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Organization of home-based physical education classes for female students during online training

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Abstract

Problem: scientists and medical professionals point to the need to modify the system of online higher education in the field of students' physical training. Physical Education (PE) teachers need to organize online training and home PE classes for students, taking into account the possibility of contact and communication both between the teacher and the students, and between the students themselves. **Aim**: to give an idea of the home PE classes related to the video exchange of physical education data between student's impacts over the university students' physical development by comparative analysis of the physical fitness tests results of female students who studied at the Siberian University. **Method**: seventy-six female students (FS) participated in this study; they practiced online learning, including home PE classes. All the participants were asked to perform a certain set of physical exercises to maintain physical fitness. FS (Group A) provided weekly paper reports to PE teachers by email. FS (Group B), in addition to paper reports, provided PE teachers with short (2-3 minutes) video files recording the performance of a set of physical exercises using popular social networks: WhatsApp, Viber, VK, etc. In addition, female participants (FS – group B) created groups on social networks and shared their video files among themselves. Two fitness trainings on data collection were conducted (January-February and June–July 2020). **Results**: it was revealed that FS (group B), who used the opportunities of social networks to exchange information about home PE classes, demonstrated significantly ($p < 0.05$) higher indicators of physical fitness profile and better BMI status during the period of online training. These results showed that regular home PE classes associated with video exchange of physical education data between female students are positively associated with participants' physical fitness and BMI ranges.

Key Words*:* physical education (PE), quarantine, social networks websites, physical training, fitness tests.

Introduction

Russian higher education realities regarding online learning were associated with a partial rejection of Physical Activity (PA) during PE classes. The time of classes allocated for students' physical education was devoted mainly to the analysis of methodological issues and to a lesser extent to PA. As for the PE classes structure, they have been transformed from typically practical to theoretical + practical classes (Osipov et al., 2020). Researchers have shown that a significant part of students do not like this format of PE classes. Students insist on full-time PE classes with the opportunity to communicate with PE teachers and other students (Glazkova et al., 2023). Also, most of the PE teachers were not prepared to conduct PE classes under the conditions of the COVID-19 pandemic and were unable to provide alternative and interesting forms and ways of organizing individual training for modern students that would allow them to maintain morphofunctional indicators of physical fitness and health at the required level (Mozolev et al., 2020). PE teachers expressed an unfavorable perception of online learning during the COVID-19 pandemic and were looking forward to full-time PE classes because they lacked personal relationships and interactions with their students (Kim et al., 2021).

In the light of these alarming findings, scientists and medical professionals point to the need to modify the system of online higher education in the field of physical culture of students, both domestically and abroad, especially among young people who are practically unrelated to physical culture issues in a broad sense (Bolotova et al. 2022; Dróżdż et al., 2022). In particular, it is necessary to promote the improvement of students' motor activity by all available means, using the huge potential of online technologies. Parsak and Sarach (2022) reported that students who are engaged in physical education and sports are less susceptible to the negative consequences associated with COVID-19, therefore it is important not to limit students' physical education and sports, taking precautions in case of various emergencies. Under these conditions, PE teachers need to organize online training and home PE classes for students, taking into account the possibility of contact and communication both between the teacher and the students, and between the students themselves.

The research aim wat to give an idea of the home PE classes related to the video exchange of physical education data between student's impacts over the physical development of university students by comparative analysis of the physical fitness tests results of female students.

Material & methods

Participants

Seventy-six female students (FS) participated in this research, they practiced online training, including home physical education during quarantine (average age - 19.37 ± 1.16 years; average height – 165.89 ± 9.17 cm; average body weight - 65.22 ± 8.11 kg). To participate in scientific work, all women had to meet the following inclusion criteria: a) not have any diseases or injuries; b) have

free access to online resources; c) have similar indicators of physical development and physical fitness. All participants got acquainted with the full information about the investigation and signed an informed consent form. This scientific work was carried out in accordance with the procedures approved by the Committee on University Ethics of the Siberian University.

Research design

All female participants were randomly divided into two equal groups: FS – group A (n=23) and FS – group B (n=23). All participants who were in self-isolation mode were asked to perform a certain set of physical exercises to maintain physical fitness during quarantine. The correct performance of these physical exercises and timely reports on their performance were attributed to physical education during the restrictive measures associated with the pandemic. All participants had to perform this set of physical exercises at least three times during the week. The set of physical exercises is presented in Table 1.

Table 1. A set of physical exercises for all participants.

Exercises	Time
Warming-up (5-6 min)	
Jump rope or Jumping jacks	3 min
Arm circles and shoulder shrugs, Swinging toe touches, Hip circles, Hip rotations, Leg swings	Each exercise performed for 30 seconds at a fast pace
Training lesson (5 circles)	
First round (3 reps)	
Push ups	10-12 reps
Squats	15-20 reps
Burpees	8-10 cycles
Rest	1 min
Second round (2 reps)	
Bodyweight Split Squats	12-16 reps
Leg Raises	15-20 reps
Forearm Plank	1 min
Rest	1 min
Cooling down (7-8 min)	
Hamstring Stretch, Butterfly Stretch, Seated Forward Fold, Supine Spinal Twist, Downward Facing Dog	Each exercise performed for 1-2 min

There were certain differences in the conditions of reporting on the correct and timely performance of physical exercises between the groups of participants. Participants (FS – Group A) provided weekly paper reports to PE teachers by e-mail. The reports indicated the total number of physical exercises performed during each week, the total time of physical exercise at each home

exercise class, heart rate indicators during physical activity and recovery time. Participants (FS – group B), in addition to paper reports, provided PE teachers with short (2-3 minutes) video files recording the performance of a set of physical exercises using popular social networks: WhatsApp, Viber, VK, etc. In addition, female participants (FS – group B) created groups on social networks and shared their video files among themselves. The participants discussed the technique of performing physical exercises, the total time of performing a set of physical exercises and gave each other ratings or left special comments and suggestions.

Two fitness sessions were conducted to collect data: one session before quarantine (January–February 2020) and one session after it (June-July 2020). All fitness tests were conducted, as a rule, during physical education hours in accordance with standard protocols by six trained PE teachers. Before evaluating fitness tests, a trained PE teacher explained each fitness test and demonstrated the correct technique for performing each fitness of them. All participants were allowed to conduct three training tests for each fitness test. The researchers tested the participants in accordance with the fitness testing protocol and standard requirements (Topend Sports. Fitness testing at home is cheap and simple). At the end of all fitness tests, direct scores were obtained for each of the tests, and the raw accurate data were entered into the central protocol.

Procedures

All participants were assessed for physical fitness before quarantine (January–February 2020) and after it (June–July 2020).

Assessment of participants' height and body weight

The participants' height was measured without shoes on a standardized electronic stadiometer TVS REP (Tambov, Russia) with marks from 0 to 220 cm and was recorded with an accuracy of 0.5 cm. Body weight was measured with a minimum amount of clothing and without shoes on a standardized weighing device Xiaomi Mi Smart Scale 2 (China) labeled from 0 to 120 kg and was recorded with an accuracy of 0.5 kg.

It is well known that body mass index (BMI) is a body mass indicator for determining height and is commonly used to classify underweight, normal body weight, overweight and obesity in the human population. The participants' BMI was calculated using the formula: body weight in kilograms divided by the square of height in meters (kg/m2). The data obtained were summarized and classified in accordance with the recommendations of doctors and medical professionals for young people: underweight (BMI <18.5 kg/m2), normal body weight (BMI from 18.5 to 24.9 kg/m2), overweight (BMI 25.0-29.9 kg/m2), obesity (BMI 30 - 34.9kg/m2) (Jha et al., 2021).

Assessment of the participants' upper body muscles strength

A fitness test with push-ups makes it easy to test the strength of the upper body at home. All participants used the standard military-style push-up technique and performed as many correct

push-ups as possible in 1 minute. The total number of correct push-ups for each participant was calculated and recorded in the central protocol.

Assessment of the participants' lower body muscles strength

The squat fitness test makes it easy to test the lower body strength at home. All participants used the standard squat technique and performed as many correct squats as possible in 1 minute. The total number of correct squats for each participant was calculated and recorded in the central protocol.

Assessment of the participants' abdominal muscle strength and endurance

A fitness test with squats makes it easy to test the strength and endurance of the abdominal muscles and hip flexors at home. All participants used the standard squat technique and performed as many correct squats as possible in 1 minute. The total number of correct squats for each participant was calculated and recorded in the central protocol.

Assessment of the participants' strength endurance

The 3-Minute Burp Test (3-MBT) is a standard fitness test for assessing the strength endurance of people (men and women) aged 18-25. All female participants correctly performed 3-MBT in the variation of R. Podstavsky et al. (2019). The total number of correct burpee cycles for each participant was calculated and recorded in the central protocol.

Statistical analysis

In this scientific paper, descriptive data analysis was carried out using the «IBM Statistical Package for Social Sciences» (SPSS) version 24 (Armonk, New York: IBM Corp.) to evaluate the variables of the participants' fitness test, the average value of the data and the standard deviation (mean ±SD). The distribution of each variable was investigated using the Kolmogorov-Smirnov normality criterion. The uniformity of the variance was tested using the Levine criterion. All variables had a normal distribution. Independent t-tests were conducted to compare the measured variables in women between groups. For this scientific work, the significance level was set at $p \leq 0.05$.

Results

During the research, each of the FS submitted 58 reports on PE classes at home. According to the reports, all FS performed a set of physical exercises in full, and the proposed physical activity did not cause any difficulties for the participants.

As for the distribution of BMI in the studied samples, the average FS body weight increased after quarantine compared to before it. For the sample (FS – group A), while the average body weight increased by 4.27 kg between the two time periods, which exceeded the normal BMI range (overweight). Accordingly, in another sample (FS – group B), the average body weight increased by 2.35 kg and remained within the normal BMI.

As for the physical fitness variables, the results show that all indicators of physical fitness (push-ups, squats, squats in 3rd place) significantly ($p<0.05$) increased in the sample (FS – group B) and decreased in the sample (FS – group A) after quarantine.

General information on the participants' physical fitness and BMI indicators for the study period (January–July 2020) is presented in Table 2.

Table 2. Indicators of participants' physical fitness and BMI before and after quarantine.

Tests	Group A (n=38)	Group B (n=38)	$p \leq$
January–February, 2020			
Body height (cm)	166.28 ± 9.55	165.59 ± 9.47	0.865
Body weight (kg)	65.35 ± 9.31	65.06 ± 8.52	0.879
BMI	23.64 ± 0.27	23.73 ± 0.19	0.876
Push-ups	15.37 ± 8.45	15.25 ± 7.68	0.874
Squats	32.06 ± 12.27	31.67 ± 10.41	0.832
Sit-ups	38.72 ± 9.34	39.05 ± 7.56	0.937
3-MBT	42.57 ± 5.34	43.02 ± 6.15	0.767
June–July, 2020			
Body height (cm)	166.31 ± 13.39	165.76 ± 11.24	0.752
Body weight (kg)	69.57 ± 7.45	67.41 ± 5.63	0.039*****
BMI	25.15 ± 0.11	24.53 ± 0.26	0.048*****
Push-ups	12.42 ± 6.34	15.68 ± 7.04	0.016*****
Squats	28.51 ± 11.15	35.82 ± 15.29	0.004*****
Sit-ups	36.15 ± 7.43	40.23 ± 6.11	0.031*
3-MBT	40.37 ± 6.21	46.13 ± 6.05	0.025*****

Note: ***** – $p \leq 0.05$ – (level of significance).

Discussion

In this scientific work, it was found that students who used the opportunities of social networks to exchange information about home PE classes demonstrate significantly ($p<0.05$) higher indicators of physical fitness profile and better BMI status during the period of online training associated with restrictive measures. FS who were deprived of the opportunity to communicate demonstrated significantly ($p < 0.05$) worse indicators of physical fitness profile and BMI status.

Glazkova et al. (2023) indicated that a significant part of Russian students have a negative attitude to online PE classes. Students prefer the full-time format of such classes, which indicates the possibility of communicating with PE teachers and other students. In our case, some students (FS – group B) were given the opportunity to communicate and exchange data using social networks, which allowed them to demonstrate higher results in the profile of physical fitness.

Dróżdż et al. (2022) reported that the successful modification of the educational system for students in the distance form will largely depend on more accurate planning of the process of transmitting didactic content and improving the methods of its verification. It becomes more important in terms of more frequent contacts between PE teachers and students in an online format and taking into account the likelihood of quarantine and forced social isolation in the future. It should be noted that in addition to the contact between PE teachers and students, there is also a need for contact between students themselves with the possibility of free access, exchange and evaluation of each other's academic achievements. This research showed that FS who freely exchange information about their performance of physical education training tasks demonstrated significantly higher levels of physical fitness during the quarantine period.

Sun et al. (2023) reported that online physical education has important advantages and disadvantages. In particular, extensive educational resources are available to support online PE classes, including videos, slides and electronic documents. In addition, online learning goes beyond the limitations of one university or region and makes PE classes more visual, since students can repeatedly view videos and slides. However, with regard to online physical education, oral communication or watching videos is not enough, because PE teachers find it difficult to control students during online training. In this case, additional control on the part of the students themselves by watching each other's video reports makes it possible to qualitatively improve the effectiveness of home PE classes during self-isolation and quarantine. It was found that female participants who used this form of control demonstrated significantly better indicators of the physical fitness level during the research.

Although the research results contribute to scientific knowledge and have a significant impact on various concerned parties in university students' participation in physical education during social distancing and isolation, this scientific work is not free from some restrictions. Firstly, this research is limited in its generalizability, since the collected data are obtained from one university (SFU). Secondly, some of the participants independently reported data on home PE classes that could not be objectively verified. Finally, the total number of participants was not too large (less than one hundred female students), which could affect the research results and their interpretation. Future scientific papers should deal with this thematic problem using objective measurements and a large number of participants.

Conclusion

This research work highlights the importance of positive participation in physical education at home to promote the development of physical fitness and maintain a normal BMI of female university students. Our results showed that regular home PE classes associated with video exchange of physical education data between female students are positively associated with the participants' physical fitness and BMI ranges.

Conflict of interest

The authors state that this scientific work was carried out in the absence of any commercial or financial relations that could be interpreted as a potential conflict of interest.

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