SECOND YEAR OF PANDEMIC PERIOD IN THE LIFESTYLE OF UNIVERSITY STUDENTS

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Abstract. The Covid-19 pandemic caused radical changes at all economic and social levels around the world, and Romania was no exception, influencing everyone's life.

The present study makes an X-ray of some components associated with lifestyle (overall health, sleep, nutrition, fluid intake and physical activity) by identifying the status of technical university students in the second year of the pandemic (2021).

The study has a descriptive exploratory longitudinal design based on a quantitative tools-questionnaire survey, using the non-parametric Wilcoxon signed-rank test for the 2237 young respondents.

The present research highlights the general profile of a predominantly male population of young students, aged 18-24 from the urban environment, who, in the pandemic period, show unchanged habits related to fluid intake, but who perceive the quality of food, of sleep, physical activity and their general health in the pandemic is lower compared to the pre-pandemic period.

Keywords: youth's lifestyle; nutrition; health; physical activity, pandemic period.

Introduction

The magnitude of COVID-19 pandemic has led to radical changes in modern society and the lifestyle of people from all over the world, also profoundly influencing the education system.

In Romania, all educational stages, from kindergarten to the university system, were severely affected. The implementation of the lockdown forced higher education institutions to completely stop face-to-face activity, avoid coexistence on university campuses and rapidly switch to online classes (Iurcov et al., 2021; Webb et al., 2021; Huang et al., 2020; Ionescu et al., 2020; Sava et al., 2021).

In this context, the POLITEHNICA Bucharest delivered exclusively online courses from March 2020 to November 2021, when a hybrid teaching system was adopted. It was decided to analyse the lifestyle of students, as we wanted to identify the status of the lifestyle of technical university students in the second year of pandemic, against the background of the online teaching, appearance of the vaccine and the subjects' habituation with the restrictions imposed by the authorities.

The study has started from the idea that overall health, sleep, nutrition, fluid intake, active lifestyle and physical activity are key elements in maintaining a healthy behaviour that promotes improved quality of life and disease prevention.

Therefore, the following research questions were formulated regarding overall health:

H1.1. "There is a statistically significant difference in health status between the pre-pandemic period and the second year of the COVID-19 pandemic regarding sleep quality."

H2. "There is a statistically significant difference in sleep quality between the pre-pandemic period and the second year of the COVID-19 pandemic regarding nutrition."

H3. "There is a statistically significant difference in food quality between the pre-pandemic period and the second year of the COVID-19 pandemic regarding fluid intake."

H4. "There is a statistically significant difference in fluid intake between the pre-pandemic period and the second year of the COVID-19 pandemic regarding physical activity."
H5. "There is a statistically significant difference in physical activity between the pre-pandemic period and the second year of the COVID-19 pandemic regarding lifestyle."
H6. "There is an influence of student behaviour in the pre-pandemic period and the second year of the COVID-19 pandemic that negatively influences the new lifestyle."
Research purpose
The present study makes an X-ray of some components associated with lifestyle (overall health, sleep, nutrition, fluid intake and physical activity) by identifying the status of technical university students in the second year of the pandemic (2021).
Methodology
Subjects
The research was conducted at the Politehnica Bucharest National University of Science and Technology, by the Department of Physical Education and Sports-kinetotherapy, during the second year of the COVID-19 pandemic.
Samples – In this study, 2237 students, from the first two years of study from 11 of the 15 faculties of Politehnica Bucharest National University of Science and Technology, who attended the physical education and sports courses, were included, regardless of specialization.
The data was collected through Google forms, between April and June 2021.
Research methods
The study is a longitudinal type that uses quantitative tools - the questionnaire survey. The questionnaire included items on how respondents perceived the quality of their overall health (in both physical and mental terms), sleep, nutrition, fluid intake, physical activity, lifestyle.
This was a self-administered questionnaire that took about 30 minutes to complete. It consisted of 30 items as follows: 5 identification questions - gender, age, occupation, level of education and environment of origin, and 25 items subsumed to the dimensions tracked in the research, respectively: I - overall health, II - sleep, III - nutrition (including weight), IV - fluid intake, V - physical activity, VI - lifestyle.
The questionnaire design was based on items 1, 2 for dimension I, items 3 - 5 for dimension II, items 6, 8, 10 for dimension III, items 7, 9 for dimension IV, items 13-16 for dimension V, items 11-12, 17 - 25 for dimension VI.
The questionnaire was previously applied in a pilot study on a group of students, which were not included in the number of respondents of the present study.
The data were processed using the MS EXCEL application (university license) and JASP, a non-commercially restricted program.
Statistical Analysis
In the longitudinal study, the variables general health status, sleep quality, nutrition, fluid intake and physical activity were compared before the pandemic vs. second year of pandemic.
Descriptive statistical used for data analysis – Wilcoxon signed-rank test, the parametric t-Test and the results provided by the computer software tabulated for the variable. The Wilcoxon signed-rank test and the parametric t-Test were used to evaluate the same group of subjects under two different conditions: before the pandemic and in the second year of pandemic.
In order to demonstrate the existence of a statistically significant different between two sets of online data, the Wilcoxon test with a non-parametric signed rank was used. To demonstrate the existence of a statistically significant difference between two data sets, the t-Test parameter was used: Paired Two Sample for Means.
In addition to the statistical analysis used we designed a model based on Factorial Analysis (Path Analysis). The model (figure 1) restrictions were determined by 2 variables introduced: one formative of behaviour and one reflective of Lifestyle. Our analysis measures the impact of each subitem/factor (LifestyleF, Optimize, Benefits, Changes, Lack) but does not help us to establish the direction of the influence. To ensure a coherent interpretation of the data and to assume the results of the research was used the SmartPls Software which estimated the model saturation based on a series of indices that enhance how well the model explains the variables and fits the

hypothesis established. The consistency of the model was evaluated with composite reliability, rho_A and the relevance of the latent constructs designed was analysed with Cronbach's alpha test.

The statistical analyses performed as stated by the STROBE recommendations.

Ethics

The questionnaire was completed by students willing to express their opinions on the proposed topic. They were explained in advance the purpose and consent procedure, and they agreed to have their data processed for the purpose of the present study.

The study followed the Helsinki declaration and national guidelines concerning the ethical guidelines and legal requirements. The study was approved by the ethics committee of National University of Physical Education and Sport from Bucharest and each student participated voluntarily.

Results

The present study makes an X-ray of some components associated with the lifestyle of students at the largest technical university in Romania, where approximately 20,000 students were enrolled in the 2020-2021 academic year, under the conditions of online teaching.

The study sample (N = 2237) consists of participants aged between 18 and 24 years (97.5%), 25 and 30 years (1.5%), 31 and 40 years (0.5%) and over 41 years (0.5%). Regarding the level of education, 93% are high school graduates, and 7% hold a bachelor's degree. In terms of occupation, the majority are university students (95%), and only 5% students have also other occupations. Related to the environment of origin, most of them are from urban areas (75%), and the rest are from rural areas. In terms of gender, 64% of respondents are male and 36% are female.

Thus, a demographic profile of the investigated sample is outlined as being predominantly male (64%), urban (75%), aged 18-24 (97.5%) and having the main occupation of university students (95%).

Next, the results obtained on the dimensions followed in this study are presented.

Dimension I-IV

Variable 1. Health status before the SARS-CoV2 pandemic

Variable 2. Health status in pandemic period (2nd year)

Variable 3 Sleep quality before the SARS-CoV2 pandemic

Variable 4 Sleep quality in pandemic period (2nd year)

Variable 5 Food quality before the pandemic

Variable 6 Food quality in pandemic period (2nd year)

To demonstrate the existence of a statistically significant difference between two ordinal data sets, the non-parametric Wilcoxon signed-rank test was used (Cohen,1988). The paired data series were analysed, namely health status before and the second year of the pandemic. The results obtained are shown in Table 1.

Table 1. Wilcoxon test & Descriptive statistic

Variable (V)	**Variable (V)**	**W**	**P**	**Hodges-Lehmann**	**Rank-Biserial**
V1. Health status before the pandemic	V2. Health status in the pandemic	245251	<.0001	<0.001	0.196
V3. Sleep quality before the pandemic	V4. Sleep quality in the pandemic	153884	<.0001	-0.500	-0.197
V5. Food quality before the pandemic	V6. Food quality in the pandemic	297806	<0.001	-0.500	-0.152
V7. Fluid intake before the pandemic	V8. Fluid intake in the pandemic	289719	0.397	>-0.001<0	-0.029
Descriptive statistics		**N**	**Mean**		**SE**
V1. Health status before the pandemic		2237	2.997		0.020

V2. Health status in the second year of pandemic	2237	2.892	0.020
V3. Sleep quality before the pandemic	2237	2345	0.050
V4. Sleep quality in the second year of pandemic	2237	2354	0.050
V5. Food quality before the pandemic	2237	2221	0.047
V6. Food quality in the second year of pandemic	2237	2304	0.049

With
a coefficient of $p < 0.001$ and a rank-biserial correlation of $0.3 > rB > 0.1$ ($rB = 0.196$), the Wilcoxon test shows a statistically significant difference ($p < 0.001$) of medium intensity ($rB = 0.196$) in health status before and in the pandemic period. Taking into account the above, H1 are validated.

With a coefficient of $p < 0.001$ and a rank-biserial correlation of $0.3 > rB > 0.1$ ($rB = -0.197$), the Wilcoxon test reveals a statistically significant difference ($p < 0.001$) of medium intensity ($rB = -0.197$) in sleep quality before and in the pandemic period.

A decline in sleep quality (negative sign, difference by increasing the rank - the questionnaire uses a higher rank for a higher level of dysfunction) can be noted between the two series of data (pre-pandemic and pandemic period.). Taking into account the above, H2 is validated.

With a coefficient of $p < 0.001$ and a rank-biserial correlation of $0.3 > rB > 0.1$ ($rB = -0.152$), the Wilcoxon test reveals a statistically significant difference ($p < 0.001$) of medium intensity ($rB = -0.152$) in food quality before and in the second year of pandemic.

A decline in food quality (negative sign, difference by increasing the rank - the questionnaire uses a higher rank for a higher level of dysfunction) can be noted between the two series of data (pre-pandemic and in the second year of pandemic). Taking into account the above, H3 is validated.

With a coefficient of $p < 0.001$, the Wilcoxon test reveals that there is no statistically significant difference ($p > 0.001$) in fluid intake before and pandemic period.

Taking into account the above, H4 is not validated.

Dimension V: Physical activity

Variable 9. Physical activity before the pandemic (V9. PA – B SARS-CoV2)

Variable 10. Physical activity in the 2nd year of the pandemic. (V10.PA – 2nd SARS-CoV2)

To demonstrate the existence of a statistically significant difference between two ordinal data sets, the parametric t-Test: Paired

Two Sample for Means was used (Cohen,1988; Vogt, 2015). The paired data series were analysed, namely physical activity before (B SARS-CoV2) and in the 2nd year of the pandemic (2nd SARS-CoV2). The results obtained are shown in Table 2.

Table 2. - t-Test: Paired Two Sample for Means & Descriptive statistics

PA	**B SARS-CoV2**	**2nd SARS-CoV2**		
Mean	2.67	2.59		
Variance	1.67	1.65		
Observations	2237	2237		
Pearson Correlation	0.75			
Hypothesized Mean Difference	0			
Df	2236			
t Stat	3.89			
P(T<=t) one-tail	4.98955E-05			
t Critical one-tail	1.65			
P(T<=t) two-tail	9.9791E-05			
t Critical two-tail	1.96			
Descriptive statistics	**N**	**Mean**	**SD**	**SE**
V9. Physical activity before the pandemic	2237	2.667	1.293	0.027

V10. Physical activity in the 2nd of pandemic period	2237	2.593	1.286	0.027

To find out if there is a statistically significant difference between the values from the initial and final testing, we apply the T test for paired samples (t-Test: Paired Two Sample for Means).

The t-Stat value of the test is 3.89 is greater than the minimum accepted value t Critical two-tail (1.96), with a very high significance level (P(T<=t) two-tail = 0.00<0.05) and a confidence degree of 95% (Table 2). We conclude that the average of the initial tests (2.67) is higher than the average in the same sample in the second test (2.59)

This difference is statistically significant. The statistical inference test allows us to extrapolate our conclusion on the entire statistical population, because t State > t Critical and p<0.05 (Table 2). In other words, when repeating the test under similar conditions, we get similar results.

A decrease in physical activity can be noted between the two series of data (2nd year of the pandemic and pre-pandemic). Taking into account the above, H5 is validated.

Dimension VI:

Path Analysis

Path Analysis demonstrates the influence of respondents' behaviour in the pre-pandemic and in 2nd year of pandemic negatively influencing the new lifestyle (Behaviour→ Lifestyle = -0.408) (Figure 1).

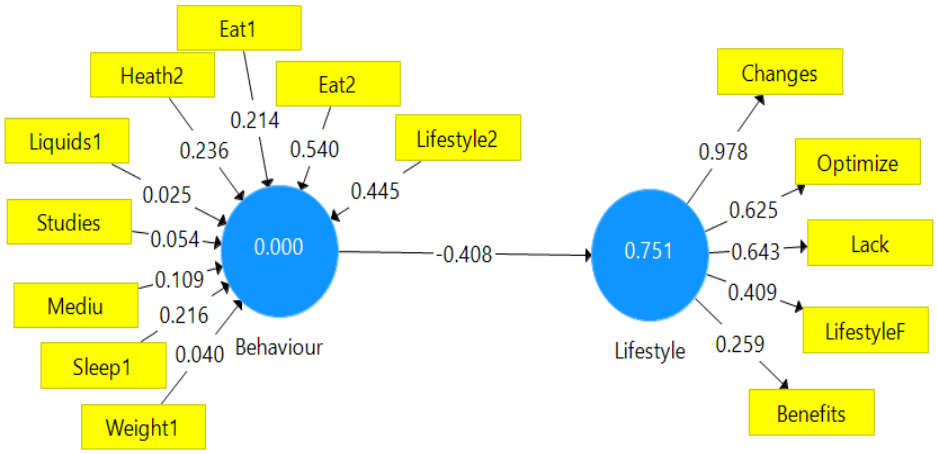

Figure 1. R Square coefficient, Track-side coefficients and Weighting of variables (LF=loading factors)

The Cronbach Alpha coefficient 0.751 (Figure 1) shows that the variables included in the analysis were suitable for the design of the model. In the analysis, 2 variables were introduced: one formative of Behaviour and one reflective of Lifestyle.

The share of the subitems that make up the Behaviour variable denotes that the biggest impact washed by the Activities of Eat2 (LF=0. 540), Lifestyle2 (LF=0. 445), Health2 (LF=0. 236), Eat1 (LF=0. 214), Sleep1(LF=0. 216), Environment (LF=0. 109), on Lifestyle.

The Lifestyle reflection variable consists of 4 changes sub-themes with very high load factor (LF=0.978), Lack (LF=0.643), Optimize (LF=0.625), LifestyleF (LF=0.409) and Benefits LF=0.998 (LF=0.259).

These subitems are explained below:

LifestyleF (Figure 2): To the question no 23 of the questionnaire: "*How would you describe your current lifestyle*?" the respondents consider that their lifestyle is now characterized by items such as Balanced, Positive Thinking Based, Satisfactory (1174 respondents), Minimum involvement and effort, comfort (946 respondents), Devoid of discipline and organization, Unsatisfying (690 respondents).

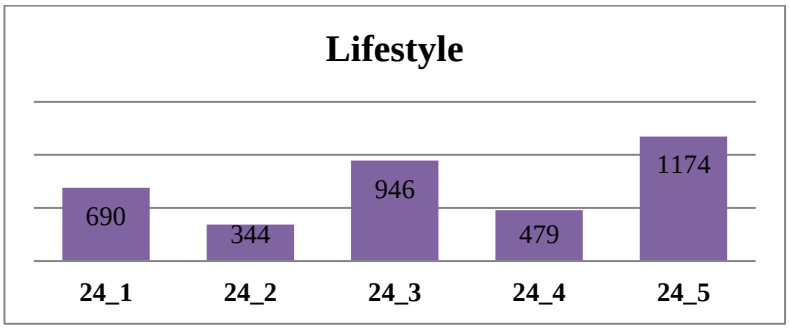

Figure 2. Lifestyle - 24_1 Devoid of discipline and organization, 24_2 Unsatisfying, Restless, 24_3 Minimum involvement, and effort Commode, 24_4 Active, Sports, Balanced, 24_5 Positive Thinking Based, Satisfactory

Optimize (Figure 3): To the question no 20 of the questionnaire: "*How would you optimize your lifestyle in the next period*?" the respondents answered that they will optimize lifestyle in the next period with many measures such as Health monitoring (1187 persons), Sleep Quality (1016 persons), Constant physical movement (1203 persons), Socialization (1086 persons), Quality free time (1074 persons), More efficient organization of the day (1085 persons), journeys (532 persons), Hydration more than (941 persons), Balanced nutrition (993 persons), Positive Thinking (948 persons).

Benefits (Figure 4) - To the question no 21 of the questionnaire "*What benefits do you think physical exercise and sport could bring to your life?"* the respondents considered that physical exercise and sport could bring different types of benefits to their lifestyle such as Health (2077 respondents), Well-being (1574 respondents), Positive psyche - positive thinking (1403 respondents), Self-confidence (1343 respondents), Relaxation (1231 respondents), Discipline (1132 respondents).

Changes: To the question no 17 of the questionnaires: "*If you consider that the last year (of the pandemic) has brought changes in your personal life*?" the people considered that the current year has brought changes in their personal life.

The most frequent changes were the rise of the convenience (1171 respondents), reduced physical activity (1093 respondents), Weight Gain (1069 respondents), Chronic Fatigue, increased Stress (960 respondents), Increased time for home entertainment - mobile TV, Video games etc- (927 respondents), Lack of free time (872), Weight Loss (828 respondents) and Poor sleep (673 respondents).

Lack (Figure 5): To the question no 19 of the questionnaire: "What did you miss this year during the last year of the pandemic"? the respondents **answered** that they missed in the last year of the pandemic especially Socialization (1531 persons), Freedom of Movement (1349 persons), Free time (759 persons), Physical Movement (769 persons), Outdoor sports and fitness (832 persons).

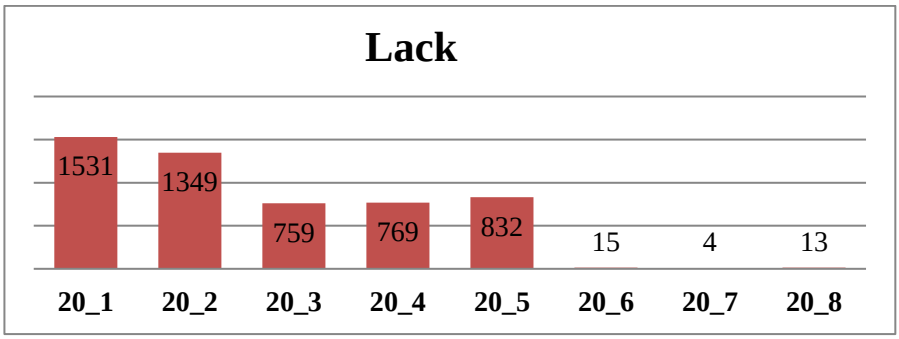

Figure 5. - 20_1 Lack – Socialization; 20_2 Freedom of Movement; 20_3.- Free time; 20_4 Physical Movement, 20_5 Outdoor sports and fitness; 20_6 Parties Travels; 20_7 Student Life; 20_8 My freedom and Constitutional Rights

Validity and relevance of variables/constructs

The SmartPls software offers many tests that can be used to ensure a factorial analysis and coherent interpretation of the data and to assume the results of the research. For example, the consistency of our model was based on the validation steps set out in Table 3. Quality of life is of great value for the reliability of the Composite Reliability=0.739, Cronbach Alpha (0.751) and rho_A (0.846) higher than 0.7 the minimum permitted threshold. We notice that for the Force and Re-education variables, the model only calculates the values rho_A, because these are formative variables. In our case the model is correctly designed because all indicators validate it (Table 3)

Table 3 Model validation steps

	Cronbach's Alpha	rho_A	Composite Reliability
Behaviour		1.000	
Lifestyle	0.751	0.846	0.739

Multicollinearity analysis

The inflation variance factor (VIF) of each variable was calculated using 5000 samples and a 95% bootstrapping procedure to verify the significance of the variables. All values less than 5 express an extremely low collinearity. Values less than 3 nonexistent collinearity. Table 4 gives an overview of the findings. Thus, we can declare that the overall VIF does not have multicollinearity between variables.

Table 4. Multicollinearity analysis

	VIF
Benefits	1.379
Changes	1.765
Eat 1	1.209
Eat 2	1.258
Health 2	1.076
Lack	1.470
Lifestyle 2	1.128
Lifestyle F	1.134
Liquids1	1.022
Environment	1.033
Optimize	1.719
Sleep1	1.010
Studies	1.001
Weight 1	1.024

The reliability of our model is also confirmed by the high value of the T statistical inference test, for which the degree of confidence is very high because the p Value < 0,05 (Table 4)

Table 5. Model Fit

	O S	SM	SD	T statistical inference	P values
Behaviour Lifestyle	-0.408	-0.414	0.021	19.657	0.000

Legend: OS=Original Sample; SM= Sample Mean; SD= Standard deviation

The values in figure 1 and Table 3-5 confirm our hypothesis (H6) the behaviour in the pre-pandemic period and pandemic period negatively influencing the respondent's lifestyle.

Discussion

This study aims to screen the lifestyle of young people from technical universities in the second year of pandemic.

The results of this study show that the quality of their food, sleep and overall health, physical activity of university students is still low compared to the period before the pandemic.

In general, everything that involves new, uncertain or changing situations generates a state of strong mental discomfort. The pandemic was not an exception, triggering feelings and reactions of frustration, panic, anger, fear, helplessness, resignation or abandonment, the need for adaptation (Knowles et al., 2021; Tanhan et al., 2020), which altered the well-being of the population (Holmes et al., 2020; Glowacz et al., 2020), especially the young population (Petzold et al., 2020; Li et al., 2022).

The epidemiological situation caused behavioural and lifestyle changes among university students, with a direct impact on the physical but especially mental health of young people (Fila-Witecka et al., 2021; Woon et al., 2021; Aslan et al., 2020; Odriozola-González et al., 2020; Elmer et al., 2020). The transition to online education for students in several countries led to an increase in screen time, accompanied by the deterioration of studying, sleeping and eating habits and the exacerbation of both physical and mental health symptoms such as backache, asthenopia, irritability and emotional instability (Pérez-Domínguez et al., 2021). Romanian students also experienced similar emotional states (Dumitrache et al., 2021), but their scores in anxiety tests depended on gender and the year of study (Ciavoi et al., 2021).

The decline in physical activity among the population is another consequence of the pandemic. Thus, five studies reported a decrease in light/mild physical activity (walking) between 32.5% and 36.5%, while seven studies revealed a decrease in vigorous physical activity between 2.9% and 52.8% among university students from different countries in the first year of the pandemic compared to pre-lockdown values (López-Valenciano et al., 2021). The negative lifestyle behaviours of the population from various countries during the lockdown period were also highlighted in a study that found an intensification of sedentary lifestyles, with inactivity time increasing from 5 to 8 hours per day and unhealthy food consumption (Ammar et al., 2020).

Studies carried out prior to the pandemic emphasized a prevalence of insufficient physical activity among Romanian university students (Leuciuc et al., 2020; Pelin et al., 2020; Wesselly et al., 2018), as well as among university students from other countries. (Verma et al., 2022; Winpenny et al., 2020; Al-Qahtani et al., 2022).

The respondents of our study describe themselves as: 22% balanced, relaxed, 15% tired, 14% stressed, 14% content, 12% optimistic, 12% happy, 9% dissatisfied, 2% free. The respondents consider that what helped them in the current year were especially: Hobbies (1565 respondents), Family (1245 respondents), TV, Mobile, Social Networks (1152 respondents), Positive Thinking (850 respondents), Friends (808 respondents).

The results of our study are in agreement with another recent studies from in which sleep disorders in Romanian university students are presented during pandemic period, not necessarily related to the pandemic but rather to their lifestyle (Ionescu et al., 2023). It seems that an unhealthy diet based on the predominant consumption of meat, confectionery, sweets, fast food was highlighted to university students in the pandemic period, to the detriment a recommended daily intake of fruit and vegetables and fish. (Kriaučionienė et al., 2023; Melguizo-Ibáñez et al., 2023). The pandemic period appears to have amplified college students' pre-pandemic symptoms of anxiety and depression (Nails et al., 2023). Another study revealed that sedentary students who skipped breakfast had a higher prevalence of obesity ($p < 0.05$), which before COVID-19 had a value of 16.1%, while in the New Normal it was 18.9%, which indicates that the pandemic seems to have affected the lifestyle of the pandemic period (Hernández-Segura et al., 2023).

In the pandemic period, there was a significant decrease in physical activity of moderate to vigorous intensity in Chinese adolescent compared to the level in pre-pandemic period (Liu et al., 2024).

This study has several limitations. The respondents come only from our university, and the majority (64%) are male. However, the sample is representative, as most of the students from the faculties of Politehnica Bucharest National University of Science and Technology are men. The method of addressing for completing the questionnaire can be another limitation of the research, the channel used being only MS Teams, to which only students enrolled in the first years of the bachelor's degree, participating in physical education lessons, had access. It should also be mentioned that causal inferences cannot be made. Such limitations open new research directions, with questionnaires in which the respondents could also include students from other universities or from other countries.

Conclusions

This study completes the literature that addresses this topic, offering a perspective on the perception of Romanian students on their own lifestyle in the second year of pandemic. The present research highlights the general profile of a predominantly male population of adolescents aged 18-24 from the urban environment, who, in the pandemic period, show unchanged habits related to fluid intake, but who perceive the quality of food, of sleep, physical activity and their general health in the pandemic is lower compared to the pre-pandemic period.

Almost half of the subjects of this study found a new balance in their lives and decided to take measures such as monitoring more aspects of their health with constant physical movement, by improving the quality of sleep, leisure journeys, and quality free time, more organization of the day. They begin to know better the benefits of exercising and playing sports.

Thus, strategies are required to promote the physical well-being of university students in the post pandemic period, essential to avoid an increase in non-communicable diseases.

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