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Original Article

The effect of individual parameters of mental health on the level of night sleep among female students

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Abstract.
Mental health significantly depends on the quality of sleep as one of the most important psychophysiological parameters of students. The research data were obtained in 2015-2021 in Chelyabinsk. The study involved female students of the Institute of Sport, Tourism and Service of South Ural State University (mean age 20.95±0.26 years). The sample consisted only of female students engaged in different sports and PE training activities 2 hours per week. Female students were divided into two subgroups with high and low levels of sleep with respect to certain mental health parameters. The first subgroup involved female students with high levels of sleep (n=147), the second - with low levels (n=72). Diagnostics of the quality of sleep and mental health components was carried out using a 10-point self-assessment scale. There were no significant differences between the groups in terms of sports skills, sports experience, age, body length and body weight. Some mental health parameters affect the level of sleep among female students. The following parameters of mental health have a positive effect on the quality of sleep: mood stability, energy level, mental performance, communicative skills, assertiveness and the desire to engage in academic, sports, and other activities. Mental health parameters that have a negative impact on the level of sleep include increased excitement, emotional excitability, stressogenic factors, psychological stress. The data obtained should be considered as a pattern, which indicates the direction of psychological and pedagogical influences aimed at improving students' sleep quality and mental health.
Keywords: **mental health, sleep, student, psychological performance, psychological status, stressogenic tor, psychological stress, assertiveness, communication.**

Introduction.

The effect of individual parameters of mental health on night sleep is associated with the priority tasks of higher education. Mental health promotion depends on night sleep as one of the most important parameters for maintaining health, psychophysiological state, and physical performance (Becker et al., 2018; Milojevich, Lukowski, 2016; Tayutina et al., 2015).

A person spends almost 33% of his/her life asleep (Kantimirova et al., 2015).

The results of the study indicate a fairly high incidence of sleep disorders among students (Becker et al., 2018; Dunay, Arinchina, Sidorenko, 2013). From 50 to 65% of mental and emotional disorders are of a psychosomatic nature (Bozhkova, Agfonova, 2018; Gazenkampf et al., 2015; Finogenko, 2013).

Sleep is important for brain rest and sports performance. At the same time, N. Bumarskova and A. Kalinkin (2010) indicate that 54% of full-time students have insufficient sleep. In general, insomnia is not typical for the educational and sports activities of students involved in sports, however, 37% of students feel reduced performance. In male sambo athletes the sleep apnea syndrome was found, which was characterized by interrupted pulmonary ventilation, which resulted in hypoxia. The whole process was accompanied by disrupted sleep structure associated with drowsiness, reduced memory and working capacity.

Understanding the relationship between night sleep and individual parameters of mental health among university students is important because sleep disturbance results in mental health deterioration (Milojevich, Lukowski, 2016). The reasons for reduced sleep among university students are the following: stress associated with the conditions of educational and sports activities, meetings with friends until late, incorrect planning of daily routine (Akimova, Konshina, Skackova, 2020; Prokopenko, Chertzova, 2016).

Academic performance of college and university students depends on the quality and duration of sleep (Okano et al., 2019; Isaeva, Antonets, 2017; Becker et al., 2018), adaptation to society, ability to perform basic social and family functions (Abdullaeva, Osmanova, 2017), irritability (Levitsky et al., 2015), mental disorders associated with the inability to communicate (Eganov, Cherepov, Romanova, Bykov, 2020), increased anxiety (Becker et al., 2018; Bozhkova, Agfonova, 2018). It was found that students with insufficient problem-solving skills or those who had increased anxiety had an increased tendency to sleep disorders. Anxiety as a character

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trait is almost constantly present in 23.7% of persons with bipolar mood disorder (Gold, Sylvia, 2016) or at the workplace (Leka, Nicholson, 2019; Fan, Mustard, Smith, 2019; Popa, Mîndrescu, Iconomescu, Talaghir, 2020). The psychophysiological characteristics of sleep described by Yumatov E. et al. (2018) indicate that a significant number of students show signs of emotional stress, sleep disorders and daytime sleepiness.

Symptoms of sleep deficiency or sleep disorders provoke constant stress, irritability, tearfulness. If lack of sleep becomes chronic, this can lead to disorders of the nervous system (Dunay, Arinchina, Sidorenko, 2013). Episodic and short-term sleep deprivation lasting from one to three weeks, excluding borderline disorders, is associated with premorbid mental conditions (Smulevich, 2011), which include delayed reaction, depression and anxiety (Bozhkova, Agfonova, 2018). Mental disorders arise from the awareness of threat to existence explained by a somatic disease and various disorders as a result of exposure to the central nervous system (Smulevich, 2011). These disorders reduce mental and physical health and affect the quality of sports and academic performance (Gazenkampf et al., 2015; Maskaeva, Germanov, 2014; Cherepov, 2013).

The most common problems of university students include fatigue, reduced energy, irritability and reduced concentration. Almost half of senior students had sleep disorders, which in almost 50% of them were combined with affective disorders (Bozhkova, Agfonova, 2018).

Maskaeva T., Germanov G. (2014) conducted a study aimed at identifying the mental and behavioral characteristics of women involved in different sports. The authors identified that the average sleep duration of female students depended on numerous factors, including age, sex, mental and behavioral characteristics, the presence of psychological stress, cardiovascular diseases, fatigue, academic performance, sleep and wakefulness, place of residence, etc. For example, Becker S.P. et al. (2018) demonstrated that sleep quality scores differed by 7% between women (64%) and men (57%). There are some data on gender-related health differences, for example, in women, depression is about twice as common as in men (Klink et al., 1992).

Properly organized academic activities, active rest, and physiologically adequate sleep have a positive impact on mental health. For example, creative activities prevent increased emotional stress, irritability and excitability and, therefore, keep the student engaged in academic and other activities during the day (Musalimova, Yanbarisova, 2018).

Thus, these data show that poorer sleep quality is also associated with poorer mental health among university students (Milojevich, Lukowski, 2016). J. Charest and M. Grandner (2020) conducted a study to identify the factors affecting the quality of sleep among elite athletes and its importance for sports performance. The authors found that sports results were associated with physical and mental performance, the ability to recover from physical activity, injury risk and knowledge about health.

A. Golenkov (2014) studied sleep disorders related to mental disorders and concluded that the most common mental disorders associated with this pathology were depression and anxiety. Sleep disorders can be both the first symptom of depression and its predictor. Becker S. et al. (2018) identified the presence of sleep problems associated with specific components of mental health. 27% of college students from multiple universities described their sleep quality as poor at 36% of cases. Special literature (Golenkov, 2014; Dunay, Arinchina, Sidorenko, 2013; Prokopenko, Chertzova, 2016) indicate sleep structure in students, however, the effect of certain parameters of mental health on sleep quality requires special studies.

Mental health depends on various factors, including sleep quality. Sleep contributes to body recovery, memory improvement, hormonal balance, psychological and physical health, and body performance in general. Bozhkova E. et al., 2018 identified that students who had insufficient problem-solving skills or increased anxiety also had an increased tendency to develop sleep disorders.

Socio-psychological factors can have a positive or negative impact on the mental health of students (Finogenko, 2013). Mental health disorders among university students are manifested in emotional changes provoked by anxiety, depression, irritability, social networks, etc. (Eganov, Bykov, Romanova, Kokin, 2021; Bashir, Bhat, 2016; Yarmak et.al., 2017). These disorders are mostly typical for first- and second-year students. About half of the students report absent-mindedness and lack of attention during the day, which affect academic performance. Apart from attention disorders, students with short sleep duration have reduced memory and cognitive activity, worsened mood, and academic performance (Gazenkampf et al., 2015; Kantimirova et al., 2015). J. Kim, A. Fernando, J. Kirby, (2021) provided empirical evidence that self-compassion and fear of compassion were associated with poor sleep quality and mental health disorders.

Lack of sleep adversely affects the ability to analyze and remember information. Complex skills also suffer, in particular, driving ability, as well as attention and speed of reaction. In people who sleep less than expected, the activity of any parts of the cerebral cortex, which are responsible for computational abilities and abstract thinking, decreases (Dunay, Arinchina, Sidorenko, 2013). Sleep disorders or poor sleep quality are the reasons for the development of various somatic and psychological pathological conditions (Akimova, Konshina, Skackova, 2020; Gritsina, Trankovskaya, Lisetskaya, Tarasenko, 2019; Yumatov et al., 2018). Those suffering from insomnia have worse mental and physical health, and the frequency of suicide attempts is four times higher compared to ordinary people (Kales et al., 1984), the role of sleep disturbances in the development of cardiovascular diseases has been proven (Drapkina, Shepel, 2015). Analysis of published data (Yumatov et al., 2018; Milojevich, Lukowski, 2016; Okano et al., 2019; Becker et al., 2018) indicates a high scientific and

practical relevance of further study of the individual parameters of mental health that affect sleep quality among university students. However, there is a need for in-depth studies in this field, especially when it comes to sleep structure in female university students. This makes it possible to identify the components of sleep disorders, predict and further substantiate approaches to the treatment of mental disorders.

The purpose of the study was to identify the effect of individual parameters of mental health on sleep quality among female students.

Materials and methods.

The data were obtained in 2015-2021 in Chelyabinsk. The study involved female students aged from 16 to 25 years (n = 252). The sample was homogeneous and included only female students involved in various sports and physical activities as part of the university program. The group of female students was divided into two subgroups with high and low levels of sleep with respect to certain mental health parameters. The first subgroup included female students with high levels of sleep (n=147), the second - with low levels of sleep (n=72). The average level of sleep estimated at seven points (n=33) was not taken into account. There were no significant differences between the groups in terms of sports ranks, sports experience, age, body length and body weight (t=0.41-1.48 at P≥0.14-0.68).

Diagnostics of mental health components was carried out using a self-assessment test with a ten-point scale (Eganov, Erlikh, Bykov, 2013). The data obtained were processed with the two-sample t-test. The calculations were carried out using the Microsoft Excel analysis package. The mean values ($\bar{x}$, points), the error of the mean value (m), and the level of significance (p) were calculated. The following definitions are used for the purpose of the study. Mental health is a holistic phenomenon that has a complex, multi-component and multi-level structure that provides mental functioning. Mental health is based on the feeling of mental comfort and characterized by the absence of mental abnormalities and optimal regulation that ensure resistance to adverse factors of the social environment and internal functioning of the body and its systems (Eganov et al., 2020). Night sleep is a physiological state of the body opposite to wakefulness, which occurs at certain intervals of rest when consciousness almost stops and reactions to external stimuli decrease due to the absence of conscious psychological activity. Poor sleep quality among university students leads to decreased academic performance, reduced mental health, psychoemotional stress and excitability that affect daily routine.

Results and discussion.

Analysis of statistical differences between female students with high and low levels of sleep made it possible to identify their features in terms of sleep characteristics and possible psychological and pedagogical tools for sleep improvement. Female students with high levels of sleep significantly differed from those with low levels of sleep (t=2.19-4.46 at p≤0.05-0.01) in terms of mental health parameters indicated in Table 1.

Significant differences between the groups were identified in terms of mood stability, which affects everyday life. Higher (t=3.07, at p≤0.01) values of this variable were found in female students with high levels of sleep.

Mood stability results from relationships between people and the activity of the nervous system that provide mental performance in daily routine. Depressive mood is associated with pessimism, self-doubt, lack of energy and negatively affects female students (Eganov, Bykov, Romanova, Kokin, 2018). Statistically significant differences indicate that female students with high levels of sleep have higher values of mood stability compared to female students with low levels of sleep. Therefore, a positive and stable mood contributes to sleep quality.

Table 1 – Statistical differences between female students with high and low levels of sleep ($\bar{x}$ ±m)

Parameter (points)	Level of sleep		t	P
	high (n_1=147)	low (n_2=72)		
Mood stability	7.82±0.14	7.04±0.21	**3.07**	**≤0.01**
Energy level	7.22±0.13	6.14±0.2	**4.63**	**≤0.01**
Mental performance	6.92±0.17	6.29±0.23	**2.21**	**≤0.03**
Communicative skills	8.19±0.13	7.72±0.17	**2.19**	**≤0.03**
Assertiveness	8.19±0.12	7.74±0.14	**2.29**	**≤0.02**
Desire to engage in academic, sports and other activities	8.02±0.15	7.07±0.26	**3.34**	**≤0.01**
Emotional excitability	4.94±0.25	5.66±0.18	**-2.33**	**≤0.02**
Stressogenic factors	7.19±0.23	8.09±0.16	**-3.22**	**≤0.01**
Psychological stress	6.25±0.23	7.10±0.16	**-3.03**	**≤0.01**
Excitement	5.61±0.25	6.09±0.17	-1.60	**≥0.11**
Aggressiveness	7.35±0.20	7.82±0.16	-1.69	≥0.09
Irritability	6.90±0.26	7.41±0.17	-1.70	≥0.09
Heart rate frequency, bpm	71.2±0.99	76.6±2.06	**-2.69**	**≤0.01**
Integral parameter of mental health	7.74±0.13	6.76±0.18	**4.46**	**≤0.01**
Level of night sleep	8.88±0.07	4.70±0.15	**28.8**	**≤0.01**

Note: t – two-sample t-test; P – level of significance; ≤ – differences between groups are significant; ≥ – differences between groups are not significant.

The table shows that higher levels of energy (t=4.63, at P≤0.01) were typical for the group with higher sleep levels. This means that such students were more active when it came to their routine activities and able to be efficient in achieving their goals.

The same is for mental performance, which was significantly higher in female students with high sleep levels (t=2.21, p≤0.03). Mental performance is understood as a potential characteristic of a person and the state of physiological and psychological functions that characterize his/her ability to perform mental, sports, and labor activities of required quality and with high efficiency during the required period of time (Akentiev, 2008).

Table 1 shows the data obtained in two groups of female students. Communicative skills imply simultaneous interaction or exchange of information between individuals. Any communication involves certain emotions and is associated with a psychological analysis of interaction, emotional and other characteristics, including mental health (Eganov, Cherepov. Romanova, Bykov, 2020). As can be seen from the table, students with high levels of night sleep statistically differed (t=2.19, at p≤0.03) from students with low levels of sleep in terms of communicative skills. Therefore, communicative skills cause positive emotions, which favorably affect the quality of sleep.

Assertiveness also has significant differences (t=2.29, at P≤0.03) between the study groups and had higher levels in the group of female students with high levels of sleep. This indicator was considered as one of the parameters of mental health and characterized the psychological and personal ability of a person. An assertive person is able to make important decisions, rationally argue, defend his/her position, and be responsible for its consequences. Such personal qualities allow building healthy relationships with others.

The desire to engage in academic, sports and other activities significantly differed in the group of female students with high levels of sleep (t=3.34 at P≤0.01). This means that the abovementioned parameter of mental health has a positive effect on quality of sleep.

Emotional excitability (Table 1) was significantly higher (t=-2.33 at p≤0.02) in female students with low levels of sleep. This parameter is understood as an emotional response to the environmental stimuli that are significant for female students. Therefore, excessive excitability affects sleep disorders and is considered as an undesirable phenomenon.

As can be seen from the table, stressogenic factors are more typical of students with low levels of sleep (t=-3.22 at p≤0.01). Stressogenic factors are understood as a set of environmental stimuli that negatively affect the psychophysical state of female students. This indicates that female students who are more susceptible to the influence of stressogenic factors more often have insomnia.

Psychological stress is a special state that occurs as a result of interaction with external factors. Such stress is usually caused by unfavorable economic conditions, emotional repetitive experiences, academic failure, etc. This condition requires adaptation of the nervous system. The table shows that female students with high levels of stress significantly (t=-3.03 p≤0.01) more often have sleep disorders. Our data are confirmed by the results of Yumatov E. et al. (2018), who found the relationship between mental stress and the quality of sleep in students.

Excitement, aggressiveness and irritability as parameters of mental health demonstrate similar trends. However, the differences were close to statistically significant. The table shows that female students with increased levels of excitement, aggressiveness and irritability have a tendency to sleep disorders.

Heart rate (HR) in this paper is considered as a parameter of mental health. The reasons that explain increased HR during sleep may include the presence of mental fatigue, anxiety, different emotional experiences, depression, etc., which affect the mental health of female students. Increased HR values during sleep can be associated with increased activity of the sympathetic nervous system and considered as the reaction to insufficient recovery from previous stress. HR in the group of female students with high levels of sleep was significantly lower (t=-2.69, at p≤0.01) compared to the group with low levels of sleep. The relationship between HR and sleep disorders is obvious. Consequently, female students with lower HR values have better mental health.

The integral indicator of mental health is determined by the sum of all abovementioned components. As can be seen from the table, sleep disorders have a negative effect on the integral indicator of mental health. Consequently, negative shifts in the structure of sleep generally lead to worse mental health in female students.

Conclusion.

Some mental health parameters affect the level of sleep of female students. The following parameters of mental health have a positive effect on the level of sleep: mood stability, energy level, mental performance, communicative skills, assertiveness and the desire to engage in academic, sports, and other activities. The following parameters of mental health have a negative effect on the level of sleep: increased excitement, emotional excitability, stressogenic factors, psychological stress.

The data obtained should be considered as a pattern, which indicates the direction of psychological and pedagogical influences aimed at improving students' sleep quality and mental health.

The authors declare no conflict of interest.

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