

University students' physical features- reasons, consequences, solutions

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Abstract

Background and Study Aim Despite the growing concern about sedentary behaviors among the youth, there has been limited focus on understanding their impact. These behaviors significantly affect students' physical potential, productivity, and overall health. The aim of this study is to investigate the effects of sedentary lifestyles on students and to assess their awareness and attitudes towards these behaviors.

Material and Methods A mixed method of investigation was applied, combining preliminary quantitative research with a qualitative analysis of results. A total of 247 students were measured and tested: 122 males and 125 females, with an average age of 19.3±0.7. The anthropometric parameter focused on was body mass index. The physical test applied was the standing long jump. Students' responses from narrative essays were the basis of the qualitative analysis. The quantitative data collected through measurements and physical tests were directly compared to standards.

Results It was found that 24.5% of young men are overweight or obese. The performance of women in physical tests was lower than average, bordering on poor. Students provided their insights on these findings. Their narrative essays were qualitatively analyzed and synthesized, focusing on the reasons, consequences, and potential solutions related to this issue.

Conclusions This study adds evidence to the limited literature investigating university students' attitudes, opinions, and contexts that contribute to a decrease in their physical potential. The current generation of university students is unmotivated to consistently devote time and energy to physical activities. The comments and insights from students have provided potentially beneficial information for decision-makers in the domains of health education, overweight prevention, and physical activity promotion.

Keywords: physical potential, opinions, attitudes, wellbeing, workforce

Introduction

Weight gain and physical inactivity are global health problems responsible for the risk increment of non-communicable diseases. Overweight and especially obese individuals usually are unable to perform the recommended level of physical activity because of their low physical fitness and comorbidities. Once entered into the diet-related diseases and lack of physical activity vicious circle the health care costs increase, creating a significant and rising economic burden. When children and adolescents are not included in activities they withdraw from their peers, causing social marginalization [1]. The physical limitations and the inability to keep up with normal activities, and peers may lead to a vicious cycle of additional weight gain.

Insufficient physical activity is a risk factor for the occurrence of overweight and obesity, both in adults and children. Physical activity is considered

insufficient if is practiced less than 5 times 30 minutes of moderate activity per week or less than 3 times 20 minutes of intense physical activity weekly, or equivalent [2].

Excessive technology use, such as mobile devices led to less physical activity and contributed to weight gain. In most of the emergent economies (Brazil, India, China, Mexico), poor environmental conditions and lack of access to public parks discourage leisure time exercise [4]. World Food Program in a report from 2020 informed that 2.01 billion adults are overweight and obese [5] healthy diets being unaffordable to most people because of the costs. The costs of quality diets are estimated to be on average five times higher than diets that meet only dietary energy needs [6]. These figures also require further increased health costs either for treatment or prevention of metabolic and associated conditions.

The cumulative effect of multiple sedentary behaviors reduces total daily energy expenditure, explaining the context in which the prevalence of childhood and youth overweight and obesity has increased worldwide in recent decades and

continues to rise. According to a study conducted among Czech university students, only 9% attained the criterion of 10,000 steps each day [7]. Physical inactivity is the fourth leading risk factor for death in the world [8], killing more than 7 million people every year.

The young generation is a true digital native [9], the use of media and Internet access is essential because typing is preferred to handwriting, multitasking is a way of life, and the internet is a quicker source of information than libraries [10]. It means that if youngsters are not asleep, they are necessarily connected to a diversity of devices. On the other hand, physical activity has an indubitable beneficial effect on many aspects of quality of life [11, 12] but requires time, energy expenditure and consistency.

Through extensive pedagogical observation spanning multiple years, the research premises proposes that there are alterations in students' BMI and physical fitness. One of the main objectives of this study is to gauge the level of these parameters among the new generation of students. Moreover, we assess the students' perception and ideas about the state of BMI and fitness characteristics in relation to causes, effects and possible solutions.

Materials and Methods

We have chosen a mixed method of investigation combining preliminary quantitative research with a qualitative analysis of the results. The quantitative research implies two sets of data resulting from anthropometric measurements and physical tests in a sample of college students.

Participants

We measured and tested 122 males and 125 females with an average age of 19.3 (range 18-21). The sampling was randomly undertaken in the second university semester 2022 and the inclusion criteria were to be students in the first year, healthy, and attending regularly physical education classes. Students' participation was voluntary and anonymous.

Research Design

The anthropometric parameter we focus on is the body mass index (BMI) calculated by dividing the weight in kilograms by the square of the height in meters. The procedure was to measure and weigh every individual in light sport equipment and bare feet. BMI is an estimation of the extent to which a person is underweight, overweight, or has a healthy body weight.

The physical test we apply was the standing long jump. It is a simple test, already known from school, which tests the muscular strength and power of the lower part of the body. The physical ability assessed is explosive leg power, but good motor coordination of all body is also required. The procedure is to

measure the best jump from two or three attempts with a metric band from the takeoff line to the last body part that touches the ground.

The qualitative approach provides the student's perspective of their BMI and fitness levels. The analyzed results were presented to the participants, and they were asked to comment on what the reasons; consequences and possible solutions are related to the anthropometrical and fitness features of the present student population. We received opinions from 56 respondents: 22 men and 34 women.

Statistical analysis

A statistical summary data was computed and further, we compare the results with standard reference data for youngsters over 16. The assessed variables were the overweight and obesity prevalence and the level of fitness in university student population. Statistical analysis consisting in descriptive statistic and the one sample t-test, where computed using SPSS and Excel data analysis tool. The main research findings were presented in tables and charts.

Results

Following the research purpose, we collected data in a sample consisted of 247 students, studying at Bucharest University of Economic Studies. The sampling was randomly undertaken from freshmen college students attending physical education classes.

The group was divided according to BMI range:

- Underweight – below 18.5 kg/m²;
- Normal weight – between 18.5 and 24.9 kg/m²;
- Overweight – 25 – 29.9 kg/m²;
- Obese – more than 30 kg/m².

Observing the results in our sample a different distribution between men and women could be noticed (Fig. 1, 2; Tabl. 1). The majority of women, 87 % fall into the underweight and normal weight categories, while men have a half percentage of underweight cases as women and relatively equal values in the normal weight category. Men in change, compensate with a higher percentage of persons caring excessive weight (Tabl. 2).

At 19 years of age, almost a quarter (24,5%) of young men in our research sample are overweight and obese. Having in mind that less than 1 percent (1 of 210 men and 1 of 124 women) of obese adults get back to healthy body weight [13], there are plenty of chances for this generation to surpass the statistics. It already indicates that overweight adults in Romania are more numerous than slim ones, the proportion being roughly 55% to 45% in favor of the heavy ones [14].

At first glance, young women seem to be more concerned about physical appearance than men (13% with excessive weight), maybe because of the social pressure and the beauty standard promoted in media.

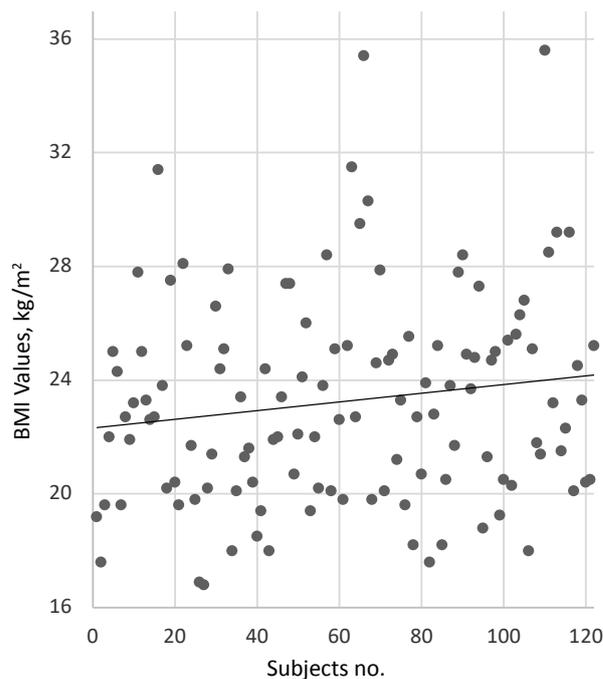
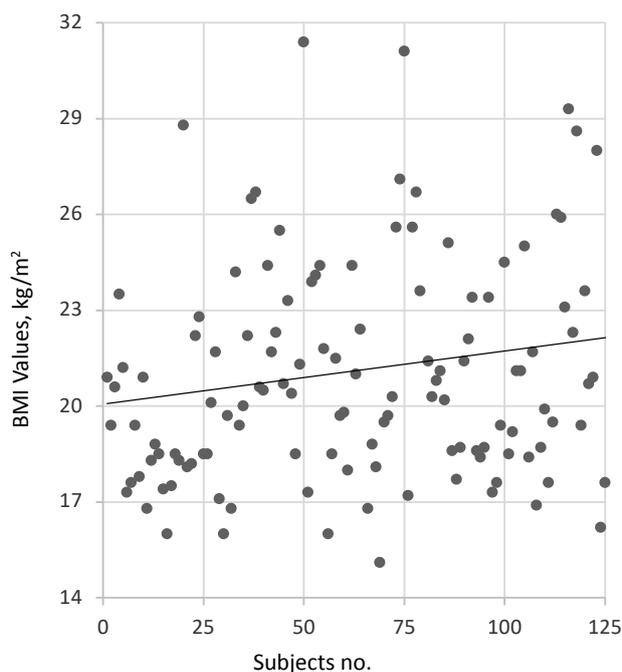


Figure 1. Female BMI distribution (Mean 21.05 ± 2.7) **Figure 2.** Male BMI distribution (Mean 23.25 ± 3.6)

Table 1. Descriptive statistic BMI

Gender	Mean	Std. Deviation	N
Male	23.25 kg/m ²	3.6	122
Female	21.05 kg/m ²	2.7	125

Table 2. Overweight and obese persons percentage

Gender	Under-weight	Normal-Weight	Overweight	Obese
Female	22%	65%	11.5%	1.5%
Male	11%	64.5%	19%	5.5%
Total	16.5%	64.75%	15.25%	3.5%

Fitness level (Tabl. 3). Standing long jump is a simple physical test with which students are already accustomed from primary school. Its purpose is to measure the explosive power of the lower limbs. Standing long jump is testing a combination of two physical abilities: strength and speed resulting in the capability to produce both in a short time over a relatively short distance. It is routinely used by specialists for talent selection and prediction of potential in several sports [15].

Table 3. Descriptive statistic standing long jump

Gender	Mean	Std. Deviation	N
Male	2.13 m	0.23	122
Female	1.50 m	0.18	125

Putting these results in context could lighten the significance and the depth of the motor abilities level. Therefore, a comparison between the obtained data and a reference raking brought information regarding fitness performance. The reference data are estimated for men over 19 years [16].

The SLJ average result of men was of 2,13 m, meaning it has fallen just 3 centimeters below average. The lowering of power for girls is more obvious than for boys (Tabl. 4). Their average SLJ performance of 1,50 m is on the border between “Below average” and “Poor”.

Table 4. Comparative table of long jump results by category for men and women (m)

Category	Men's		Women's	
	Results	Mean	Results	Mean
Excellent	>2.44		>1.91	x
Good	2.29-2.43		1.78-1.90	x
Average	2.16-2.28		1.77-1.63	x
Below Average	1.98-2.15	2.13	1.50-1.62	1.50
Poor	<1.98		<1.50	x

Testing the hypothesis that there is a significant difference between the average of our sample and the average reference values, we applied the one sample t test 2 tail: $t = (x - \mu) / (s/\sqrt{n})$.

The results for men $t_{(120)} = 40.9$ ($p < .00,1$) confirms that the difference between the two means is statistically significant. Also for women sample the t-test result $t_{(125)} = 12,5$ ($p < .00,1$) demonstrates a significant statistical difference between the two data sets. Both calculated t-values ($40.9 > 3.373$ and $12.5 > 3.373$) are greater than the critical tabular t-value, and consequently, we can conclude that the difference between the sample and reference values is 99.9% statistically significant.

Qualitative research. In the present research, we explore the students' understanding and opinion about the stage of the university population in terms of physical and fitness features. Following this purpose, we delivered e-mails with the quantitative study results to those students we measured and tested before. We received narrative essays from 56 students randomly selected from those previously measured and tested and they commented on those data in terms of reasons, consequences, and solutions. The content, supported by quotes, was analyzed and sorted into themes, categories, and subcategories grounded in literature models [17, 18]. After coding the main themes, categories, and subcategories deducted in the process of transcribing and analyzing the narrative material, we were able to synthesize the participant's opinions and their insights and perspectives, as can be seen in Table 5.

Discussion

Many people spend most of their time in a seated position, so their gluteal muscles are stretched out for a long time. Inactivity affects most of those muscles and those which run parallel to the spine. Remaining inactive for long periods results in muscle atrophy, lowering physical abilities, and even causing pain. Physical insufficient activity explains the decrease in fitness levels and has an influential role in weight gain in the young population.

According to a National Statistics Institute report, just half of the Romanian children in primary school (6-14 years) play, practice a sport or are physically active in their leisure time. Moreover, less than 20% of teenagers and youngsters between 15-24 years spend time being actively involved in hobbies or independent activities which require physical effort at least once a week [19]. As they grew older Romanian adults tend to ignore physical activities.

- Reasons. One of the reasons for the impact of both physical appearance and a decrease in fitness level is an inadequate focus on formal physical education lessons. Once physical education has been excluded from the baccalaureate exam the interest of secondary school students has steadily

decreased. It seems to be not just a personal or singular experience, but a widespread phenomenon.

"First reason may be connected to the fact that physical education is no longer taken seriously in general schools and high schools. Being a high school student not long ago, I, myself can confirm the fact that PE lessons are being conducted superficially, mostly in every high school. However, this was not always the case. For example, before the year 2008, a physical education evaluation was included in the Baccalaureate exam. That means students were used to be more involved in physical activities and considered it part of their Baccalaureate preparation. Since the evaluation was ruled out from the exam, shortly after 2008, I believe there is a strong connection between this aspect and the decreasing results of the study we are analyzing."

The main physical education objectives, regardless of context, grade, or gender are harmonious physical development, a reasonable level of physical abilities, and strengthening the state of health. Physical development is a long term approach planned to help students of all ages and all abilities optimize their body functions and reach their potential. Several conditions should be met to achieve these goals; among them, continuity and active involvement are critical in the educational process.

Continuity is a principle derived from a law of biology: "if you don't use it, you lose it". It means that if there is no regularity in physical effort and a progressive load that stimulates the body, the fitness level returns slowly to the original level. Widely spaced loading will produce little or no fitness improvement [20]. The lack of sufficient physical activity will lead to muscle atrophy and causes changes in the ratio of muscle mass and body fat percentage even in young adults. The muscle mass decreases even more with age [21] and is replaced by adipose tissue followed by changes in body shape and volume.

Active involvement in exercise means that for a physical education program to be fully effective the student needs drive and consistency or the will of active participation. It should not be forgotten that success in the educational process is a combination of student efforts and teacher skills. Teachers could motivate students by involving them in a wider variety of activities because the preferences and "trends" changed as the following comment reveals:

"Another fact that led to an increase in the body mass index is the change in the exercising trends over the years; if 20 years ago people would prefer aerobics, running, different sports and light exercises aiming to keep in shape, nowadays people prefer heavy training, using machines and heavyweights. These different types of exercises can change the appearance of the body and the body mass index because they stimulate the body in a different way."

Table 5. Students' opinions and perspectives – synthesis

Theme	Categories	Subcategories
Reasons	<i>Inadequate focus on formal P.E.</i>	Superficial classes
		Exclusion from baccalaureate exam
	<i>Increased access to technology</i>	Changes in preferences
		Virtual versus real activity
		Eating, snacking more
	<i>Parent neglect</i>	Time consuming sedentary activities
Lack of interest for outdoor activities		
<i>Unhealthy diet</i>	Lack of time for cooking, house chores, family physical activities	
	Poor quality food	
<i>Transportation</i>	Excess of sugar	
	Processed versus natural products	
<i>Bad habits</i>	Excessive use of car versus “green transportation”	
	Smoking, alcohol abuse, use of psychoactive substances	
Consequences	<i>Deteriorated health</i>	Low energy
		Low concentration
		Heart related disease, diabetes
		Depression
		Low birth rate
		Increase mortality rate
<i>Economic effects</i>	Immunodeficiency	
	Physical limitations in carrying out tasks	
	Low productivity	
	Pressure on social security budget	
Solutions	<i>Education</i>	Constrains on labor market
		Diminished lifetime expectancy
		Decrease in future workforce quality
		PE and sport promotion
		Programs for parenting
<i>Awareness raising</i>	<i>Personal</i>	Making P E content appealing
		PE friendly approach & climate
		Nutrition classes in elementary school
		Enough sleep
		Weight management
	<i>Public</i>	Exercise regularly
		Responsibility for own choices
		Awareness of consequences
		Interesting and appealing projects
		Campaigns for children and parents
National action plan against obesity		

Indeed, aerobic gymnastics, jogging, and team sports are addressing the cardio system aiming for functional improvements, while bodybuilding aims for an improved physical appearance. The focus has shifted from efficient functioning to an appealing appearance, from content to shape, and from substance to form.

Increased access to technology is an issue addressed in most of the essays. Students explain that being connected to a device almost all the time becomes an addictive activity from childhood.

“Almost every child uses a mobile phone; instead of playing in parks with their friends or going for a walk they prefer to spend time surfing the internet.”

Spending a significant amount of time on screen activities reduces the time allocated to other tasks, including any kind of dynamic activities. Adolescents spent 57% of the after school period in sedentary behaviors including watching TV, video games, doing homework, motorized transport, social media [22].

“...they are replacing physical activities with social media and computer / mobile games. Willing to have more and more time to spend on social media and [games, surfing internet] they neglect any other activity.”

A form of retreat from real life is signaled in the previous paragraph; virtual reality is preferred maybe because is more dynamic and more prompt in responding to immediate needs. The same tendency can be included in the withdrawal from the natural environment into the anthropic one.

“Throughout the past years, teenagers have been spending more and more time in front of computers and phones, replacing many physical, real life activities with virtual ones.”

They communicate and coexist online almost every hour of the day, which leads to a lack of interest in outdoor activities and, therefore, less physical activities.

A connection between the excessive use of technology and the decrease in physical abilities has been made:

“... considering the increased amount of time spent using such technologies by teenagers, we surely can see a connection between the excessive use of technology and the decrease of physical abilities.”

Technology does not just keep us seated in front of our desks or on sofas but has increased the propensity to consume snack foods [23]. Changes in eating habits add more weight than the lack of physical activity alone and our respondents noticed this consequence:

“...spending a lot of time at the computer is associated with eating more, usually low quality food – such as fast food, snacks, and sweets.”

There is a real interest in studying the link between the use of technology and being overweight. A comprehensive study in 27 OECD countries

revealed that for every 10% increase in information communications technology investment as a share of gross capital formation, the obesity rate climbs 1.4 % on average. At the same time, a 1 % increase in the number of physically active people can prevent a 0.2 percentage point rise in obesity [24].

It seems easier to increase investments in technology by 10 percent than make 10 percent more physically active people. Technology development increases productivity while physical inactivity is the 4th leading risk factor for death worldwide. It is estimated that more than 5.3 million people die annually due to being sedentary [3].

An unhealthy diet and parental neglect are other reasons signaled by some students.

“Unhealthy food is more accessible than ever, especially to the younger population. Fast foods are strategically placed close to universities and high schools”.

Nevertheless, food habits and customs do change during the second half of the Twentieth Century, and they are influenced by urbanization, globalization, and the contemporary “fast forward” way of living. Communities do not depend on local food resources anymore and working people are not accustomed to cook in a traditional, slow manner. Therefore, fast food, and processed products are always within reach and an apparently time saving solution, but with repercussions on nurturing habits and consequently on health.

“The products found on the market are more and more processed that are a lot easier to cook, a fact that is attracting the younger population, leading to young people eating a lot of unhealthy food, like fast food, which has a very small positive nutritional value but contains a lot of unhealthy calories and fats that, if ate regularly can lead to obesity and a number of health problems.”

The family has a decisive role in promoting a healthy lifestyle because excessive weight tends to run in families. Parental style influences children’s self-regulation in calorie intake until a certain age, eating, and daily life habits are passed down from one generation to another. Parents have an important responsibility in giving a good example for their children. Childhood health condition has a lasting impact on health and socioeconomic status in middle adulthood, [25]. There is a 50% chance for a child of being overweight if one parent is overweight or obese, and if both parents have weight management problems the chances will increase to 80%. A child who has overweight parents, who eat high-calorie foods and are physically inactive, will likely become overweight too.

However, if the family adopts healthy eating and involves children in outdoor activities, house chores, or green transportation their chance of being overweight or obese is reduced proportionally. Parent’s neglect is explained by a lack of time and

stress or pressure to fulfill multiple and different tasks:

“I think a good part of the fault belongs to their parents, which, because of the continuing pressure on them from all directions in our world, have less and less time to dedicate to their children, to involve them in time consuming and old-fashioned activities such as food preparation, outdoor games and so on.”

A study undertaken by WZB Berlin Social Science Center found that preschoolers aged between three and four years old are more at risk of obesity if their mothers work for more than 35 hours a week. If mothers are working less than 24 hours per week the risk of a child becoming overweight is lower [26]. Up to a certain working program mothers could balance the family and job efficiency, having time and dedication to implement a healthier diet and a more rigorous program for their children. As more hours are spent on the job, less time and energy for children care and “old fashioned activities” remains.

- Consequences. Two categories emerged related to the consequences of BMI increase and physical skills decay: deteriorated health and economic effects. Among the health issues mentioned were predictably heart-related diseases, diabetes, immunodeficiency, and depression. More interesting seems to be the discussion about increasing the mortality rate in “an unhealthy society” and a low birth rate:

“...they might die younger. Dying younger also means that these people are less likely to have children as some of them might not have the time. Even if they do have children, they are likely to promote unhealthy lifestyles, like the ones they had which only perpetuates the existing problems”.

The result might be negative population growth or a positive trend in the number of overweight and obese adults. Unfortunately, Romania faces both sides of this problem and does not seem to have realistic solutions. A related question to the previous statement could be how many years of healthy life are losing individuals by failing to tackle obesity and comorbidities?

An interesting idea emerged from our respondents' comments; it corresponds to the ancient quote of a sound mind in a sound body or “Mens sana in corpore sano”. The link between body health and the ability to focus the mind was brought into the discussion. A poor diet, through its consequences, may affect general well-being, making youngsters unable to perform physically and intellectually as well as their age would normally allow if they led a healthy lifestyle. This holistic approach suggests that keeping the body in a good state of functioning and stimulating the regeneration of energy resources will result in a better mood, better concentration, and improved focus. The meaning of “a sound mind in a sound body” is for the contemporary man the emotional,

physical, and mental well-being.

Economic effects. Diet related non-communicable diseases including high blood pressure, stroke, diabetes, and coronary heart disease, with a concomitant increase in health care costs, create a significant and rising economic burden. The pressure on health and social security budgets was correctly underpinned by our group, students in the business and economics faculties.

“A precarious state of health of the student’s bodies could determinate a decrease in their academic performances as well. Therefore, the quality of our society’s future workforce will also decrease”.

There are also concerns linking workforce low quality with low productivity due to physical limitations in carrying out tasks. The implications of these three elements are constraining on the workforce sustainability and local labor market.

- Solutions. The solutions identified follow two main directions: education and rising public and individual awareness regarding weight gain and physical skills decay. All respondents highlighted the educational aspect of preventing obesity spread and suggested measures for formal physical education and sports. Among those a friendly approach in lessons and extracurricular activities sounds more feasible, depending more on teachers, specific contexts, materials, curricula content, and not so much on public policies.

Motivation is a pivotal element in involving actively students in physical activities [27] and convincing them to invest time and energy in getting tired and sweating. Variety could maintain the student’s interest and motivation. One of the new generation features is that they lose interest and get bored quicker than any other generation before. Adapting and adjusting the curricula to correspond to their needs requires time, energy, and creativity on the PE teacher’s part.

“Education should be done in a friendly manner, not by forbidding them [students] from technology or fast food, but rather by making them aware that the commodity of sitting all day long and eating tasty but unhealthy food comes with concerning consequences”.

From the above quote, another task for educators stands out: the necessity of nutrition and health classes in elementary school not only for students but for parents too.

“Food education classes could be introduced into school curricula, and the number of physical education hours could be increased. In addition, campaigns based on this topic can be created for both children and parents, as they have a great influence on young people’s lives”.

In our student’s opinion a few simple, common sense prescriptions should be followed to prevent life long lasting consequences: weight management, exercise regularly, enough sleep, and taking responsibility for own choices. The right choices

are made by being aware of side effects, long term consequences, and available alternatives. Awareness rising against overweight and insufficient physical activity needs to be a more intense presence in the media, in public campaigns, and through the health and education system.

Further research is needed to determine how the generation that experienced pandemic confinement during their studies will fit into the labor market.

Conclusions

The research novelty consists of adding evidence to the limited literature investigating future workforce attitudes, opinions and context that causes a decrease in their physical potential. Several limitations may explain the partial achievement of

physical education objectives: the limited access to sports facilities, limited time allocated to physical education in the curriculum, the gap between teachers' skills and knowledge and the changing of student's needs and interests. The present generation of university students is unmotivated to spend consistent time and energy on physical activities, and is reluctant to physical and emotional fatigue.

Solutions are required and salient in education and prevention, considering the two years of sanitary constraints and the long term consequences for individuals, communities, and society. Health care, education and quality of life are three pillars of social sustainability that can support a valuable future work force.

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