



The impact of physical exercise on the psycho-emotional state of students during the academic year

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Abstract. The aim of the study was to determine the impact of different levels of physical activity on the psycho-emotional indicators of students in the context of the educational process. The research methodology was based on a twelve-week empirical and analytical observation conducted at Uzhhorod National University from 24 February to 16 May 2025, during which students underwent initial, intermediate and final psychodiagnostic examinations using scales of positive and negative affect and emotional mood profile, and performed a set of aerobic and general physical exercises of varying intensity. During 12 weeks of regular physical exercise, positive affect scores in the group of students with low activity increased from 22.8 to 27.1 points, in students with medium activity – from 28.6 to 34.9 points, and in the highly active group – from 33.4 to 40.2 points. At the same time, a consistent decrease in negative affect was noted: in inactive students – from 31.7 to 26.4 points, in the moderately active group – from 25.9 to 20.1 points, and in the highly active group – from 20.8 to 15.7 points. The indicators of emotional components on the mood scale also showed a marked improvement: in the highly active group, tension decreased to 41.2 points, depression to 39.0 points, anger to 40.5 points, while vigour increased to 65.3 points, which was the highest result among the participants. The study confirmed that systematic aerobic and general physical exercises over a period of twelve weeks contributed to a sustained increase in positive effects and vigour and a decrease in emotional distress in students, regardless of their initial level of physical activity. The results can be used by physical education teachers, coaches and sports and health technology specialists to develop effective training programmes aimed at maintaining the psycho-emotional stability of youth under the conditions of academic stress

Keywords: affective reactions; level of physical activity; aerobic exercise; mood indicators; distress; students; educational process

Introduction

Physical exercise plays an important role in maintaining the psycho-emotional stability of students, while the academic year is associated with significant cognitive load, lack of time for recovery, and long periods of sedentary activity. According to a Eurobarometer survey conducted as part of European Union initiatives, 45% of the adult population in European countries do not engage in any form of physical activity, indicating a high prevalence of sedentary lifestyles in contemporary European society (European Union, 2022). When such low levels of physical activity

are combined with chronic stress and an intense learning process, this can lead to increased emotional exhaustion, a decrease in the body's adaptive reserves, and a disruption of stress regulation mechanisms, which in turn exacerbates psycho-emotional difficulties and worsens the functional state of students.

Studying the impact of physical activity on the psycho-emotional state of students allows to identify the mechanisms of emotional regulation in the context of academic workload. Z. Zhang *et al.* (2022) found that increased

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physical activity is associated with a reduction in negative emotional manifestations among students. It was also demonstrated that tolerance to stress and resilience mediate this relationship by strengthening protective psycho-emotional mechanisms. According to C. Herbert *et al.* (2020), regular physical exercise contributes to a reduction in emotional stress and an increase in subjective well-being. In addition, the authors showed that short-term training interventions have a positive effect on mental health indicators even in a remote interaction format. A study by I. Kalashchenko *et al.* (2021) found that insufficient physical activity among medical students is associated with a deterioration in psycho-emotional health, with negative changes exacerbated by an increase in sedentary behaviour during distance learning. An analysis presented by M. Yaroshyk *et al.* (2020) showed that differences in physical activity levels cause significant variations in emotional stability: more active students demonstrated better psycho-emotional characteristics compared to those who were less active.

Sports activities are emerging as a factor that modulates students' psychophysiological responses to academic and stress loads. According to X. Huang *et al.* (2023), structured physical interventions reduce anxiety and depression among students. These interventions also help stabilise emotional reactions under conditions of intense cognitive stress. The combination of aerobic activity with elements of mindfulness practices, as shown in the study by L. San Román-Mata *et al.* (2020), contributes to a more pronounced recovery of the psychophysiological state of students who are under stressful learning conditions. The results of M. Bejtka *et al.* (2022) showed that the level of sports activity of students of pedagogical universities affects vegetative and orthostatic parameters. Students with higher motor activity showed more optimal psychophysiological reactions. The authors L. Korobeinikova *et al.* (2024) also identified differences between active and inactive students in terms of nervous regulation indicators: increased motor activity is associated with higher emotional stability.

Low levels of physical activity are considered a factor that increases students' vulnerability to psycho-emotional disorders and reduces their ability to regulate their emotions during academic stress. It has been established that insufficient physical activity is accompanied by an increase in negative emotional states (irritability, tension, and low mood) and at the same time correlates with an increase in psycho-emotional instability, which increases the risk of stress reactions, as evidenced by the results of Y. Li *et al.* (2022). In a study on the impact of sedentary behaviour, I. Jiang *et al.* (2020) showed that increased sitting time is associated with higher levels of anxiety, depression and suicidal ideation among students. The authors proved that limited physical activity impairs the ability to compensate for emotional stress. Scientists A.M. Rogowska *et al.* (2020) found that a decrease in physical activity is associated with a deterioration in students' emotional well-being, increased mental stress, and intensified dysfunctional emotional reactions. The results obtained by the authors indicate a weakening of emotional regulation mechanisms in conditions of prolonged physical inactivity. O. Byshevets *et al.* (2024) determined that low levels of physical activity among students in stressful conditions are accompanied by an increased risk of emotional disorders and a decrease in the adaptive abilities of youth.

Despite previous studies, the relationship between the level of physical activity of students and the characteristics of changes in their psycho-emotional state during the academic year in the context of physical education and sports remains insufficiently understood. The aim of the study was to establish the influence of different levels of physical activity on the indicators of the psycho-emotional state of higher education students during the academic year. To achieve this aim, the following objectives were set: to characterise the level of physical activity of students; to analyse the indicators of the psycho-emotional state of students; to compare the psycho-emotional characteristics of individuals with different levels of physical activity.

Materials and Methods

The essence of the study consisted in the development and implementation of a specialised physical exercise programme aimed at optimising the psycho-emotional state of students over the course of an academic semester. The training intervention was based on a modular structure of the exercise programme, within which each module performed a specific function in ensuring students' psychophysiological and psycho-emotional adaptation. The aerobic module was designed to create stable cardiorespiratory load and included cyclic exercises of moderate intensity: jogging on a Horizon Adventure 3 treadmill (USA), brisk walking, as well as training on cardio machines such as the Kettler Giro S cycle ergometer (Germany) and the Sportop E5000 elliptical trainer (Taiwan). The duration of the aerobic module averaged 20-25 minutes and was performed at a steady pace, ensuring uniform activation of the cardiovascular and respiratory systems. In parallel with aerobic load, a general physical conditioning module was implemented, which included strength exercises using body weight (squats, lunges, planks and press-ups), performed in 2-3 sets of 10-15 repetitions (for planks, 30-40 seconds). This module was aimed at developing muscular endurance, maintaining muscle tone and ensuring stable activation of major muscle groups. To standardise the load, universal exercise mats and modular rubber platforms were used, allowing the difficulty of exercises to be adapted to the individual fitness level of participants.

To expand the functional variability of the programme, a sensorimotor module was included in the structure of the session and implemented in the second half of training. This module comprised exercises focused on movement coordination and static balance. Its content included static holds in a single-leg stance, dynamic movements with controlled changes in body position, as well as coordinated movements involving simultaneous use of upper and lower limbs, which required maintenance of postural stability. Exercise execution involved control of trunk position, balance maintenance during slow positional changes and spatial coordination of movements without abrupt accelerations. Control of training intensity was carried out within a regulatory – monitoring module by tracking heart rate using wrist-worn heart rate monitors Xiaomi Mi Band 7 (China), produced by Xiaomi. Heart rate was recorded at the beginning of the session, in the middle of the main training module and immediately after its completion, ensuring that the load corresponded to students' individual capacities and preventing overload. The final stage of the session was the recovery – regulatory module, which

consisted of two consecutive components. The first component included stretching exercises for major muscle groups lasting 8-10 minutes, aimed at normalising muscle tone and restoring breathing rhythm. The second component was represented by a meditative psycho-emotional self-regulation module lasting 3-6 minutes, implemented in the form of guided breathing relaxation. The meditative module included thematically oriented exercises focused on mindful breathing and attention concentration, aimed at reducing emotional tension, forming a sense of bodily relaxation and stabilising emotional background after physical exertion. The themes of short meditative instructions varied depending on the stage of the programme and included focusing on breathing, a sense of calm, restoration of inner balance and awareness of training session completion. Application of this module contributed to improved subjective well-being and the formation of a positive affective state at the end of the session.

The programme was implemented at the sports hall of Uzhhorod National University over a period of 12 weeks (from 24 February to 16 May 2025) within the autumn-winter academic semester, without holiday breaks or examination-related workload. Training sessions were held three times per week (Monday, Wednesday and Friday) after the completion of scheduled classes (between 16:00 and 18:00), which ensured a rational balance between academic activities and the body's recovery capacity. The duration of one session was 45-55 minutes, corresponding to recommendations regarding the volume of organised physical

activity for young people and allowing maintenance of a stable training effect throughout the entire period of programme implementation (World Health Organization, 2020).

The study involved 84 full-time students of Uzhhorod National University aged 17 to 23 years ($M = 20.1 \pm 1.4$ years), enrolled in the 1st-4th years of study across various educational fields. The sample was formed on the basis of voluntary participation following student briefing; all participants provided written informed consent, and ethical procedures were aligned with the requirements of the International Code on Social Research ICC/ESOMAR (2016) and approved by the Ethics Committee (Protocol No. 2/2025 dated 13 September 2024). In terms of gender distribution, the sample comprised 44.0% males ($n = 37$) and 56.0% females ($n = 47$), ensuring adequate gender representation. Following initial questionnaire assessment (Table 1), students were stratified into three groups according to their level of physical activity: low level – 27 participants (15 females, 12 males), moderate level – 29 participants (17 females, 12 males), and high level – 28 participants (15 females, 13 males). The study included full-time students without medical contraindications to physical exertion, who were willing to complete all stages of measurement and attended sessions regularly. Individuals with acute or chronic conditions limiting physical activity, as well as participants with incomplete data, missed training periods or withdrawal at any stage, were excluded; one respondent was withdrawn due to absence from the repeated measurement, and their results were not included in the analysis.

Table 1. Questionnaire for determining the level of physical activity

Question/parameter	Answer options/ numerical values	MET (metabolic equivalent of task) values for calculation
I. Intense physical exercise		
Number of days per week when intense exercise was performed (running, sports, strength training)	___ days (0-7)	8 MET
Average duration of one session of intense exercise	___ minutes	
II. Moderate physical activity		
Number of days per week when moderate exercise was performed (brisk walking, cycling, fitness)	___ days (0-7)	4 MET
Average duration of one moderate exercise session	___ minutes	
III. Active walking		
Days per week when ≥ 10 minutes of active walking was performed	___ days (0-7)	3.3 MET
Average duration of one episode of active walking	___ minutes	
IV. Sports activities		
Participation in sports clubs/sections	☐ yes ☐ no	
Type of sport		
Training sessions per week	___ times	<i>intensity is recorded separately</i>
Duration of training	___ minutes	
Intensity of training	☐ low ☐ medium ☐ high	(3 MET / 4 MET / 8 MET)
V. Daily activity		
Time spent sitting per day (studying, computer, phone)	___ hours/day	-
Time spent actively moving per day	___ minutes/day	-
Number of steps per day (according to tracker, if available)	___ steps	-
Self-assessment of overall physical activity level	☐ low ☐ medium ☐ high	-
VI. Formula for calculating MET minutes		
MET $\times$ minutes $\times$ days	To be completed by the researcher	
VII. Grouping criteria		
Low activity level	< 600 MET min/week	
Medium activity level	600-2,999 MET min/week	
High activity level	$\geq 3,000$ MET min/week	

Note: MET – Metabolic Equivalent of Task, a unit for assessing the intensity of physical activity; activity levels were stratified according to the sum of MET-min/week: low level – <600 MET-min, moderate – 600-2,999 MET-min, high – $\geq 3,000$ MET-min

Source: made by the authors

All psychodiagnostic procedures were conducted in university classrooms by a sports psychology specialist with relevant education and practical experience in applying standardised methods, in collaboration with a physical education teacher competent in organising the training process. Initial testing was performed before the start of the programme intervention, intermediate testing was performed in the sixth week to record early changes in the psycho-emotional state, and final testing was performed after the completion of the programme, which allowed for the assessment of the cumulative effects of systematic physical activity. The assessment of the students' psycho-emotional state was carried out using two internationally validated psychodiagnostic techniques, which allowed for a comprehensive characterisation of affective reactions and changes in the emotional profile under the influence of physical activity. The main tool was the PANAS (Positive and Negative Affect Schedule) scale, created on the basis of a two-factor model of affect (Watson *et al.*, 1988), which measured the level of positive affect, reflecting vigour, inspiration and interest, as well as negative affect associated with anxiety, tension and emotional arousal. The intensity of affective manifestations was interpreted based on the percentile distribution of total scores: values below the 25th percentile corresponded to a low level, the 25th-75th percentile interval corresponded to an average level, while values above the 75th percentile were interpreted as a high level of affective expression. For an extended characterisation of mood states, the BRUMS (Brunel Mood Scale) was used, validated in the field of sports psychology (Terry *et al.*, 1999), which allowed to assess the intensity of six emotional components – tension, depression, anger, fatigue, confusion, and vigour – with the formation of a structured mood profile in the context of training influence. The obtained indicators were converted into standardised T-scores, where the mean value corresponded to 50 points ($M = 50$) and the standard deviation was 10 points ($SD = 10$), after which

they were interpreted according to the normative limits: 40-60 T-scores – as a conditional norm, 60-69 T-scores – as an increase in individual emotional components, ≥ 70 T-scores – as pronounced mood changes, while values below 40 T-scores were interpreted as reduced vigour or suppression of emotional characteristics.

Statistical processing of the obtained data was performed using IBM SPSS Statistics 28.0 software. The normality of the distribution of indicators was checked using the Kolmogorov-Smirnov criterion. The analysis of the dynamics of psychoemotional indicators was performed using Student's *t* test for dependent samples, while intergroup differences were determined using one-way analysis of variance (ANOVA). In case of violation of the normality of distribution, the non-parametric Wilcoxon and Mann-Whitney criteria were used. The level of statistical significance was set at $p < 0.05$, and the results were presented in the format $M \pm SD$. Additionally, a gender analysis was performed using Student's *t* test for independent samples, which did not reveal any statistically significant differences between men and women in any of the studied psycho-emotional indicators ($p > 0.05$).

Results

Initial indicators of students' psycho-emotional state

The initial testing made it possible to outline the basic psycho-emotional profile of students with different levels of physical activity and to determine the initial intergroup differences before the start of the training influence. Based on the results of the first measurement, a comparative analysis of affective and mood indicators in three groups was carried out, which allows to identify general trends in emotional stability, mobilisation resources and the intensity of negative emotional manifestations. The summarised mean values and standard deviations were presented in Table 2, which provided further opportunity to track the dynamics and compare the reactions of students during the 12-week training period.

Table 2. Initial indicators of the psycho-emotional state of students according to PANAS and BRUMS ($M \pm SD$)

Indicator	Low activity ($n = 28$)	Medium activity ($n = 29$)	High activity ($n = 27$)
PANAS			
Positive affect	22.8 ± 6.4	28.6 ± 5.9	33.4 ± 6.2
Negative affect	31.7 ± 7.1	25.9 ± 6.3	20.8 ± 5.4
BRUMS (T-scores)			
Tension	63.2 ± 8.1	54.6 ± 7.3	48.9 ± 6.8
Depression	59.1 ± 7.4	51.3 ± 6.6	45.8 ± 6.2
Anger	56.4 ± 7.2	49.8 ± 6.5	44.7 ± 6.0
Fatigue	61.4 ± 7.9	52.7 ± 6.9	46.1 ± 6.5
Confusion	58.7 ± 7.5	50.2 ± 6.4	45.7 ± 6.1
Vigour	41.5 ± 6.8	50.8 ± 7.1	58.4 ± 7.6

Note: T-scores – standardised values; $M \pm SD$ – mean value and standard deviation

Source: compiled by the authors

The results showed clearly structured differences in the psycho-emotional state of students with different levels of physical activity, which already at the initial stage creates unequal conditions for their adaptation to further training loads. According to the PANAS scale, students with low activity levels had the lowest positive affect scores (22.8 ± 6.4), indicating reduced vigour, motivational engagement, and overall emotional tone. Such indicators are characteristic of

states of emotional fatigue, loss of interest, and insufficient readiness for activity, which is often observed in students with a sedentary lifestyle. Conversely, in the high activity group, positive affect was maximal (33.4 ± 6.2), indicating higher initiative, emotional uplift, and a predominance of adaptive emotions. At the same time, negative affect showed the opposite dynamic: students with low activity had the highest level (31.7 ± 7.1), while in the high activity

group this indicator was the lowest (20.8 ± 5.4). This correlation means that inactive students experienced more anxiety, internal tension, and emotional instability. This is due to the imbalance between intellectual loads and a lack of physical activity, which is typical for an educational environment. In contrast, active students had a more stable emotional background, indicating higher adaptive reserves and a natural ability to counteract stressors.

Analysis of the BRUMS scale provided a more detailed picture of the structure of emotional states. Indicators of tension, depression, anger, fatigue, and confusion in the low-activity group exceeded the normative range (63.2 – 58.7 T -scores). This indicates emotional exhaustion, mental strain, and impaired stress regulation. Increased fatigue (61.4 ± 7.9) combined with decreased vigour (41.5 ± 6.8) demonstrated the dominance of asthenic states characteristic of students with a sedentary lifestyle and low overall physical fitness. In the medium activity group, the indicators were within the normal range (mainly 49 – 54 T -points), which indicates a balanced emotional state without significant disturbances. These students demonstrated a relatively stable mood and an medium level of vigour (50.8 ± 7.1), which corresponds to medium physical activity, capable of partially compensating for the effects of academic stress. Students with high activity had the most favourable profile: indicators of depression, anger and confusion were below average normative values (44.7 – 45.8 T -scores), indicating emotional stability and a low level of negative experiences. Fatigue and tension were within the lower norm, and the vigour indicator was the highest among all groups (58.4 ± 7.6). This corresponds to the optimal functional state of the nervous system and high mobilisation readiness.

A comparison of the three groups showed a clear gradient dependence: the lower the motor activity, the worse

the psycho-emotional state, and vice versa – high activity was associated with optimal emotional characteristics. Such differences are of important functional significance. Students with low activity entered the experimental period with higher emotional vulnerability and lower stress resistance, which limits their ability to adapt to physical activity. In contrast, students with high activity demonstrated psychological readiness for the training process and greater potential for positive change. The data obtained confirm that physical activity is a significant moderator of the psycho-emotional state of students. It affects not only the general emotional background, but also individual structural components: energy level, severity of asthenic states, emotional stability, and the ability to maintain balanced affective reactions. Thus, the initial differences between the groups determined different initial sensitivity to the training effect and created the basis for further analysis of the dynamics during the twelve-week cycle.

Changes in psycho-emotional indicators in the sixth week of the study

An interim measurement conducted in the sixth week of the training cycle allowed to record the early emotional and psychophysiological reactions of students to systematic physical activity and to assess the rate of adaptive changes in three groups with different initial levels of physical activity. Analysis of the obtained values showed stable positive dynamics in all groups, but the degree and speed of change varied, indicating that emotional responses depend on previous training and the development of regulatory mechanisms. The results presented in Table 3 demonstrate the intermediate values of affective and mood components within PANAS and BRUMS, which allows to identify the first signs of adaptive processes and compare them with the initial data.

Table 3. Interim indicators of students' psycho-emotional state ($M \pm SD$)

Indicator	Low activity ($n = 28$)	Medium activity ($n = 29$)	High activity ($n = 27$)
PANAS			
Positive affect	24.5 ± 6.2	31.2 ± 5.8	36.8 ± 6.1
Negative affect	29.8 ± 6.9	23.4 ± 6.1	18.1 ± 5.0
BRUMS (T -scores)			
Tension	60.1 ± 8.1	51.2 ± 7.1	46.0 ± 6.5
Depression	56.0 ± 7.4	48.9 ± 6.4	43.0 ± 6.0
Anger	54.1 ± 7.1	47.3 ± 6.3	42.8 ± 6.0
Fatigue	58.3 ± 7.8	49.5 ± 6.6	44.9 ± 6.3
Confusion	55.9 ± 7.4	47.8 ± 6.2	43.5 ± 6.0
Vigour	44.0 ± 6.7	53.2 ± 7.0	60.5 ± 7.5

Note: T -scores – standardised values; $M \pm SD$ – mean value and standard deviation

Source: compiled by the authors

The interim results demonstrate systematic changes in psycho-emotional parameters that characterise the early stages of students' adaptation to organised physical activity. Comparison of the three groups made it possible to determine not only the direction of changes but also their intensity and stability depending on the initial level of physical activity, which is important for further interpretation of the effectiveness of the developed programme. In the low physical activity group, positive affect increased from 22.8 to 24.5 points, indicating the initial formation of an emotional-energetic uplift under the influence of training load. However,

these values remained at the lower boundary of the range, confirming slower emotional adaptation. The reduction in negative affect from 31.7 to 29.8 points indicates a moderate decrease in anxiety and emotional tension, yet its level remained significantly higher than in the other two groups. This dynamic is consistent with the baseline emotional instability of this category of students and their lower stress resistance.

Analysis of the BRUMS indicators also demonstrates characteristic early improvements, although the trends remain limited. Tension decreased from 63.2 to 60.1 T -scores, depression from 59.1 to 56.0 T -scores, while anger, fatigue

and confusion changed within 2-3 *T*-scores. Importantly, these indicators still remained above the normative zone, indicating incomplete adaptation. Vigour increased from 41.5 to 44.0 *T*-scores but remained below average values. Thus, this group demonstrates only a primary phase of normalisation of emotional responses, typical of poorly trained individuals experiencing initial load-related stress. In the medium activity group, the training effect was more pronounced. Positive affect increased from 28.6 to 31.2 points, reflecting activation of the motivational-energetic sphere, while negative affect decreased from 25.9 to 23.4 points. These changes indicate optimal adaptive mechanisms formed against the background of a moderate level of fitness. The BRUMS indicators show more structured positive shifts: tension decreased to 51.2 *T*-scores, depression to 48.9 *T*-scores, and all other indicators fell below 50 *T*-scores, which already corresponds to the conditional normative zone. Vigour increased to 53.2 *T*-scores, indicating the formation of adaptive emotional uplift. This dynamic reflects mid-term stabilisation of emotional components and the emergence of stable compensatory responses. In the high activity group, the most intensive positive dynamics were observed. The positive affect score increased from 33.4 to 36.8 points, while negative affect decreased to 18.1 points, the lowest among all groups. This indicates a high level of emotional regulation characteristic of students with a good level of physical fitness. BRUMS values demonstrate normalisation and even optimisation of the mood profile: tension decreased to 46.0 *T*-scores, depression to 43.0 *T*-scores, while anger and confusion stabilised at around 43 *T*-scores. Vigour increased to 60.5 *T*-scores, indicating a high level of psychophysiological activation and a pronounced adaptive effect.

Comparative analysis of the three groups clearly demonstrates the dependence of the rate and magnitude of changes on the initial level of physical activity. The slowest and least structured changes are characteristic of sedentary students, which corresponds to the concept of lower adaptive reserve capacity. The medium activity group approached normative indicators by the sixth week, confirming the effectiveness of moderate training experience. The highest activity level ensured the most harmonious and stable profile of positive changes, indicating the advantages of a systematic motor regime and well-formed physical and psycho-emotional resilience. Thus, the interim results demonstrate a clearly expressed positive training effect that is already formed by the sixth week but varies in intensity depending on the initial level of physical activity.

Final indicators of psycho-emotional state after 12 weeks of training

Final testing conducted after the training intervention allowed for a comprehensive assessment of the depth of adaptive changes in students with different levels of physical activity and determined the stability of the psycho-emotional effects of physical exercise. A comparison of the final and initial indicators showed a systematic improvement in emotional and mood parameters in all three groups, but the nature and intensity of this improvement remained significantly differentiated. The most pronounced positive changes were observed in students with medium and high levels of activity, while individuals with low physical activity demonstrated a slower but consistent trajectory of emotional process stabilisation. The final values are presented in Table 4.

Table 4. Final psycho-emotional indicators of students depending on the level of physical activity ($M \pm SD$)

Indicator	Low activity ($n = 28$)	Medium activity ($n = 29$)	High activity ($n = 27$)
PANAS			
Positive affect	27.1 $\pm$ 6.0	34.9 $\pm$ 5.6	40.2 $\pm$ 5.8
Negative affect	26.4 $\pm$ 6.5	20.1 $\pm$ 5.7	15.7 $\pm$ 4.9
BRUMS (<i>T</i> -scores)			
Tension	55.4 $\pm$ 7.9	45.8 $\pm$ 6.8	41.2 $\pm$ 6.2
Depression	52.8 $\pm$ 7.1	43.7 $\pm$ 6.1	39.0 $\pm$ 5.8
Anger	50.3 $\pm$ 7.0	44.8 $\pm$ 6.0	40.5 $\pm$ 5.9
Fatigue	52.9 $\pm$ 7.6	45.1 $\pm$ 6.4	40.3 $\pm$ 5.8
Confusion	51.4 $\pm$ 7.2	44.6 $\pm$ 6.1	40.7 $\pm$ 5.8
Vigour	48.7 $\pm$ 6.6	57.1 $\pm$ 7.2	65.3 $\pm$ 7.4

Note: *T*-scores – standardised values; $M \pm SD$ – mean value and standard deviation

Source: compiled by the authors

Comparison of the three groups showed that in the low activity group positive affect was 27.1 points, indicating a medium level of emotional activation that was lower than in students with medium and high activity levels. Negative affect in this group remained at 26.4 points, which was the highest among all groups. This suggests that even after the training intervention, emotional and stress-related reactions in physically inactive students remained pronounced. The BRUMS profile further confirms this observation: tension, depression, anger, fatigue and confusion were maintained within the range of 50-55 *T*-scores, reflecting only partial normalisation of the emotional state. Vigour, at 48.7

T-scores, although increased, remained below the average norm, demonstrating limited psychophysiological resources and insufficient mobilisation capacity of the nervous system. Students with medium activity demonstrated a more balanced psycho-emotional profile. Positive affect at 34.9 points approached optimal values, while negative affect decreased to 20.1 points, reflecting a more effective reduction in emotional tension. BRUMS indicators in this group were characterised by a shift of most values into the normative zone: tension, depression, anger and confusion were within the range of 43-46 *T*-scores. Particularly notable were fatigue (45.1 *T*-scores) and vigour (57.1 *T*-scores), indicating

optimal recovery processes and a sufficient level of internal motivation and activity. This configuration of results reflects a formed adaptive type of emotional response typical of individuals with moderate training status.

The high activity group demonstrated the most structured and optimised profile. Positive affect reached 40.2 points – the highest value among all groups – indicating the dominance of emotions associated with energy, interest and inspiration. Negative affect was only 15.7 points, reflecting a minimal level of anxiety and emotional tension. BRUMS indicators confirm this pronounced adaptive pattern: tension, depression, anger, fatigue and confusion were maintained within the range of 39–42 *T*-scores, corresponding to a low level of negative emotional responding and high stress resistance. The most indicative value was vigour (65.3 *T*-scores), which was significantly higher than in the other groups and reflects maximal mobilisation of psychophysiological resources and a high degree of emotional regulation. For a clearer interpretation of the dynamics of affective changes during the twelve-week training intervention, a separate diagram was constructed to illustrate trends in positive and negative affect in groups with different levels of physical activity. The graph demonstrates stepwise changes across three measurement points (T1, T2, T3) and allows comparison of the rate and direction of affective shifts depending on students' baseline training status (Fig. 1).

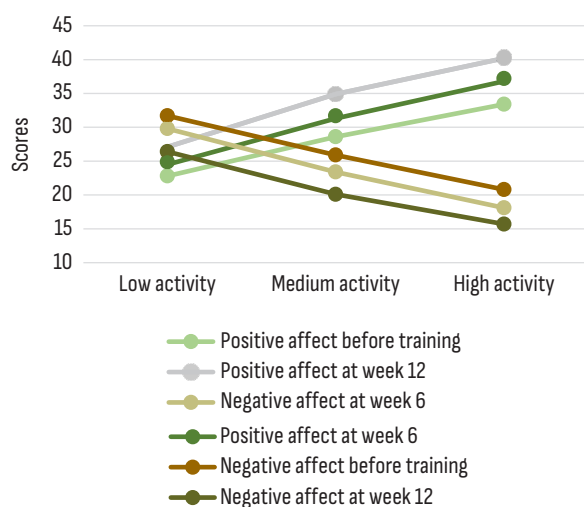


Figure 1. Dynamics of positive and negative affects in three groups during the experiment

Source: compiled by the authors based on data obtained in the study

To clearly demonstrate the dynamics of emotional components on the BRUMS scale, three analytical graphs were constructed, reflecting the key directions of psycho-emotional changes in students with different levels of physical activity at three stages of measurement. The selection of pairs of indicators was made taking into account their functional content: emotional distress (tension and depression), reactivity and vigour depletion (anger and fatigue), as well as cognitive-emotional disorientation and mobilisation resources (confusion and vigour). The set of graphic materials is presented in Figure 2.

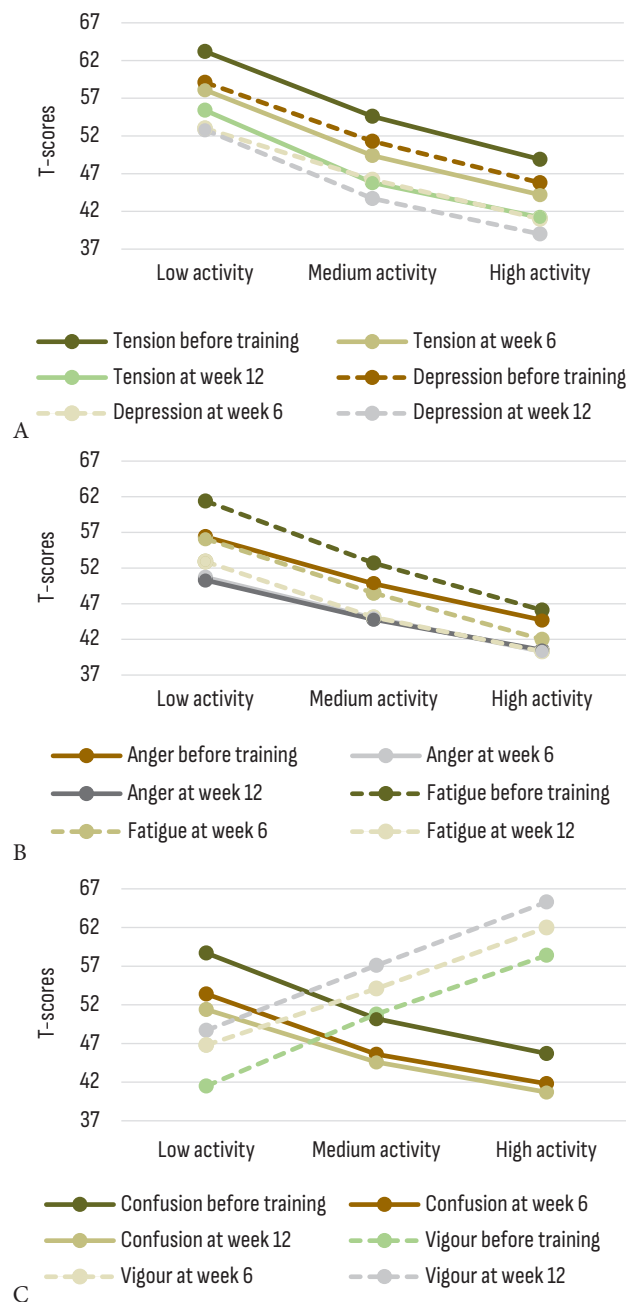


Figure 2. Dynamics of BRUMS emotional indicators by activity levels

Note: A – tension and depression; B – anger and fatigue; C – confusion and vigour

Source: compiled by the authors based on data obtained in the study

Comparing the results of all the graphs, which cover both positive and negative affect indicators on the PANAS scale and the dynamics of emotional components on the BRUMS scale, makes it possible to form a comprehensive picture of the psycho-emotional changes in students over the 12 weeks of the training intervention. All groups showed an increase in positive affect and a decrease in negative affect, as well as a gradual decrease in the intensity of tension, depression, anger, fatigue, and confusion, along with an increase in vigour. These trends indicate the

systemic impact of physical exercise on the emotional sphere and improved psychophysiological regulation.

Intergroup comparisons revealed significant differentiation in the depth of positive changes. Students with low levels of physical activity retained the most tense and unstable emotional profile, despite gradual positive changes; their indicators remained closer to the upper limit of the norm or slightly exceeded it. The medium activity group showed clearly balanced and close to optimal values, indicating a sufficient level of adaptation and the formation of more effective emotional regulatory mechanisms. The most harmonious and resourceful profile was formed in the high activity group, which is characterised by the lowest values of negative emotional components, the highest levels of energy and a consistently high positive affect. The overall picture shows that the structural differences between the groups reflect not only different initial levels of physical activity, but also varying degrees of development of psycho-emotional regulation mechanisms. This allows to conclude that regular physical exercise is an important modulating factor of emotional stability and psychophysiological balance, ensuring better adaptation of students to prolonged academic and physical stress.

Generalised effects of regular physical exercise on the psycho-emotional state of students

Summarising the results of the three measurement stages allows to trace a complete picture of the impact of systematic physical exercise on the psycho-emotional state of students. The data obtained indicate that a structured training load integrated into the educational process causes consistent positive changes in the affective sphere, regardless of the initial level of motor activity. This effect confirms the significant role of physical education as a pedagogical tool aimed at reducing emotional tension, increasing the level of subjective activity and strengthening the stress resistance of students. An integrated analysis of PANAS and BRUMS indicators confirms the general direction of emotional shifts: there was a gradual increase in positive affect, a decrease in the intensity of negative affect, and a normalisation of key emotional components associated with psychophysiological stress. Indicators such as tension, fatigue, depression, and vigour, which most closely reflect the adaptation of the nervous system to physical activity, proved to be particularly sensitive to the training effect. The reduction in manifestations of nervous and emotional exhaustion and the increase in energy indicate the formation of a positive functional state, which is one of the key goals of the academic discipline "Physical Education".

It is also important to conduct a comparative analysis of students with different levels of activity, which demonstrates the graduated nature of the adaptation effect. Individuals with low physical activity showed gradual but less intense improvement, which indirectly confirms a lower level of initial physical fitness and more limited adaptation reserves. Participants with an average level of activity showed the most harmonious normalisation of emotional components, which manifested itself through the stabilisation of mood indicators and a significant reduction in distress. Students with high activity levels were characterised by the most optimal emotional profile, reflecting the stable formation of emotional regulation mechanisms associated

with systematic involvement in physical culture and sports exercises. A comparison of the groups in terms of dynamics allows to identify a key trend: the higher the level of regular physical activity, the faster emotional processes stabilise and the more clearly the resource type of emotional response is formed. This pattern is consistent with sports psychology models that interpret physical activity as a factor in enhancing serotonergic reactivity, activating dopaminergic pathways of motivation, and normalising vegetative balance (Chen & Nakagawa, 2023). The stabilisation of these mechanisms contributes to improved mood, reduced periods of emotional exhaustion, and faster recovery from academic stress.

Systematic training programmes based on a combination of aerobic, strength and recovery exercises have been shown to not only reduce the manifestations of psycho-emotional distress, but also to form lasting adaptive changes that remain pronounced after the completion of a twelve-week cycle. This provides grounds for including regular medium-intensity training modules as mandatory components of physical education in higher education institutions, emphasising the importance of gradually involving sedentary students. Thus, a generalised analysis of the effects of training intervention proves that systematic physical education classes are an effective means of improving the psycho-emotional state of students and create conditions for increasing their emotional stability, adaptability and overall psychophysiological well-being throughout the academic year.

Discussion

The results demonstrate consistent positive changes in the psycho-emotional state of students under the influence of training intervention integrated into the structure of physical education. All groups showed an increase in positive affect, a decrease in negative affect, and normalisation of key emotional components according to PANAS and BRUMS. The most pronounced effects were observed among students with medium and high levels of physical activity, while in less active individuals the dynamics were slower and less structured. The combination of changes indicates the systemic influence of physical exercise on affective reactions, psychophysiological regulation, and resistance to academic stress.

The initial testing revealed significant intergroup differences in the structure of emotional state: students with low physical activity had the lowest level of positive affect (22.8 points) and the highest negative affect (31.7 points), while physically active individuals had the most favourable emotional profiles. The consistency of these trends can be seen in the study by J. Gaia *et al.* (2022), where regular physical activity is associated with reduced tension and improved overall mood in youth. At the same time, this study showed that sedentary people are more prone to fluctuations in emotional background, which is fully consistent with the results obtained. Similar patterns were demonstrated in a meta-analysis by O. Cho (2020), where physical education contributes to increased emotional competence. This is consistent with higher levels of positive affect in students with medium and high activity levels. However, the researcher also noted that the effects of physical activity are less pronounced in insufficiently trained individuals, which is consistent with the highest values of negative affect in the inactive group. The results

of L. Gasiūnienė & B. Miežienė (2021), where low activity levels are accompanied by increased academic stress, confirm the increased tension and fatigue found in this study. Researchers M. Grasdalsmoen *et al.* (2020) also noted that students with low physical activity showed a higher risk of emotional difficulties, which confirms the vulnerability of this group at the initial stage and directly corresponds to the results obtained.

The interim results of the sixth week showed clear early changes: in students with medium and high physical activity, positive affect increased to 31.2 and 36.8 points, respectively, while negative affect decreased to 23.4 and 18.1 points. BRUMS scores for tension, fatigue, and depression also showed a gradual decline in all groups, indicating the initial phase of emotional adaptation to systematic physical activity. These trends are consistent with the findings of C. Herbert (2022), where a decrease in emotional tension and an improvement in psychophysiological well-being were recorded in the first weeks of the training programmes, confirming the accelerated adaptive nature of the changes obtained. The authors found that early emotional reactions are sensitive to the intensity of the sessions, which corresponds to more pronounced changes in the high-activity group. The results of R. Jiang *et al.* (2021) showed that during the first month of training, fatigue, disorganisation and psychophysiological tension decreased – indicators that also decreased in this study. The partial increase in positive affect and decrease in negative affect is consistent with the proposition that early emotional shifts are shaped by increased self-efficacy, as shown in L. Li *et al.* (2024). The study found that it is the increase in the sense of control over physical activity that serves as a key mediator of the initial reduction in emotional tension, which is fully consistent with the dynamics observed in students of medium and high activity levels. The regular decrease in negative emotional modalities is consistent with the model of gradual emotional adaptation described by Y. Lu & B. Wang (2024), which emphasised that the first weeks of training intervention are characterised by the dominance of processes of reducing stress sensitivity. The authors demonstrated that at this stage, it is the reduction of distress that precedes the formation of a stable positive emotional background, which fully coincides with the interim results obtained.

The final results of the intervention showed the most pronounced positive dynamics: in the high activity group, positive affect increased to 40.2 points, while negative affect decreased to 15.7 points. BRUMS indicators showed a steady decrease in tension (to 41.2-55.4 T-points), fatigue (to 40.3-52.9 T-points) and depression (to 39.0-52.8 T-points) in all groups, but the most optimised emotional profile was formed in physically active students. The results are consistent with the conclusions of A. Martinez *et al.* (2024), where prolonged engagement in physical activity contributes to improved emotional regulation and reduced risk of negative mood reactions. The study also emphasised that lasting emotional changes are formed only with regular exercise, which fully corresponds to the final indicators in the high activity group. The differences between active and sedentary students identified in this study coincide with the results of T. McGuine *et al.* (2021), where athletically active adolescents demonstrated better psychological

well-being during stressful periods. The authors emphasised the protective role of regular physical activity, which reduces the likelihood of anxiety and distress. This trend is fully reflected in the lowest negative affect scores among active students. The reduction in depression and emotional exhaustion is consistent with the data from A. Murray *et al.* (2022), where physical activity shows the ability to stabilise the emotional state in students with high stress levels. The researchers noted that the effects increased gradually, which corresponds to the most significant changes in the final stage of the study. The overall configuration of the final indicators is consistent with the results of J. Ren & H. Xiao (2023), in which prolonged physical activity is associated with the normalisation of neurobiological mechanisms of mood regulation. The researchers emphasised that it is the duration of the intervention that determines the depth of positive emotional changes, which directly corresponds to the pronounced effect in the medium and high activity groups.

The results of the study indicate a stable positive dynamic of the psycho-emotional state over 12 weeks: in all groups, the indicators of negative emotional modalities BRUMS gradually decreased, while energy and positive affect increased. The most pronounced changes were observed in students with high physical activity, confirming the leading role of systematic sports-oriented physical exercises in the formation of sustainable adaptive effects. The patterns identified are consistent with the data of C. Chen & S. Nakagawa (2023), who showed that prolonged physical activity activates neurobiological mechanisms of resilience and normalises emotional responses through the regulation of serotonergic and dopaminergic pathways. This corresponds to a significant reduction in depression and tension in students with high physical activity. The findings are also consistent with those of M. Monserrat-Hernández *et al.* (2023), who found that regular physical activity reduces academic stress and stabilises mood in young people, which correlates with a reduction in fatigue and confusion in all groups. There is a partial coincidence with the findings of I. Ullah *et al.* (2023), who showed that increased physical activity is associated with a reduction in anxiety symptoms and improved emotional states, although the authors emphasised slower dynamics in sedentary individuals, which is consistent with the moderate changes in the low-activity group. At the same time, the results of J. Magallón & P. Catalán (2024) partially disagree with this study, as the authors found that sedentary behaviour can negate the positive effects of training, whereas in this study, even inactive participants showed positive dynamics.

The final analysis emphasised that systematic physical exercise and sports-oriented training programmes contribute to the formation of stable emotional regulatory mechanisms, which manifests itself in a marked increase in positive affect, a decrease in negative emotional modalities, and increased energy at the end of the intervention. This combination of emotional effects indicates the key role of the intensity and regularity of physical activity in the formation of holistic psychophysiological adaptation in students. The results obtained are consistent with the conclusions of M. Bigliassi *et al.* (2024), where it was found that an increase in tolerance to physical activity is accompanied by a decrease in psychophysiological reactivity and stabilisation

of the emotional state during stress. This corresponds to the reduction in tension and fatigue observed in all groups. The study by K. Wang *et al.* (2020) emphasised that physical activity increases students' emotional intelligence and self-efficacy, and these factors act as mediators of improved emotional stability, which is consistent with the observed increase in positive affect and energy in physically active participants. The findings of E.M. Wiedenman *et al.* (2024) also confirmed that participation in sports programmes enhances psychological resilience and the satisfaction of basic needs, which correlates with the most optimised emotional profile in highly active students. Partial correspondence was demonstrated by the results of G.H. Zieff *et al.* (2024), where aerobic exercise contributes to stress reduction in young people with high levels of tension. In this study, similar effects were pronounced but had a broader coverage of emotional components.

A summary of the discussion results showed that regular physical activity is an effective means of stabilising the psycho-emotional state of students, contributing to a reduction in negative emotional manifestations and an increase in vigour and positive affect. The most pronounced adaptive changes were observed in students with medium and high levels of activity, which emphasises the importance of regular physical exercise for maintaining emotional balance. The patterns obtained are consistent with data from other studies, which indicates the universality of the positive impact of physical exercise on the psycho-emotional stability of youth.

Conclusions

Initial testing confirmed clear intergroup differences in the psycho-emotional state of students depending on their level of physical activity. Students with low activity demonstrated the lowest positive affect (22.8 points) and the highest negative affect (31.7 points), as well as increased levels of tension, depression and fatigue within the range of 58-63 *T*-points. In the medium activity group, the values were close to normal, while physically active students had the most optimal profile – high positive affect (33.4 points), low negative affect (20.8 points) and the lowest indicators of negative emotional components of BRUMS, which remained stable at the lower limit of the normative zone (tension – 48.9, depression – 45.8, anger – 44.7, fatigue – 46.1, confusion – 45.7 *T*-points). The data obtained indicate that the initial level of motor activity determines emotional stability and initial adaptability before training intervention.

In the sixth week, a systematic positive dynamic was recorded in all groups, but its severity depended on the initial activity. In low-activity students, positive affect increased from 22.8 to 24.5 points, and negative affect decreased from

31.7 to 29.8 points, reflecting only the initial phase of adaptation. In the medium activity group, these changes were more significant: positive affect increased to 31.2 points, negative affect decreased to 23.4 points, and most BRUMS indicators approached normal. The most intense dynamics were observed in highly active students, where positive affect increased to 36.8 points and negative affect decreased to 18.1 points, accompanied by a marked decrease in negative emotional components of BRUMS to a level close to the norm. The results show that early emotional changes directly depend on the level of training, and adaptation mechanisms are more active in better-prepared participants.

The final measurements showed the most significant improvement in emotional indicators and the completion of the formation of an adaptive emotional profile. In low-activity students, positive affect increased to 27.1 points, negative affect decreased to 26.4 points, and BRUMS indicators decreased to 50-55 *T*-points, indicating a partial normalisation of the condition. In the medium activity group, positive affect reached 34.9 points, negative affect decreased to 20.1 points, and all mood indicators entered the normal range (43-46 *T*-points). The most favourable profile was found in the highly active group: positive affect was 40.2 points, negative affect was only 15.7 points, while tension, depression, anger and fatigue decreased to 39-42 *T*-points, and vigour reached a maximum of 65.3 *T*-points. This emphasises that long-term training intervention has a pronounced adaptive effect, especially in students with high physical activity. The overall trajectory of change indicates that regular exercise integrated into the learning process normalises emotional responses, reduces distress and forms an optimal functional state of the nervous system. Thus, physical culture is an effective means of ensuring psycho-emotional stability throughout the academic year. A limitation of the study was that it covered only one type of organised physical activity (a set of moderate-intensity aerobic and general physical exercises), while other forms (dancing, swimming, sports games) could cause different dynamics of emotional changes. A promising direction for future research would be to compare the effectiveness of different types of physical activity for optimising the psycho-emotional state of students.

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Conflict of Interest

None.

References

- [1] Bejtka, M., Kozina, Z., Boychuk, Y., Garmash, I., Tamozhanska, G., Kovieria, V., & Lysenko, V. (2022). Sports activities and professional specialty influence on psychophysiological functions and orthostatic reactions indicators of pedagogical universities students. *Health, Sport, Rehabilitation*, 8(3), 8-26. doi: 10.34142/HSR.2022.08.03.01.
- [2] Bigliassi, M., Antonio, D S., Celoch, K., & Krause, M.P. (2024). Examining the relationship between subjective exercise tolerance and psychophysiological reactivity during physical stress. *Psychophysiology*, 61(12), article number e14680. doi: 10.1111/psyp.14680.
- [3] Byshevets, N., Andrieieva, O., Pasichniak, L., Honcharova, N., Yarmak, O., Zakharina, Y., & Blystiv, T. (2024). Evaluation of emotional disorder risk in students with low physical activity levels under stressful conditions. *Journal of Physical Education and Sport*, 24(4), 894-904. doi: 10.7752/jpes.2024.04102.

- [4] Chen, C., & Nakagawa, S. (2023). Recent advances in the study of the neurobiological mechanisms behind the effects of physical activity on mood, resilience and emotional disorders. *Advances in Clinical and Experimental Medicine*, 32(9), 937-942. doi: [10.17219/acem/171565](https://doi.org/10.17219/acem/171565).
- [5] Cho, O. (2020). Impact of physical education on changes in students' emotional competence: A meta-analysis. *International Journal of Sports Medicine*, 41(14), 985-993. doi: [10.1055/a-1192-5812](https://doi.org/10.1055/a-1192-5812).
- [6] European Union. (2022). *Special Eurobarometer: Sport and physical activity*. Retrieved from <https://europa.eu/eurobarometer/surveys/detail/2668>.
- [7] Gaia, J.W.P., Ferreira, R.W., & Pires, D.A. (2022). Effects of physical activity on the mood states of young students. *Journal of Physical Education*, 32, article number e3233. doi: [10.4025/jphyseduc.v32i1.3233](https://doi.org/10.4025/jphyseduc.v32i1.3233).
- [8] Gasiūnienė, L., & Miežienė, B. (2021). The relationship between students' physical activity and academic stress. *Baltic Journal of Sport and Health Sciences*, 4(123), 4-12. doi: [10.33607/bjshs.v4i123.1142](https://doi.org/10.33607/bjshs.v4i123.1142).
- [9] Grasdalsmoen, M., Eriksen, H.R., Lønning, K.J., & Sivertsen, B. (2020). Physical exercise, mental health problems, and suicide attempts in university students. *BMC Psychiatry*, 20, article number 175. doi: [10.1186/s12888-020-02583-3](https://doi.org/10.1186/s12888-020-02583-3).
- [10] Herbert, C. (2022). Enhancing mental health, well-being and active lifestyles of university students by means of physical activity and exercise research programs. *Frontiers in Public Health*, 10, article number 849093. doi: [10.3389/fpubh.2022.849093](https://doi.org/10.3389/fpubh.2022.849093).
- [11] Herbert, C., Meixner, F., Wiebking, C., & Gilg, V. (2020). Regular physical activity, short-term exercise, mental health, and well-being among university students: The results of an online and a laboratory study. *Frontiers in Psychology*, 11, article number 509. doi: [10.3389/fpsyg.2020.00509](https://doi.org/10.3389/fpsyg.2020.00509).
- [12] Huang, X., Wang, Y., & Zhang, H. (2023). Effects of physical exercise intervention on depressive and anxious moods of college students: A meta-analysis of randomized controlled trials. *Asian Journal of Sport and Exercise Psychology*, 3(3), 206-221. doi: [10.1016/j.ajsep.2023.01.001](https://doi.org/10.1016/j.ajsep.2023.01.001).
- [13] ICC/ESOMAR. (2016). *International code on market, opinion and social research and data analytics*. Retrieved from <https://surl.it/eainno>.
- [14] Jiang, L., Cao, Y., Ni, S., Chen, X., Shen, M., Lv, H., & Hu, J. (2020). Association of sedentary behavior with anxiety, depression, and suicide ideation in college students. *Frontiers in psychiatry*, 11, article number 566098. doi: [10.3389/fpsyg.2020.566098](https://doi.org/10.3389/fpsyg.2020.566098).
- [15] Jiang, R., Xie, C., Shi, J., Mao, X., Huang, Q., Meng, F., Ji, Z., Li, A., & Zhang, C. (2021). Comparison of physical fitness and mental health status among school-age children with different sport-specific training frequencies. *PeerJ*, 9, article number e10842. <https://peerj.com/articles/10842/>.
- [16] Kalashchenko, S., Lutsak, O., Hrynzovskiy, A., Kovalchuk, O., Martynenko, S., & Kondratiuk, M. (2021). Assessment level of physical activity and psycho-emotional health status of the Bogomolets National Medical University students under conditions of distance learning organization. *Ukrainian Scientific Medical Youth Journal*, 4(127), 116-123. doi: [10.32345/USMJ.127\(4\).2021.116-123](https://doi.org/10.32345/USMJ.127(4).2021.116-123).
- [17] Korobeinikova, L., Raab, M., Korobeynikov, G., Pryimakov, O., Kerimov, F., Chernozub, A., Korobeinikova, I., & Goncharova, O. (2024). Comparative analysis of psychophysiological state among in physical active and sedentary persons. *Journal of Physical Education and Sport*, 24(2), 382-389. doi: [10.7752/jpes.2024.02046](https://doi.org/10.7752/jpes.2024.02046).
- [18] Li, B., et al. (2022). Epidemiological study of physical activity, negative moods, and their correlations among college students. *International Journal of Environmental Research and Public Health*, 19(18), article number 11748. doi: [10.3390/ijerph191811748](https://doi.org/10.3390/ijerph191811748).
- [19] Li, L., Xu, L., & Zhu, Y. (2024). Examining how exercise influences the mental health of college students: The role of a mediating effect model. *Journal of the Knowledge Economy*, 15, 18721-18738. doi: [10.1007/s13132-024-01776-5](https://doi.org/10.1007/s13132-024-01776-5).
- [20] Lu, Y., & Wang, B. (2024). Physical exercise and emotional management college students. *3c Empresa: Investigación y Pensamiento Crítico*, 13(1), 120-137. doi: [10.17993/3cemp.2024.130153.120-136](https://doi.org/10.17993/3cemp.2024.130153.120-136).
- [21] Magallón, J., & Catalán, P. (2024). [Sedentary behaviour in college students and its influence on heart rate and mental health](https://doi.org/10.3390/ijerph191811748). *European Journal of Human Movement*, 52, 172-189.
- [22] Martinez, A.G., Gietzen, L., & McDaniel, V.F. (2024). Exploring the role of physical activity influencing emotional regulation and mental health in adolescents. *Pacific Journal of Health*, 7(1), article number 1. doi: [10.56031/2576-215X.1046](https://doi.org/10.56031/2576-215X.1046).
- [23] McGuine, T.A., Biese, K.M., Petrovska, L., Hetzel, S.J., Reardon, C., Kliethermes, S., Bell, D.R., Brooks, A., & Watson, A.M. (2021). Mental health, physical activity, and quality of life of US adolescent athletes during COVID-19-related school closures and sport cancellations: A study of 13 000 athletes. *Journal of Athletic Training*, 56(1), 11-19. doi: [10.4085/1062-6050-0478.20](https://doi.org/10.4085/1062-6050-0478.20).
- [24] Monserrat-Hernández, M., Checa-Olmos, J.C., Arjona-Garrido, Á., López-Liria, R., & Rocamora-Pérez, P. (2023). Academic stress in university students: The role of physical exercise and nutrition. *Healthcare*, 11(17), article number 2401. doi: [10.3390/healthcare11172401](https://doi.org/10.3390/healthcare11172401).
- [25] Murray, A., Marenus, M., Cahuas, A., Friedman, K., Ottensoser, H., Kumaravel, V., Sanowski, J., & Chen, W. (2022). The impact of web-based physical activity interventions on depression and anxiety among college students: Randomized experimental trial. *JMIR Formative Research*, 6(4), article number e31839. doi: [10.2196/31839](https://doi.org/10.2196/31839).
- [26] Ren, J., & Xiao, H. (2023). Exercise for mental well-being: Exploring neurobiological advances and intervention effects in depression. *Life*, 13(7), article number 1505. doi: [10.3390/life13071505](https://doi.org/10.3390/life13071505).

- [27] Rogowska, A.M., Pavlova, I., Kuśnierz, C., Ochnik, D., Bodnar, I., & Petrytsa, P. (2020). Does physical activity matter for the mental health of university students during the COVID-19 pandemic? *Journal of Clinical Medicine*, 9(11), article number 3494. [doi: 10.3390/jcm9113494](https://doi.org/10.3390/jcm9113494).
- [28] San Román-Mata, S., Puertas-Molero, P., Ubago-Jiménez, J.L., & González-Valero, G. (2020). Benefits of physical activity and its associations with resilience, emotional intelligence, and psychological distress in university students from southern Spain. *International Journal of Environmental Research and Public Health*, 17(12), article number 4474. [doi: 10.3390/ijerph17124474](https://doi.org/10.3390/ijerph17124474).
- [29] Terry, P.C., Lane, A.M., Lane, H.J., & Keohane, L. (1999). Development and validation of a mood measure for adolescents. *Journal of Sports Sciences*, 17(11), 861-872. [doi: 10.1080/026404199365425](https://doi.org/10.1080/026404199365425).
- [30] Ullah, I., Ullah, M., & Ullah, H. (2023). Relationship of physical activity with anxiety and mood states: A case study of health and physical education students. *Journal of Asian Development Studies*, 12(3), 1020-1037. [doi: 10.62345/jads.2023.12.3.80](https://doi.org/10.62345/jads.2023.12.3.80).
- [31] Wang, K., Yang, Y., Zhang, T., Ouyang, Y., Liu, B., & Luo, J. (2020). The relationship between physical activity and emotional intelligence in college students: The mediating role of self-efficacy. *Frontiers in Psychology*, 11, article number 967. [doi: 10.3389/fpsyg.2020.00967](https://doi.org/10.3389/fpsyg.2020.00967).
- [32] Watson, D., Clark, L.A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54(6), 1063-1070. [doi: 10.1037/0022-3514.54.6.1063](https://doi.org/10.1037/0022-3514.54.6.1063).
- [33] Wiedenman, E.M., Kruse-Diehr, A.J., Bice, M.R., McDaniel, J., Wallace, J.P., & Partridge, J.A. (2024). The role of sport participation on exercise self-efficacy, psychological need satisfaction, and resilience among college freshmen. *Journal of American College Health*, 72(9), 3507-3514. [doi: 10.1080/07448481.2023.2177817](https://doi.org/10.1080/07448481.2023.2177817).
- [34] World Health Organization. (2020). *WHO guidelines on physical activity and sedentary behaviour*. Geneva: World Health Organization.
- [35] Yaroshyk, M., Malanchuk, H., & Solovei, A. (2020). Assessment of the state of emotional health of Ukrainian university student youth that is involved into different levels of physical activity. *Society. Integration. Education*, 6, 467-475. [doi: 10.17770/sie2020vol6.4867](https://doi.org/10.17770/sie2020vol6.4867).
- [36] Zhang, Z., et al. (2022). The roles of exercise tolerance and resilience in the effect of physical activity on emotional states among college students. *International Journal of Clinical and Health Psychology*, 22(3), article number 100312. [doi: 10.1016/j.ijchp.2022.100312](https://doi.org/10.1016/j.ijchp.2022.100312).
- [37] Zieff, G.H., Stoner, L., Frank, B., Gaylord, S., Battle, S., & Hackney, A.C. (2024). Aerobic exercise, mindfulness meditation, and stress-reduction in high-stress, college-based young adults: A pilot study. *Journal of American College Health*, 72(5), 1331-1335. [doi: 10.1080/07448481.2022.2076103](https://doi.org/10.1080/07448481.2022.2076103).

Вплив фізичних вправ на психоемоційний стан здобувачів під час навчального року

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Анотація. Мета дослідження – визначити вплив різних рівнів фізичної активності на психоемоційні показники студентів в умовах навчального процесу. Методологія дослідження ґрунтувалася на дванадцятитижневому емпірично-аналітичному спостереженні, проведеному на базі Ужгородського національного університету з 24 лютого до 16 травня 2025 року, у межах якого студенти проходили первинне, проміжне та підсумкове психодіагностичне обстеження за шкалами позитивного і негативного афекту та емоційного профілю настрою й виконували комплекс аеробних та загальнофізичних вправ різної інтенсивності. Протягом 12 тижнів регулярних фізичних вправ показники позитивного афекту у групі студентів з низькою активністю підвищилися з 22,8 до 27,1 бала, у студентів із середньою активністю – з 28,6 до 34,9 бала, а у високоактивної групи – з 33,4 до 40,2 бала. Одночасно відзначено послідовне зменшення негативного афекту: у малорухомих студентів – з 31,7 до 26,4 бала, у групі середньої активності – з 25,9 до 20,1 бала, у високоактивних – з 20,8 до 15,7 бала. Показники емоційних компонентів за шкалою настрою також продемонстрували виражене покращення: у групі високої активності напруженість знизилася до 41,2 бала, депресивність – до 39 бала, гнів – до 40,5 бала, а енергійність підвищилася до 65,3 бала, що стало найвищим результатом серед учасників. Дослідження підтвердило, що систематичні аеробні та загальнофізичні вправи протягом дванадцяти тижнів сприяли стійкому підвищенню позитивного ефекту, енергійності та зниженню емоційного дистресу у студентів незалежно від їхнього вихідного рівня рухової активності. Результати можуть бути використані викладачами фізичного виховання, тренерами та фахівцями зі спортивно-оздоровчих технологій для розробки ефективних програм занять, спрямованих на підтримання психоемоційної стабільності молоді в умовах навчального навантаження

Ключові слова: афективні реакції; рівень рухової активності; аеробні вправи; показники настрою; дистрес; студенти; освітній процес