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Research Article

Wakefulness-Sleep Patterns and their Relationship to Practicing of Sports, Quality of Sleep and Academic Performance in School Students

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Abstract

Objective: The aim of the study was to study the chronotype of school students in the preparatory stage in Egypt (10-14 years) and its relationship to practicing sports, sleep and academic performance.

Methods: 158 preparatory school students participated in the present cross-sectional study. Their demographic characteristics were collected. The self administered questionnaire Composite Scale of Morningness (CSM) and the Disturbance in Initiating and Maintaining Sleep (DIMS) subscale of the Sleep Disturbance Scale for Children (SDSC) were used to determine chronotype and level of disturbance of sleep respectively.

Results: We found that 19.2% of the sample was of morning type, most of the sample (74.4%) was of the intermediate type and 6.4% of it was of evening type. It was found that: not practicing sports (P=0.001), presence of disturbance in initiating and maintaining sleep (DIMS) (P=0.000), and lower academic performance was significantly associated with the evening type.

Conclusion: Most of school students in the preparatory period in Egypt were of the intermediate chronotype. Evening type was significantly associated with no practicing of sports, sleep problems and lower academic performance.

Keywords: School students; Chronotype; Sports; Academic performance; Egypt

Introduction

Circadian rhythm ms, or cyclic fluctuations in physiological and psychological functions, are thought to affect many aspects of an individuals' life. Study, exercise, eating habits, and adaptability to shift work are just some of the domains that are affected by the circadian rhythms that usually approach 24hr [1]. It is well known that individual differences in circadian rhythms, that are called morningness and eveningness, points to the preferences associated with morning or evening activities. According to this information, a morning-type person prefers morning activities and consequently he gets up easily, and is more alert in the morning than in the evening, and on the contrary, an evening-type person prefers afternoon–evening activities consequently, he is more alert at night and able to sleep late in the morning. Traditionally, morningness and eveningness have been considered a trait, lying along a continuum known as the morningness-eveningness dimension [1-3].

A definition of chronotype, states that a single phase reference point is utilized to determine the circadian rhythms entrainment of the endogenous timing system to a period of 24 hours. Other definitions, describe chronotype as a phase of entrainment that points to the relationship between external and internal time [4].

Researchers discovered differences with relation to the age in individuals' morningness and eveningness. For example, the preference towards morningness and eveningness appears to differ throughout life. Children usually show increased morningness rates relative to other age groups. During adolescence a delay of phase preference is usually observed [5,6] reaching a maximum of phase delay at around the age of 20 [7].

This is caused by a phase delay in melatonin secretion which usually happens in adolescence [8,9], and this is in accordance with the finding that adolescence is a stage in which the sleep–wake cycle tends to become delayed and accordingly adolescents tend to stay up progressively later and to sleep later in the morning when compared to preadolescents. After the age of 50, many studies reported a fast increase in morningness [10,11].

Relationships between chronotype and academic performance have been examined in a considerable number of studies. Researchers repeatedly show that eveningness and academic performance are strongly and inversely related, and on the other hand, morningness and performance in school are positively related. These findings are true for both school children [12-14] and university students [14-16]. A meta-analysis study also found small but significant and significant correlations between morningness and academic achievement (r = .16, 13 studies) and eveningness and academic achievement (r =–.14, 6 studies). So, students of the morning type achieved better in academic situations than evening type students [17].

Also, it was found that evening type students usually have less class attendance and school achievement and are less alert during

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Table 1: Socio-demographic characteristics of school students.

Variable	N	%	Mean	st. deviation
1. Gender:				
Female	40	25.3		
Male	118	74.6		
1. practice of sports:				
No practice	86	55.1		
Practicing sports	70	44.9		
2. sleep problems:				
No DIMS	116	74.4		
DIMS	40	25.6		
3. chronotype:				
Morning type	30	19.2		
Intermediate type	116	74.4		
Evening type	10	6.4		
4. marks of students:				
<70	64	41		
≥ 70	92	59		
5. score of CSM:			37.33	7.98
6. marks of students:			69.66	19.44
7. Age:			11.51	1.98

Table 2: Chronotype and its association with practicing sports.

		Sports		Total	P
Chronotype		no sport	practicing sport		
type	morning	8	22	30	
	intermediate	70	46	116	0
	evening	8	2	10	
Total		86	70	156	

class than morning type students [13].

Methods

Setting

The present cross sectional study was approved by the ethical committee of college of medicine, Al-Azhar university (New Damietta). Data were collected during January- April 2017 at department of pediatrics, Al-Azhar university hospital (New Damietta).

Participants

The sample consisted of preparatory school students who came to pediatrics department for treatment or follow up. Before data collection the students and their families were briefed about purpose of the study and the way of completing the questionnaires. They were given the assurance of anonymity and that the information would be absolutely confidential. The sample was collected according to the rules of random sampling. The students with a history of sleep disorders or with a history of psychiatric disorders or any illness that would affect their sleep were excluded from the study. A total number of 158 students were included and their ages ranged from 10-14 years.

Intervention

The socio-demographic characteristics of the enrolled preparatory school students were obtained by the data collection form given to the students and their families to be filled. The form included items such as: age, sex, school year, practice of sports, presence of sleep problems or not and marks and grades of students in the first midterm exam.

- Wakefulness and sleep patterns were determined using the Composite Scale of Morningness questionnaire (CSM) [18].

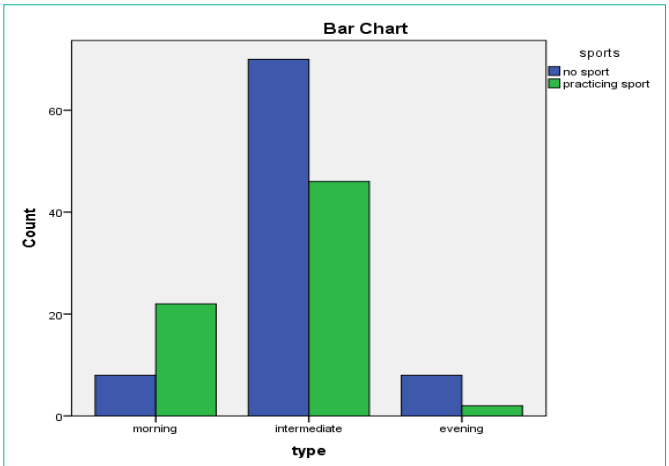

Figure 1: Association between chronotype and practice of any kind of sports by students.

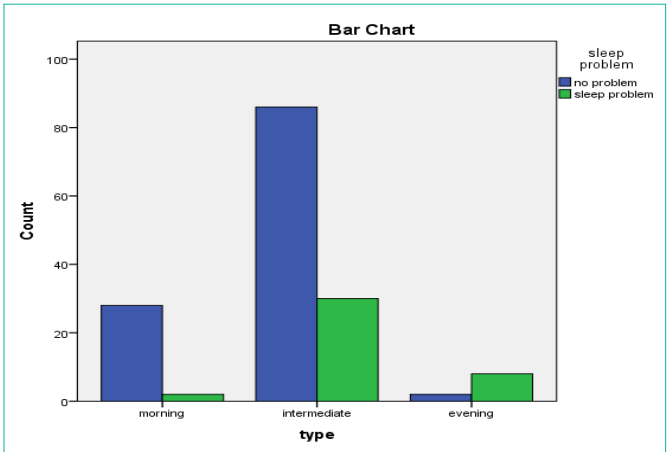

Figure 2: Association between chronotype and presence or absence of DIMS (Disorders of Initiating or Maintaining Sleep).

The questionnaire was afforded in simple Arabic language and was validated before [19]. It comprises 13 questions with Likert- type responses. The total CSM scores ranges from 13-55 [18]. The CSM has shown good psychometric properties when used with both students and workers [20]. The students were asked to fill the questionnaire with the information that was present one week before they came to the outpatient clinic. Among the 180 questionnaires distributed 158 were valid for the study.

- Sleep was assessed with the Sleep Disturbance Scale for Children (SDSC) questionnaire [21]. Parents were asked to recall the child's sleep during the previous 6 months. The SDSC provided 6 sleep problem factors grouped from 26 items: Disorders of Initiating and Maintaining Sleep (DIMS), Sleep Breathing Disorders (SBDs), Disorders of Arousal (DA), Sleep–Wake Transition Disorders (SWTDs), Disorders of Excessive Somnolence (DOES), and sleep hyperhidrosis. It also provided a total SDSC score. All sleep factor scores were transformed into age-specific T scores. T score of >70 was considered pathological. The SDSC in Arabic was developed by translation and back-translation. Reliability analysis showed that Cronbach's alpha was 0.87 according to a previous study [22]. The first subscale about Disturbance of Initiating and Maintaining Sleep

(DIMS) was the subscale only done by students' families.

Statistical methods

Data was entered manually into a database and cleaned before analyses. The Statistical Package for the Social Science (SPSS) version 20 software was used for both descriptive and inferential analysis. Items that were not answered by respondents were considered as missing. Univariate statistics such as mean values, standard deviations, frequencies and proportion percentages were derived for continuous and categorical variables respectively. Bivariate analyses were used to measure the strength of association between the variables in the study. All tests were two-tailed with significance defined as $p < 0.05$.

Results

158 preparatory school students were studied, their ages ranged from 11-14 years from which 74.6% were males and 25.3% were females. The mean age of the respondents was (11.51± 1.98). Regarding practicing any kind of sports, 86 (55.1%) were practicing sports and 70 (44.9%) were not. 116 (74.4%) experienced sleep problems in the form disturbance in the initiation and maintenance of sleep (DIMS) and 40 (25.6%) did not experience sleep problems. 64 (41%) got exam marks in the first midterm that are <70 and 92 (59%) got exam marks ≥70. The mean score of Composite Scale of Morningness (CSM) was (37.33± 7.98). The mean exam marks of the students were (69.66± 19.44). We found that according to CSM, 30 (19.2%) of the sample were of the morning type, 116 (74.4%) of the sample were of the intermediate type and 10 (6.4%) were of the evening type (Table 1).

Pearson Chi-square analysis showed that not practicing sports (P=0.001) (Table 2, Figure 1), presence of DIMS (P=0.000) (Table 3, Figure 2) and exam marks that are <70 (P=0.006) (Table 4, Figure 3) were significantly associated with evening type.

Discussion

Our study showed that the prevalence of morning type reached 19.2% and that of evening type was 6.4%. Among the total population with relation to Horne and Ostberg classification, 49.8

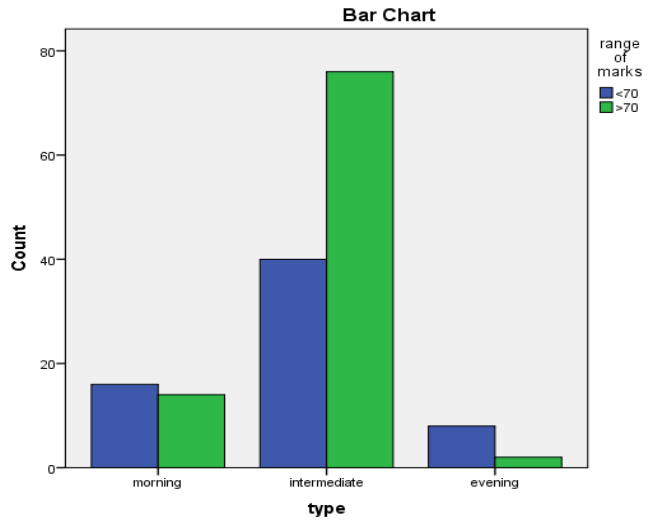

Figure 3: Association between chronotype and marks of students (academic performance).

Table 3: Chronotype and its association with sleep problems (DIMS).

		Sleep problem		Total	P
Chronotype		no DIMS	DIMS		
type	morning	28	2	30	
	intermediate	86	30	116	0
	evening	2	8	10	
Total		116	40	156	

Table 4: Chronotype and its association with academic performance.

		Range of marks		Total	P
Chronotype		<70	≥70		
Type	Morning	16	14	30	
	Intermediate	40	76	116	0.01
	Evening	8	2	10	
Total		64	92	156	

were considered as morning type compared to 5.6% considered as evening type [23]. Another study done in a large sample of young adults Saudis, found that morning types were 18.2% and 26.9% were evening types [24]. Children tend to have a morning typology but this tendency shifts to evening typology as they approach puberty and then return back to morning typology during adulthood [11]. We consider that preparatory school students in our study were of pre-adolescent and adolescent age. Also, our results showed that most of the participants were of intermediate type (74.4%) that is in agreement with the studies done in western societies [25].

The evening type was significantly associated with not practicing of sports (P= 0.001). It was documented that chronotype was related to participation in sports and physical activity [26-28]. In one study, later bedtime, and wake time (evening type) were associated with decreased time involved in moderate to vigorous physical activity and more time spent in sedentary behavior [27]. Another study of Hungarian high school students found that morningness was associated with higher levels of physical activity compared to eveningness [28].

Physical inactivity may be a risk factor for depression [29]. It has been recognized that regular physical activity has benefits to individuals with depressive and anxiety symptoms [29-35] and this proved to be true in recent studies [36]. Also, physical activity reduce symptoms of nicotine abstinence and fibromyalgia [37]. Furthermore, there are studies that reported improvement of self esteem [38] and vitality [39], well being and satisfaction with physical appearance [40]. Acute effects of a single aerobic physical activity showed improvement of depressive [41-46] and anxiety [32,34,47-49] symptoms and this last for some hours or even one day.

Furthermore, we found that evening type was significantly associated with Disturbance in the Initiation and Maintenance of Sleep (DIMS) (P=0.000). One study found that evening type showed insufficient sleep and nightmares and is significantly more likely to use hypnotics [50]. Recent studies found that evening type was associated with more frequent and intense nightmares [51]. Furthermore, evening type reported more pathological, insomnia related symptoms than intermediate and morning types [52].

Disturbed sleep quality in evening type can be explained by the fact that evening type is associated with relatively longer circadian period [52] That cause increased levels of sleep inertia that cause them to experience morning sleepiness and insufficient sleep [50].

Evening types are more likely to show severe depressive symptoms compared to morning or intermediate types [53,54] and evening type insomnia was associated with greater depressive symptoms than other chronotypes [52]. Another study found that eveningness was associated with higher trait, state and pre sleep state anxiety. Sleep disturbance commonly occurs before development of acute psychiatric difficulties such as development of manic episode, first episode of psychosis, paranoia and before development of major depression [55]. So, interventions to improve quality of sleep should have an impact on the associated disorders. These interventions can be in the form of simple acceptable techniques in children or adolescents with subsyndromal states.

On the other hand, eveningness and insomnia were found to predict non remission in depressed patients [56]. In a sample of people with insomnia, it was found that evening type was associated with lower positive affect than morning types [57].

Also, we found that evening type was significantly associated with lower academic performance represented in the form of marks <70 and ≥70 from 100 marks. Many studies have demonstrated that persons with a proclivity towards eveningness are more likely to exhibit characteristics that are negatively related to academic attainment. These include negative attitude towards school, anxiety disorders, lower levels of conscientiousness, or higher drug consumption [58]. Evening types are forced to wake up early in the morning to go to school although they find it very difficult and in the evening they became more active and they experience difficulty in falling asleep accumulating a considerable sleep debt [59]. Enough sleep duration is positively associated with academic performance [60].

The evening type is considered as a risk factor whereas morning type is a protective factor for development of several mental disorders and this could be caused by clock gene polymorphism, social jet lag and some personality traits. In a sample of college students, evening type showed more anxiety symptoms [61]. The evening type was also associated with personality traits that can predispose to psychopathology such as neuroticism, novelty seeking and harm avoidance [61-64]. The link between eveningness and psychopathology could be useful in selecting more tailored treatments or preventive methods such as light therapy, sleep deprivation, behavior habits and melatonin supplementation that are well known chronotherapies that can be further indicated as first line treatments in evening type patients.

We suggest that by improving sleep quality, the risk of common mental disorders can be reduced. Measures to improve sleep hygiene among school students should be taken and also education to promote sleep hygiene. Furthermore, decreasing light pollution that may cause disruption of circadian rhythms should be done [65].

Generalizability of our findings is restricted and Replications with younger and older students are needed. Furthermore, most measures employed in our study were Likert-based self-reports, or reports that were filled with students' families which are known to be influenced by factors such as faking and social desirability [66]. More sophisticated assessments might be used in future inquiries. Finally, the study had a cross-sectional design which does not allow for causal inferences.

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