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DAYTIME SLEEPINESS AND SLEEP PARAMETERS IN CHILDREN LIVING IN THE EUROPEAN NORTH OF RUSSIA

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Parameters of sleep and excessive daytime sleepiness were studied in 601 children aged 7-12 years living in the Arctic zone of Russia. No gender differences in daytime sleepiness were found. Our work also found the delay in bedtime onset for most children 7-12 years old. Self-questionnaires revealed awakenings in the middle of the night in almost half of the children, and insomnia was mild or moderate in 43.3% of the examined children in the European North of Russia. We have shown that children's age affects the level of daytime sleepiness. Consequently, older children must sleep more than younger ones to achieve the same level of alertness and cognitive ability. Thus, children compensate for lack of sleep during the next day via daytime nap.

Keywords: daytime sleepiness, chronotype, children, Arctic, children, age, sex, sleep duration.

Introduction. Sleep parameters are determined by a number of biological, environmental and social factors [3]. In modern society people spend a significant part of their time in a closed space, so it is logical to assume that the signals of social time play a major role in synchronizing the rhythm of sleep-wakefulness. On the other hand, a recent study showed that the phase of the sleep-wake rhythm (chronotype) of a person is determined by the time of sunrise [18]. With the growth of industrialization of society, the difference between social and biological clocks is growing. Among the population of megacities, the frequency of detecting individuals with a late chronotype, which is characterized by desynchronization of the circadian system, called the "social jet lag" [2], is increased. For this reason, individuals with a late chronotype exhibit lower school performance [14] and are prone to consume stimulants 2]. At school age, most children retain a sleep duration of 10–11 hours, however, increased educational and physical activity can negatively affect a child's sleep. These disorders often come in conjunction with attention deficit hyperactivity disorder (emotional reactions and cognitive impairment) [1]. Studies of daytime sleepiness of schoolchildren in different countries revealed a rather high frequency of spread, especially during puberty, from 51% in Turkey [15] to 63% in Japan [12] and 68% in Canada [20]. In Russia, this problem has hardly been studied among schoolchildren of primary school age.

The aim of our work was to study the influence of various factors on excessive daytime sleepiness of children and adolescents living in the north of the European part of Russia.

Materials and methods. The study was conducted in 2018 among students of grades 1-6 of secondary schools located in 8 settlements of the European North of the Russian Federation: in the Republic of Karelia - Petrozavodsk, Kem, Kostomuksha, Vidlitsa, Rabocheostrovsk; in the Murmansk region - Apatity, Olenegorsk, Umba. The research program was approved by the Committee on Bioethics of the Institute of Biology of the Karelian Scientific Center of the Russian Academy of Sciences and by the Joint Ethics Committee on Medical Ethics under the Ministry of Health of the Republic of Karelia (Protocol No. 41 from 08.01.2018). All respondents or their legal representatives were informed with the purpose of the upcoming study and signed an informed consent to participate in it. Questionnaires were distributed to students by teachers or school psychologists. Incomplete questionnaires and questionnaires with several answers instead of one were excluded from the analysis.

At the preliminary stage, we conducted a study to assess the reliability and validity of the Russian version of the children's daily sleepiness scale (PDSS-RUS) [17]. Further, in the framework of the project, in a sample of schoolchildren it was proposed to evaluate the occurrence of various sleep disorders and to identify the relationship of sleep characteristics with various lifestyle factors. Assessed: demographic data, lifestyle, school performance and the self-adminstered scale of daytime sleepiness in children (Pediatric Daytime Sleepiness Scale). Each respondent was asked to answer questions regarding personal data, as well as fill out a questionnaire: Munich Chronotype Assessment Test (MCTQ). Questionnaires were processed according to the work of MCTQ [18]. The chronotype was expressed as the middle of the sleep phase on the day off in hours, adjusted for the "duty" of sleep accumulated over the school days. The higher the value of the indicator, the more a person belongs to a later chronotype. The average weekly sleep duration was calculated.

Statistical processing was performed in the PAST package (PALEONTOLOGICAL STATISTICS SOFTWARE PACK-

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Results and discussion. The average age of the children was 10.62 ± 2.87 years. Table 1 presents information on the sex and age composition of the respondents. In the questionnaires, the answers to the questions corresponded to the normal distribution, and the average total score was 11.95 ± 6.2. We did not find gender differences on the daytime sleepiness scale. The reliability and reliability of the PDSS-RUS questionnaire is validated and confirms its one-factor structure. The Russian version of PDSS can be used in our study to assess sleep hygiene among Russian children and adolescents [17].

Most of the surveyed children showed excess daytime sleepiness within normal limits (less than 16 points on the PDSS scale). Significant differences in the level of drowsiness were found in children of primary school age, both in northern Karelia and in the Murmansk region (PDSS (May) M ± m (11.95 ± 6.24) versus PDSS (February) M ± m (12.75 ± 6.06, p <0.05) .For the group of indigenous people of the same age category, there is a tendency to increase this indicator (PDSS (May) M ± m (12.01 ± 5.72) versus PDSS (October) M ± m (12.79 ± 5.79, p> 0.05), respectively) (Fig. 1B). In addition, there was an inverse correlation for the duration of sleep with estimates of the drowsiness scale (r = -0.122, p = 0.02). This suggests that children compensate for the lack of drinking during the next day due to daytime sleep. Our work also shows a delay in bedtime for most children 7-12 years old. According to self-questionnaires, awakenings were revealed in the middle of the night in almost half of the children, and in 43.3% of the examined children in the European North of Russia insomnia is expressed in mild or moderate degree (Table 2).

In all the settlements of the European North of the Russian Federation, where we conducted studies, it was found that daytime sleepiness increased with age (Fig. 1A). This fact is consistent with earlier studies for various ethnic groups [12, 4]. Thus, older children must sleep more than younger children in order to achieve the same level of alertness and cognitive ability [16, 20, 6]. Feinberg and Campbell suggested an alternative hypothesis - increased drowsiness in adolescents in the daytime is a consequence of the reorganization of their brain, which reduces the intensity of activity of the waking brain [11]. Surprisingly, these brain changes are not associated with puberty, but are reliably associated with age. Also, as a result of our research, it was found that gender is not associated with daytime sleepiness.

In most studies, PDSS was used as a tool for assessing drowsiness associated with sleep pathologies (respiratory, neurological and developmental disorders),

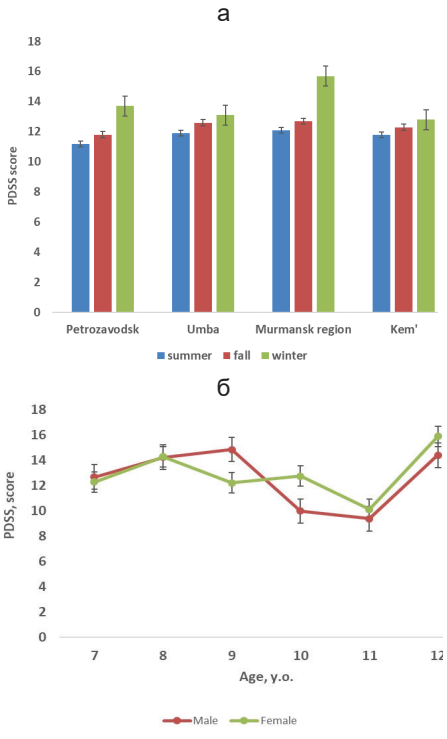

Fig. 1. Dynamics of infant drowsiness in children of the European North of the Russian Federation: a- age dependence, b – season dependence

as well as for monitoring the monitoring of side effects of sleepiness treatment [13, 7]. In several works, the authors used a questionnaire to assess healthy children and adolescents [21, 19, 22]. In a number of works, scores ranged from 6.7 to 25.7, showing a tendency to excessive drowsiness in the daytime. In addition, higher PDSS scores were associated with decreased overall sleep time, poor school performance, and frequent illnesses in different countries [18, 19]. The values obtained by us for the PDSS scale correspond to published data for healthy

Table 1

Sample parameters

Variable	Result
Sex, male/female, n (%)	321 / 280 (51.3 % / 48.7 %)
Age, n (%) 7 years 8 years 9 years 10 years 11years 12 years	 42 (6.9%) 135 (22.6%) 111 (18.5%) 118 (19.6%) 124 (20.6%) 71 (11.8%)
Physical activity 1-2 per week Every day Rarely	 421 (70 %) 90 (15%) 90 (15%)
Caffeine consumption, n (%) Daily Rarely Never	 120 (19.9 %) 331 (55 %) 150 (25.1 %)
Alcohol consumption, n (%) Often (every week) Never	 40(6.7%) 561(93.3%)
Smoking, n (%) Yes No	 110 (18.3%) 491(81.7%)

Table 2

Sleep disorders in children living in the European North of the Russian Federation, identified in the study (n = 601)

Low subjective sleep assessment, n (%)	341 (56.7)
Night awakenings, n (%)	360 (58.3)
Duration of falling asleep, n (%) 0-15 min 15-30 min 30-60 min >60 min	 180 (30) 350 (58.3) 51 (8.4) 20 (3.3)
Daytime sleepiness, n (%)	92 (15)
Insomnia severity scale, n (%) None Light Moderate	 341 (56.7) 220 (36.6) 40 (6.7)

children from the USA [9], Argentina [19], China [5] and Italy [9]. It should be noted that the average age in this sample was 10.62 years. This fact explains why in our study, scores on the PDSS scale are slightly lower than in studies on the drowsiness of Brazilian [10] or Argentinean children [4].

Conclusion. We have shown that the age of the child affects the level of daytime sleepiness, which, in turn, corresponds to the level of sexual development. Consequently, older children must sleep more than younger children in order to achieve the same level of alertness and cognitive ability. Thus, children compensate for lack of sleep during the next day due to daytime sleep.

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SCIENTIFIC REVIEWS AND LECTURES

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INDICES OF LIPID METABOLISM FOR THE EARLY DIAGNOSIS OF CARDIOVASCULAR DISEASE IN RESIDENTS OF THE NORTH

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Cardiovascular disease is one of the leading causes of morbidity and mortality among the adult population. In Russia, over a million people (around 700 people out of each 100 thousand population) die each year from cardiovascular diseases. The high prevalence of cardiovascular disease is observed in people living in the North, whose severe climatic conditions produce increased demands for a human body. Northern climatic factors lead to significant changes in human’s physiological functions based on modified functional condition of the endocrine system, metabolic processes, and lipid metabolism in particular. According to L.E. Panin’s concept (1978), in high-latitude regions we can observe “the changeover from carbohydrate-type metabolism to the lipid one”. This concept states transformation of the lipid profile in residents of the North caused by a number of external factors frequently leading to changes in metabolic pathways and abnormalities in lipid metabolism. Adequate assessment and correct interpretation of lipid metabolism variables are of major importance for early detection and timely prevention of cardiovascular pathology. The review considers key lipid metabolism indices. We also present our own data about the role of compound indices in lipid metabolism assessment in healthy inhabitants of the North.

Keywords: lipid metabolism, adaptation, North, cardiovascular disease, apolipoproteins.