

THE PECULIARITIES OF SLEEP TIMING IN TEENAGERS

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Sleep is very important for human health and well-being, and sleep reduction and disturbances are associated with a wide range of negative health consequences especially for children.

The aim of this study was to assess sleep peculiarities and sleep disturbances in contemporary school-age children.

Material and methods. We have examined 562 children at the age of 10-18 years (middle age - 13.6 ± 0.08 years) from urban and rural areas of two regions. Demographic and clinical data, sleep timing characteristics (sleep onset, time for getting up, sleep latency), frequency of daytime sleep, sleep duration and its quality assessment were obtained by means of sleep questionnaires.

Conclusions. Sleep analysis established in children under study insufficient night sleep, with increased time expenditures for multimedia and electronic entertainment before going to bed. Self-assessment of sleep quality in children was low in total especially in age period 14-15 years.

Ключевые слова:
подростки,
структура сна,
ночной сон,
качество сна.

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ОСОБЕННОСТИ СТРУКТУРЫ СНА У ПОДРОСТКОВ

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Сон очень важен для здоровья и благополучия человека, а его сокращение и нарушения связаны с широким диапазоном отрицательных последствий для здоровья, особенно у детей.

Цель работы - оценить особенности сна и нарушения сна у современных детей школьного возраста.

Материал и методы. Мы обследовали 562 детей 10-18 лет (средний возраст - $13,6 \pm 0,08$ лет) из городских и сельских районов двух областей. Демографические и клинические данные, временные характеристики сна (начало сна, время подъема, длительность засыпания), частота дневного сна, продолжительность сна и оценка его качества были получены с помощью анкет сна.

Выводы. Анализ сна установил у обследованных детей недостаточный ночной сон, увеличением времени на мультимедийные и электронные развлечения перед сном. Самооценка качества сна у детей была ниже в целом, особенно в возрасте 14-15 лет.

Ключові слова:
підлітки,
структура сну,
нічний сон, якість
сну.

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ОСОБЛИВОСТІ СТРУКТУРИ СНУ У ПІДЛІТКІВ

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Сон є дуже важливим для здоров'я та благополуччя людини, а його скорочення сну і порушення пов'язані з широким діапазоном негативних наслідків для здоров'я, особливо у дітей.

Мета роботи - оцінити особливості сну та порушення сну у дітей сучасного шкільного віку.

Матеріал та методи. Ми обстежили 562 дітей віком 10-18 років (середній вік - $13,6 \pm 0,08$ років) з міських та сільських районів двох областей. Демографічні та клінічні дані, часові характеристики сну (початок сну, час прокидання, тривалість засинання), частота денного сну, тривалість сну та оцінка його якості були отримані з опитувальників сну.

Висновки. Аналіз сну встановив у обстежених дітей недостатність нічного сну, зростання витрат часу на мультимедійні та електронні розваги перед сном. Самооцінка якості сну у дітей з була низькою в цілому, особливо у віці 14-15 років.

Introduction

Sufficient and good quality sleep is extremely important for children. Just like a healthy diet and physical exercise, sleep is critical for children. Healthy sleep is an important physiological process for children

growth and development. The good sleep must have adequate duration, appropriate timing, sufficient quality and absence of disturbances [3, 7, 8, 9]. Sleep problems are prevalent in childhood, and aspects of insomnia, such as difficulties with sleep onset, awakening at night time

and hard morning awakening, are among the most common non-respiratory sleep problems during the school years [1, 5]. Some of the consequences of poor sleep in teenagers are behavioral problems, impaired learning and school performance, sports injuries, mood deviation and emotional dysregulation, and worse health including obesity, metabolic syndrome, arterial hypertension [5]. Evidence also indicates that in adolescence a lack of sleep may be related to high-risk behaviors such as alcohol and drug use, suicidal behaviors [1, 2].

The gold standard for the assessment of sleep is overnight polysomnography, which involves attachment of a number of sensors for neurophysiological recording, and is usually carried out in a special sleep laboratory [10]. The limitations of polysomnography are following: it is costly, time-consuming, labor intensive and may be difficult to use in infants and young children. Sleep logs or sleep diaries are used extensively to assess sleep in any age groups: in infants, children and adults [1, 3]. Use of sleep diaries is inexpensive method of collecting sleep/wake information from large numbers of subjects over long periods of time. But they are dependent on the accuracy and reliability of the person completing them, and thus have a number of limitations. Typically, pediatric sleep diaries rely on parents to record bedtime, the time the child went to sleep, the number and duration of nocturnal awakenings, the time the child awoke in the morning, and any daytime napping. This is used to estimate both time in bed and total sleep time. In the last years the average duration of night sleep has decreased considerably [8]. National surveys in the US have shown up to 2-hour decline in self-reported sleep duration over the past 50 years [6, 9]. The peculiarities of sleep in contemporary children have stimulated debate in pediatric research.

Objective

The aim of this study was to assess sleep peculiarities and sleep disturbances in contemporary school-age children.

Material and methods

In total 562 children at the age of 10-18 years (middle age - 13.6 ± 0.08 years) from urban and rural areas of two regions were examined. The study includes assessment of resting anthropometric data, nutrition, physical activity habits, peculiarities and quality of sleep, family and socioeconomic data etc. Sleep timing - sleep onset, time for getting up, sleep latency (time to falling asleep), frequency of daytime sleep, nighttime and total sleep duration and quality assessment were obtained with self-report sleep diaries. Children's sleep quality graded as "excellent," "good," "fair," and "poor." Circadian rhythm chronotype was assessed too with the standard questionnaire for identifying the chronotypes (morning-evening). Statistical analysis was conducted with program Statistica (version 5.11, StatSoft Inc.). All p-values were two-tailed and $p < 0.05$ was considered to be statistically significant.

Results and discussion

Sleep duration is the most frequently investigated sleep measure in relation to health development outcomes in children and in our sample it was 8.45 ± 0.44 (5-12) hours. According to recommendations of US National Sleep Foundation for age group 6-13 years sleep duration is sufficient 9-11 hours and for teenagers (14-17 years) - 8-10 hours [9]. In our research the averages of night sleep duration was close to these ranges but at least 12.6% of children had night sleep shorter than 7 hours and 42.7% - shorter than recommended 8 hours. Duration of night sleep according to child age demonstrates decrease in older groups (fig.1).

Sleep hygiene is one of important conditions for good sleep. In our sample 11% of persons share a bed with sibling, 76% sleep alone in a bed but share a room with someone else and only 13% have their own room. Shared beds are more likely among younger children aged 10-11 years and child's own room in 15-17 years was in 41% of cases. Inside or outside noise was more commonly reported to be a problem for the child's sleep when the person shared a room. Separate room frequently associates with use of electronic devices and shared room associates with TV watching and computers use.

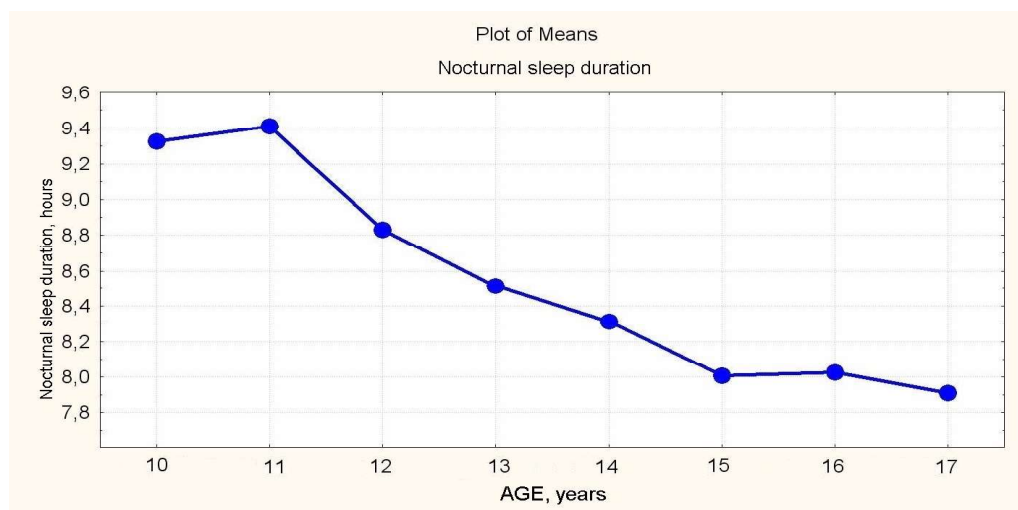


Fig.1. Nocturnal sleep duration according to children's age

The shorter sleep duration correlate with later sleep onset ($r=0.86$, $p<0.05$). In our cohort there are dependence of sleep onset time with child's age (fig.2). In total the time of going to bed earlier than 21 hours was in 12.8% cases and later 23 hours - in 10.8%. Delayed sleep timing during adolescence is partly dependent on environmental factors that can displace sleep, such as homework, TV watching or electronic devices and Internet use. However, peculiarities of person circadian timing systems - morning or evening chronotype, particularly during pubertal period, can also explain delayed sleep/wake timing in teenagers. Time of sleep onset in the most cases could be chosen and changed by child itself or family. With the age it became later and mostly in boys. The biggest obstacles for early sleep beginning were TV regarding and use of electronic devices. Late sleep onset had negative

correlation with the child physical activity. Starting from the 14 years children with biphasic stereotype are going to sleep later and compensate sleep deficiency by day napping.

The duration to fall asleep (sleep latency) is a measure of sleep quality computed as the time interval between 'lights out' until the onset of sleep. Photic information from the retina is transmitted to the suprachiasmatic nucleus and at night these signals release melatonin which promotes sleep. Sleep latency may be assessed using self-reports, actigraphy or with polysomnography. Previous studies show that sleep latency is largely independent on an individual's chronotype but is one of clinical symptoms of sleep disturbances [3, 4]. There are also changes of this index with children age (fig.3) but they mostly depend upon child health, sleep hygiene, use

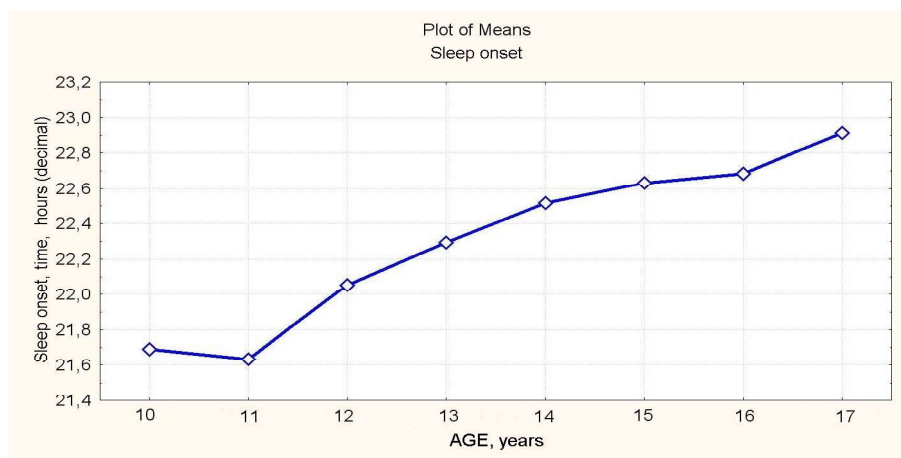


Fig.2. Sleep onset time in children according to age

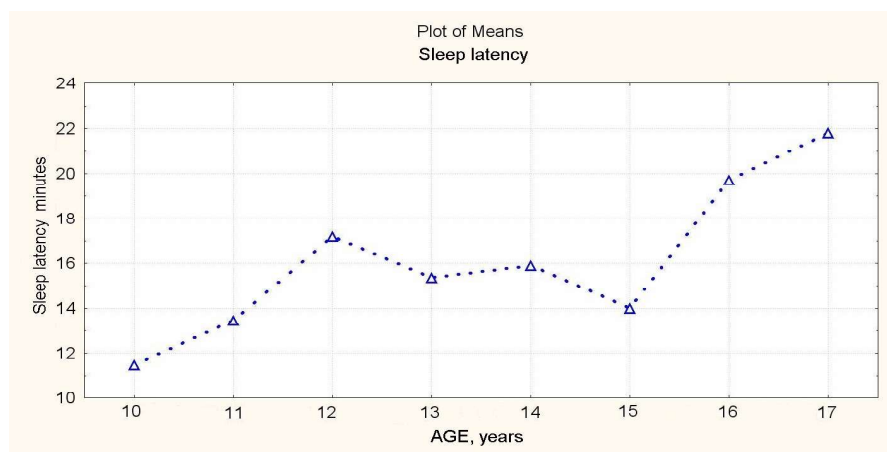


Fig.3. Time of sleep latency in children according to age

of electronic devices in older school age.

Persistent increased sleep latency is a major characteristic of delayed sleep phase syndrome and/or sleep onset insomnia. Long sleep latency may shorten sleep duration and may lead to a wide range of problems including irritability, cognitive impairment, depression and loss of productivity. Increased sleep latency is also associated with poor academic performance in adolescents [1]. Although very long sleep latency can lead to sleep deprivation but very short sleep latency can reflect sleep deprivation too such as index of 'sleep debt' due to insufficient sleep duration.

The time for getting up is mostly scheduled by the necessity to go to school and only on weekend could be changed. The difference according to age is very narrow in the average range in half of hour (fig.4). There is 15 minutes difference in awakening time between girls which get up earlier than boys. Total sleep deficiency resulted in hard awakening in the morning in 56.6% cases and 93.2% of children have desire to sleep more. To compensate insufficient night sleep 27.2% children have daytime sleep in average 35.4 ± 2.0 minutes. Short naps of around 5 to 15 minutes were reviewed as beneficial and associated with better cognitive function, as were naps of longer than 30

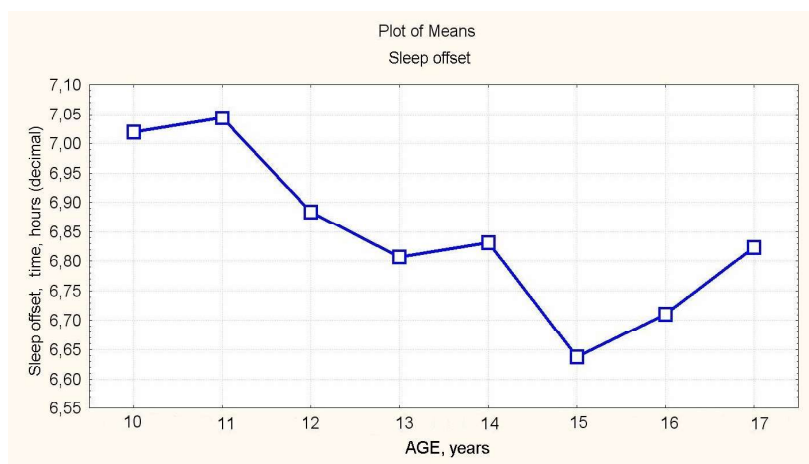


Fig. 4. Sleep offset (awakening) time in children according to age

minutes [7].

Self-assessment of sleep quality is a complex indicator which reflects the sleep environment, the duration of the deep sleep (non-REM) phase and the presence of sleep deteriorations [6]. The maturation of circadian sleep regulation or its adjustment to sleep/wake schedule in adolescence is very fine processes that might be affected by decrease of night sleep. The heterogeneous nature of sleep has been recently well established and distinct sleep

stages and sleep patterns in functions. In general, whereas the presence of long non-REM sleep at nighttime contributes to energy conservation and synaptic homeostasis, while REM sleep dominated in daytime, is serving for neuronal recuperation and emotional regulation. Self-assessment of sleep quality in our children was the worst in total especially in age period 14-15 years (fig.5).

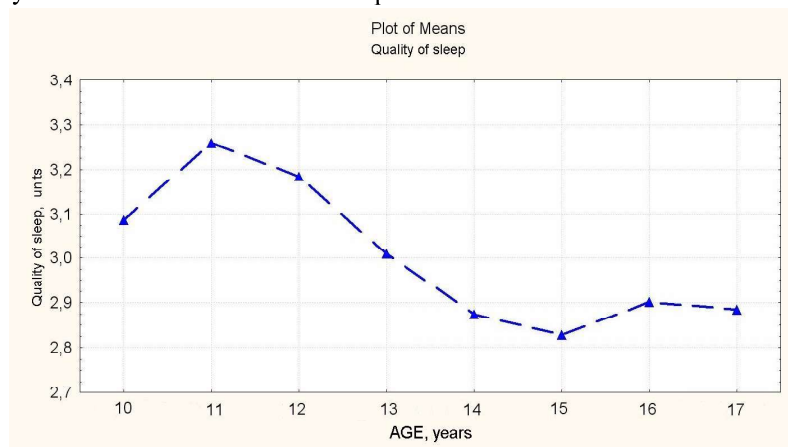


Fig. 5. Self-assessment of sleep quality according to age

The limitations of our investigation depend on observational study design. We have not use polysomnigraphy or actigraphy. Certain stratified analyses performed for this study were also limited in power by the small sample size in the stratified groups.

Conclusions

1. In our research the averages of night sleep duration according to age were close to the recommended, but at least 12.6% of children have night sleep shorter than 7 hours and 42.7% - shorter than recommended 8 hours.

2. Sleep hygiene is not optimal for good sleep. Shared beds and room, inside noise, electronic devices and computers use, TV watching lead to sleep deprivation.

3. Self-assessment of sleep quality was low in all cohort especially in age period 14-15 years

Prospects of further research

To establish real prevalence of sleep deprivations in

general pediatric population following clinical examination and use at least actigraphy could be done. The possible prognostic role of daytime sleep duration could be also studied.

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