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# Self-perceived health status and physical activity levels among students in the Visegrad Group countries: a cross-sectional analysis

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**Abstract**

**Background.** Adolescents and young adults are particularly vulnerable to physical inactivity, especially during the transition from secondary school to university. Self-rated health is a validated indicator of physical and mental well-being and is influenced by lifestyle behaviors such as physical activity.

**Material and methods.** A cross-sectional study was conducted from March to May 2025 among secondary school and university students in the Czech Republic, Hungary, Poland, and Slovakia. A total of 2,691 university students and 2,085 secondary school students were included in the analysis. Data were collected using a standardized questionnaire based on the International Physical Activity Questionnaire (IPAQ). Associations were analyzed using chi-square tests and Cramer's V.

**Results.** In all the countries, most students did not meet recommended physical activity levels. Among university students, meeting physical activity recommendations was significantly associated with better self-rated health in the Czech Republic, Hungary, and Poland, but not in Slovakia. Among secondary school students, this association was statistically significant in all four countries, with the strongest relationship observed in Poland.

**Conclusions.** Regular physical activity is positively associated with better subjective health among secondary school and university students in V4 countries, highlighting the need to promote physical activity within educational systems.

**Keywords:** self-rated health, cross-sectional studies, physical activity, adolescents, students



## Introduction

The World Health Organization (WHO) estimates that more than 60% of an individual's quality of life is influenced by their own behavior and lifestyle [1]. A healthy lifestyle includes positive behavioral patterns that promote health and prevent disease. Lifestyle diseases, also known as noncommunicable diseases (NCDs), pose the most significant health threat to the current population. Their main determinants include risky behaviors such as substance abuse, a sedentary lifestyle, unhealthy eating habits, and chronic psychological stress. Longitudinal

studies confirm that an unhealthy lifestyle increases the risk of premature death from NCDs, especially cardiovascular and metabolic diseases [2].

Non-communicable diseases such as cardiovascular disease, diabetes mellitus, certain types of cancer, chronic respiratory diseases, and mental disorders are currently the leading causes of death in Europe and worldwide. According to the WHO, NCDs account for more than 80% of all deaths in Europe [3]. One of the most significant risk factors is overweight and obesity, which are the fourth most common determinant of disease burden. Lack of regular physical activity and sedentary behavior are considered key factors contributing to their development. In Europe, one in four school-age children is overweight or obese [4]. Physical inactivity alone contributes to approximately 9% of all premature deaths [5], and 27% of adults in the European region do not meet the minimum physical activity recommendations [6].

For this reason, the WHO has been strengthening policy strategies aimed at promoting physical activity across the population in recent years [1]. Physical activity encompasses all body movements that result in increased energy expenditure – from walking, cycling, swimming, dancing, organized sports, to household chores. Its health benefits are well documented: reduced risk of cardiovascular disease, type 2 diabetes, obesity, and certain types of cancer, improved mental health, reduced anxiety and depression, improved cognitive function and school performance in children and adolescents, and support for mobility, balance, and quality of life in older adults [1,7].

According to the current WHO recommendations, people aged 18-64 should engage in 150-300 minutes of moderate-intensity aerobic activity per week, or 75-150 minutes of vigorous-intensity aerobic activity – ideally a combination of both. The WHO now also places greater emphasis on strength exercises, which should be included at least twice a week, preferably using one's own body weight [8]. This strength component is considered a key element in the prevention of obesity, sarcopenia, and musculoskeletal disorders. In the young adult group, promoting a healthy lifestyle should not focus solely on disease prevention but also on behaviors that enhance the overall well-being of the individual. These include, for example, positive habits that we practice throughout the day, such as a balanced diet, sufficient rest, regular exercise, adequate water intake, self-control, and the quality of interpersonal relationships [9].

The topic of healthy lifestyles resonates strongly and aligns with the themes of wellbeing and social security, clearly reflecting the quality of life for students. Several factors, including

opportunities for physical activity, influence physical activity, and the transition from secondary school to university brings with it lifestyle changes [10,11].

## Aim of the work

Our goal was to focus on assessing physical activity and self-rated health in the university and secondary school populations of the Visegrad Group (V4), which includes the Czech Republic, Slovakia, Poland, and Hungary.

## Materials and methods

*Study design and setting*

This cross-sectional study was conducted from March to May 2025 among adolescents from four Central European countries: the Czech Republic, Hungary, Poland, and Slovakia. Data collection was part of the framework project "Physical Activity Patterns among Secondary School and University Students in the V4 Countries – a Comparative Study" (Agreement number 22420149), which focuses on the physical activity of university students and related contextual factors using harmonized research protocols. Universities in four countries, corresponding to partner academic institutions, were involved in the research: University of Pécs (Hungary), John Paul II University in Biała Podlaska (Poland), Pavol Jozef Šafárik University in Košice (Slovakia), and University of South Bohemia in České Budějovice (the Czech Republic). Schools in these locations were randomly selected to ensure a diverse representation of students. The questionnaire was distributed online via a link. Data were collected during regular class time, with students completing the questionnaire in a controlled classroom environment using standardized procedures across all the participating sites. Questions assessing recreational physical activity were based on the validated IPAQ (long version) questionnaire [12]. For analysis, a dichotomous variable was created to determine whether the participant engaged in recreational physical activity. The total weekly number of minutes of physical activity during leisure time was determined for each participant as the sum of the number of days and the average duration of each form of recreational activity (walking, moderate-intensity, and vigorous-intensity activity). This variable was evaluated according to the updated WHO recommendations, i.e. 150 minutes of physical recreational activity per week.

Self-assessment of health was also used for the evaluation. Responses were given on a five-point Likert scale.

*Statistics*

Descriptive statistics were calculated for all variables and presented separately for secondary school and university students, as well as by country (the Czech Republic, Hungary, Poland, and Slovakia). The associations between meeting the age-adjusted physical activity guideline (PA_guidelinemeets_agecontrolled: yes/no) and self-reported health status (goodhealth1_other0: good vs. not good) were examined using chi-square ($\chi^2$) tests of independence. Analyses were conducted for the full sample and stratified by country to explore potential regional differences for secondary school students and university students separately. For each contingency table, effect sizes were quantified using Cramer's V (equivalent to the φ coefficient for 2×2 tables). The significance level was set at $p<0.05$. All analyses were performed in IBM SPSS Statistics (version 29). Missing cases were excluded listwise before analysis.

*Participants*

The sample of students from selected universities in the V4 countries included 2,691 students. The average age varied slightly between countries, with the lowest values recorded in Slovakia (19.9±1.6 years) and the highest ages reported by the respondents from Hungary (21.8±2.4 years) and the Czech Republic (21.8±2.1 years). In all the countries, self-assessed overall health most often fell into the categories “Very good” and “Good”. The highest proportion of very good health was reported by respondents from the Czech Republic (40.2%), while the lowest was from Poland (30.8%). The “Poor” category was minimally represented, with values not exceeding 1.3%. The BMI distribution indicates that the majority of the sample falls within the normal weight category (62.2-70.9%). Underweight was most common in Poland (10.4%), while obesity was highest in the Czech Republic (9.7%) and Poland (9.8%). Physical activity levels vary across the countries: the recommended level of physical activity was achieved by 39.2% of respondents from the Czech Republic and 48.9% from Hungary, while in Poland and Slovakia, this figure was 45.7% and 39.7%, respectively. In all the countries, the group of respondents who did not meet the recommendations prevailed. The

variables, including PA (150 minutes weekly), BMI categories, general health, and gender, by country, are shown in Table 1.

In the sample of secondary school students, the age of the respondents across the countries ranged from 16 to 18 years (n=2,085), with the lowest average recorded in Poland (16.4±1.1 years) and the highest in the Czech Republic (17.2±1.3 years). Self-rated health in all the countries most often ranged between the categories “Good” and “Very good”. The category “Excellent” was represented by only a minority (6-9%, depending on the country). On the contrary, the category ”Poor” showed very low values in all the countries, up to a maximum of 2%. The BMI distribution shows that most respondents are of normal weight (65-72%). Underweight was most common in Poland (23%) and lowest in the Czech republic (10.7%). The prevalence of overweight and obesity was relatively low, with obesity occurring most frequently in Hungary (8%). Approximately one third of the respondents reported meeting the recommendations for physical activity, with the highest percentage in Hungary (37.7%) and the lowest in Slovakia (28.3%). In all the countries, the group that did not meet the recommended level of physical activity was the prevailing one. The variables, including PA 150 minutes weekly, BMI categories, general health, and gender, by country for secondary school students are shown in Table 2.

**Table 1.** University students – descriptive statistics

| Variable | Category | Czech Republic | | | Hungary | | | Poland | | | Slovakia | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n | %N | Mean±SD | n | %N | Mean±SD | n | %N | Mean±SD | n | %N | Mean±SD |
| **Age** | | 655 | 24.34 | 21.85±2.19<br>2.63±0.82 | 904 | 33.59 | 21.88±2.42<br>2.64±0.80 | 498 | 18.50 | 21.29±2.37<br>2.81±0.79 | 634 | 23.56 | 19.93±1.69<br>2.67±0.82 |
| **General health** | **Excellent** | 40 | 6.1 | - | 63 | 7.0 | - | 18 | 3.6 | - | 40 | 6.4 | - |
| | **Very good** | 262 | 40.2 | | 310 | 34.4 | | 153 | 30.8 | | 220 | 35.0 | |
| | **Good** | 257 | 39.4 | | 422 | 46.8 | | 235 | 47.4 | | 285 | 45.3 | |
| | **Fair** | 87 | 13.3 | | 101 | 11.2 | | 85 | 17.1 | | 76 | 12.1 | |
| | **Poor** | 6 | 0.9 | | 6 | 0.7 | | 5 | 1.0 | | 8 | 1.3 | |
| | **Total** | 652 | 100.0 | | 902 | 100.0 | | 496 | 100.0 | | 629 | 100.0 | |
| **BMI categories** | **Underweight (<18.5)** | 41 | 6.3 | 23.75±4.38 | 64 | 7.2 | 22.74±3.14 | 51 | 10.4 | 24.30±4.41 | 62 | 10 | 22.26±2.37 |
| | **Normal (18.5-24.9)** | 409 | 63.2 | | 598 | 67.6 | | 306 | 62.2 | | 440 | 70.9 | |
| | **Overweight (25-29.9)** | 134 | 20.7 | | 156 | 17.6 | | 87 | 17.7 | | 102 | 16.4 | |
| | **Obese (≥30.0)** | 63 | 9.7 | | 67 | 7.6 | | 48 | 9.8 | | 17 | 2.7 | |
| | **Total** | 647 | 100.0 | | 885 | 100.0 | | 492 | 100.0 | | 621 | 100.0 | |
| **Exercises weekly** | **Does not meet** | 397 | 60.8 | 3.58±1.7 | 461 | 51.1 | 3.82±1.75 | 270 | 54.3 | 3.44±1.8 | 382 | 60.3 | 3.75±1.61 |
| | **Meets** | 256 | 39.2 | | 441 | 48.9 | | 227 | 45.7 | | 252 | 39.7 | |
| | **Total** | 653 | 100.0 | | 902 | 100.0 | | 497 | 100.0 | | 634 | 100.0 | |

**Table 2.** Secondary school – descriptive statistics

| Variable | Category | Czech Republic | | | Hungary | | | Poland | | | Slovakia | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n | %N | Mean±SD | n | %N | Mean± SD | n | %N | Mean± SD | n | %N | Mean± SD |
| **Age** | | 437 | 20.99 | 17.29±1.31 | 634 | 30.40 | 17.23±1.39 | 339 | 16.26 | 16.40±1.19 | 675 | 32.37 | 17.03±1.46 |
| **General health mean (SD)** | | 2.71±0.86 | | | 2.75±0.81 | | | 2.69±0.89 | | | 2.67±0.86 | | |
| **General health** | **Excellent** | 27 | 6.3 | - | 44 | 7 | - | 31 | 9.2 | - | 50 | 7.5 | - |
| | **Very good** | 150 | 34.7 | | 340 | 53.9 | | 106 | 31.5 | | 237 | 35.5 | |
| | **Good** | 183 | 42.4 | | 163 | 25.8 | | 141 | 41.8 | | 274 | 41 | |
| | **Fair** | 64 | 14.8 | | 74 | 11.7 | | 55 | 16.3 | | 99 | 14.8 | |
| | **Poor** | 8 | 1.9 | | 10 | 1.6 | | 4 | 1.2 | | 8 | 1.2 | |
| | **Total** | 432 | 100.0 | | 631 | 100.0 | | 337 | 100.0 | | 668 | 100.0 | |
| **BMI categories** | **Underweight (<18.5)** | 45 | 10.7 | 22.39±4.02 | 84 | 14 | 22.71±4.93 | 75 | 23 | 21.05±3.45 | 119 | 18.2 | 21.65±3.99 |
| | **Normal (18.5–24.9)** | 302 | 71.7 | | 394 | 65.4 | | 212 | 65 | | 436 | 66.7 | |
| | **Overweight (25–29.9)** | 54 | 12.8 | | 76 | 12.6 | | 35 | 10.7 | | 70 | 10.7 | |
| | **Obese (≥30.0)** | 20 | 4.8 | | 48 | 8 | | 4 | 1.2 | | 29 | 4.4 | |
| | **Total** | 421 | 100.0 | | 602 | 100.0 | | 326 | 100.0 | | 654 | 100.0 | |
| **Exercises weekly** | **Does not meet** | 298 | 68.2 | 4.08±1.96 | 395 | 62.3 | 4.11±1.86 | 213 | 62.8 | 3.99±1.92 | 484 | 71.7 | 3.96±1.91 |
| | **Meets** | 139 | 31.8 | | 239 | 37.7 | | 126 | 37.2 | | 191 | 28.3 | |
| | **Total** | 437 | 100.0 | | 634 | 100.0 | | 339 | 100.0 | | 675 | 100.0 | |

## Results

Analysis of the relationship between meeting the recommended level of physical activity (PA≥150 min/week, according to IPAQ) and self-assessed health status among university students revealed different patterns among the surveyed countries. In the Czech Republic, a statistically significant relationship was found ($\chi^2$=17.545; $p$<0.001; Cramer's V=0.164), with students who rated their health as good or very good more likely to meet the recommended level of physical activity. Similarly, in Hungary, the relationship was also significant ($\chi^2$=25.408; $p$<0.001; V=0.168), confirming a consistent association between higher physical activity and better self-rated health. A statistically significant relationship was also found in Poland, albeit slightly weaker ($\chi^2$=8.405; $p$=0.004; V=0.130). Students who met the PA recommendations were more likely to report better health. In contrast, no statistically significant relationship was found between these variables in Slovakia ($\chi^2$=0.367; $p$=0.545; V=0.024), suggesting that in this population, the level of physical activity did not appear to be a factor related to subjectively perceived health (Table 3).

**Table 3.** Analysis of the relationship between the recommended level of physical activity and self-rated health status

| Physical activity level | | | | Average or poor health status | | Good or very good health status | | Total | | Statistical evaluation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | N | % | N | % | N | % | Chi square | *p* | Effect size |
| University students | Czech Republic | PA≥150 min/week (IPAQ) | Does not meet | 23 | 68.4 | 158 | 52.3 | 396 | 60.9 | 17.545 | 0.000 | 0.164 |
| | | | Meets | 110 | 31.6 | 144 | 47.7 | 254 | 39.1 | | | |
| | | Total | | 348 | 100.0 | 302 | 100.0 | 650 | 100.0 | | | |
| | Hungary | PA≥150 min/week (IPAQ) | Does not meet | 307 | 58.0 | 152 | 41.0 | 459 | 51.0 | 25.408 | 0.000 | 0.168 |
| | | | Meets | 222 | 42.0 | 219 | 59.0 | 441 | 49.0 | | | |
| | | Total | | 529 | 100.0 | 371 | 100.0 | 900 | 100.0 | | | |
| | Poland | PA≥150 min/week (IPAQ) | Does not meet | 192 | 59.3 | 78 | 45.6 | 270 | 54.5 | 8.405 | 0.004 | 0.130 |
| | | | Meets | 132 | 40.7 | 93 | 54.4 | 225 | 45.5 | | | |
| | | Total | | 324 | 100.0 | 171 | 100.0 | 495 | 100.0 | | | |
| | Slovakia | PA≥150 min/week (IPAQ) | Does not meet | 226 | 61.2 | 153 | 58.8 | 379 | 60.3 | 0.367 | 0.545 | 0.024 |
| | | | Meets | 143 | 38.8 | 107 | 41.2 | 250 | 39.7 | | | |
| | | Total | | 369 | 100.0 | 260 | 100.0% | 629 | 100.0 | | | |

Analysis of the relationship between meeting the recommended level of physical activity (PA≥150 min/week according to IPAQ) and self-rated health status in secondary school students showed a consistent trend across all the countries surveyed in favor of more active adolescents. This relationship was statistically significant in all four countries, although the strength of the association varied.

In the Czech Republic, the relationship between physical activity and health status was statistically significant ($\chi^2$=4.304; $p$=0.038; Cramer's V=0.100), indicating a weak but existing correlation. Students with subjectively better health more often met the recommended level of PA. Similarly, in Hungary, this relationship was also significant ($\chi^2$=9.124; $p$=0.003; V=0.120), again suggesting that better health is associated with higher levels of physical activity.

The most significant relationship was observed in Poland, where a moderately strong association was found ($\chi^2$=21.474; $p$<0.001; V=0.252). Polish students with good or very good health were much more likely to meet PA recommendations than their peers with average or poor health. A significant relationship was also confirmed in Slovakia ($\chi^2$=13.612; $p$<0.001; V=0.143), where students who rated their health positively also showed higher levels of physical activity (Table 4).



**Table 4.** Analysis of the relationship between the recommended level of physical activity and self-assessed health status

| Physical activity level | | | | Average or poor health status | | Good or very good health status | | Total | | Statistical evaluation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | N | % | N | % | N | % | Chi square | *p* | effect size |
| Secondary school students | Czech Republic | PA≥150 min/week (IPAQ) | Does not meet | 184 | 72.2 | 111 | 62.7 | 295 | 68.3 | 4.304 | 0.038 | 0.100 |
| | | | Meets | 71 | 27.8 | 66 | 37.3 | 137 | 31.7 | | | |
| | | Total | | 255 | 100.0 | 177 | 100.0 | 432 | 100.0 | | | |
| | Hungary | PA≥150 min/week (IPAQ) | Does not meet | 282 | 66.5 | 112 | 54.1 | 394 | 62.4 | 9.124 | 0.003 | 0.120 |
| | | | Meets | 142 | 33.5 | 95 | 45.9 | 237 | 37.6 | | | |
| | | Total | | 424 | 100.0 | 207 | 100.0 | 631 | 100.0 | | | |
| | Poland | PA≥150 min/week (IPAQ) | Does not meet | 146 | 73.0 | 66 | 48.2 | 212 | 62.9 | 21.474 | 0.000 | 0.252 |
| | | | Meets | 54 | 27.0 | 71 | 51.8 | 125 | 37.1 | | | |
| | | Total | | 200 | 100.0 | 137 | 100.0 | 337 | 100.0 | | | |
| | Slovakia | PA≥150 min/week (IPAQ) | Does not meet | 295 | 77.4 | 185 | 64.5 | 480 | 71.9 | 13.612 | 0.000 | 0.143 |
| | | | Meets | 86 | 22.6 | 102 | 35.5 | 188 | 28.1 | | | |
| | | Total | | 381 | 100.0 | 287 | 100.0 | 668 | 100.0 | | | |

**Discussion**

Regular physical activity contributes to improved cardiovascular and metabolic fitness, reduces the risk of obesity, and improves immune system function, which is directly reflected in subjective health assessments. The psychological effects of exercise, including improved mood, increased self-esteem, and reduced stress, are also well-documented in WHO research. The social dimension of physical activity, particularly team and community sports, enhances social integration and support, which in turn increases subjective well-being.

Our analysis showed a consistent correlation between achieving the recommended level of physical activity (≥150 min/week) and better self-rated health in most of the respondent groups and countries surveyed. Active students reported "good/very good health" more often, while among the inactive, there was a higher proportion of those who rated their health as average to poor. This pattern was found in both secondary school and university students, with effect sizes generally stronger among university students (except in the Slovak sub-sample, where the relationship was not statistically significant). These findings align with previous studies that have identified a positive association between physical activity and subjective health ratings in children, adolescents, and young adults [13].

The mechanisms linking physical activity to subjective health are multifactorial [14]. Physical activity enhances physical fitness, cardiometabolic health indicators, and sleep quality, while also having a positive impact on mental health. It reduces symptoms of depression and anxiety and increases self-esteem and social inclusion. These psychophysiological pathways help explain why active students rate their health better. Systematic reviews and meta-analyses support the idea that interventions to increase activity can be expected to bring about positive changes in the mental and physical well-being of young people [15,16]. Similar results were achieved by Kochman et al., who showed that physically active students have a more positive self-assessment of their health status [17].

Our international comparisons showed that the strength of the association is not homogeneous: for example, among secondary school students, it was highest in Poland, while among university students, relatively strong associations were found in Hungary and the Czech Republic. These differences may be due to a combination of socio-cultural factors (norms and customs associated with leisure activities), structural conditions (availability of sports facilities and organized activities), as well as age differences in the roles of parents and peers. Similarly, book reviews emphasize that context (school/public environment, pandemic restrictions,

program availability) significantly modulates the effects of physical activity interventions and their impact on subjective health [13,14].

At the recommendation level, it is essential to note that the WHO sets age-specific thresholds: for adults, 150-300 minutes of moderate-intensity aerobic activity per week (or equivalent), and for children and adolescents, an average of 60 minutes per day of moderate to high intensity. These international guidelines provide a suitable reference framework for interpreting our cut-off points (≥150 min/week) and emphasize that any increase in activity brings health benefits [1].

*Study limitations and interpretation of results*

Our study is cross-sectional, which limits causal inference and does not allow reverse causality to be excluded. The findings may also be influenced by subjective self-assessment of health and physical activity, measurement heterogeneity across countries, and unmeasured confounding factors, underscoring the need for longitudinal and randomized studies to confirm causality.

*Implications for practice and research*

Our results support a public health strategy aimed at increasing young people's participation in regular physical activity, with interventions tailored to age-specific and cultural conditions in individual countries. Programs in schools and universities (improving access to sports facilities, integrating physical activity into teaching, promoting active commuting) can be effective. For future research, we recommend conducting longitudinal studies and randomized interventions in target subpopulations (e.g. groups with low activity levels or poor self-rated health) to investigate the mediators (psychological, social, and physiological) that link activity to subjective health.

The regional similarity between the Czech Republic, Slovakia, and Hungary may reflect the proximity of their educational systems, similar sporting conditions, and the traditional perception of sport as an essential part of young people's lives. At the cultural level, it can be assumed that physical activity plays a similar role in these societies and that health-related values have comparable significance in these countries.

## Conclusions

These results support the importance of regular physical activity for the subjective health of university students, although specific differences between countries remain.

The results have contributed to the exploration of the association between physical activity and subjective health in an international context. Given the close cultural similarities between the countries in which the research was conducted, the results are of comparable significance. Physical activity and its prevalence among young people have a significant impact on the development and prognosis of several lifestyle diseases. For this reason, it is essential to promote physical activity among secondary school and university students specifically. School systems should incorporate sports activities into students' lives. This could include, for example, free access to sports facilities, organized sports clubs, or regular exercise challenges.

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