PHYSICAL EDUCATION OF STUDENTS

ORIGINAL ARTICLE

Health behaviours of students from Polish universities participating in obligatory physical education classes

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Abstract

Background and Study Aim: University life often introduces new conditions and changes in young people's lifestyles, influencing their daily habits and routines. During this period, students frequently experience increased independence, academic pressure, and social challenges, which may shape their health-related behaviours in various ways. Although different programmes and physical education classes are applied to encourage healthy behaviours, their role in supporting positive lifestyle patterns among students continues to draw practical attention. The aim of this study is to assess and compare the intensity of specific health behaviour categories among students at various universities in Poland and to identify the factors underlying their variation.

Material and Methods: The test group consisted of students (N=1097) from five Polish universities located in different regions of the country and with diverse academic profiles. The students' average age was 19.7 years. All of them actively participated in physical education classes within their university curricula. A standardised questionnaire, Juczyński's Health Behaviour Inventory (HBI), was used alongside the authors' own questionnaire on selected lifestyle elements. Basic information about the participants' socio-economic background was collected, together with measurements of height and body mass, as well as calculated BMI values. To assess the significance of differences between the compared groups, the Student's t-test, ANOVA, and chi-squared test were applied. The threshold level of statistical significance was set at $\alpha = 0.05$.

Results: Twice as many participants exhibited a low level of health behaviours as those with a high one. The majority (48.3%) of respondents showed an average level of health behaviours. Male students had a lower overall health behaviour index score ($p<0.001$). In both male and female participants, the lowest scores were noted in the categories of proper eating habits and prophylactic behaviours. When comparing the intensity of particular categories of health behaviours among students from different universities, no differences were found in the group of women. Among the respondents, 53% of females and 32.2% of males were not physically active outside their university physical education classes. A total of 12.9% of men and 5.4% of women smoked regularly. The students' financial situation, physical activity, and smoking were the variables differentiating the intensity in all four categories of health behaviours according to the HBI. The factors significantly differentiating the degree of intensity in HBI health behaviours included the student's financial situation, physical activity of the student and their parents, smoking, above-normal BMI, and sex. The place of residence before entering university (urban or rural) was not such a factor. Low scores were observed in the areas of nutrition and physical activity.

Conclusions: In promoting a healthy lifestyle, special attention should be paid to healthy eating habits, prophylactic behaviours, and students' participation in leisure-time physical activity. It is recommended that within compulsory physical education classes, universities undertake interventions supporting a healthy lifestyle among students, with particular attention to developing habits related to regular physical activity and maintaining proper body mass.

Keywords: students, health promotion, health behaviours, BMI, physical activity

Introduction

Health behaviours formed during young adulthood have a lasting influence on overall wellbeing and quality of life. The period of university education is often accompanied by lifestyle changes that affect students' physical activity, nutrition, and general health habits. This stage involves academic responsibilities, social adjustment, and growing independence, which together shape diverse patterns of health-related behaviours among students.

In this context, lifestyle and everyday habits become essential factors influencing students'

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overall health condition. Numerous key risk factors for disease originate from lifestyle-related issues, personal habits, and behaviours shaped by various social determinants [1]. Health behaviours are defined as actions whose frequency and intensity affect health outcomes [2]. They include nutrition and body mass control, substance use, physical activity, hygienic habits, and prophylactic actions [3]. Research indicates that individual behaviours may account for up to 40% of premature deaths [4]. Consequently, improving health and reducing premature mortality largely depend on modifying personal behaviours. These behaviours are not static but evolve across the lifespan, differ among population groups, and vary with changing environmental and social conditions [2].

There are several key theories and models that help to explain changes in health behaviours. These models take into account factors such as readiness for change, awareness of risks, expected outcomes, motivation, and the sense of self-efficacy. They are often fundamental to health-promoting interventions [5]. According to Liao et al. [6], autonomy, self-determination, and internal motivation play a pivotal role in changing health behaviours, and the integration of various theoretical models supports a more structured approach to health interventions. As da Silva Domingues et al. [7] note, following Cockerham's theory, the decision-making process of young people is not an isolated act but one influenced by both internal and external factors, including the social and cultural context in which they function.

The university period is commonly associated with new conditions and lifestyle changes among young people [8]. Scientific reports indicate an increase in unfavorable health behaviours during this stage of life [9, 10, 11, 12, 13].

Studies conducted among Australian students indicate a deterioration in physical activity, mental well-being, diet quality, and sleep [10]. According to the study by Whatnall et al. [9], the indices of unhealthy lifestyle behaviours and related health risk factors among Australian students are high. Researchers studying students from British universities have expressed similar concerns, emphasizing that health behaviours in this population are poor: 83% have a low-quality diet, 32% are overweight or obese, and 51% are at high or increased risk of alcohol consumption. Moreover, sex and ethnic origin significantly influence students' health behaviours [13].

A study involving students from the Polish, Slovak, Romanian, and Ukrainian parts of the Carpathian Euroregion confirmed the coexistence of adverse health behaviours such as smoking and alcohol abuse. The results showed that hazardous alcohol consumption occurred in approximately every seventh person, with risky drinking being much more common among male students [14]. A comparison of health behaviours among students from Turkey, Poland, Greece, and Hungary revealed significant cross-national differences. Students from Poland most frequently exhibited risky behaviours, those from Hungary had the highest BMI, students from Turkey engaged least often in prophylactic behaviours, and those from Greece reported the lowest engagement in physical health-related activities [15]. In contrast, the main problem among students at Italian universities was insufficient physical activity [16].

In a systematic review of studies assessing the relationship between health behaviours and mental health among university students, consistent evidence was found for an association between low levels of physical activity and poorer mental well-being [17]. Another important issue concerning students' health relates to the problematic use of the Internet. Research involving medical students shows that this behaviour is associated with symptoms of depression and eating disorders, as well as with an overall unhealthy lifestyle [18].

The assessment of health behaviours is commonly performed using the Health Behaviour Inventory (HBI) adapted by Z. Juczyński [19]. However, the studies conducted so far have mainly been regional, inter-university, or single-center in scope, and have involved relatively small samples [20, 21, 22, 23].

Analysis of research findings has shown that students' health behaviours are shaped by a combination of personal, social, and environmental factors influencing their daily choices and long-term wellbeing. Researchers emphasize that the university period is particularly sensitive for the development and consolidation of habits related to nutrition, physical activity, and preventive practices. Although numerous studies have examined these issues in different countries and educational contexts, there remain aspects of variability and interaction among determinants that are not yet fully understood. This complexity continues to highlight the need for a broader, comparative approach to examining health behaviour patterns among university students.

Given these considerations, it becomes essential to explore how such patterns manifest in specific national contexts where university health education plays an active role. In Poland, the university period represents the final stage of formal education during which programmes aimed at developing, maintaining, and monitoring health-promoting behaviours can still be effectively implemented. Such initiatives are primarily conducted within compulsory physical education classes or modules offered to students across all academic disciplines and university types. These classes are supervised by physical education teachers working in university-affiliated units such as Academic Sports Centres or Departments of Physical Education and Recreation,

whose primary educational objective is to encourage the adoption of health-promoting behaviours and active participation in physical activity.

Within this framework, the present study aims to assess and compare the intensity of health behaviours from the HBI categories among students at various Polish universities and to identify the factors underlying their variation.

Materials and Methods

Participants

The study was cross-sectional, multi-centre, and based on self-reported data. It included 1,097 first-cycle students of Polish origin from five universities located in Krosno, Rzeszów, Lublin, Kraków, and Poznań, representing diverse academic profiles. Recruitment was carried out through random selection of student groups within individual faculties. At each university where official permission to participate was granted, a list of all student groups undertaking compulsory physical education classes was prepared. Random sampling without replacement was then used to select groups from these lists for inclusion in the study.

The inclusion criteria were participation in physical education classes, voluntary consent to take part in the study, and complete data from the questionnaire and measurements. Exclusion criteria included medical contraindications to participation in physical education classes, lack of consent, incomplete questionnaire data, or missing measurements. The study was conducted in October and November in accordance with a uniform research protocol.

Female students constituted 55.6% of the sample. Slightly more than half of the participants (56.3%) had lived in rural areas prior to starting university. Most students (79.8%) rated their family's financial situation as good or quite good; 14.9% described it as very good, and 5.3% as difficult or very difficult. Participants' ages ranged from 17 to 32 years, with the vast majority (90.6%) between 18 and 23 years. The mean age was 19.7 ± 1.4 years. All students actively participated in physical education classes as part of their university curriculum.

All research procedures complied with the ethical standards of the Declaration of Helsinki and were approved by the Bioethics Committee of the University of Rzeszów (No. 20/12/2015, dated 2 December 2015). Written informed consent was obtained from all participants prior to questionnaire completion. The study was conducted as part of the project *Selected aspects of students' health in the light of their physical activity and cardiorespiratory endurance*, implemented under the grant *Development of Academic Sport* (No. NRSA4 016 54), financed by the Ministry of Science and Higher Education in Poland. The data presented here refer to the first stage of this project.

Research Design

Questionnaire

The assessment of health behaviours was conducted using the *Health Behaviour Inventory* (HBI) developed by Zygfryd Juczyński [19], a standardised self-assessment tool (Cronbach's alpha = 0.85) consisting of 24 statements describing various types of health-related behaviours. The inventory enables the determination of both an overall health behaviour index and the intensity of four specific categories: proper eating habits (PEH), prophylactic behaviours (PB), health practices (HP), and a positive mental attitude (PMA). Each participant rated the frequency of exhibiting these behaviours on a 5-point scale, where 1 indicated "almost never" and 5 indicated "almost always." Responses were summed according to the author's guidelines to obtain the overall health behaviour intensity index, ranging from 24 to 120 points. A higher score reflected a higher frequency of health-promoting behaviours. Based on the cumulative HBI scale classification in individual stens, participants were assigned to one of three levels: sten 1–4 (low level), sten 5–6 (average level), and sten 7–10 (high level). The intensities of the four categories were also calculated separately, with each index representing the mean number of points obtained in a given category. The scores for proper eating habits, prophylactic behaviours, positive mental attitude, and health practices could range from 6 (lowest) to 30 points (highest) [19].

In addition to the HBI, the authors' own questionnaire was used, consisting of seven questions related to selected lifestyle elements. It included items on free-time physical activity and attitude towards it, parents' physical activity, smoking, self-assessment of health status and physical fitness, and ways of spending leisure time. Basic socio-economic information was also collected, including age, sex, place of residence before entering university, and financial situation. The data were collected using the PAPI (Paper and Pen Personal Interview) method. Respondents completed the questionnaire in paper form in the presence of research team members, who provided detailed explanations and clarifications when necessary.

Anthropometric measurements

Anthropometric measurements were conducted by a trained research team in a gym during morning hours, following standardised measurement procedures. Body height (BH) was measured using a portable stadiometer (SECA 2013, Germany) accurate to 1 mm. Participants were measured without footwear, socks, or head coverings and wore light sports clothing. Each participant stood upright on the designated stadiometer platform with feet

together so that the heels touched the footboard. After aligning the head in the Frankfurt plane, the stadiometer's measuring arm was applied.

Body weight (BW) was measured to the nearest 0.1 kg using a Tanita TBF 300 (Japan) scale, and the body mass index (BMI) was calculated according to the standard formula: weight (kg) / height^2 (m). Classification of BMI values followed the World Health Organization (WHO) norms [24]. All measurements were performed during scheduled physical education classes as part of the research protocol.

Statistical Analysis

Basic statistical measures, including arithmetic mean and standard deviation, were calculated. The significance of differences between the analysed groups was assessed using the Student's *t*-test (for two groups), ANOVA (for three or more groups), and the chi-squared test. The threshold level of statistical significance was set at $\alpha = 0.05$. All statistical analyses were performed using STATISTICA 13 (StatSoft, Poland).

Results

Table 1 presents the numerical distribution of overall measures for individual categories of HBI health behaviours, divided into female and male groups. In two categories of behaviours, as well as in the overall HBI index, men showed significantly lower mean scores for health-related behaviours compared to women ($p < 0.001$).

As shown in Table 1, after converting the health behaviour indices into sten scores in accordance with the test guidelines, three levels of behaviour were identified: low, average, and high. Among all participants, only 186 students (17.0%) were classified as having a high level of declared health behaviours. The majority of respondents, 530 students (48.3%), were characterized by an average level of health behaviours, while 381 students (34.7%) displayed a low level of health behaviours.

Sex was identified as a factor differentiating the numerical values of the overall HBI index. When comparing the universities, the analysis was also conducted separately for female and male students (Table 2). No significant differences were observed among women, whereas in the group of men, significant differences occurred. The lowest results were recorded among students from Cracow University of Technology and Krosno State College (PWSZ Krosno).

The responses of the examined students to additional questions beyond the HBI questionnaire were analyzed. These questions referred to selected aspects of their lifestyle and self-assessment of health status. As shown in Table 3, sex was a factor that significantly differentiated the responses ($p < 0.001$). Although most participants expressed a positive attitude towards physical activity, a considerable proportion did not engage in any activity outside the compulsory physical education (PE) classes at university, with women less active in this regard ($p < 0.001$).

More than half of the students' parents did not participate in sports or physical activity, and this variable did not significantly differ between the sexes ($p = 0.063$). The majority of students preferred social events and listening to music or radio as their main leisure activities, while many also reported spending free time sleeping ($p = 0.022$). Smoking was more common among men, who also more frequently reported regular use ($p < 0.001$). Most respondents assessed their health status as good and their physical fitness as average (Table 3, $p < 0.001$).

As shown in Table 3, the BMI of the examined students was calculated based on anthropometric measurements of body height and mass. According to the WHO classification, students were divided into four body mass categories. The majority had a BMI within the normal range, while a smaller proportion were classified as underweight, overweight, or obese. Overall, almost one-third of the students were outside the optimal BMI range.

In the subsequent analysis, selected variables were examined to identify the factors differentiating specific health behaviour categories of the HBI among the entire study population. As shown in Table 4, the place of residence did not differentiate health behaviours in any of the analyzed areas. However, statistically significant differences were

Table 1. Numerical distribution of measures of HBI health behaviour categories with reference to sex (N=1097)

Sex	N	PEH		PB		PMA		HP		Total HBI	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Female	610	19.8	4.4	19.3	4.2	20.9	3.8	20.3	3.4	80.2	11.5
Male	487	17.6	4.2	18.3	4.3	21.0	3.9	20.0	3.3	76.9	11.6
p-Value		<0.001		<0.001		0.484		0.160		<0.001	

Note. SD = standard deviations, p-Value = p-values calculated using the t-test, PEH = Proper eating habits, PB = Prophylactic behaviours, PMA = Positive mental attitude, HP = Health practices, Total HBI= overall index of health behaviour inventory

Table 2. Comparison of HBI categories with reference to type of university and sex

University	N	PEH		PB		PMA		HP		Total HBI	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Females (N=610)											
University of Rzeszów	186	19.3	4.7	19.2	4.1	20.7	3.7	20.1	3.1	79.3	11.0
Poznań University of Life Sciences	169	20.1	4.8	19.5	4.4	20.9	4.0	20.3	3.6	80.8	12.5
Cracow University of Technology	66	20.4	4.0	18.5	4.4	20.5	4.1	20.3	3.7	79.7	11.8
PWSZ Krosno	58	20.1	3.6	20.5	3.5	22.0	3.4	20.7	3.0	83.3	9.4
UMCS Lublin	131	19.7	4.0	19.0	4.0	20.8	3.7	20.2	3.4	79.6	11.5
p-Value		0.315		0.081		0.169		0.876		0.191	
Males (N=487)											
University of Rzeszów	129	18.0	4.8	18.9	4.7	21.0	4.3	20.4	3.0	78.2	12.6
Poznań University of Life Sciences	78	18.1	4.3	19.1	4.3	21.9	3.5	20.6	2.8	79.7	11.3
Cracow University of Technology	123	16.6	3.9	17.7	4.4	21.1	3.9	19.1	3.5	74.5	11.2
PWSZ Krosno	34	16.9	3.2	18.1	3.4	19.4	4.1	19.7	3.0	74.1	10.0
UMCS Lublin	123	18.1	4.1	17.8	4.1	21.0	3.6	20.1	3.5	77.0	11.2
p-Value		0.018		0.051		0.044		0.011		0.010	

Note. SD = standard deviation, p-Value = p-values were calculated using ANOVA test, PWSZ = Państwowa Wyższa Szkoła Zawodowa (Krosno State College), UMCS= Uniwersytet Marii Curie-Skłodowskiej (Maria Curie-Skłodowska University in Lublin), PEH = Proper eating habits, PB = Prophylactic behaviours, PMA = Positive mental attitude, HP = Health practices, Total HBI= overall index of health behaviour inventory

Table 3. Selected aspects of the tested students' lifestyle with reference to sex

Questions	Possible answers	Sex						p-Value
		Female (N=610)		Male (N=487)		Total (N=1097)		
		N	%	N	%	N	%	
1. Do you engage in physical activity outside PE classes at university?	no	323	53.0	157	32.2	480	43.8	<0.001
	yes, recreationally	225	36.9	247	50.7	472	43.0	
	yes, for tourism	38	6.2	17	3.5	55	5.0	
	yes, competitively	24	3.9	66	13.6	90	8.2	
2. What is your attitude to physical activity?	negative	7	1.1	3	0.6	10	0.9	<0.001
	nearly negative	11	1.8	6	1.2	17	1.5	
	neutral	107	17.5	71	14.6	178	16.2	
	nearly positive	215	35.2	95	19.5	310	28.3	
	positive	270	44.3	312	64.1	582	53.1	
3. Do your parents practice any sports/ physical activity?	no	387	63.4	275	56.5	662	60.3	0.063
	yes, recreationally	171	28.0	155	31.8	326	29.7	
	yes, competitively	26	4.3	23	4.7	49	4.5	
	yes, for tourism	26	4.3	34	7.0	60	5.5	
4. Do you smoke?	no	408	66.9	268	55.0	676	61.6	<0.001
	in the past	45	7.4	57	11.7	102	9.3	
	occasionally	118	19.3	99	20.3	217	19.8	
	regularly	39	6.4	63	12.9	102	9.3	
5. How would you assess your health status?	very good	122	20.0	156	32.0	278	25.3	<0.001
	good	384	63.0	263	54.0	647	59.0	
	weak / bad	8	1.3	4	0.8	12	1.1	
	average	96	15.7	64	13.1	160	14.6	

Table 3. (Continued)

Questions	Possible answers	Sex						p-Value
		Female (N=610)		Male (N=487)		Total (N=1097)		
		N	%	N	%	N	%	
6. How would you assess your level of physical fitness?	medium	325	53.3	277	56.9	602	54.9	<0.001
	average	196	32.1	92	18.9	288	26.3	
	low	43	7.0	24	4.9	67	6.1	
	high	46	7.5	94	19.3	140	12.8	
7. Indicate your preferred forms of spending free time *)	social events	505	82.8	350	71.9	855	77.9	<0.001
	music, radio	426	69.8	313	64.3	739	67.4	0.051
	sleep	338	55.4	236	48.5	574	52.3	0.022
	computer	215	35.2	309	63.4	524	47.8	<0.001
	cinema, theatre	283	46.4	169	34.7	452	41.2	0.001
	practicing sport	166	27.2	215	44.1	381	34.7	<0.001
	reading	252	41.3	119	24.4	371	33.8	<0.001
	watching TV	161	26.4	114	23.4	275	25.1	0.257
	gym	106	17.4	146	30.0	252	23.0	<0.001
	bike tourism	141	23.1	106	21.8	247	22.5	0.595
	household chores	159	26.1	81	16.6	240	21.9	<0.001
	studying	137	22.5	101	20.7	238	21.7	0.492
	hiking	125	20.5	84	17.2	209	19.1	0.174
	paid work	94	15.4	103	21.1	197	18.0	0.014
	dancing	96	15.7	30	6.2	126	11.5	<0.001
	water tourism	37	6.1	28	5.7	65	5.9	0.826

Note. p – p-values calculated using the chi-square test of independence; *) The total does not have to add up to 100%, as it was possible to choose any number of answers

observed between groups distinguished by financial situation, particularly in the categories of positive mental attitude, health practices, and in the overall HBI index. A better financial situation was associated with more favorable health behaviours among the respondents.

Physically active students, regardless of the type of activity, demonstrated considerably higher HBI levels in all four categories and in the overall score. Physical activity practiced by students' parents had a positive impact on their children's health behaviours, particularly in the domains of eating habits and prophylactic behaviours, but did not significantly influence mental attitude or health practices.

Smoking was another differentiating factor. Statistically significant differences were noted in all four health behaviour categories ($p < 0.001$). Non-smoking students achieved markedly higher overall health behaviour scores than regular smokers. Students with a BMI above the normal range also showed lower levels of health practices ($p = 0.015$), whereas no significant differences were found in the remaining HBI measures.

Discussion

The main aim of this study was to assess and compare the intensity of health behaviours in different HBI categories among students from various Polish universities and to identify factors underlying their variation. The results indicated that female students demonstrated higher overall health behaviour scores than male students. The majority of participants presented an average level of health behaviours, with only a small proportion reaching a high level. Financial situation, physical activity, smoking habits, and BMI were among the variables that significantly differentiated health behaviours. In contrast, the place of residence before entering university did not show a notable effect.

These findings highlight the relevance of health-related behaviours among students as an important component of preventive health care and health promotion at the academic level. Lifestyle-related behaviours and their associated health risk factors among students are an important issue in the context of public health and disease prevention. Supporting students in maintaining their health

Table 4. Variables differentiating categories of HBI behaviours in the group of tested students from Poland (N=1097)

Variables	N	PEH		PB		PMA		HP		Total HBI	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Place of residence before university											
village	618	18.8	4.4	19.0	4.2	20.9	3.9	20.2	3.3	78.9	11.7
city	479	18.9	4.6	18.6	4.3	21.0	3.8	20.1	3.4	78.6	11.7
p-Value		0.679		0.164		0.947		0.637		0.644	
Financial situation											
difficult	59	18.5	4.2	19.3	4.6	19.1	4.5	18.5	3.6	75.4	12.0
quite good	367	18.8	4.5	18.6	4.3	20.7	3.9	19.9	3.1	77.9	12.0
good	508	18.6	4.3	18.7	4.1	21.1	3.6	20.2	3.3	78.6	10.9
very good	163	19.9	4.7	19.7	4.5	21.8	4.1	21.0	3.5	82.4	12.5
p-Value		0.012		0.020		< 0.001		< 0.001		< 0.001	
Activity outside PE classes											
no	480	17.6	4.3	18.3	4.1	20.3	3.9	19.9	3.3	76.1	11.5
yes, recreationally	472	19.8	4.5	19.3	4.4	21.4	3.9	20.5	3.4	81.0	11.7
yes, for tourism	55	19.3	3.5	19.0	3.6	21.9	3.8	19.3	3.6	79.5	10.6
yes, competitively	90	20.2	4.3	19.3	4.1	21.3	3.5	20.1	3.0	80.9	10.5
p-Value		< 0.001		0.002		< 0.001		0.020		< 0.001	
Practicing sport / physical activity by the student's parents											
yes	662	18.3	4.5	18.5	4.2	20.8	3.9	20.1	3.4	77.8	11.7
no	435	19.6	4.4	19.3	4.3	21.2	3.8	20.1	3.3	80.3	11.5
p-Value*)		< 0.001		0.003		0.090		0.936		0.001	
Smoking											
no	676	19.4	4.5	19.4	4.1	21.4	3.7	20.9	3.2	81.1	11.4
in the past	102	18.7	4.1	19.0	4.3	20.7	3.7	19.8	3.0	78.3	9.8
occasionally	217	18.3	4.4	18.0	4.3	20.2	4.0	19.2	3.0	75.6	10.9
regularly	102	16.5	4.1	16.7	4.0	20.1	4.2	17.3	3.2	70.6	11.7
p-Value		< 0.001		< 0.001		< 0.001		< 0.001		< 0.001	
BMI classification											
underweight	120	18.6	4.6	19.0	4.7	21.0	4.1	20.7	3.4	79.3	12.2
norm	757	19.0	4.5	18.9	4.1	21.0	3.8	20.2	3.3	79.1	11.7
overweight	178	18.6	4.3	18.7	4.5	20.8	4.0	19.6	3.4	77.7	11.4
obesity	42	17.7	3.9	18.4	5.1	20.4	3.9	19.4	2.9	75.9	11.2
p-Value		0.250		0.866		0.652		0.015		0.188	

Note. SD = standard deviation, p-Value = p-values were calculated using ANOVA test, *) p-Value= p-values were calculated using the Student's t-test, PEH = Proper eating habits, PB = Prophylactic behaviours, PMA = Positive mental attitude, HP = Health practices, Total HBI= overall index of health behaviour inventory

and preventing the intensification of risk factors in this social group requires systematic monitoring of their health behaviours. Monitoring and diagnosing academic environments in the context of health behaviours is a necessary and preliminary stage in designing health programmes for students. Only on this basis can effective interventions promoting a healthy lifestyle be developed. According to Kang et al. [25], interventions aimed at modifying multiple risky behaviours that tend to accumulate among students, and tailored to specific population groups, may have a greater impact on disease prevention than those focused on single behaviours.

This study revealed significantly lower scores of health behaviour intensity among male students ($p < 0.001$). However, the findings of Pasieka and Zdziarski [22], who examined 216 students from Polish medical and non-medical universities, did

not confirm this tendency. Their results indicated no significant differences between men and women in the declared health behaviours. Similar conclusions were drawn by Kosiba et al. [23] in a study of 486 teacher-training students and by Ossowski et al. [26], who analyzed 178 physical education students from selected universities in Poland and Lithuania. Likewise, Baumgart et al. [27] found no statistically significant sex differences among 85 physiotherapy students (50 women and 35 men). In the research conducted by Matłosz et al. [21] on 132 students, women obtained slightly higher mean values of the overall index compared to men, but the differences were not significant. Comparable results were also reported among university athletes (N = 99) training team sports [28]. It should be noted that all these studies, despite using the same measurement tool, involved considerably smaller samples than the present study, which included 1,097 students. This difference in sample size may partly explain the discrepancies between results.

The findings of the current study further indicate that the number of students presenting a low level of health behaviours was approximately twice as high as those with a high level. Only 17% of participants were classified as having a high level of health behaviours, while 34.7% displayed a low level. Similar proportions were reported by Kosiba et al. [23] (13.17% high, 47.94% low), Mandziuk [29] (12.14% high, 48.57% low), and Rogowska et al. [30] (14% high, 46% low), which suggests a consistent pattern of moderate to low engagement in health-promoting behaviours among Polish university students.

In the present study, among the analyzed HBI categories, the highest scores in both sexes, with men showing a slight advantage, were obtained in the category related to positive mental attitude (mean score: 21.1 points in men and 20.9 points in women). Similar findings were reported by Matłosz et al. [21]. Conversely, both women and men achieved the lowest scores in proper eating habits (19.8 and 17.6, respectively) and prophylactic behaviours (19.3 and 18.3, respectively). Our findings in this respect are consistent, fully or partially, with those of other authors [21, 22, 23]. Matłosz et al. [21] emphasized that prophylactic behaviours were the least developed among Polish university students.

With regard to eating habits, recent large-scale research in Poland involving adult respondents (N = 1196102) highlighted the urgent need for targeted strategies to improve dietary behaviours, particularly among younger populations [31]. According to the World Health Organization, unhealthy diet remains one of the main global health risks, primarily contributing to noncommunicable diseases such as cardiovascular diseases, diabetes, and cancers [32]. Studies among students also confirm a widespread prevalence of unhealthy dietary habits [9, 33, 34].

When comparing the intensity of HBI health behaviour categories among students from different universities participating in this study, no significant differences were observed in the female group. However, among men, significant differences were found in proper eating habits ($p = 0.018$), positive mental attitude ($p = 0.044$), health practices ($p = 0.011$), and in the overall HBI index ($p = 0.010$). The lowest results were obtained by students from Cracow University of Technology and Krosno State College (PWSZ Krosno). Interpreting these outcomes requires further and more detailed analysis. The findings of Nowak et al. [20] also point to deficiencies in health-related behaviours among male students. The authors identified overweight in more than one-third of male physical education students, and this proportion reached 63% among practicing PE teachers [20].

These results may indicate that, despite access to physical activity opportunities within academic settings, health awareness and behaviour management among men remain insufficiently internalized. Future research should explore how cultural and environmental factors within university settings shape health priorities differently for men and women, especially concerning nutrition and preventive habits.

In the analyzed group of Polish students, 30.9% were outside the optimal BMI range, including 10.9% classified as underweight and 20.0% with above-normal BMI values. By comparison, among students from Italian universities, 13.7% were underweight and 11.2% were overweight or obese [16]. The authors of that study noted an increase in the prevalence of overweight and obesity from 8.8% in the 18–21 age group to 18.1% in those aged 25–30 [16]. Among British university students, 32% were overweight or obese [13], while in Australian samples this proportion reached 39.6% [9].

According to the World Health Organization, the global prevalence of overweight and obesity continues to rise across all age groups. Between 1990 and 2022, the proportion of adults aged 18 and over with obesity doubled from 7% to 16% [35]. In the European region, overweight and obesity rank as the fourth leading risk factors for noncommunicable diseases, following high blood pressure, dietary risks, and smoking [36]. The present study also demonstrated that students with a BMI above the normal range had significantly lower levels of health practices ($p = 0.015$), suggesting that body mass may be linked to less consistent engagement in health-promoting behaviours.

In the self-assessment of health status, only 25.3% of all tested students described their health as very good. One of the key behaviours positively influencing all aspects of health is regular physical activity (PA) [37]. The results of this study indicate that physically active individuals, regardless of the

form of activity, demonstrated significantly higher overall health behaviour levels as well as higher scores across all four HBI categories. At the same time, a substantial proportion of students from Polish universities (43.8%) reported not engaging in leisure-time physical activity, despite 81.4% expressing a positive attitude towards it. More than half of the female students (53.0%) and about one-third of the male students (32.2%) declared that they were not physically active outside compulsory PE classes. Social events and listening to music or radio were among the most preferred leisure activities, which reflects a tendency toward passive forms of recreation.

The problem of insufficient physical activity among university students is not limited to Poland. Studies across 23 countries found that 41.4% of students were physically inactive [38]. Among students in Italian universities, 25.8% reported never participating in physical activity [16]. In the United Kingdom, 30% did not meet PA recommendations, while 54% spent more than six hours per day in sedentary activities [13]. Similarly, Slovak students (N = 1,061) spent an average of 6.6 hours daily sitting, with women spending significantly more time in a sedentary position [39]. Australian studies also confirmed that 38.1% of students were insufficiently active [9].

The increasing prevalence of sedentary behaviour and the declining participation in physical activity among students have been widely analyzed in the scientific literature. Researchers have sought to identify both barriers and facilitating factors of PA within the framework of behaviour change theories and to develop appropriate interventions [40, 41]. Studies show that the most effective strategies for increasing PA levels are those incorporating social media or text message-based interventions. These methods have proven more successful when combined with the formation of peer-support groups [42]. Considering that insufficient physical activity contributes to approximately 9% of all premature deaths [36], promoting regular PA and implementing interventions that encourage lasting behavioral change should be a key priority in academic environments. Supporting this approach, the study by Pranoto et al. [43] confirmed that a four-week exercise-based intervention in a university setting effectively reduced sedentary behaviour and improved key health indicators among students.

Although the question about smoking is included among the 24 items of the HBI, it was also repeated in the authors' own questionnaire to capture the frequency of this behaviour. In the present study, 29.1% of students reported smoking, including 9.3% who smoked regularly. Regular smoking was declared twice as often by men as by women (12.9% vs. 6.4%). The analysis showed that smokers had significantly lower overall health behaviour index scores as well as lower results across all HBI categories. Previous research has indicated that smoking is closely correlated with other risky lifestyle behaviours, particularly alcohol consumption. This association has been observed among both male and female students in Poland and Slovakia, as well as among male students from Ukraine and Romania [14]. These findings confirm that smoking remains one of the critical behavioral factors negatively influencing the overall pattern of health behaviours among university students.

The analysis of the collected data revealed that students with a better financial situation demonstrated more favorable health behaviours across all examined HBI categories. Differences in the intensity levels of health behaviours between groups distinguished by financial status were statistically significant. These findings are consistent with the results reported by other authors [21, 44]. Comparative analyses based on EUROSTUDENT data also indicate that students experiencing financial difficulties are more likely to report health problems [45]. Similarly, the most recent report *Health Situation of Poland and Its Determinants – 2025* [46] highlights a strong relationship between financial situation and health behaviours, including the frequency of prophylactic examinations, physical activity, and diet quality. Furthermore, the socio-economic status of the family has been shown to positively influence students' mental health competences [47]. Together, these findings suggest that economic stability remains an important determinant of health-related behaviours and overall wellbeing in the academic population.

A review of studies indicates that scientific data on the effectiveness of interventions aimed at improving health behaviours, as well as on the mental health outcomes of university students, remain limited [48]. In light of this, contemporary education at all stages should place greater emphasis on developing in young people the knowledge, skills, and attitudes necessary to maintain good physical and psychosocial health. A particularly important role in this regard belongs to physical education teachers, who should act as health promoters and role models for sustainable, health-oriented behaviour rather than merely as sports instructors.

Today, university graduates are expected to demonstrate a high level of professional competence, readiness, and commitment. These expectations require both psychological and physical resilience. However, students at Polish universities face high levels of stress in their daily lives [49], and according to self-assessments, they rate their coping and stress-management abilities as the lowest [50]. Physical activity, therefore, serves as an important protective factor that enhances health satisfaction and psychological well-being [49]. At the same time, a gradual decline in high-intensity physical

activity and an increase in sedentary lifestyles have been observed among students [51]. Universities should therefore intensify initiatives that promote participation in leisure-time physical activity and integrate such programmes into the broader framework of academic health promotion [52].

Contemporary universities in Poland are autonomous institutions that independently determine their fields of study, curricula, educational objectives, and the organization of physical education. Within this autonomy lies the potential to shape health-oriented environments that not only support students' academic development but also reinforce their lifelong engagement in physical activity and health-promoting practices. Physical education in higher education should contribute to the stimulation of further physical development, the formation of self-care competences, and the promotion of a healthy lifestyle. Moreover, teacher-training programmes should place greater emphasis on developing self-regulatory and self-development skills in the context of health-promoting behaviours [20].

Limitations of the Study

The present study has several limitations that should be considered when interpreting the findings. As a cross-sectional design, it does not allow for determining cause-and-effect relationships. The study sample included only first-cycle (bachelor's) students without medical contraindications to participation in physical education classes, which means the results apply primarily to a generally healthy population. Therefore, caution should be exercised when generalizing the findings to all university students. Further research is needed to address these limitations and to provide a more comprehensive understanding of the observed relationships.

The study was conducted in multiple academic centers and involved a relatively large sample of students from different regions of Poland, which increases the diversity of the data and provides a broader perspective on health behaviours in the academic population.

In addition, the significant differences observed among male students from different universities in the intensity of certain HBI categories require more detailed analysis. Future studies should adopt a longitudinal approach to monitor changes in health behaviours from university entry to graduation. Such data could contribute to the development of educational programmes better tailored to students' specific needs and behavioral patterns.

Conclusions

Low results in the areas of nutrition and physical activity highlight the need for targeted health education among students at Polish universities. In promoting a healthy lifestyle, particular attention should be paid to developing healthy dietary habits, engaging in preventive behaviours, and increasing participation in leisure-time physical activity. Factors that significantly differentiated the intensity of HBI health behaviour categories included the student's financial situation, the physical activity of the student and their parents, smoking, above-normal BMI, and sex. The place of residence prior to university (urban or rural) was not identified as a differentiating factor.

Practical Implications

Universities are encouraged to implement health-oriented interventions within compulsory physical education programmes. These initiatives should focus on fostering regular physical activity, promoting healthy nutrition, and supporting the maintenance of proper body mass among students.

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Conflict of Interest

The authors declare no conflict of interest.

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