

# Motivation for physical activity among university students residing in areas of military conflict in Ukraine

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## Abstract

**Background and Study Aim** Military conflicts significantly stress students in affected areas, impacting their physical well-being and motivational factors. This study aims to assess motivation levels for physical activity among university students in conflict-impacted regions of Ukraine.

**Material and Methods** The study involved 196 students from three Ukrainian universities, two in the eastern region (Kharkiv - included in the list of territories of active military operations) and one in the western part (Ivano-Frankivsk - a territory that is under constant threat of shelling). A short-form 'Physical Activity Questionnaire' (PAQ) with seven Likert scale questions was used. Statistical analysis was performed using PyCharm CE and Python libraries. Metrics like mean, standard deviation, and Cronbach's alpha coefficient for reliability were calculated. Bartlett's test of sphericity and Principal Axis Factoring were employed, with a statistical significance threshold set at  $p < 0.05$ .

**Results** The questionnaire's reliability was confirmed with a Cronbach's alpha coefficient of 0.872. Bartlett's test of sphericity indicated suitable data for factor analysis, with a Chi-Square value of 641.808 and a  $p$ -value  $< 0.05$ , affirming good construct validity. University students from the Eastern part of Ukraine show average motivation levels for physical activity of 25.0 and 27.193, respectively. University students from the Western part of Ukraine have the highest average motivation level at 29.234. This indicates stronger motivation for physical activity in the Western region. Additionally, male students showed higher average motivation scores than females.

**Conclusions** Students living in different regions of Ukraine have varying motivations for physical activity in the context of the military conflict. Students from the western part of Ukraine (an area subjected to periodic military shelling) show a higher interest in engaging in physical activities compared to students from the eastern part (a zone of active military operations).

**Keywords:** physical well-being, survey, living conditions, young people, health

## Introduction

In today's world, where military conflicts persistently affect societal dynamics, the examination of their impact on educational processes gains heightened relevance. University students residing in areas impacted by armed conflicts encounter distinct challenges, notably in sustaining regular physical activity. Comprehending the influence of military conflicts on students' motivation for physical activity is essential for devising effective strategies aimed at supporting their health and overall well-being.

Since the onset of the COVID-19 pandemic in 2020, there has been a notable restriction in students' freedom of movement and social interactions, significantly impacting their physical activity levels and overall health [1, 2]. The shift to online learning

modalities has further impeded the efficacy of students' professional training, particularly due to the reduced opportunities for practical, hands-on experiences in their education [3, 4]. Concurrently, a decline in physical fitness levels among university students has been documented, with test results indicating a more pronounced decrease in disciplines such as physical education [5, 6].

The ongoing armed conflict in Ukraine has further aggravated the already challenging situation concerning students' physical activity, health, and overall fitness [7, 8, 9]. This conflict has introduced additional complexities in the regions where students live, compelling a need for significant adjustments in the educational and professional training conditions within universities.

Recent research underscores the critical role of monitoring student motivation levels to foster increased physical activity. The 'Physical Activity Questionnaire' (PAQ) has been identified as a highly effective tool for gauging student motivation

and encouraging physical activity [10, 11, 12, 13]. Continuous monitoring through such questionnaires yields essential data on current activity levels, enabling the development of targeted strategies to boost physical activity engagement [14, 15, 16]. This methodology has gained validation across various studies, particularly in adapting and validating physical activity and lifestyle questionnaires for different cultural and demographic groups. A notable example includes the work of Adiguzel et al. [10], who adapted the Global Physical Activity Questionnaire (GPAQ) for the Turkish population, highlighting the significance of cultural considerations in physical activity assessment.

Chen et al. [15] demonstrated the effectiveness of the Paffenbarger Physical Activity Questionnaire (PPAQ) for Chinese students, showcasing its versatility in diverse educational contexts. Doyle et al. [11] established the reliability of the Arabic version of the Global Physical Activity Questionnaire (GPAQ-A), advocating for its application across various linguistic groups. Similarly, Mannocci et al. [13] evaluated the Italian version of the International Physical Activity Questionnaire for Adolescents (IPAQ A), highlighting its critical role in assessing youth physical activity. Further, Maria Cancela et al. [17] and Nascimento-Ferreira et al. [16] successfully validated the International PAQ in Spanish-speaking academic environments and its online adaptation for college students. These studies collectively emphasize the universal relevance of questionnaires in evaluating physical activity and lifestyle choices across different cultural and educational settings.

The primary objective of this research is to evaluate the levels of motivation for participating in physical activity among university students living in the areas of Ukraine affected by military conflict.

## Materials and Methods

### *Participants*

The study involved students from three universities in Ukraine (faculties of physical education): two universities are located in the Eastern part (Kharkiv - included in the list of territories of active military operations) and one in the Western part (Ivano-Frankivsk - a territory that is under constant threat of shelling). In light of these conditions, students were advised to comply with safety protocols during air raid alerts. Furthermore, they were encouraged to use the 'Alert' mobile application, designed to provide timely notifications about potential missile threats.

### *Living Conditions and Environment*

The study was conducted during a pivotal moment in Ukraine's history, coinciding with the beginning of the military conflict on February 24, 2022, and overlapping with the global COVID-19 pandemic. By

the start of the study, the duration of online learning had extended to three and a half years, profoundly affecting Ukraine's educational system. In eastern regions like Kharkiv, close to zone of active military operations, a complete transition to online learning was necessitated due to safety concerns, including frequent shelling and air raids. Conversely, in the western region, particularly in Ivano-Frankivsk, the university adopted a hybrid educational approach, blending in-person and online classes. This model provided students with the flexibility to switch to entirely remote learning in response to escalated military activities or emergencies.

### *Research Design*

In the study, the "Physical Activity Questionnaire" (PAQ) was utilized, constructed based on the Likert scale principle. The PAQ consists of 7 questions:

1. How much do you enjoy doing physical exercises? (1 - Strongly dislike, 5 - Strongly like).
2. How important is engaging in physical activity to you? (1 - Not important at all, 5 - Very important).
3. How motivated do you feel to engage in physical activity? (1 - Not motivated at all, 5 - Very motivated).
4. How strongly do you believe in your ability to achieve goals related to physical activity? (1 - Absolutely do not believe, 5 - Completely believe).
5. How much pleasure do you derive from physical exercises? (1 - Do not feel any pleasure at all, 5 - Feel a lot of pleasure).
6. How often do you experience the desire to engage in physical activity? (1 - Rarely or never, 5 - Always or almost always).
7. How well do you control your motivation for physical activity? (1 - Do not control it at all, 5 - Completely control it).

The questionnaire was administered as a Google online survey, aimed at gathering data on student preferences and attitudes towards physical activity. This survey is particularly relevant in the context of over three years of primarily online education, a shift necessitated by the COVID-19 pandemic beginning in 2020 and further influenced by the onset of military conflict in 2022. The study was conducted at the start of the academic year, in September and October 2023. Participation in the survey was anonymous, ensuring that all responses were confidential and utilized exclusively for research purposes.

The Google form collected data including pseudonym, age, height, weight, academic year, university affiliation, and 7 PAQ questions. This study evaluated the PAQ's reliability and validity. Previous standardization and testing of the PAQ were noted [10, 11]. The zone of active military operations unique context necessitated reassessing these metrics. The validation aimed to confirm the questionnaire's reliability and effectiveness

under altered conditions. This approach aligns with recommendations from various studies [18, 19, 20].

### Statistical Analysis

For statistical analysis, we used the PyCharm CE environment and various Python libraries. Cronbach's alpha assessed the questionnaire's internal consistency. Bartlett's sphericity test evaluated data suitability for factor analysis. We examined validity using Principal Axis Factoring (PAF) for factor analysis. Post-PAF, Varimax-rotated factor loadings simplified interpretation.

## Results

The results of the Cronbach's alpha test (0.872) indicated good internal consistency of the questionnaire, suggesting its reliability. The Bartlett's sphericity test results (Chi-Square Value – 641.808;  $p$ -value < 0.05) confirmed the suitability of the data for factor analysis, a necessary condition for assessing validity. The Principal Axis Factoring method was employed to examine the questionnaire's validity, with the results presented in Table 1.

**Table 1.** Principal axis factoring analysis results for Likert scale data

Factor 1	Factor 2
0.828	0.290
0.738	0.306
0.753	0.376
0.155	0.931
0.686	0.362
0.857	-0.150
0.626	0.403

Based on this data, it can be concluded that the questionnaire exhibits good construct validity: most questions strongly associate with one of two factors. However, the divergent results from the factor analysis may reflect the influence of stress and changes in perception among students in the zone of active military operations. Factor 1 is linked to general motivation and interest in physical activity, while Factor 2 relates to self-efficacy and specific goals in physical activity. This interpretation suggests that the questionnaire can reliably measure two interconnected concepts: overall motivation for physical activity and confidence in achieving related goals.”

The questionnaire analysis yielded descriptive statistics presented in Table 2. Data analysis identified common trends:

- Questions 1 and 2 averaged near 4.0, reflecting a positive participant attitude towards physical activity and its significance.
- Question 3 showed a more neutral average rating of approximately 3.67, indicating less pronounced motivation.
- Questions 4 through 7 averaged around 4.0 with

low standard deviations, suggesting a consistent and stable rating distribution leaning towards higher scores.

Table 3 displays the percentage distribution of participants' responses to the questionnaire. The data reveals several common trends. In question 1, a majority of participants rated physical activity positively (scores of 4 and 5), indicating a favorable attitude towards it. Question 2 also shows a strong inclination towards higher ratings. Responses to question 3 predominantly fall between 3 and 4, suggesting a more neutral stance on motivation for physical activity. For the remaining questions (4, 5, 6, and 7), while ratings of 3 and 4 are common, higher ratings are also notable, pointing to a balanced response distribution.

The Kendall's correlation matrix analysis, as shown in Table 4, reveals specific trends among the questionnaire's questions:

- Questions 1, 2, and 5 demonstrate a strong positive correlation, indicating a similar perception and association among them.
- Questions 3 and 7 show a high correlation, suggesting they similarly influence the investigated factor. In contrast.
- Questions 4 and 6 exhibit weaker correlations with the other questions, implying a less direct interaction.

Table 5 presents the mean response values for each university. University 3 (Ivano-Frankivsk) records the highest mean scores across all questionnaire items, particularly for questions 1, 2, and 5. This suggests a more positive attitude towards physical activity and motivation among its students. Universities 1 and 2 show similar mean scores, though lower than University 3. University 2 has slightly higher means for questions 1, 2, and 5 compared to University 1, but also exhibits a higher standard deviation for most questions, indicating a broader range of responses. Comparing data from Universities 1 and 2 with University 3, it appears that Ivano-Frankivsk students have a more positive attitude towards physical activity and motivation than those from Kharkiv. The responses from Kharkiv students, facing constant rocket attacks and proximity to conflict frontlines, may be impacted by these stressful conditions.

Table 6 compares student responses by gender, revealing differences in motivation for physical activity across universities and between genders. Male students exhibit higher average motivation scores than female students. University 3 shows higher average scores compared to Universities 1 and 2 ( $t = -4.17$ ,  $p < 0.05$ ). This suggests that the stressful conditions faced by Kharkiv students, such as proximity to the zone of active military operations and constant city shelling, may negatively impact their motivation for physical activity.

Data analysis from Table 7 highlights key trends in students' motivation for physical activity across

**Table 2.** Descriptive statistics (n=197)

Descriptive Statistics	Question1	Question2	Question3	Question4	Question5	Question6	Question7
Count	197.0	197.0	197.0	197.0	197.0	197.0	197.0
Mean	4.122	4.086	3.67	3.98	4.005	3.579	3.503
Std	0.792	0.727	0.891	0.742	0.842	0.964	0.972
Min	2.0	3.0	1.0	2.0	2.0	1.0	1.0
25th percentile	4.0	4.0	3.0	4.0	4.0	3.0	3.0
50th percentile	4.0	4.0	4.0	4.0	4.0	4.0	4.0
75th percentile	5.0	5.0	4.0	4.0	5.0	4.0	4.0
Max	5.0	5.0	5.0	5.0	5.0	5.0	5.0

**Table 3.** Distribution of students' responses to the questionnaire's questions, % (n=197)

Answers	Question1	Question2	Question3	Question4	Question5	Question6	Question7
1	0.0	0.0	1.02	0.0	0.0	1.52	2.03
2	1.02	0.0	9.14	4.06	5.08	13.71	14.72
3	22.84	22.34	27.92	16.24	19.8	25.89	27.92
4	39.09	46.7	45.69	57.36	44.67	43.15	41.62
5	37.06	30.96	16.24	22.34	30.46	15.74	13.71

**Table 4.** Kendall's correlation matrix

	Question1	Question2	Question3	Question4	Question5	Question6	Question7
Question1	1.0	0.6319	0.5944	0.3439	0.6413	0.525	0.5169
Question2	0.6319	1.0	0.596	0.3317	0.4862	0.4367	0.4605
Question3	0.5944	0.596	1.0	0.3874	0.5134	0.5063	0.5638
Question4	0.3439	0.3317	0.3874	1.0	0.3534	0.1311	0.3472
Question5	0.6413	0.4862	0.5134	0.3534	1.0	0.4538	0.4112
Question6	0.525	0.4367	0.5063	0.1311	0.4538	1.0	0.396
Question7	0.5169	0.4605	0.5638	0.3472	0.4112	0.396	1.0

**Table 5.** Mean values of responses for each question and university

University	Questions														Total	
	1		2		3		4		5		6		7		Mean	Std Dev
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev		
1	3.803	0.789	3.848	0.685	3.348	0.969	3.697	0.859	3.682	0.88	3.5	0.981	3.121	1.015	25.0	0.889
2	4.145	0.783	4.108	0.765	3.747	0.839	4.108	0.699	4.048	0.779	3.458	0.991	3.578	0.989	27.193	0.842
3	4.532	0.62	4.383	0.61	4.0	0.722	4.149	0.51	4.383	0.739	3.894	0.84	3.894	0.667	29.234	0.68
University 1 and 2	3.974	0.786	3.978	0.725	3.548	0.904	3.903	0.779	3.865	0.83	3.479	0.986	3.35	1.002	26.096	0.865

Note:  $t = -4.17$ ,  $p < 0.05$ **Table 6.** Average responses by gender (n=196)

University	Gender	Mean	Std Dev	Count	Total
1	Female	24.891	4.701	46	66
1	Male	25.25	3.768	20	
2	Female	26.536	4.289	56	83
2	Male	28.556	4.774	27	
3	Female	28.409	3.05	22	47
3	Male	29.96	3.36	25	

Note:  $t = -4.17$ ;  $p < 0.05$

different universities and times of day. A notable pattern is the increase in the average number of questions throughout the day. For instance, students from University 1 average 23.143 questions in the morning, rising to 26.519 in the evening. This suggests that motivation for physical activity may grow towards the evening. Another trend is the variation between universities. For example, the average evening score for University 1 is 26.519, compared to 29.8 for University 3. It's important to note that the average number of questions at night for University 1 is 23.0, based on only one participant's response. Therefore, this data might not accurately represent the entire student group.

Table 8's analysis reveals trends in physical activity motivation among students from three universities under varying conditions. Students from Universities 1 and 2 in Kharkiv, an area with active military operations, show average motivation scores of 25.0 and 27.193, respectively. This could

indicate reduced motivation due to the challenging conditions and ongoing shelling.

In contrast, students from University 3 in Ivano-Frankivsk, which faces periodic shelling, have the highest average score of 29.234. This suggests a possibly higher motivation level, perhaps as a reaction to intermittent threats.

It's important to note the variation in participant count across universities and conditions. University 2 has the most participants (83), while University 3 has the fewest (47).

The data suggests that the environmental conditions significantly impact students' motivation for physical activity. Students in constant zones of active military operations show lower motivation than those in areas with sporadic shelling. However, a more comprehensive analysis is necessary to fully understand the factors affecting student motivation in these contexts.

Table 9's data suggests the military conflict's

**Table 7.** Time of day chosen by students for responses

University	Time of Day	Mean	Std Dev	Participants
1	Evening	26.519	4.627	27
1	Day	24.161	4.22	31
1	Night	23.0		1
1	Morning	23.143	3.237	7
2	Evening	27.167	4.469	12
2	Day	27.424	4.479	33
2	Morning	27.0	4.69	38
3	Evening	29.8	2.387	5
3	Day	30.0	2.517	19
3	Night	34.0		1
3	Morning	28.227	3.779	22

Note. Morning entries (from 6:00 AM to 12:00 PM); Daytime entries (from 12:00 PM to 6:00 PM); Evening entries (after 6:00 PM until midnight); Nighttime entries (after midnight and until 6:00 AM).

**Table 8.** Living conditions of students

University	Conditions	Mean	Std Dev	Participants
1	Kharkiv is included in the list of territories where military operations are taking place.	25.0	4.413	66
2	Kharkiv is included in the list of territories where military operations are taking place.	27.193	4.525	83
3	Ivano-Frankivsk is a territory subject to periodic shelling.	29.234	3.278	47

**Table 9.** Body Mass Index of students from three universities

University	Gender	Mean, kg/m <sup>2</sup>	Std Dev	Participants
1	Female	21.054	3.458	46
1	Male	22.86	3.81	20
2	Female	21.276	3.016	56
2	Male	23.693	3.661	27
3	Female	20.678	4.049	22
3	Male	23.102	3.261	25
University 1-2	Female	21.176	3.209	102
University 1-2	Male	23.339	3.708	47

Note: University 1-2 – General data for the two universities from Eastern Ukraine.

possible impact on BMI. Analysis reveals significant differences in average BMI between Universities 1 and 2 in the zone of active military operations and University 3 in Western Ukraine, which faces lower military threats. Group 1-2, comprising universities in the zone of active military operations, shows the highest average BMI values for both women and men. This could point to a higher obesity level among students in this group compared to Group 3. Conversely, Group 3 records the lowest average BMI for women but the highest for men. This indicates gender-based physical condition variations among students from different university groups. These disparities in average BMI between groups may reflect the influence of environmental factors, lifestyle, and diet on student health amidst military conflict.

## Discussion

The aim of our research was to evaluate the motivation for physical activity among university students in Ukraine's zone of active military operations. We found that the learning conditions significantly influence students' motivation and ability to engage in physical activity. The differing educational methods between universities in Ukraine's eastern and western regions emerge as crucial factors.

In the eastern region, universities are adapting to an unstable situation, often relying on virtual teaching methods. This shift limits students' access to physical activities on campus, potentially creating additional stress and barriers to an active lifestyle. In contrast, a university in the western part of Ukraine may offer a more flexible hybrid educational model. This approach allows students greater freedom in planning their time and encourages more engagement in physical activity.

Our findings suggest that the educational environment plays a significant role in shaping students' attitudes and opportunities for physical activity, especially in regions affected by conflict.

The COVID-19 pandemic's impact on education at all three universities, leading to a shift towards online learning, may have contributed to students adopting a more sedentary lifestyle and losing motivation for physical activity. Our findings resonate with previous research conducted during the pandemic.

Amekran et al. [21] highlight the need to consider students' physical activity characteristics in the context of current crises, including armed conflicts. This aligns with our observations about the importance of physical activity motivation among students. Hamzah et al. [22] found a positive correlation between physical health and mental well-being, supporting our findings on the significance of physical activity motivation.

Jalal et al. [23] emphasize the importance of

student awareness about a healthy lifestyle and active physical activity, particularly in challenging circumstances. Similarly, Lopez Garcia et al. [24] underscore the role of physical activity in mitigating mental health issues among students during the pandemic. These studies reinforce the relevance and practical implications of our findings, highlighting the critical role of physical activity in maintaining student health and well-being in times of crisis.

To gain a deeper understanding of how military conflict affects students' motivation for physical activity, we employed the Physical Activity Questionnaire (PAQ) as our primary assessment tool. Notably, the PAQ has been previously validated for reliability in various studies [10, 11, 15, 17], establishing its credibility as an instrument for measuring physical activity.

However, the unique psychological and emotional impacts of military conflict on students could potentially influence their motivation. Acknowledging this, we conducted additional reliability and validity testing of the standard version of the PAQ. This step was crucial to ensure that the PAQ remains an effective and relevant tool for assessing physical activity levels in environments characterized by military conflict and associated stress.

It's noteworthy that in our study, we engaged 196 students to evaluate their motivation for physical activity amidst a military conflict. This participant count is comparable to other studies utilizing the PAQ, which had varying participant numbers: 199 in the study by Hamzah [22], 628 in the study by Jalal [23], 63 in the study by Lopez Garcia [24], 213 in the study by Romero-Blanco [25], and 450 in the study by Al-salhi [26]. Despite a relatively smaller sample size (n=196), our study offers valuable insights into the impact of military conflict on student motivation for physical activity. The unique context of our study, particularly the military conflict environment, provides a distinct perspective on how such conditions influence student motivation.

Our findings highlight the significant effect of military conflict on the psychological well-being of Ukrainian university students. Echoing the observations of Geller [27], Al-salhi [26], and Orlov [28], our research reveals that students often feel helpless and hopeless amidst such conflicts, negatively impacting their motivation for physical activity. This aligns with Kurapov's [29] study, which underscores the adverse effects of war on mental health, fear, substance use, and stress levels.

Samara et al. [30] suggest that psychological well-being's adaptive potential can be bolstered through love, faith, and hope. However, these resources are often severely tested in war contexts. Our research underscores the importance of supporting students and developing initiatives to boost their psychological resilience and motivation for physical

activity amidst ongoing military conflict. Such support is crucial for their comprehensive education and health maintenance under challenging conditions.

Our findings align with those of other researchers. For example, Ferreira Silva et al. [31] observed that barriers to physical activity correlate with reduced activity levels, echoing our insights into the impact of military conflict on student motivation. Similarly, Romero-Blanco et al. [25] reported increased physical activity during isolation periods, which may parallel our findings on the effects of extreme conditions like military conflict.

The study by Vuckovic et al. [32] highlights the critical role of motivation in physical activity, resonating with our findings on the importance of student motivation. Additionally, the research by Lopez-Fernandez et al. [33] emphasizes the need for adaptability in education, a concept highly pertinent to our study in the context of a military conflict. These studies collectively underscore the necessity for further research and the development of supportive strategies for students facing challenging circumstances. Our work contributes to this ongoing dialogue, emphasizing the need for targeted interventions to support student well-being and motivation in environments affected by conflict.

Our research highlights the need for further studies on the psychological resilience and motivation for physical activity among students in zone of active military operations. Future research should explore the effectiveness of various support strategies and educational adaptations in enhancing student well-being and motivation under such challenging conditions. Additionally, investigating the long-term impacts of military conflict on student health and educational outcomes will provide valuable insights for developing comprehensive support systems.

## Conclusions

Our study underscores the critical importance of considering the context of military conflicts when analyzing student motivation for physical activity. It highlights the need to integrate psychological and sociocultural factors into the development of programs aimed at motivating physical activity in similar conditions. These conclusions stress the significance of adapting educational and support strategies to enhance the well-being and motivation of students, particularly in conflict-affected regions. Furthermore, our research points to the necessity for further investigations in this area to more comprehensively understand the impact of military conflicts on student health and education.

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