ANALYSE OF SELECTED LIFESTYLE INDICATORS OF TOP ROWERS IN ADOLESCENT AGE

Kamila ALINČOVÁ, Milada KREJČÍ

Abstract
The study was realised within the international research project W/VSP/161/ I "Basic research of circadian determinants of lifestyle and performance of Japanese and Czech athletes and non-athletes". The objective of the study was to analyse selected lifestyle indicators, including circadian habits, of top rowers in adolescent age with focus on their sport performance support. The group of 50 top rowers in the age range of 15 - 20 years was involved in the survey. The measurements were realised in laboratories of the scientific and service workplace of physical education and sport CASRI in Prague. Exploratory methods were used for diagnostics, i.e. "Weekly schedule of athlete's activities", "Questionnaire of life rhythms and sleep regime" and questionnaire "Healthy lifestyle and regeneration of athlete". Following methods were used for statistical data analysis: Spearman´s correlation coefficient, Student's t-test, one-factor ANOVA, Mann-Whitney test, Kruskal-Wallis test and Fischer's exact test. Results analyses shown that the top rowers in adolescent age are predominantly early morning types, which is desirable in terms of performance support and sleep regeneration. The results also show that the monitored group of athletes shows signs of health promotion as recommended for juvenile top athletes' healthy lifestyle, their daily rhythms and habits are well-set, which may indicate an excellent educational guidance of coaches and parents. Only some reserves in the regular inclusion of compensatory exercises in the daily routine of monitored juvenile athletes were found.

Keywords
Circadian rhythms; juvenile athletes; performance; rowing; top-level sport; wellness lifestyle.

1 INTRODUCTION

Rowing is one of the force-endurance sports, from the psychological point of view it represents functionally-mobilizing and also risky sport (Hošek 2006). It is an individual sport in which a cyclical movement of a dynamic nature is performed. It is a sport mainly in the natural environment. The goal is to cross the track in the shortest possible time. Performance is largely influenced by the height and weight of the rower. The rower is rather a mesomorphic type. A top rower needs an explosive strength and endurance, to have a sense of technique, to be mentally resilient, to have tenacity and concentration. Furthermore, to cope with unpleasant feelings from their own body for a long time, changing climatic conditions, such as water flow, water whirlpools and

weather conditions (Bernaciková, et al. 2010). Rower in adolescence is fully mentally and physically prepared for the best possible performance and to manage the load even in an uncomfortable zone and thus to shift the performance further with simultaneous will and endurance development. Like other teenagers, young rowers use the latest mobile phones, tablets, laptops and other accessories. They control internet social networks and have no problem finding any content from internet sources. The effects of the virtual world, together with insufficient sleep, are reflected in the psyche. It is most often manifested by irritability, impulsivity, and a tendency to depression. Closely related to this is virtual communication, which has almost replaced verbal communication. Lack of sleep causes headaches, anxiety,

depression, risky behavior and significantly affects athletic performance (Gariepy et al. 2020). The human body has a so-called internal clock, which is controlled by a 24-hour alternation of darkness and light (Kachlík, 2017). Circadian rhythms are characterized by a 24-hour duration. Pacemakers or biological clocks, which are located in the suprachiasmatic nucleus of the hypothalamus, are used to indicate the rhythm (Homolka, 2010). Sleep is important for the regeneration of mental and physical condition and for the processing of all information and reactions (Suni, 2021). In adolescents, sleep has a positive effect on their growth, mental balance and performance. Krejčí (2021) states in his publication the ideal time to fall asleep 22:00. Another important factor of health is diet, physical activity, including stretching. The diet should be varied, freshly prepared and should include some ingredients of the raw diet, such as milk, fruits, nuts and more. Ideally, the rower should eat 5-6 times a day with a break of 2-3 hours between meals.

The circadian activities of young rowers include stretching as an active form of regeneration. Long-term insufficient muscle stretching can lead to degenerative changes, ruptures of muscle fibers and chronic problems in young rowers. When stretching muscles, it is important that the muscle is warm, perfused and relaxed (Dovalil, 2009). Krejčí (2016) describes stretching as an additional compensatory exercise, which serves mainly performance and top young rowers. Stretching in static or dynamic forms and yoga may be applied regularly.

2 OBJECTIVE, HYPOTHESES

The objective of the presented study was to analyse selected lifestyle indicators, including circadian habits, of top rowers in adolescent age with focus on their sport performance support.

Two hypotheses were established in the study.

Hypothesis H1: "There is a significant correlation between M-E score and M-H scores in the group of monitored top juvenile rowers".

Hypothesis H2: "All the top juvenile rowers practice regularly the set of stretching compensatory exercises every day.

3 METHODS

3.1 Participants

A total of 50 top rowers (range15-20 years; mean age 18.9 ± 3.7; median 15), 13 females (average 16-20; mean age 17.4 ± 3.7; median 17), and 37 males (average 15-19; mean age 16.8 ± 3.7; median 17). All monitored juvenile top rowers were potential future junior representatives of the Czech Republic. Each athlete and his coach was informed in detail about the research and its procedure. They confirmed their voluntary participation in the research.

3.2 Procedure

The investigation took place in the laboratories of the CASRI scientific and service workplace. All staff of the facility were also acquainted with the content and procedure of the investigation. Based on the informed consent of the heads of the individual departments of the CASRI workplace and the head coaches, the research investigation could begin. The survey was always carried out before the routine exercise examination, which the athletes attend as part of the performance check. Athletes went to the laboratories after two athletes and at hourly intervals. The questionnaire survey was applied in such a way that it was not affected mentally or physically by routine examinations of the stress test, as follow:

- The survey was carried out under relatively suitable conditions: it took place in the morning, in a spacious bright laboratory with a sufficient number of windows for regular ventilation.

- The questionnaire survey always started with a weekly recording of the athlete's activities. During the table completing an investigator was present and open to all questions.

- After completing of the table, there was a 5 minute break. After that the "Questionnaire of life rhythms and sleep regime" (Nakade, Takeuchi and Krejčí 2015) was applied. The questionnaire was given to athletes on an electronic device (tablet. The investigator sat nearby, answering any questions and ensuring the privacy of athletes when filling out.

- After completing the first questionnaire, another 5-minute break followed, during which the laboratories ventilated. The second questionnaire "Healthy lifestyle and regeneration" (Alinčová, 2021) was also applied in the electronic form.

A database in MS Excel was created from the obtained data of both electronic forms of questionnaires, which could be entered only after logging in to the Microsoft Forms application. In this way, the data were protected and accessible only to the researcher.

3.3 Diagnostic methods
"Weekly recording of the athlete's activities" (Nakade, Takeuchi, Krejčí, 2015)

The table is divided into weekdays and weekends and also into time periods: early morning, morning, afternoon, evening and night since 22pm. All athletes were asked to try to outline what the content of their weekdays and weekends looks like (study, training, hobbies, rest, regenerative activities, sleep, etc.).

"Life Rhythms and Sleep Questionnaire" (Nakade, Takeuchi, Krejčí, 2015)

The test was developed and focused specifically on circadian rhythms and habits of athletes, including sleep. It consists of 33 questions, which are divided into 4 parts. The first part is focused on sleep habits, the second on the circadian typology of the athlete with a possible subsequent calculation of the circadian type (M-E score), the third on eating habits, the fourth on the level of mental health of the athlete with a possible subsequent calculation of the mental health level (M-H score). The M-E score is the sum of the values from questions 14-20. The maximum number of score points is 28, what indicates a significantly morning type. The minimum number of points is 7 and it indicates a significantly evening type. According to the values of M-E score, the circadian typology is divided into 4 bands: significantly evening type - score value 7-11 points, tendency to evening type 12-17 points, tendency to gravitate towards morning type 18-22, significantly morning type 23-28 points. M-H score represents a sum of values from questions no. 34–37. The maximum score is 16 and indicates a high level of mental health. The minimum number of points is 4 and indicates a low level of mental health. Mental health is divided into 4 bands according to the M-H score values: low level of mental health 4-6 points, deteriorated mental health 7-9 points, good level of mental health 10-12 points, excellent level mental health 13-16 points.

Questionnaire "Healthy lifestyle and regeneration" (Alinčová, 2021)

This questionnaire consists of 21 questions, focused on motivation for sports, hobbies, volume of training hours, the athlete's experience with diets, visits to fast food, the drinking regime and the intake of food supplements. The last part contains questions about drinking alcohol and smoking cigarettes. The questionnaire includes open answers or a choice of several options.

3.6 Statistics
Basic descriptive characteristics (central tendency, scatter) were calculated for all variables. In the case of data normality,

parametric tests were used for analysis, otherwise non-parametric tests, as follow: Spearman's correlation coefficient (Hebák, et al. 2013), Two-sample Student's t-test - this parametric test compares the average values of quantitative variables in two groups (Hindls, et al. 2006), ANOVA - one-factor comparing average values of quantitative variables in several groups (Hindls, et al. 2006), Mann-Whitney - this nonparametric test compares medians, resp. whole distribution of variables in two groups (Pecáková, 2011), Kruskal-Wallis - Kruskal-Wallis test extends the previous Mann-Whitney test for a variant in which more groups are compared, so the observed factor has more categories than two (Hindls, et al. 2006) and Fischer's exact chi-square test (Hindls, et al. 2006).

4 RESULTS AND DISCUSSION

4.1 Analyses of the weekly record of activities

The monitored rowers had training at least twice a week in early morning. Early morning training usually took the form of running or swimming. After training, all 50 rowers went to school, where they stayed until 1pm (Table 1). The afternoon content one or several phase training. During one-phase training, there was mostly a space reserved for stretching. In the late afternoon to evening, athletes most often engaged in their hobbies, family or school duties. However, out of the total number of 50 respondents, there was no one who did not mention the time spent on the computer, on television, on mobile phones and social networks. These results indicate a possible lack of rest, see Table 1.

Table 1 Weekly overview record of circadian activities in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

| Day	Early morning	Morning	Afternoon	Evening	Night (after 10 pm)
Monday	school	school	stretching, sauna	learning, movies, series	sleeping, mobile
Tuesday	fitness	school	training	TV, family, relax	sleeping, TV
Wednesday	school	school	training	hobbies, stretching	sleeping
Thursday	training	school	training	learning, hobbies, family	sleeping social networks
Friday	school	school	training	stretching	sleeping
Saturday	sleeping, racing, training	sleeping, racing, training	trips, home duties, relax	friends, family, PC	sleeping, entertainment
Sunday	sleeping	TV	free time	school responsibilities	sleeping

4.2 Analysis of sleep habits and mental health

From the sleep habits analyses, it is clear that the time in which athletes went to bed at the weekend was significantly longer than on weekdays. In several cases until the early morning hours. This was mostly the case for boys, but 4 boys went to bed like this on weekdays. The average bedtime on weekdays was 22:09 for girls and 22:26 for boys. Weekend for girls 22:57 and for boys 23:29. The average bedtime indicates that the girls went to bed and got up earlier than the boys, see Figure 1, Figure 2.
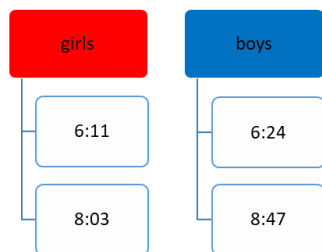
*Figure 1 Time when the participants woke up at week and in weekend days (n= 50, 13 girls, 37 boys)*
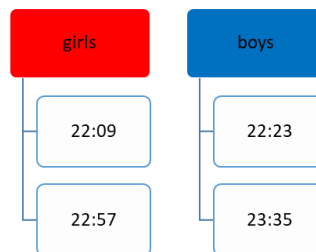
Figure 2 Ttime when the participants went to the bed at the week and in weekend days (n= 50, 13 girls, 37 boys)

It is clear from the results that the young rowers examined did not have problems falling asleep. Most girls said that they sometimes had trouble falling asleep. Most boys rarely had problems. There was not a single rower who always had trouble falling asleep. It can be seen that the largest percentages were for the "occasionally" and "rarely" options, which may indicate athletes with a tendency to tend to the morning type rather than the evening type, see Table 2.

Table 2 Troubles of falling asleep on weekdays in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

Sex	Always	Often	Sometimes	Rarely	Never
Girls	0%	23,08%	46,15%	23,08%	7,69%
Boys	0%	16,22%	18,92%	59,46%	5,41%
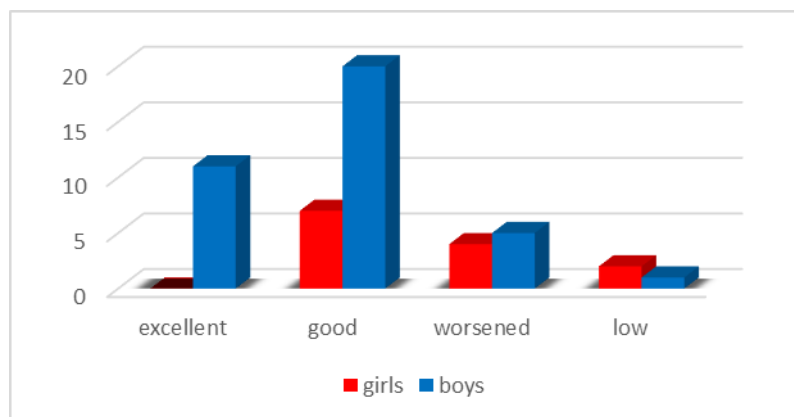
Figure 3 Score of mental health in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

Figure 3 presents that the average value of the M – H score for 50 rowers was 10.66. This meant that, on average, they were athletes with a good level of mental health. Mental health was good for most rowers. There were significantly fewer girls than boys, so their data could not be significantly compared. However, it could be said that female rowers are worse in mental health compare males. There was not one of the girls who had an excellent level of mental health. Most of the female rowers were on level "good mental health", 4 had their level of mental health "deteriorated" and 2 even "low". Among the rowers, 11 boys with excellent mental health appeared. Most of them were again only "good". Only 5 of them had their level of mental health "deteriorated" and 1 "low".

4.3 Analysis of circadian typology

The average value of the M – E score for the 50 rowers examined was 18.64, with a median value of 19 and a modal value of 17. The results also show that 27 rowers tended to shift towards the morning type. Another 20 shift to the evening type and only 3 were significantly early type. Among the 13 girls, only 3 appeared, to shift to the evening type. However, none of them were a significantly evening type. On the contrary, 2 of the entire set of rowers belonged to the distinctly early types. Most girls found out again that they tend to gravitate towards the morning type. As for the boys, no significantly evening type appeared again. The boys did not have such significant differences in whether they leaned more towards the morning or evening type. However, the tendency to gravitate towards the morning type rather than the evening one slightly prevails. Only 1 of the monitored 37 rowers was of the markedly early type, see Figure. 4.
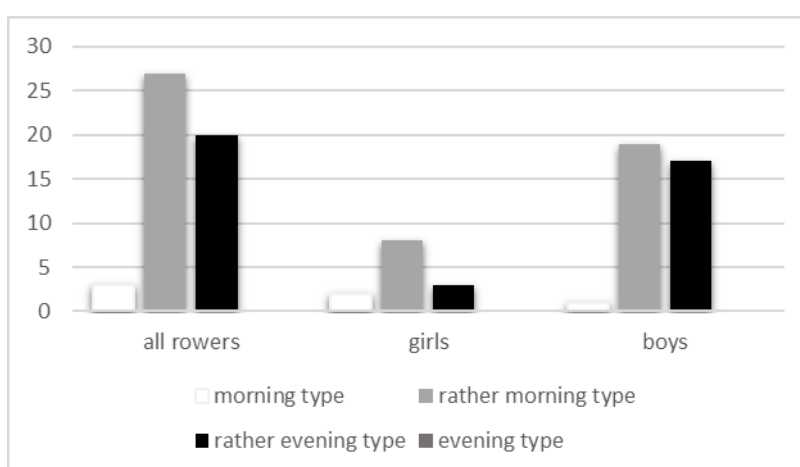

Figure 4 Circadian typology in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

In monitored rowers, the correlation between the M-E score and age was further determined. Based on Spearman's correlation coefficient, there was no statistically significant relationship between the M-E score and age (p-value 0.120), see Table 3. However, it could be said that the M-E score value generally increases with increasing age, see Figure 5.

Table 3 Correlation between M-E score and age in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

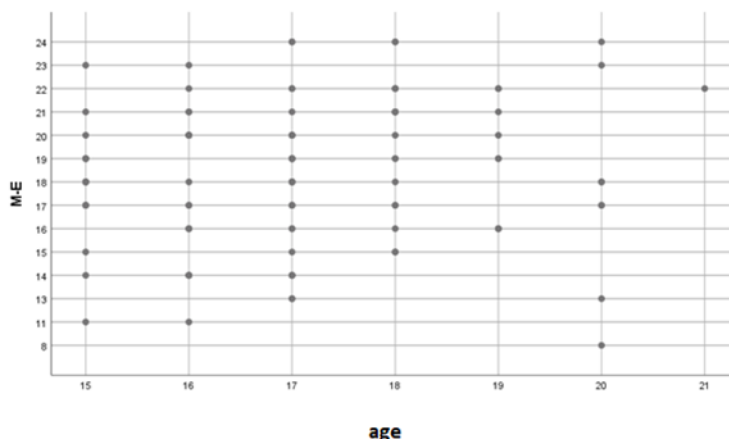|			age
Spearman´s correlation coefficient	**M - E**	**correlation coefficient**	0,154
		p-value	0,12
		N	103

Figure 5 Corellation between M-E score and age in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

4.4 Analysis of eating habits

The analysis of eating habits dealt with the regularity of breakfast. Figure 6 shows a regular breakfast with the rowers surveyed. At first glance, it is clear that no athlete has stated that he or she would eat breakfast regularly only occasionally or would not eat breakfast at all. Of the 50 rowers, 33 ate regularly or mostly regularly. Only two of all the rowers ate breakfast irregularly. With the exception of 3, who usually ate breakfast regularly, the girls agreed that they all had a regular daily breakfast. The boys chose the same answers as the girls. Only 2 rowers ate breakfast irregularly, otherwise most regularly every day. The other 12 stated that they eat breakfast regularly.
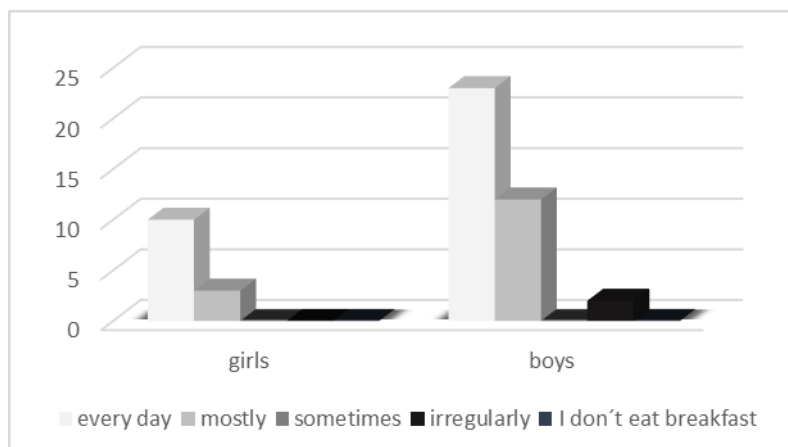
Figure 6 Regular breakfast in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

In Figure 7 the results of drinking sweet drinks in 50 rowers are presented. Most rowers answered that they drink sugary drinks a maximum of 2-3 times a week. In 15 cases, athletes drank them very rarely or never. In 11 cases they drank 5-6 times and in 8 cases 1-2 times a week. For girls, the answer was most often chosen exceptionally or never. In boys, on the other hand, 2-3 times a week. At least girls and boys consumed sugary drinks 1-2 times a week.
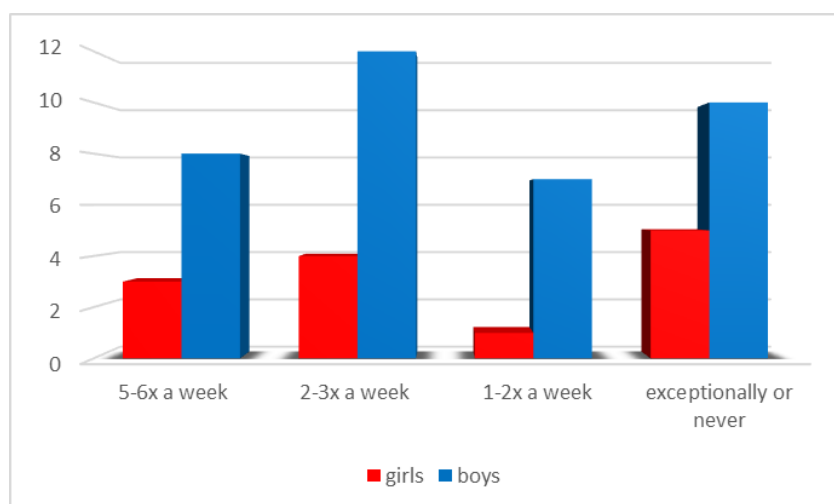

Figure 7 Sweet drinks with sugar in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

Figure 8 shows that out of 13 rowers, 46.15% ate sweet 5-6 times a week and 30.77% 1-2 times. Exceptionally or never, 15.38% and at least girls ate sweets 3-4 times a week. Most male rowers liked to eat sweets 3-4 times, but also 5-6 times. The remaining 21.62% 1-2 times and only a small percentage exceptionally or never.
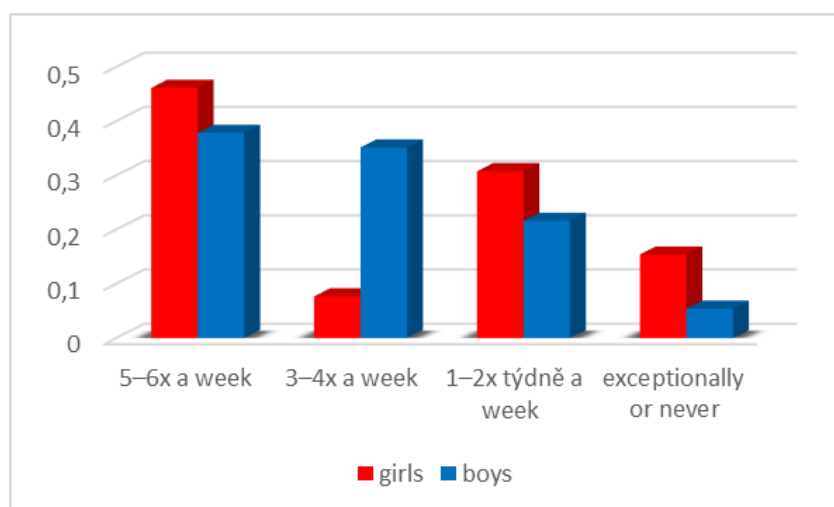

Figure 8 Eating of sweets in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

4.5 Analysis of spending time on IT technologies in monitored athletes

Young female rowers spent 2-4 hours in information technology per day. The same result was obtained in 73% of the young rowers examined. Another 16.2% spent 5- 6 hours a day with technology in hand. The remaining 10.8% were individuals who chose more than 6 hours a day. There was not one of the rowers who would spend less than 2 hours on IT technologies, see Table 4.

Table 4 Time spent on IT technology in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

Sample	0–1 hour	2–4 hour	5–6 hour	more than 6 hours	total
Rowers	0	40	6	4	**50**
Girls	0	13	0	0	**13**
Boys	0	27	6	4	**37**

Correlation analysis showed whether the time spent in information technology is related to the value of the M-E score in athletes. According to the hours spent in IT technologies, the M - E score did not have a confirmed normal distribution for all categories (the p-value of one was less than 0.05 and in one it could not be calculated). A nonparametric Krukal-Wallis test was used to compare groups. The results of the Kruskal-Wallis test show that the M - E score does not differ statistically significantly according to the hours spent in IT technologies (p-value 0.487). It can only be stated that rowers with a higher average M-E score spent less time on information technologies, Table 5.

Table 5 Correlation between M-E score and time spent on IT technology in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

M – E score		Median	diameter	SD	N	p-value
IT technology	0–1 h per diem	19,5	19,5	2,121	2	
	2–4 h per diem	19	18,62	2,822	74	0,487
	5–6 h per diem	17,5	17,05	4,071	20	
	more than 6 h. per day	17	17,57	3,78	7	

4.6 Analysis of the use of stretching and regenerative procedures of monitored rowers

The results (Figure 9, Figure 10) show that only 6% of rowers engaged in regular stretching. Half of them mostly did regular stretching. Occasionally, 28% of all rowers engaged in stretching. The remaining 16% stretched irregularly. There was no one among the rowers who would not stretch.
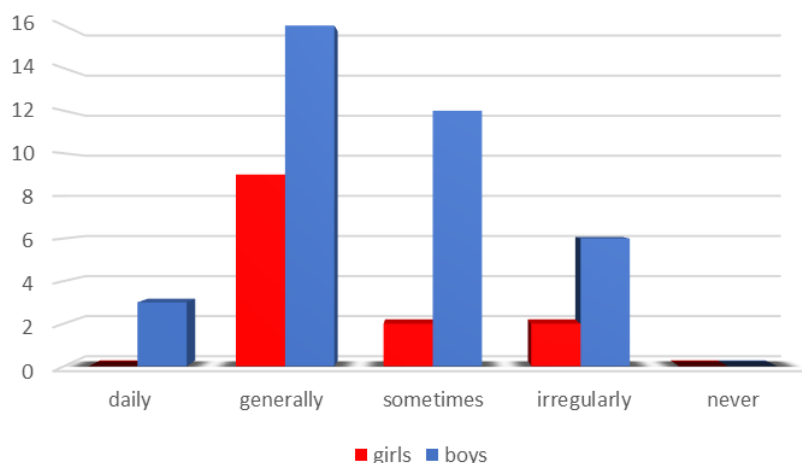
Figure 9 How often is stretchin practiced in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

The largest percentage of girls and boys answered that they mostly do regular stretching. There was no girl who stretched regularly every day, but the boys were 3. The same percentage of girls did regular stretching occasionally or irregularly. Occasionally, 32.4% of boys practiced stretching and 16.2% practiced irregularly. As for regenerative procedures, young top rowers most often compensate sport training with sauna and swimming. Then massages, whirlpool, some form of physiotherapy or immersed in ice water. The results were processed only for an overview of the most frequently used regenerative procedures of adolescent athletes.
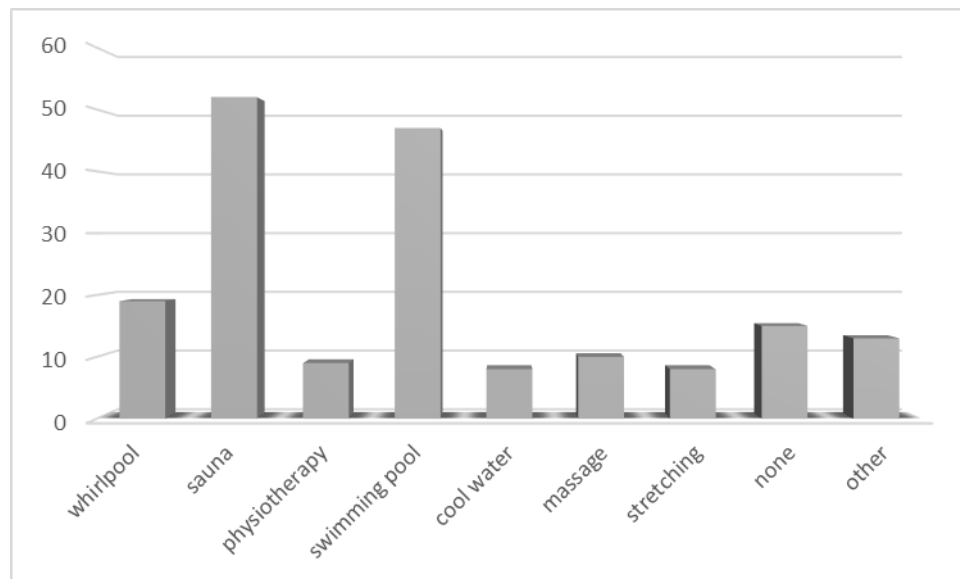

Figure 10 The most used regeneration procedures in rowing in monitored juvenile rovers (n= 50, 13 girls, 37 boys)

4.3 Discussion

The scheme of the week was created to show what a normal week and the lifestyle of a top adolescent athlete looks like. The relationship between sport and leisure was examined. The purpose was to find out if they have free time at all and how they spend it. It was found that the main focus of the week of top athletes was almost exclusively training and on weekends races along with light training. Given this, it seems surprising that the

60

monitored athletes devote a minimum of time to compensatory exercises or stretching, which serve to compensate for their great physical and mental load. Most of the monitored top athletes stated that they have a boring life, that they have no other but a friend in the sports environment and that they usually only have time for school or family just before bedtime. Burlot, Richard and Joncheray (2016) examined the lifestyle of top athletes. They stated that with increasing years, the prestige and demands for top sport have increased and continue to grow. In general, the volume of training increased, technique, equipment and more improved. This may seem to have accelerated the overall time. Athletes are subject to higher demands and he finds himself in constant physical and mental tension, simply because he has to adapt the minimum of free time to family, friends, hobbies and school responsibilities. In any case, the authors confirmed that it only depends on the athlete how he organizes his priorities and what he wants to give priority to. He himself must know how much time and when he will devote to his family. How much time for friends, how much preparation for school and how much rest. Krejčí (2016) points out that the lack of rest and the constant action of stress disturbs not only circadian rhythms but also mental balance. Novotná (2018) states that the lives of normal adolescents differ from top athletes, but slightly. They differ mostly in duties such as school, part-time, homework and more. According to her, the lifestyle of athletes is modified by the social environment and performance requirements.

Kosticová, Husarová and Dankulincová (2020) state that sleep problems are common in adolescence. Sleep problems affect the mental health, emotionality and functioning of an adolescent. They mention that 30-50% of adolescents sleep less than usual and 10-20% suffer from sleep problems. The same fact is interpreted by Gaspar de Matos et al.

(2019) from data from a Portuguese study. It turned out that more girls than boys suffer from sleep deprivation. It was added that girls suffering from sleep deprivation sometimes have problems falling asleep. The results of the study agree with the data of our research. Specifically, it was a question of difficulty falling asleep. There was no girl or boy who always had trouble falling asleep, but she did have occasional problems. Gariepy (2020) further states that boys sleep longer on school days than girls. The same statement was proved in the results of the surveyed rowers, where the boys got up later than the girls on weekdays and on weekends. According to Krejčí (2021), the ideal time to go to bed is around 22:00. The time of sleeping by the author Krejčí differed slightly from the displayed results of this research. The results show that most athletes were with a good level of mental health. At first glance, girls were worse than boys in terms of mental health. Nakade, Takeuchi, Krejci et al. (2015) explain that a high level of mental health represents an individual balanced with high resilience. They were not individuals with confidence and the ability to adapt to unpleasant things. A good level of mental health 98 is not specified. Deteriorated level of mental health represents an eternally irritated individual who has frequent mood swings. The last low level of mental health is an individual who succumbs to anxiety, sadness, depression, etc. According to the characteristics of the individual bands of the mental health score, it is clear that the athlete should be with an excellent or at least good level of mental health.

The results are consistent with the claims of Mandelbaum, Harada, Takeuchi et al. (2017) and Krejčí (2021), according to which everyone, regardless of whether they are an athlete or not, should organize their lifestyle so that it is more of a morning type, for several reasons. According to the study by Krejčí, Harada, et al (2016), a person with a tendency to

the morning type contributes better to a higher levels of serotonin. Díaz-Morales (2007) is also a proponent of the morning type. Accordinghis study only 10–15% of people are either the significantly morning type. Díaz-Morales (2007) further presents the results of a study where the orientation of the morning and evening type was related to how individuals search for, regulate and process information about their environment. The morning type forms the knowledge of clear, concrete, tangible and direct experiences. He analyzes them and processes them logically. He has honest behavior, he can control himself. He is obedient and respects an authoritative approach. These characteristics confirm the fact that morning types have better study results than evening types. Based on these claims, it can be seen that being more of an early type is for the most part only good. Several questions of the M-E score were statistically compared with different components or other questions. Unfortunately, for example, the M - E score also had no effect on age, and there was no evidence that younger athletes suffered in any way.

Klimešová (2016), Affenito (2007) confirm that regular breakfast is considered a key component of lifestyle. Breakfast has a higher proportion of nutrients than other main courses during the day and is associated with better school or work performance and mental functioning. Of the athletes surveyed, the vast majority of girls and boys, without distinction, had breakfast regularly every day. This result can be considered positive due to their school duties or morning training. Sweet drinks and sweets are each associated with weight gain and diabetes. Few people know what they further affect in the human body. Too much sugar has a negative effect on the brain and nerve impulses. It affects memory, increases glucose, insulin and triglyceride levels. Excessive drinking of syrup affects genes and contributes to

bipolar disorder, depression and other diseases. This fact was verified in laboratory mice. The group of mice given syrup was addicted to sweets. Their brains were unable to regulate behavior and could not resist sweets. Furthermore, it turned out that the group of mice given only water did not have a problem learning to crawl through the maze. It took the syrup mice twice as long. Thus Gal (2017) shows that sugar really affects memory to a greater extent. It wase confirmed by the HBSC study (2010), which examined the lifestyle of children and schoolchildren. The study shows that in combination with sugary foods, insulin is flushed out and blood glucose is reduced. This leads to attention deficit disorders and fatigue.

Modern information technologies are a part of teen life. The time spent on information technology by top athletes attracts attention. Given their time-consuming workload, it would seem from their weekly schedule that they would not have time for modern technology either. But the opposite is true. The results showed that rowers spend an average of 2-4 hours a day on information technology. Several of them even 5-6 hours a day, which is a lot for athletes. The question is when they can handle it. As the question of when they most often use mobile phones and other electronic devices has not arisen, it is possible to devote the most time to modern technologies in the afternoon or evening, which is not good. The biggest problem is radiation from electronic devices. The so-called blue lights emit light from the electronics. Krejčí (2016) specifies the negative effect of blue lights mainly on sleep quality and melatonin production. The author of Gariepa (2020) agrees with this statement. According to him, information technology has a negative effect on the psyche and circadian typology - shifting towards the evening type.

Stretching in top adolescent athletes does not seem to be very popular. At first glance, only a small percentage of rowers stretched regularly every day. The results

contradict the claims of several authors. The author Válek (2015) emphasizes that not only athletes, but also non-athletes should stretch at least once a day. The same opinion is expressed by Nelson and Kokkonen (2015). They add that stretching significantly affects flexibility or mobility. This is crucial for quality training. They take stretching as a functional prevention against injuries and cramps. It is easy to automate and feels like a routine to a minority. They also recommend stretching each muscle group for at least 15 minutes each day. The fact that stretching is beneficial is confirmed by Kabešová et al. (2016) in the study. A 12-day stretching 99 program was created as part of the study. The results of the study show that after the completion of the twelve-day stretching program, all the examined schoolchildren developed flexibility. In conclusion, he adds that flexibility is one of the important components to good sports performance and continuous stretching reduces the risk of injury. Fortunately, athletes engaged in at least some regenerative procedures, including sleep. They mostly visited saunas, swimming pools, whirlpools or massages. Any such regeneration procedure is suitable for young rowers.

5 CONCLUSIONS

In the group of rowers, a higher proportion of morning type or tendency to morning type was analysed in girls than in boys. However, the difference is not significant. For the other circadian preferences analysed, no significant differences were analysed with respect to gender, age of the examined athletes. Based on the performed analysis, it can be argued that the tendency to gravitate towards the morning type is a desirable phenomenon in young top rowers due to the development of their performance. It was shown that the studied athletes with a tendency to the morning type (i.e. higher M-E score) do not have a problem with

falling asleep, have no problem getting up, eat and drink less foods with sugar content. This testifies to the correct educational guidance of athletes by coaches, as well as to the correct preferences of the groups of athletes themselves. The presented study with its analysis may be an inspiration for coaches of juvenile top rowers' athletes. It can also serve as a demonstration of the issues addressed in the field of lifestyle, circadian rhythms and sleep habits in young top athletes in general.

Based on the interpreted results and the discussion, the following recommendations can be made for the practice of coaches and wellness specialists dedicated to young top athletes, especially in the context of functionally mobilized and risky sports:

Top adolescent athletes should go to bed every day until 22:00. Their sleep time should not be less than 8-9 hours. This time should be the same during the week and on the weekend. The quality of their sleep is also affected by whether they go to bed at the same time and when they get up at the same time. We recommend that you do not expose yourself unnecessarily to blue light sources before going to bed, ie radiation from telephones or other IT technologies, as this radiation negatively affects and reduces the production of melatonin. Only if these conditions are observed can sleep be of good quality and may fill its function. Every athlete should have regular breakfast, no later than 9:00, and breakfast should include tryptophan-rich foods. After breakfast, the athlete should stay in the daylight for about 30 minutes to allow serotonin synthesis. Serotonin in the brain is used to maintain mental health, affecting vitality and endurance.

lifestyle and performance of Japanese and Czech athletes and non-athletes".

6 REFERENCES

Affenito, S. (2007). Breakfast: a missed opportunity. *Journal of the American Dietetic Association, 107*(4), 565-9. https://doi.org/10.1016/j.jada.2007.01.011

Alinčová, K. (2021). Dotazník "Zdravý životní styl a regenerace" [Questionnaire "Healthy lifestyle and regeneration"]. In: Alinčová, K. (2021). *Monitoring životního stylu vybraných vrcholových sportovců adolescentního věku* [Lifestyle monitoring of selected top athletes of adolescent age]. Vysoká škola tělesné výchovy a sportu PALESTRA. Diploma theses.

Bernaciková, M., Kapounková, K., Novotný, J., et al. (2010). Veslování [Rowing] [online]. In: *Fyziologie sportovních disciplín*. [Physiology of sports disciplines.] [cit. 2021-03-20]. Available on: https://is.muni.cz/do/fsps/e-learning/fyziologie_sport/index.html.

Burlot, F., Richard, R., Joncheray, H. (2016). The life of high-level athletes: The challenge of high performance against the time constraint. *International Review for the Sociology of Sport, 53*(2), 234-249. https://doi.org/10.1177/1012690216647196

Díaz-Morales, J.F. (2007). Morning and evening-types: Exploring their personality styles. *Personality and Individual Differences 43*(4), 769-778. https://doi.org/10.1016/j.paid.2007.02.002

Dovalil, J. a kol. (2009). *Výkon a trénink ve sportu.* [Performance and training in sports] Olympia.

Gal, P. (2017). Cukr mění náš mozek víc než kokain. [Sugar changes our brain more than cocaine]. *Psychologon.* http://www.psychologon.cz/data/pdf/548-cukrmeni-nas-mozek-vice-nez-kokain.pdf

Gariepy, G., et al. (2020). How Are Adolescents Sleeping? Adolescent Sleep Patterns and Sociodemographic Differences in 24 European and North Ametican Countries. *Journal of adolescent Health, 66*(6), 81-88. https://doi.org/10.1016/j.jadohealth.2020.03.013

Gaspar de Matos, M., Marques, A. et al. (2019). Sleep in adolescence: sex matters? *Sleep Science, 12*(3), 138-146. doi: 10.5935/1984-0063.20190075

Harada, T., Wada, K., Tsuji, F., Krejci, M., Kawada, T., Noji, T., Nakade, M. & Takeuchi, H. Intervention study using a leaflet entitled 'three benefits of "go to bed early! get up early! and intake nutritionally rich breakfast!" a message for athletes' to improve the soccer performance of university soccer team. *Sleep and Biological Rhythms 14,* 65–74 (2016). https://doi.org/10.1007/s41105-015-0035-5

Hebák, P. a kol. (2013). *Statistické myšlení a nástroje analýzy dat.* [Statistical thinking and data analysis tools]. Infomatorium.

Hindls, R., Hronková, S., a kol. (2006). *Statistika pro ekonomy.* [Statistics for economists.]. Professional Publishing.

Homolka, P., et al. (2010). *Monitorování krevního tlaku v klinické praxi a biologické rytmy*. [Blood pressure monitoring in clinical practice and biological rhythms]. Grada Publishing.

Hošek, V. (2006). *Psychologická typologie sportu.* [Psychological typology of sport]. In: Slepička, P., Hošek, V., Hátlová, B. (Eds.), *Psychologie sportu.* [Sport psychology]. Karolinum. 24-26.

Kabešová, H. et al. (2016). Komparace vlivu 12týdenní aplikace dynamického a statického strečinku na rozsah kloubní pohyblivosti. [Comparison of

the effect of a 12-week application of dynamic and static stretching on the range of joint mobility.] *Česká kinantropologie, 20*(4), 78-86.

Kachlík, P. (2017). Lidské biorytmy a jejich význam. [Human biorhythms and their meaning]. *Tělesná kultura, 40*(1), 23-32. doi:10.5507/tk.2017.001

Kalman, M., Sigmund, E., Sigmundová, D., Hamřík, Z., Beneš, L., Benešová, D., Csémy, L. (2010). Národní zpráva o zdraví a životním stylu dětí a školáků: v rámci mezinárodního projektu "Health Behaviour in School-aged Children: WHO Collaborative Cross-National study (HBSC) ".Univerzita Palackého v Olomouci.

Klimešová, I. (2016). *Základy sportovní výživy.* [Basics of sports nutrition]. Univerzita Palackého v Olomouci.

Kosticová, M., Husarová, D., Dankulincová, Z. (2020). Difficulties in getting to sleep and their association with emotional and behavioural problems in adolescents: does the sleeping duration influence this association? *International Journal of Environmental Research and Public Health, 17*(5): 1691.doi: 10.3390/ijerph17051691

Krejčí, M. (2016). Wellness, životospráva, spánek. [Wellness, lifestyle, sleep]. In: Krejčí, M., Hošek, V., et al. (Eds.), *Wellness.* Grada Publishing. 187-191.

Krejčí, M., Hošek, V. (2016). Rozvoj osobnosti, pozitivní self-transformace. [Personality development, positive self-transformation]. In: Krejčí, M., Hošek, V., et al. (Eds.), *Wellness.* Grada Publishing. 142-155.

Krejčí, M. (2016). Modifikace jógových technik k podpoře lidského zdraví. [Modification of yoga techniques to support human health]. In: Krejčí, M., Hošek, V., et al. (Eds.), *Wellness* (s. 254-255). Grada Publishing.

Krejčí, M. (2021). *Aktivní životní styl a cirkadiánní preference: Studijní opora k distančnímu vzdělávání.* [Active lifestyle and circadian preferences – E-learning]. Vysoká škola tělesné výchovy a sportu Palestra.

Mandelbaum, M., Harada, T., Takeuchi, H. et al. (2017). Selected circadian determinants of performance in super league floorball players. *Acta Salus Vitae, 5*(2). http://odborne.casopisy.palestra.cz/index.php/actasalusvitae/article/viewFile/135/pdf_5

Nakade, M., Takeuchi, H., Krejci, M., Tsuji, F., Noji, T., Harada, T. (2015). Questionnare study on the comparison among circadian typology, sleep habit, physical and mental health and meal habit in Japanese university athletes. *Psychology. 6*(12), 1562-1569. Doi: 10.4236/psych.2015.612153. https://www.scirp.org/journal/paperinformation.aspx?paperid=59874

Nelson, G.A., Kokkonen, J. (2015). *Strečink na anatomických základech*. [Stretching on anatomical bases]. Grada Publishing.

Novotná, K. (2018). *Motivační faktory podílející se na změně životního stylu u sportovců v období dospívání* [Motivational factors involved in lifestyle change in athletes during adolescence]. [Disertační práce]. Univerzita Karlova. Dissretation theses.https://ftvs.cuni.cz/FTVS-2169-version1-disertacni_prace__katerina_novotna.pdf

Pecáková, I. (2011). *Statistika v terénních průzkumech.* [Statistics in field surveys]. Professional Publishing.

Suni, E. (2021, 10. March). *How much sleep do we really need?*. A OneCare Media company. https://www.sleepfoundation.org/how-sleep-works/how-much-sleep-do-we-really-need

Válek, F. (2015). Strečink a kompenzační cvičení se často podceňují

[Stretching and compensatory exercises are often underestimated [online]. [cit. 19.4.2021]. https://behame.cz/3249/strecink-a-kompenzacnicviceni-se-casto-podce

7 CONTACTS

Kamila ALINČOVÁ, M.A.
College of Physical Education and Sport PALESTRA, Prague, Czech Republic

Prof. PaedDr. Milada KREJČÍ, PhD.
(author correspondent)
College of Physical Education and Sport PALESTRA, Prague, Czech Republic
E-mail: krejci@palestra.cz