

Associations Between Morningness-Eveningness and Sleep Quality Among Female Dormitory Residents

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Received: November 2, 2014; Revised: January 5, 2015; Accepted: January 7, 2015

Background: Variations in diurnal preferences for activity and sleep are classified as morning and evening chronotypes. Morning and evening-type individuals differ regarding a number of psychological and biological variables such as sleep.

Objectives: The current study aimed to investigate the relationship between chronotypes and sleep quality.

Patients and Methods: In this descriptive, correlational study, 159 university girl students were studied. Horne-Ostberg Morningness-Eveningness Questionnaire (MEQ) and Pittsburgh Sleep Quality Index (PSQI) were used to assess chronotypes and sleep quality respectively. The data were analyzed using descriptive and Pearson's linear correlation coefficient tests by SPSS software version 16.

Results: Over 60% of the students were categorized as poor-quality sleepers by the PSQI, 69.2%, 27.5%, and 3.2% of the subjects were intermediate, evening, and morning types, respectively. There was a significant negative correlation between MEQ and PSQI scores and its dimensions such as subjective sleep quality, sleep latency, sleep duration, and sleep efficiency ($P < 0.05$); while there were no significant differences between sleep disturbances, daytime dysfunction, use of sleep medication, and MEQ scores.

Conclusions: The results showed that the quality of evening type sleep was worse than that of the morning type.

Keywords: Sleep Disorders; Circadian Rhythm; Female; Students

1. Background

Sleep is part of a daily biological rhythm that is essential for the promotion of health and better physical function (1). In humans, the night phase of 24-hour time scale is stabilized by complex interactions between two systems that are circadian rhythm and sleep-wake homeostatic system (2). Despite the biological need for sleep, nowadays it is being replaced by work and social schedules in modern societies. Numerous studies show that sleep disorder and poor quality sleep are followed by adverse psychological outcomes (3, 4), which will result in increased mortality and morbidity rates (5). Although the mechanisms underlying sleep disorder are not well understood in adolescents and adults, some of the factors affecting sleep disorders include behavioral and environmental factors (6). Weekend sleep recovery is a compensatory mechanism for sleep debt on weekdays, while the delay in the sleep time seems to be the result of changes in the circadian rhythm (chronotype) (7), which is among other factors that affect sleep habits. For this reason, people are different in terms of sleep/awakeness time (8). Although these differences are somewhat innate, they are affected by environmental factors such as exposure to light (natural and artificial), seasonal photoperiod, and latitude and longitude of residence (9, 10). Daily rhythm is accepted as a criterion to distinguish between different people in their work at different hours of the day (11). Individuals are classified into three groups in terms

of morning-evening types: morning, evening, and none of them (intermediate). People in the first two groups are called lark and owl, respectively (12). Morning people who wake up early in the morning can benefit the highest and best physical and mental performance in the morning and go to bed early, while the best physical and mental performance of the evening type people, who wake up late and go to bed late, is obtained in the afternoon and evening (13).

People with an evening chronotype are at greater risk of sleep disorder and disruption, due to imbalances in their biological and social time. Other factors associated with chronotype and affect sleep include lifestyle habits (working agenda) and social and economic stresses (14, 15).

Several studies demonstrated the relationship between sleep problems and chronotype. People with an evening chronotype have higher levels of daytime sleepiness and more maladaptive beliefs about sleep, compared to morning types (16, 17). In addition, they have more irregular sleep-wake patterns, weaker voluntary control of sleep habits, and greater tendency to fall asleep (18-20). On the other hand, morning-type people are faced with increased sleep problems, such as night waking, early waking and daytime sleepiness (20).

Inconsistent results are found in the studies evaluating sleep parameters among different chronotypes. Some studies reported no difference between different chro-

notypes in terms of sleep efficiency and sleep duration in the total sleep time (21, 22); while others suggested that morning types have higher sleep efficiency than evening types, regarding the dimensions of sleep efficiency (23).

2. Objectives

Since the relationships between sleep quality and chronotypes still unknown to a large extent, the current study aimed to further examine the relationship between sleep quality and chronotype.

3. Patients and Methods

The present descriptive correlational study was performed on 159 female students living in the dormitory of Ahvaz University of Medical Sciences in 2013. Except for the students in semester one and two, totally 700 students lived in the three dormitories. After attending the dormitory complex (includes three dormitories), the researcher collected subjects through convenience sampling in such a way that those interested in participation were given questionnaires to complete. Students working night shifts in the last month as well as the students in semester one and two were excluded from the study because of possible non-compliance with the dormitory environment. The data collection tool in this study was the demographic questionnaire that included information on individual and familial characteristics, the type of courses and the number of semesters already passed. Pittsburgh Sleep Quality Index (PSQI) was used to examine sleep disorders. The questionnaire, completed by the person herself, examines the sleep quality and its disorders in the last month (24); it contains 24 items and 19 ones assess the quality of sleep. The questionnaire contains two types of questions, the short-answer questions (what time did you go to bed in the last month?) and multiple-choice questions (scored on the Likert scale from 0 - 3). The questionnaire considers seven dimensions including subjective quality of sleep, sleep latency, duration of sleep, effective sleep, sleep disorders, daytime dysfunction, and use of sleep medication. The overall score of the dimensions range from 0 to 21, with higher scores indicating the worse sleep quality (25). The Cronbach's alpha coefficient was reported from 0.77 to 0.81 (26, 27). The reliability and validity of the questionnaire in Iran was confirmed from $\alpha = 0.78$ to 0.82 (28).

The standard Horn-Sternberg questionnaire, i.e. Morningness-Eveningness Questionnaire (MEQ), was used to examine the morning-evening types. The questionnaire is a common tool to examine the types of chronotypes, including 19 items on the habits of waking and sleeping, the individual's preferred time to perform his physical and mental tasks, and the level of consciousness before falling asleep and after waking. The questionnaire yields a score ranging from 16 to 86, which is considered as absolute evening type for scores of 16 - 30, relative evening type for 31 - 41, intermediate for 42 - 58, relative morning type for 59 - 69, and absolute morning type for 70 - 86 (29, 30). The questionnaire is also valid in Iran ($\alpha = 0.72$) (11). Fi-

nally, the data were analyzed using descriptive statistics and Pearson correlation by SPSS software version 16.

4. Results

The mean age of the subjects was 21.92 ± 1.74 , and 98.1%

Table 1. Prevalence of Sleep Disturbances Measured by the Pittsburgh Sleep Quality Index (PSQI) ^{a,b}

Variable	No. (%)	Mean \pm SD
Total score of sleep quality		6.66 \pm 3.04
Good sleep quality ≤ 5	58 (37.7)	
Poor sleep quality > 5	96 (62.3)	
Subjective sleep quality		1.22 \pm 0.76
0	23 (14.8)	
1	82 (52.9)	
2	42 (27.1)	
3	8 (5.2)	
Sleep latency		1.59 \pm 0.96
0	23 (14.9)	
1	46 (29.9)	
2	55 (35.7)	
3	30 (19.5)	
Sleep duration		1.0 \pm 1.02
0	64 (41.6)	
1	42 (27.3)	
2	32 (20.8)	
3	16 (10.4)	
Sleep efficiency		1.48 \pm 0.86
0	106 (68.8)	
1	32 (20.8)	
2	5 (3.2)	
3	11 (7.1)	
Sleep disturbances		1.14 \pm 0.50
0	10 (6.5)	
1	113 (72.9)	
2	32 (20.6)	
Daytime dysfunction		1.12 \pm 0.78
0	31 (20.0)	
1	81 (52.3)	
2	35 (22.6)	
3	8 (5.2)	
Use of sleep medication		0.09 \pm 0.33
0	142 (91.6)	
1	11 (7.1)	
2	2 (1.3)	

^a Minimum Score = 0 (better); Maximum Score = 3 (worse).

^b (n = 154).

Table 2. Prevalence of Chronotype Measured by the Morningness/Eveningness Questionnaire (MEQ)

Variable	No. (%)
Definite evening	3 (1.9)
Moderate evening	40 (25.6)
Intermediate	108 (69.2)
Moderate morning	5 (3.2)
Total	156 (100)

Table 3. Correlation Between Sleep Disorders and Morningness/Eveningness Questionnaire (MEQ)^a

Variable	Subjective Sleep Quality	Sleep Latency	Sleep Duration	Sleep Efficiency	Sleep Disturbances	Daytime Dysfunction	Use of Sleep Medication
Chronotype	-0.21	-0.19	-0.16	-0.17	0.07	-0.10	0.20
P-Value	0.007 ^b	0.014 ^c	0.04 ^c	0.02 ^c	0.33	0.18	0.77

^a Total Score (n = 156).^b P < 0.01.^c P < 0.05.

of the subjects were undergraduate students. The highest and lowest number of subjects included the Nursing and Midwifery Faculty (39.6%) and the Faculty of Medicine (0.6%), respectively. The highest number of the subjects (26.4%) belonged to the seventh semester and the lowest (2.5%) to the third semester.

Regarding sleep disorders, 154 out of 159 subjects fully completed the questionnaires. Overall, 37.7% and 62.3% of the people had good sleep quality and poor sleep quality, respectively (Table 1). Among the morning-evening types, the majority of subjects (69.2%) represented an intermediate type (Table 2), with a mean score of 45.06 ± 7.38 . When evaluating the relationship between chronotype and dimensions of sleep quality, a statistically significant negative relationship was found between the total score of sleep quality and chronotype ($P = 0.004$, $r = 0.23$) (Table 3).

5. Discussion

The results of the current study indicated that students of dormitories mainly had poor sleep quality, which was similar to other studies in China (31) and North America (25), while less sleep disorders were reported in the studies in Palestine (32) and South America (33). Although poor quality sleep is generally observed in students, the difference in the levels may have roots in different socio-economic and cultural habits of groups.

The current study, consistent with the study by Kabrita (34), found that the circadian rhythm (chronotype) had a significant negative relationship with overall PSQI score, showing that the quality of sleep was poorer in the evening types. Previous studies also indicated that morning types had more regular sleep-wake schedule and enjoyed a better quality of sleep (35), while evening types faced with more sleep disorders (36). In the current study, a statistically significant negative relationship was observed between dimensions of sleep quality (including subjective quality of sleep, sleep latency, duration of sleep and effective sleep) and PSQI score. It is well known that the morning and evening types have different stages of sleep and wakefulness, therefore, compared to the evening types, the morning types wake up earlier and sleep earlier (22). Although the evening types go to bed late and wake up late, the current study and that of Roenneberg et al. showed that the evening types had less duration of sleep (37). While no relationships were observed between chronotype and sleep duration and effectiveness in the

study by Mongrain et al. performed in a laboratory setting with a sleep duration of 8 hours (22). Sleep latency is a feature of the evening types, which leads to a noticeable sleep deficit on weekdays, therefore, they can compensate their lack of sleep by the extended weekend sleep (19, 37). Roenneberg et al. assumed a significant relationship between sleep duration and chronotype due to social programs (37). Evening types have less sleep during the week, but they get more sleep on the weekend. Thus, the current study findings should be interpreted cautiously, because the duration of the week and weekend sleep were not examined separately. The current study found a statistically significant negative relationship between subjective quality of sleep and PSQI score. Similar to the study by Barclay et al. (38), Gaina et al. (39) showed that morning types were more satisfied with their quality of sleep, compared to the evening types. The study of Lehnkering et al. found no relationship between evening types and sleep latency (23), while this study showed that sleep latency had a significant negative relationship with PSQI score. There is a relationship between chronotype and effective sleep, and the morning types have a more beneficial sleep (23), which is in line with the findings of the current study, in which no significant relationship was observed between PSQI score and impaired daily functioning, while the study by Giannotti et al. showed that evening types faced with the problem of daytime drowsiness, which leads to attention problems, poor educational achievement, physical injuries and emotional distress (40). Jamali et al. indicated that during internship, medical students show lower scores in all domains of QOL, factors such as working hours in hospitals, responsibility for patient care, perceived medical errors, sleep deprivation and fatigue contributed to the reduction of their QOL (41). No relationship was found between the use of sleep medication and score PSQI in the current study. Since the subjects were medical students, according to their knowledge about the drugs and their side effects less sleeping drugs consumption could be predicted and only 10.3% of the subjects used sleeping drugs.

The limitations of this study were the lack of separate studies on sleep during the week and weekends, as well as the use of retrospective self-report questionnaire of sleep quality, which can be associated with errors because it is completed by individuals. In general, the results of the study showed poor sleep quality among the students of evening types. Raising students' awareness

on the importance of sleep and the role of chronotype to obtain adequate sleep can help them make better choices in education and employment programs to achieve the best efficiency.

Acknowledgements

All students of Ahvaz University of Medical Sciences are hereby appreciated for participating in the study.

Authors' Contributions

Study concept and design: Bakhshandeh Bavarsad. Acquisition of data: Mahmud Latifi. Analysis and interpretation of data: Mahmud Latifi. Drafting of the manuscript: Bakhshandeh Bavarsad and Nasrin Azimi and Khadije Moradbeigi. Critical revision of the manuscript for important intellectual content: Bakhshandeh Bavarsad. Statistical analysis: Bakhshandeh Bavarsad and Mahmud Latifi. Administrative, technical, and material support: Bakhshandeh Bavarsad and Nasrin Azimi. Study Supervision: Bakhshandeh Bavarsad.

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