

# Is daytime napping a healthy habit in adolescents?

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## Abstract

**Introduction:** Napping is a commonly observed phenomenon, seen due to increase in daytime drowsiness and is usually perceived as a part of circadian rhythm dip in level of alertness. Whether such brief periods of sleep are just a habit, a sign of sleep deprivation or underlying mood disorder is a matter of debate. This study was conducted to see the relationship of napping with various aspects of mood & performance

**Material & Method:** One hundred first year medical students were assessed for sleep habits by means of a validated questionnaire. Mood disorders were scored using the depression, anxiety, stress scales (DASS). Performance was calculated based on their overall grades during the academic session.

**Result:** We found that non-nappers were significantly (59.3%) more regular in their sleep routines, followed early to bed and early to rise routines and had e" 7Hrs of sleep at night on weekdays compared to nappers. Nappers reported significant sleep disturbances and mood changes though there was no significant difference in the academic performance of the two groups. We also found that with increasing length of nap there was significant increase in various sleep disturbances and mood changes though these changes were minimal in those napping either for 30mins or 90mins.

**Conclusion:** From this study it appears that napping may not always be a healthy habit and in fact could be a marker of an underlying sleep deprivation, a psychiatric or psychological disturbance in some individuals. Further studies with larger sample size are needed to confirm these observations.

**Keywords:** napping, sleep fragmentation, mood, performance

## Introduction

Physiological and behavioral activities of humans are influenced by the interaction of a number of forces, the two strongest being the circadian and sleep homeostatic systems. The circadian system achieves a balance between the timing of endogenous activities

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by the individual and the external environment. It plays an integral role not only in regulating the time of sleep/wake periods but also in influencing waking neurobehavioral functioning capabilities, alertness or fatigue levels,<sup>(1)</sup> sleep/wake duration, and sleep structure (REM sleep).<sup>(2-4)</sup> Opposing the wake drive provided by the circadian system, the sleep homeostatic system affects sleep propensity, sleep duration, and sleep structure.<sup>(5)</sup> The magnitude of sleepiness or alertness experienced at a given time is a product of the opposing influences of these two systems.<sup>(6)</sup>

Napping is a commonly observed phenomenon seen due to a natural increase in daytime drowsiness after 7-

8 hrs of awake state which may be a feature of our circadian rhythm. However, because the urge for a nap is appreciably weaker than the need to sleep at night, it can be suppressed or masked by stimulants like caffeine, but at the cost of increased sleepiness and reduced mood and performance. Whether such brief periods of sleep are just a habit, a sign of sleep deprivation, or they serve some biological purpose is still a matter of debate. Some studies have designated 15.00 hrs as the optimum time for a nap as it coincides with the midpoint of the day and results in rejuvenation of the individual for the remainder of the day. The restorative effects of daytime naps are well supported by scientific evidence and range from an immediate boost in alertness levels & mental performance<sup>(7-10)</sup> to improvement in mood and subjective well being<sup>(11-12)</sup>

Several studies have been done in laboratory settings but studies in natural settings relating this aspect of sleep on mood & performance in adolescents are few. The above study was done to see the effect of napping on mood & performance in medical students.

## Material & Methods

A cross-sectional study was conducted among 100 1st year students of VMMC & Safdarjung Hospital in the age group of 18 – 22 years by means of a validated questionnaire. A written, informed consent was obtained from all the subjects. Questions analyzed the sleep pattern, sleep duration, period & frequency of naps separately for weekdays & holidays<sup>(13)</sup>. Daytime sleepiness was scored using Epworth Sleepiness Scale (ESS)<sup>(14)</sup> wherein values of ESS score > 8 indicated excessive sleepiness (0-8 - normal, 9-12 –mild, 13-16-moderate & > 16 severe sleepiness). Stress, anxiety & depression among the students were assessed using standardized depression, anxiety, stress scales (DASS)<sup>(39)</sup>. Regarding substance abuse, the students were asked for consumption of caffeine, sleeping pills, alcohol and cigarettes. Performance was calculated based on their overall grades during the academic session.

## Statistical methods

All the data analysis was performed using statistical software SPSS 13. Unpaired t-test and Spearman correlation were used to determine significance of correlation and testing the differences in the prevalence's by characteristics.

## Results

Based on the data collected, students were divided into nappers (n=73) & non- nappers (n=27) and were analyzed accordingly.

### Sleep routines of nappers & non- nappers

On comparing sleep routines of the two groups (table-1) we found that significantly higher numbers of non-nappers went to bed before 12am, woke up early (before 7 am) & 59.3% of them followed regular sleep routines. Significantly higher numbers of non-nappers slept for e" 7Hrs at night on weekdays compared to nappers.

**Table 1:** Comparison of sleep routines, mood & performance of nappers and non- nappers

Variables	Non-nappers (N=27)	Nappers (N=73)	P value
<b>Bed time (upto 12am)</b>			
Weekday	85.1%	48%	.004*
Weekend	81.5%	35.6%	.007*
<b>Get up (upto 7am)</b>			
Weekday	74%	65.8%	.356
Weekend	18.5%	15.1%	.193
<b>Reason</b>			
Alarm & other reasons	81.5%	89%	
Wake up by themselves	18.5%	11%	
<b>Regular sleep habits</b>	59.3%	41.1%	.106
<b>Night sleep e" 7Hrs</b>	70.3%	24.6%	.0001**
<b>Total sleep e" 8Hrs</b>	33.3%	30.1%	.548

### Sleep problems among nappers & non-nappers

Among nappers 75.4% students slept for < 7 Hrs in night on weekdays, a higher percentage of nappers reported difficulty in falling asleep (27.5%), frequent awakening (26%), difficulty in going back to sleep (32.9%), feeling tired in morning (56.2%), sleep loss affecting mood (84.9%).(figure-1)

### Relation of time of napping to mood & performance

Sixty three percent of nappers reported sleeping between 4pm to 6 pm (table-2). On comparing the subjects based

on their time of napping we found that performance of students was best for students napping earlier (before 4pm) & it reduced as time of napping shifted to late evenings but at any time it was better in nappers compared to non-nappers. Mood changes were reported to be more in nappers. Anxiety & stress was highest in those napping in early afternoon (before 4 pm) while depression & sleepiness was maximum in those napping between 4-6pm. Those napping between 4-6pm also reported significantly higher sleep disturbances as difficulty in falling asleep ( $P=0.017$ ), frequent awakenings ( $P=0.034$ ), difficulty in going back to sleep ( $P=0.058$ ) & tiredness in the mornings ( $P=0.206$ ). While other group of nappers (napping before 4 pm & those after 6 pm) did not have significant differences, though these difficulties were reportedly higher in nappers compared to non nappers.

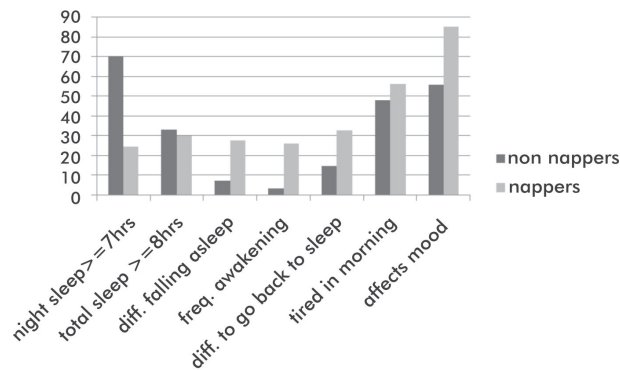


Figure 1: Comparison of various sleep problems in nappers & non-nappers

### Relation to duration of napping

Based on duration of napping, the students were compared as non nappers, those napping for 30mins, 45mins, 60mins, 90mins & 120mins (table-3). Nappers in all groups had significant reduction in night sleep as a consequence of napping during the day. There was almost no difference in any of the parameters between non nappers and those napping for 30mins except that nappers reported significant higher stress ( $p=.019$ ). Compared to non nappers, 45mins nappers reported few sleep disturbances like difficulty in going back to sleep ( $P=0.058$ ) & tiredness in morning ( $P=0.034$ ) but no mood changes. 60mins nappers reported significant sleep disturbances, along with depression ( $P=0.062$ ), anxiety ( $P=0.023$ ), stress ( $P=0.005$ ) & sleepiness ( $P=0.06$ ). 90mins nappers reported significant depression ( $P=0.049$ ) & sleepiness ( $P=0.026$ ) but no other sleep difficulties. 120mins nappers again had significant sleep disturbances {difficulty in falling asleep ( $P=0.021$ ), frequent awakening ( $P=0.015$ ), difficulty in going back to sleep ( $P=0.031$ )} as well as mood changes {depression ( $P=0.068$ ), anxiety ( $P=0.09$ ), stress ( $P=0.057$ ), sleepiness ( $P=0.058$ )}. Thus it was seen that there were none to few sleep disturbances and mood changes in those either napping for 30mins or 90mins (table-3). Results also showed that with increasing length of nap there were significant increase in various sleep disturbances and mood changes.

Table 2: Comparison of those napping between 4-6pm & those at other times

Variables	Non nappers (N=27)	Napping Before 4pm(N=15)	Napping between 4-6 pm (N=46)	Napping after 6 pm (N=12)	P. value
Night Sleep	7.0 $\pm$ 0.87	6.60 $\pm$ 0.98	5.78 $\pm$ 0.81	5.66 $\pm$ 0.98	.0001**
Day Sleep	0	0.80 $\pm$ 0.86	1.30 $\pm$ 0.66	1.25 $\pm$ 0.621	.0001**
Performance	53.11 $\pm$ 11.95	57.20 $\pm$ 10.41	55.56 $\pm$ 12.7	53.5 $\pm$ 14.6	.523
Depression	7.8 $\pm$ 5.81	8.40 $\pm$ 5.96	12.86 $\pm$ 7.44	10.5 $\pm$ 8.61	.021
Anxiety	7.5 $\pm$ 4.87	11.86 $\pm$ 6.2	10 $\pm$ 5.81	9.0 $\pm$ 5.08	.420
Stress	10.66 $\pm$ 5.43	16.53 $\pm$ 8.53	15.21 $\pm$ 7.55	12.66 $\pm$ 7.87	.128
Difficulty in Falling asleep	0.15 $\pm$ 0.53	0.6 $\pm$ 0.91	0.76 $\pm$ 1.53	0.66 $\pm$ 0.98	0.076
Frequent awakening	0.18 $\pm$ 0.96	0.73 $\pm$ 1.43	0.82 $\pm$ 1.56	0.41 $\pm$ 0.79	0.069
Diff. going back to sleep	0.40 $\pm$ 1.11	0.73 $\pm$ 1.43	1.04 $\pm$ 1.69	0.91 $\pm$ 1.56	0.088
Tired in morning	1.29 $\pm$ 1.63	0.66 $\pm$ 0.97	1.84 $\pm$ 1.86	1.91 $\pm$ 2.06	0.086
ESS	7.29 $\pm$ 3.4	8.93 $\pm$ 2.86	9.65 $\pm$ 3.24	7.58 $\pm$ 1.88	.196
Total Sleep	7.0 $\pm$ 0.87	7.4 $\pm$ 1.35	7.08 $\pm$ 0.78	6.9 $\pm$ 0.99	.625

Table 3: Comparison of various correlates depending on different length of nap

Variables	Non Nappers N=27	30min N=2	45 min N = 2	60 min N = 31	90 min N = 11	120 min N = 25	P value
Night Sleep	7.0 ± .08	5.5 ± 0.7	5.5±0.7	6.27 ± 0.76	5.54 ± 1.09	5.7 ± 0.97	.001**
Day Sleep	0	.5 ± 0.7	1± 0	.87 ± .54	1.36 ± 0.50	1.54 ± .77	.0001**
Performance	53.11±11.9	60±8.4	49±12.7	55.7±12.1	57.45±14.6	54.6±12.9	.427
Depression	7.85 ± 5.81	12.0 ± 8.4	12.0±0	11.27 ± 7.69	11.44 ± 7.7	11.83 ± 7.68	.007**
Anxiety	7.55 ± 4.87	8.0 ± 8.4	13.00±12.7	10.84 ± 5.85	8.5 ± 4.9	10.08 ± 5.64	.193
Stress	10.66 ± 5.43	21.0 ± 9.n8	15±12.7	15.63 ± 7.6	13.8 ± 7.3	14.4 ± 8.20	.144
Difficulty in Falling asleep	0.14±0.53	0	0	0.72±1.17	0.18±0.6	1.04±1.74	.041*
Frequent awakening	0.18±0.96	1±1.41	1±1.41	0.48±1.3	0.36±0.8	1.2±1.75	.005**
Diff. goig back to sleep	0.40±1.11	0	2±0	0.81±1.5	0.36±0.8	1.40±1.93	.039*
Tired in morning	1.29±1.63	0	2±0	1.69±1.82	1.72±1.42	1.56±2.04	.613
ESS	7.29 ± 3.4	7.5 ± 3.5	11.0 ± 2.8	8.93 ± 3.16	10.09 ± 3.04	9.04± 2.96	.056
Total Sleep	7.0 ± 0.8	6.0 ± 1.4	6.5 ± .70	7.15 ± 0.93	7.32 ± 0.9	7.32 ± 0.91	.324

### Relation to frequency of napping ( no. of days in week)

On comparing the subjects as non-nappers, those napping d" 4 days a week( GROUP-A) & those for > 4 days a week (GROUP-B) we found that total night sleep was significantly low in both groups A & B compared to non-nappers thus nappers reported highly significant sleepiness. Mood changes were more in nappers & performance of all the groups did not show any significant difference. (Table-4)

Table 4: Comparison of various correlates depending on frequency of nap

Days in a Week Correlates	0 days (N=25)	≤4 days (N =31) Group-A	> 4 days (N=44) Group-B	p. value
Performance	52.0 ± 11.5	58.38 ± 11.9	54.09 ± 12.7	.728
Depression	8.16 ± 5.65	11.48 ± 7.22	11.27 ± 7.8	.196
Anxiety	7.84 ± 5.19	10.19 ± 6.18	9.95 ± 5.44	.244
Stress	10.48 ± 5.51	15.61 ± 7.9	14.59 ± 7.61	.079
Total sleep duration	7.0 ± 0.86	7.09 ± 1.16	7.13 ± 0.79	.620
Night sleep on weekdays	7.0 ± 0.86	6.38 ± 0.95	5.65 ± .83	.0001**
Day sleep on weekdays	0	0.70±0.73	1.47 ± .54	.0001**
ESS	7.56 ± 3.26	7.61 ± 2.67	10 ± 3.17	.001**

### Discussion

In our study 73% of the students reported napping during the course of the day. On analyzing, it was seen that nappers were more irregular in sleep habits, were late night sleepers and significant number of them had a shorter (<7hrs) night sleep. Though their performance was slightly better but they reported significant mood changes (depression P=0.02, anxiety P=0.036, stress P=0.002) & sleep disturbances.

### Sleep routines & sleep problems in nappers & non-nappers

Sleep routines of non-nappers were more regular, followed "early to bed & early to rise" routine and most of them slept for e"7 hrs at night. Nappers were splitting their total sleep in two slots compared to non nappers who slept at a stretch, as total sleep duration was almost equal in two groups. Sleep disorders such as delayed sleep phase syndrome (DSPS) ( unable to fall asleep before late in the night), difficulty falling asleep, frequent awakenings and feelings of tiredness & dullness were higher in nappers compared to non-nappers. Frequent nighttime awakenings in older adults have been reported in multiple studies<sup>(15-22)</sup> & these arousals have been associated with reduced daytime well-being, daytime sleepiness, and napping<sup>(20-23)</sup>. Goldmann et.al. (2008)<sup>(24)</sup> were able to demonstrate that higher levels of

fragmentation were associated with higher odds of having taken a nap but they were still not clear whether napping lead to fragmentation or fragmentation of night sleep lead to napping.

### **Relation of time of napping to mood & performance**

Twenty percent of students reported napping before 4pm, 63% between 4-6 pm & rest after 6 pm. Among nappers depression was highest among those napping between 4-6 pm, who also had longest duration of daytime nap & scored maximum on ESS. Long daytime naps increase sleep inertia and are associated with a temporary reduction in performance and deterioration of mood soon after waking<sup>(25)</sup>. Previous studies have failed to find whether depression leads to sleepiness or vice versa but the two are definitely associated. Sleep disruption is a common feature of depression & can manifest as reduced total sleep time, increase in sleep latency, and frequent awakenings during night-time sleep<sup>(26)</sup>. This group of nappers also reported higher sleep difficulties (difficulty falling asleep, frequent awakening etc).

Anxiety, stress & performance were highest in those napping early in afternoon & went on reducing in subsequent groups. Early nappers had shorter daytime nap & lesser sleep disturbances compared to the nappers of other groups. Short naps of less than 30 min duration have shown invigorating effect. They help to maintain daytime arousal levels and enhance performance<sup>(27,28,29)</sup>. Short naps have beneficial effects as they allow an individual to awake refreshed after completing one sleep cycle. Sleep inertia occurs immediately after napping, but its severity is directly proportional to the length of nap. It can be minimized by avoiding long naps that may result in awakening from deep non-rapid eye movement sleep<sup>(30)</sup> which also results in sluggish responses, mood disturbances and sleep disturbances like poor quality, increased sleep latency & frequent awakenings. This study also shows that those napping for shorter duration, though showed maximum anxiety, had scored maximum academically and reported less sleep disturbances. Kizilbash AH et al<sup>(31)</sup> also found that symptoms of anxiety (without depression) do not have a significant deleterious effect on any aspect of memory functions assessed. As suggested by the Yerkes–Dodson ‘Law’, there is a curvilinear relationship between anxiety and performance, such that a moderate level of anxiety may actually benefit cognitive performance depending on task difficulty<sup>(32)</sup>.

### **Relation to duration of napping**

On comparing the non nappers with nappers of different duration we found that nappers of 30mins and 90mins duration had nil to minimal complaints regarding sleep disturbances and mood changes. In this study we also found that those napping apart of this duration (45mins, 60mins and 120mins) showed significant sleep disturbances and mood changes. Performance of those napping for 30mins and 90mins was also better than other groups though not significant. Dhanda R& Sohal H<sup>(33)</sup> have shown that the occurrence of sleep inertia is more severe if the individual awakens from deep non-REM sleep. The development of sleep inertia could be reduced by taking naps shorter than 20 min to avoid the likelihood of deep non-REM sleep, or by taking a nap for approximately 90 min, to allow time for one non-REM cycle and waking from REM sleep. Long naps only lead to shortening of night sleep subsequently increasing sleepiness & sleep disturbances (frequent awakening, difficulty falling asleep etc) which were directly proportional to the length of naps. Studies<sup>(34, 35)</sup> have shown that the occurrence of slow wave sleep during daytime naps reduces periods of slow wave sleep in the subsequent major nocturnal sleep, suggesting a decline in the quality of subsequent nocturnal sleep.

### **Relation to frequency of napping (no. Of days in week)**

Consistent results were found when nappers were compared based on their frequency of napping. Nappers whether napping d” 4 days or more reported higher mood changes & sleepiness and had no significant difference in performance compared to non nappers. On correlating the frequency of naps with total night sleep, we found that subjects napping > 4 times per week had a highly significant decrease in their night sleep duration compared to nappers d” 4 days / week. Correspondingly, they had greater duration of daytime nap and excessive sleepiness. These observations reflect the “vicious cycle” effect between sleep deprivation & daytime sleepiness. Lack of proper night sleep leads to excessive sleep hunger which causes longer naps during day and these in turn promote further sleepiness. Various animal and human models have demonstrated that sleep curtailment or fragmented sleep results in excessive daytime sleepiness<sup>(36, 37)</sup>. Further, it is evident that the physiological need for sleep created by sleep loss can only be reversed by sleep.<sup>(38)</sup>



## Conclusion

This study shows that though short daytime naps were slightly helpful in increasing performance, longer and frequent naps during the day had adverse effects on mood and were also associated with significant sleep disturbances at night. Probably these individuals requiring such naps were either sleep deprived or were having undiagnosed sleep disorder, psychiatric or psychological disturbances in the form of depression and anxiety. Further studies with much larger sample are needed to study the association of napping with sleep deprivation and disorders of mood.

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