PHYSICAL EDUCATION OF STUDENTS

ORIGINAL ARTICLE

Impact of COVID-19 lockdown on body mass index in young adults

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Abstract

Background and Study Aim: We conducted our research on the supposition that in pandemic context the student's weight might increase, influencing consequently BMI values. For the present moment humankind must cope with important changes and regulation which have massively impacted our daily lives. Social distancing measures taken in many schools and universities for limiting exposure and transmission coronavirus run counter how the education process is operating usually. The question that this context rises is: how people in general and especially young people are coping with this lack of physical activity and physical education changes?

Material and Methods: In this study were involved 176 male university students, 19.3±0.67 years of age, divided in two equal groups: the first one measured in 2018, with regular physical activity in face-to-face mode and the second one measured in the end of 2020, after almost one year of remote learning.

Results: In between the two measurements the BMI increased with 1.8 kg/m^2, primarily because weight gain. It results that in just two years the percentage of young men with weight issues had a significant increase from 19.3% to 33%. Applying Bonferroni correction for two tests and $p < 0.05$ it turns out that the two data samples are different with a statistical confidence >95%.

Conclusions: Under the pandemic circumstances the energy balance between food consumption and physical activity was seriously disturbed, resulting in an increased BMI. Our results confirm this tendency presented in other studies on samples of adolescents and young adults, from different countries and regions.

Keywords: weight gain, pandemic, physical education, passive leisure time.

Introduction

Nowadays pandemic confront us with an imposed idleness due lockdown, social isolation, travel restrictions, and further on with remote work and massive unemployment. The sanitary crisis will be followed by an economic crisis; the global recession seems to be inevitable [1]. The technological advance will replace many of the lost jobs and there is unlikely that the available working force will be re-employed. Short time work programs and the universal basic income concepts are examples of how society is adapting following the COVID-19 outbreak. Crisis sometimes force changes because they are quite common, but fundamental transformations are rare [2].

Restrictions were applied first in sport, culture, and hospitality domains, which have been identified as "high risk" activity sectors. Sport competitions are taking place in empty halls and stadiums, depriving athletes of the energy and support of the fans in the stands. Tourism is massively affected by travel restrictions and the closure of recreational and cultural facilities. Above all this the Olympic Games were one year postponed generating huge supplementary costs for the hosting country. Tokyo 2020 will remain in the modern Olympic Games history as the first edition that has been postponed in peacetime.

For the present moment humankind must cope with important changes and regulation which have massively impacted our daily lives. Social distancing measures taken in many schools and universities for limiting exposure and transmission coronavirus run counter how the education process is operating usually. These measures imply blended or remote schooling with many students learning on-line, with minimum or not at all social interaction, and in the best scenario wearing masks covering face and restricting the movement space. Therefore, the use of electronic devices is commune in the blended, remote, and home-schooling scenario.

Two months before the school start in Romania the sales of laptops increased with 80% and those of tablets with 85%, comparing to the same period of the previous year [3]. Not only the students are the beneficiary of those devices, but also for parents and adult people working from home imply the sitting position in front of a screen for long periods of time. Therefore, exercising at home or nearby became even more necessary in this pandemic breakdown.

For every 10% increase in information communications technology investment as a share of gross capital formation, the obesity rate climbs 1.4 % on average [4]. At the same time 1 percentage point increase in the number of physically active people can prevent a 0.2 percentage point rise in obesity.

+10% investments in technology => +1,4% obesity.

+10% physically active people => - 2% obesity.

If the techno consumerism would rise in the same path with the number of physical active people, the obesity trend will slowly reverse. In fact, massive use of information and communication technology most often implies idleness in a sitting hunched position. Involuntarily, because the pandemics, or due to the technological accelerate progress, people spend not only their working time, but also their leisure time in a

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passive and even more individualistic manner: surfing internet, playing video games, shopping on-line, watching television, sometimes reading [5]. Children, teenagers, and young adults, beside the remote schooling, entertain themselves playing videogames, watching popular series on the web while the sport facilities, swimming pools and playgrounds have been permanently or intermittently closed in the last year. Bending the head over a device for taping or playing compresses the internal organs restricting their function and especially the breathing. The so called "text neck" exerts four times higher pressure on the spine than normal [6] and consequently causes a wide range of detrimental effects from shoulder and back pain to low levels of energy and depression [7].

The question that this context rises is: how people in general and especially young people are coping with this lack of physical activity and physical education changes? Yin highlights the importance of context within a case study: "the boundaries between the phenomenon being studied and the context within which it is being studied are not clearly evident" [8]. The context in our study is the social distancing and restrictions imposed due to the COVID 19 pandemic. The study goal is to deduct the consequences of remote physical education classes and the reduced energy expenditure in the mentioned context.

Materials and Methods

Participants.

In this study were involved 176 male university students, divided in two equal groups: the first one measured in 2018, with regular physical activity in face-to-face mode and the second one measured in the end of 2020, after almost one year of remote learning. Most of students were in their first year of studies, having 19.3± 0.67 years of age. We chose a random stratified sampling, due to age and gender, aiming to address the same population differentiated in terms of physical activity in different contexts: before and during the pandemic preventing measures and restrictions. The two successive independent samples consisted of N_1=88 (2018) and an equivalent number of analysis units with the reference group N_2=88 (2020). Students participation in this research was voluntary and their individual results were confidential.

Research Design.

The research was focused on Body Mass Index (BMI) calculated on basic anthropometric measurements: weight and height. BMI is a largely used equation for approximate the body fat, defining overweight, obesity and one's health state. We conducted our research on the supposition that in pandemic context the student's weight might change, influencing consequently BMI values. Pursuing this objective, we compare the data collected in December 2020 with other series of data obtained in the second semester of 2018 from students participating actively in physical education classes at least 60 minutes weekly.

BMI calculation allowed us to divide the two samples in four weight categories: underweight (<18.5 kg/m^2), normal weight (18.5 – 24.9 kg/m^2), overweight (25-29.9 kg/m^2) and obese (≥30 kg/m^2) and to observe their evolution into a relatively short period of time.

Statistical Analysis.

Recently collected data were quantitatively analyzed and statistically compared with the same population reference data. The assessed variable was the overweight and obesity prevalence and evolution in university student population. Statistical analysis data where computed using SPSS and Excel data analysis tool. The BMI difference between groups was tested with ANOVA simple factor and a post-hoc t-test for the significance. Then a Bonferroni correction was applied for confidence interval. The main research results were presented in tables and charts.

Results

Calculating the mean BMI value for the two samples (table 1) we observe already a substantial difference: for the 2018 sample the mean value was of 22.4±4.5 kg/m^2 BMI, with a range from 15.8 to 40.3, while for the 2020 sample the mean value was 24.2± 3.7 kg/m^2, with the data distributed in a narrower range from 17.8 to 35.6.

Calculating the coefficient of variation, we observed that the second group is more homogenous than the reference one: CV 2018 = 20 % resulting a in a relatively dispersion around the central value, while CV 2020 = 15% could mean fewer outliners.

From the summary data it appears that in between the two measurements the BMI increased with 1.8 kg/m^2, primarily because weight gain. Testing the difference between groups we apply the analysis of variance (ANOVA) simple factor, which returned a positive result: the two sample are different (table 2).

Performing the post-hoc t-test assuming equal variance 2 tail it returns the following result P (T<=t) two-

Table 1. BMI Summary Data

Sample	N	Mean	Std. Deviation	Std. Error Mean
2018	88	22.4	4.51	.487
2020	88	24.2	3.69	.353

Table 2. ANOVA results

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	149.5558	1	149.5558	8.783949	0.003465	3.895458

tail 0.003415907. Applying Bonferroni correction for two tests and $p < 0.05$ it turns out that the two data samples are different with a statistical confidence >95% (0.0034 <0.025).

Further we divided the groups according to BMI values in underweight, normal weight, overweight and obese. The row data and percentage are displayed in table 3.

Focusing on the highest percentege it is noticeble that normal weight and underweight categories coresponds to the reference sample and the percentage in categories overweight and obese are higher in the 2020 sample. It results that in just two years the percentage of young men with weight issues had a significant increase from 19.3% to 33%, as can be seen in the following graph (Fig 1).

Discussion

An increase of 1.8 kg/m^2 in BMI in such a short period of time is equivalent with an increase recorded in decades under normal condition. In most European countries, the prevalence of obesity was increased from 10% to 40% in 10 years (from 2007-2017) [9], whilst in our sample we recorded an increase of 14.7% in just 2 years.

The significant number of articles related to weight gain and obesity rate during the COVID-19 pandemic demonstrates a special interest of researchers for this topic. Worrying results were obtained in a study on BMI in a sample of students 19.92±2.21 years of age from three countries, with a mean value around 26 kg/m^2 [10]. The perception of weight gain was observed in 48.6% of the population in Italy [11], while 41.7% of the adolescents reported weight gain in Palestine [12] and 25% in Spain [13]. The results of our research, with 33 % overweight and obese students, are on the same ascending trajectory as the results reported by the above studies. Due to the amplitude of the phenomenon a new term 'covibesity' has appeared to synthesize the increment in obesity rates due to restriction imposed during the pandemic [14].

The absence of social interaction, especially in young or active individuals could cause stress, anxiety and even depression [15]. Weight gain could be explained as a reaction to psychosocial stress [16] which have been found to increase energy intake. The isolation feeling might trigger emotional eating as a mean to relieve negative feelings [17]. Even short periods of increased energy intake combined with physical limited activity could altered the eating behavior with consequences in weight gain and further in BMI increased values. The lifestyle positive and negative effects on health and well-being is for over the life-course [18], impacting the individual future resilience and work capacity.

There is an undeniable connection between being physical active and being in a good state of health. In the present pandemic conditions' physical education and formal physical activities are largely suspended. Even in on-line lessons, physical education outcomes are difficult to evaluate. Eventually physical education is a practical subject while remote schooling means primarily the use of electronic devices. The results of this kind of teaching depend mainly on the student's availability to spend time and energy in exercising and their awareness that being physically active means a stronger immune system, a fit body, and an enhanced general well-being.

A regular physical activity not only keeps the BMI

Table 3. BMI categories

Sample	Underweight		Normal weight		Overweight		Obese	
2018	13	14.7%	58	66%	12	13.6%	5	5.7%
2020	4	4.5%	55	62.5%	23	26.2%	6	6.8%

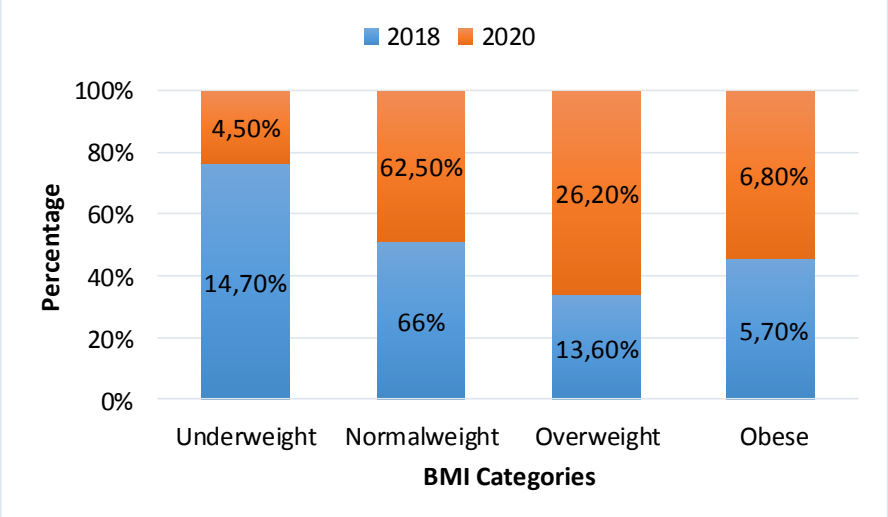

Fig 1. Percentage evolution

and muscle mass percentage in balance with body fat, preventing weight gaining, but also avoids pulmonary dysfunction and provides a sufficient level of oxygen for a normal body functioning [19]. Overweight and especially obesity is not only a risk factor for COVID patients, but disease severity increased with BMI [20].

In a study on similar sample was found that, even before pandemic restrictions, only 22% of university students exercise regularly; 10% only occasionally practice physical exercises and the majority of 68% never spend time in any sport linked activity [21].

Adapting classical methods and develop new types of exercises, less complex [22] could be a technic to motivate students to exercise and adopt healthier habits in this context in which students exercise individually and most of them in a confined workspace.

Conclusion

Under the pandemic circumstances the energy balance between food consumption and physical exertion was seriously disturbed, resulting in an increased BMI. Our results confirm this tendency presented in other studies on samples from different countries and regions. The consistent weight gain of 1.8 kg/m^2 observed in our research is causally related to inappropriate eating habits, the predominance of sedentary activities and the lack of social interaction.

Remedial measures are needed to reverse the weight gain trend of young people after sanitary crisis. These measures are primarily the responsibility of the school, families, and public health, but might be difficult to implement under the circumstances.

Self-management skills including self-discipline, self-motivation, and independent physical activity are concepts to be taught in tight relation with health and well-being. PE teachers need a convincing argument against idleness and in favor the use of leisure time to compensate the physical skills decay, the weight gain and, the stress implied by this stage of isolation and intensive technology consumption.

Conflict of interest

Authors have declared no conflict of interest.

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