sleepiness Scale, Samn–Perelli fatigue scale And DSPAN test to measure the short term memory.

Karolinska Sleepiness Scale⁷

Karolinska Sleepiness Scale is the subjective measurement scale of sleepiness. It is from 1 to 9 where 1: extremely alert, 2: very alert, 3: alert, 4 : fairly alert, 5 : neither alert nor sleepy, 6 : some sign of sleepiness, 7 : sleepy, but no effort to keep awake; 8 : sleepy, but some effort to keep awake; 9 : very sleepy great effort to keep awake.

Samn–Perelli fatigue scale⁸

Samn–Perelli fatigue scale is the subjective measurement scale of fatigue. It is from 1 to 7 where 1 : fully alert; wide awake; 2 : very lively, responsive, but not at peak; 3 : okay, somewhat fresh; 4 : a little tired, less than fresh; 5 : moderately tired, let down; 6 : extremely tired, very difficult to concentrate; 7 : completely exhausted, unable to function effectively.

DSPAN

In this task participants see and listen progressively longer sequence of digits (one digit per second) which they have to recall and enter at the end. On giving two correct answers of a given length of digit sequence they

are taken to the next level with one more digit. On giving one correct and one incorrect answer they are given 3rd chance. If they give correct answer then they are taken to the next level. On giving 2 incorrect answers out of 3, the test is ended. The maximum length of digit sequence that a person can remember for 2 out of 3 attempts is considered the short term memory span. Although various other measures of verbal STM capacity exist, the digit span task outnumbers all of them by a factor of at least 16:1. The test was taken on a laptop computer using software called PEBL which contains a battery of psychological tests.¹²

RESULTS

From the sleep logs that participants provided, it was established that 28 out of the 50 participants had a habit of taking a nap during the daytime. The remaining 22 participants did not take daytime nap on most of the days. Age of participants were between 23 to 52. Average age of nappers was 31.53 and average age of non nappers was 28.5. Difference between average age of nappers and non nappers was not statistically significant. Results of SPF, KSS and TDAT are in table 1. At the beginning of night shift both nappers and non nappers were equally alert and their DSPAN was also similar. By the middle of the night shift, non nappers begin to experience sleepiness but it was not significant. Fatigue and DSPAN were similar in both groups. By the end of the night shift sleepiness of non nappers was significantly more than nappers and DSPAN was significantly less than nappers. However the fatigue in both groups was similar. At the beginning and the middle of the morning shift, performance of nappers and non nappers was of similar But at the end of the morning shift, performance of nappers was significantly poor than non nappers in KSS, SPF and DSPAN.

Table 1: SPF, KSS, and DSPAN among shift workers

	SPF			KSS			DSPAN		
	nappers	non nappers	p value	nappers	non nappers	p value	nappers	non nappers	p value
Night shift									
start	1.893	2.136	0.184	3.071	3.682	0.084	6.929	7.136	0.419
mid	2.393	2.636	0.340	3.929	4.409	0.184	7.107	6.727	0.156
end	3.429	3.818	0.141	5.643	6.455	<u>0.036</u>	6.143	5.591	<u>0.032</u>
Morning shift									
start	2.750	2.364	0.146	4.464	4.091	0.311	6.821	6.545	0.335
mid	1.857	1.727	0.264	3.143	3.045	0.634	7.250	6.864	0.102
end	3.000	2.455	<u>0.015</u>	5.036	4.136	<u>0.001</u>	6.536	7.182	<u>0.038</u>

DISCUSSION

The result indicates that sleepiness and fatigue are common amongst the nurses who have to constantly adapt to the changing shift work throughout the week. People develop different coping mechanisms to adapt to this disturbance in their circadian cycle. One of the common coping mechanism to adapt to the night shift is daytime napping. Nappers did better than the non nappers near the end of night shift. However it was observed that the nappers had habit of sleeping

late at night. As a result, nappers were unable to complete their sleep in the morning shift because it starts at 8:00 a.m. Which increased their need to have a nap in the afternoon but the morning shift ends around 3.00 p.m. so it significantly affected their performance near the end of the morning shift. Thus it was observed that instead of the shift work, the changes in the shift hamper person's ability to cope up with the disturbance in circadian cycle. Limitation of our study was that we were unable to eliminate the effect of workload during the shifts of different ICUs of Junagadh.

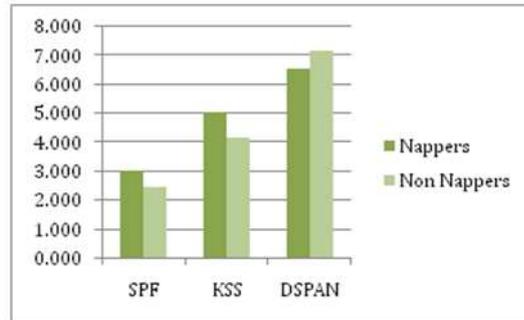
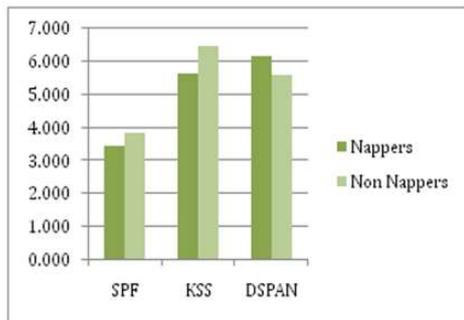


Figure 1: SPF, KSS, and DSPAN near the end of night shift **Figure 2:** SPF, KSS, and DSPAN near the end of morning shift

Ayas *et al.* associated Long work duration and night shift with increased risk of injuries in young physicians.^[9] Extended duration of work shifts also increase the risk of automobile accidents.¹⁰ It is also believed that the nuclear plant meltdown at Chernobyl was due to human error related to work scheduling.¹¹ Similarly our research also indicates the increased risk.

CONCLUSION

In conclusion we have found that daytime napping helps in Reducing sleepiness during night shift but if the morning shift has longer duration such a starting early in the morning and ending late in afternoon then Performance of the workers having habit of napping gets affected. Night shift affects the circadian cycle of the worker. However with time, different workers develop different coping mechanism using naps. But the change in shift work ends up making their coping mechanism of one shift to be a hindrance of the other shift. So instead of changing the shifts throughout the week, changing the shift after every quarter night or a month might improve the performance of nurses by reducing sleepiness, fatigue and maintaining short term memory around the magic number 7, average DSPAN of humans.

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