

## ORIGINAL SCIENTIFIC PAPER

# Analysis of Physical Fitness and Physical Activity Results of Female Undergraduate and Graduate Students

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## Abstract

Information about the volume and intensity of the physical activity of students is collected through various methods of inquiry. Questionnaire data needs to be compared with objective criteria of the physical fitness of students. The purpose of the present research is a comparison of the International Physical Activity Questionnaire (IPAQ) data and the results of functional fitness assessment tests of female undergraduate (n=639) and graduate (n=625) students. The IPAQ data were used to determine the level of physical activity in females. Data regarding the BMI and self-perceived physical fitness of females are collected. The physical fitness level of the female students was assessed using functional fitness assessment tests. The IPAQ results show significant ( $p < 0.05$ ) differences in the total weekly volume of physical activity of females. More weekly physical activity volume was found in female graduate students. The advantage in IPAQ results is achieved by significantly ( $p < 0.01$ ) more weekly physical activity in the office job. The weekly volume of health and sports physical activity is significantly ( $p < 0.01$ ) higher in female undergraduate students. The data on the volume of regular daily movement in female groups do not differ significantly. The results of fitness testing showed an insufficient level of physical fitness of female students of both groups. BMI results of female students are normal. A significant lack of the total volume of physical activity of students of both groups in comparison with the IPAQ data of female students of some European countries was revealed. Increasing the total amount of physical activity and improving the quality of physical activity is recommended.

**Keywords:** female students, physical fitness, IPAQ, fitness tests, BMI

## Introduction

Human health significantly depends on the level of physical activity (PA) and healthy nutrition (Concha-Cisternas et al., 2018). Scientists indicate that PA should be systematic and regulated by age-appropriate exercise intensity (Bergier et al., 2018). A detailed study of students' PA level is vital for assessing the health status of future social elites of society (Bergier

et al., 2018). The research data suggests that many students do not meet the PA recommendations of the World Health Organization (Juškelienė & Česnavičienė, 2017). The main reasons for the lack of PA of students include a heavy study load and enthusiasm for the internet and computer games (Kudryavtsev, Kramida, & Osipov, 2016). To collect data on the daily PA level of students, scientists use a variety of survey



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methods. In recent years, the International Physical Activity Questionnaire (IPAQ) has become a common tool (Loginov, Nikolaev, Vetoshnikov, & Sagadeeva, 2015). The final results of the survey of students differ significantly. Some studies indicate a sufficient PA level of students of some universities (Mulahasanović, A. Mujanović, E. Mujanovic, Atikovic, & Maglaj, 2018). Other data indicate a significant PA deficiency in this social group (Pedisic, Rakovac, Bennie, Jurakic, & Bauman, 2014). It was found that a significant proportion of students did not comply with global recommendations for optimal PA levels during the week (Tinazci, EAlrefai, & Musa, 2019).

It was revealed that the PA level of male students is significantly higher than that of female students (Bergier et al., 2018). Female students showed lower levels of interest in regular PA and sports than male students did (Bukova, Zuskova, Szerdiová, & Kuchelová, 2017). The consequence of PA deficiency is the deterioration of health and the development of obesity in a significant proportion of female students (Osipov et al., 2018). The direct dependence between the decrease in the level of physical fitness and increase in body weight of females has been defined (Kolokoltsev & Iermakov, 2019). The PA level has been found to be significantly lower in obese females, in each type of physical effort, except light effort (Gabrys, Nowak, Michalski, Szmatlan-Gabrys, & Stanula, 2018). Lack of regular PA has an adverse impact on the level of psychological endurance of females (Şar Nuriye, Soyer, & Koç, 2018). However, there is evidence that the majority of students, particularly females, were within the healthy body weight range. At the same time, the PA level of female students was not high (Yahia, Wang, Rapley, & Dey, 2016). Female students, more frequently than male students, demonstrated lower indices of participation in PA as well as a positive phenomenon seen in the normal BMI and trace values of overweight in females, which is exactly the reverse to males (Bergier, Bergier, & Tsos, 2017).

Scientists state the need to use practical tests to study the correlation between subjective assessments and objective indicators PA level of students (Leuciuc, 2018). A widely-used self-report tool (International Physical Activity Questionnaire (IPAQ) also needs to be modified, and the data reliability needs to be improved (Frehlich, Friedenreich, Nettel-Aguirre, & McCormack, 2018). To improve the reliability of the PA structure and volume assessment, it is necessary to compare IPAQ data with the results of the physical fitness testing of students. The need to compare IPAQ data with measurements of step daily activity of students is emphasized by researchers (Marttinen, Fredrick, & Silverman, 2018; Nikolaev & Solodilov, 2016). In the Russian Federation, students' physical education (PE) scores are assessed by means of tests of the Russian Physical Culture and Sports GTO complex (Zyurin, Bobkova, Morozov, & Poliyevsky, 2018). Students take part in GTO complex tests on a voluntary basis. Many female students do not participate in the GTO complex, which does not allow for objective conclusions about the state of physical fitness. A problem of determining the total volume and quality of physical activity of a significant part of female students of Russian universities exists.

The review of scientific data identified the primary purpose of the research: comparison of IPAQ results with objective physical fitness profile indicators of Russian female students (undergraduate and graduate students).

## Methods

### Participants

Females participants: (n=1264): undergraduate students (n=639) and graduate students (n=625). The average age of female students was 20.36±2.19 years. The average age of female graduate students was 23.18±2.24 years. All participants gave their informed consent to take part in the studies and had no medical contraindications for PE and fitness training.

### Organization and research methods

The research was based in large universities located in different regions of the Russian Federation (Krasnoyarsk Region, Nizhny Novgorod Region, and Udmurt Republic). The research was conducted over two months (May-June 2019). The PA level of females was assessed using IPAQ. The IPAQ questionnaire was supplemented with three original questions concerning body mass and height, which allowed for calculating the BMI index, as well as self-perceived physical fitness (high, good, moderate, and low). Administering the questionnaire to the students took place twice, with an interval of four weeks.

The level of physical fitness profile of the participants in the study was assessed using Functional fitness assessment tests: aerobic fitness test (one-mile run test); rest 5 minutes; upper body strength/endurance (push-up) test; rest 3 minutes; lower body strength/endurance (squat) test; rest 3 minutes; core strength/endurance (plank) test.

### Statistical analysis

Analysis of the results was carried out using the IBM SPSS Statistics for Windows 20.0 (Armonk, NY: IBM Corp.). The general findings are presented as means and standard deviations (SD). The reliability and statistical significance of the results were determined using the Pearson test (Chi-square) and T-test. The level of significance was accepted  $p < 0.05$ .

## Results

The IPAQ findings are presented in the total time of PA spent (minutes). A significant number of participants had difficulty counting results at the MET (metabolic equivalent of task). Also, a more robust comparison with data of other investigators (represented in time spent - minutes) was required.

The IPAQ results show a significant ( $p < 0.05$ ) predominance of the total weekly PA (PA-total) in the female graduate students. They have significantly ( $p < 0.01$ ) higher volume of working PA (PA-job) during the week. There were no significant differences in PA-moving and PA-homework in both groups. In the volume of sports and fitness (PA-sport and fitness) a significant ( $p < 0.01$ ) prevalence of weekly PA in female undergraduate students was revealed. Most of the independent PA scores in both groups are positive scores (Good level). BMI indicators correspond to the norm in both groups of studied females. In the group of female graduate students, BMI data were significantly higher ( $p < 0.05$ ).

The findings of functional fitness assessment tests are presented: aerobic fitness test (minutes), plank test (seconds); push-up and squat tests (repetitions). The overall results of functional fitness assessment tests were found to be unsatisfactory in both groups. Female undergraduate students showed significantly ( $p < 0.05$ ) higher results in the aerobic fitness test (one-mile run test) and upper body strength/endurance (push-up) test. In other fitness tests, there were no significant differences between the groups. The main results of the IPAQ and fitness tests of females are presented in Table 1.

**Table 1.** The IPAQ and fitness tests results of female undergraduate and graduate students

IPAQ / Functional fitness assessment tests	Female undergraduate students (n=639)	Female graduate students (n=625)
Job PA	426.74±42.63	883.56±64.18**
PA moving	853.29±37.44	849.23±28.32
Homework PA	795.72±46.29	782.47±52.44
Sport and Fitness PA	796.61±32.45**	512.42±41.23
Total PA	2872.36±159.21	3027.68±186.17*
Self-perceived PF	Good level (65.4%)*	Good level (61.9%)
One mile run test	7.44±0.27	8.26±0.32*
Push-up test	14.43±2.51*	13.58±2.46
Squat test	52.17±4.75	51.94±4.23
Plank test	0.54±0.13	0.51±0.09
BMI	22.39±0.16	23.06±0.22*

Legend: \* -  $p < 0.05$ ; \*\* -  $p < 0.01$ .

The percentage of tests results of female students to standard results of the functional fitness assessment tests is presented in Figure 1.

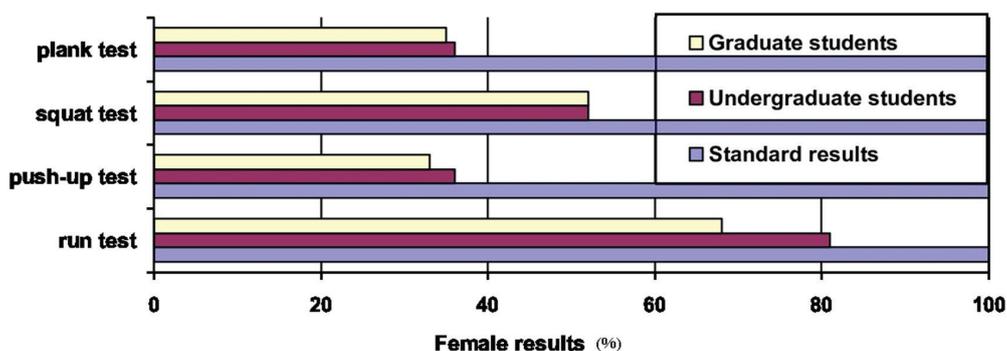


FIGURE 1. The ratio of the test results of female students with the standard results Functional fitness assessment tests

## Discussion

The results obtained differ significantly from the results of PA female students' assessment in several European countries. The weekly PA volume of Bosnian female students was found to be at least 4600 minutes (Mulahasanović et al., 2018). Ukrainian female students have a PA of at least 3,100 minutes per week (Bergier et al., 2018). The maximum weekly volume of the PA of female graduate students is slightly more than 3000 minutes, as recorded in our studies. The volume of the PA of female undergraduate students is lower by approximately 100–150 minutes per week. The data from other Russian experts confirm the lower volume of weekly PA Russian female students. Scientists point out that the total amount of PA in female students is approximately 2900–3200 minutes per week (Nikolaev & Solodilov, 2016). A significant increase in the volume of PA in Russian female students is necessary because the volume of PA is related to significant public health and psychological benefits (Acebes-Sánchez, Diez-Vega, Esteban-Gonzalo, & Rodriguez-Romo, 2019).

The results of the research show that the majority of female students (more 60%) assess their level of weekly PA positively. The obtained results differ from the estimates of physical activity by students of other European countries. In the Czech Republic and Poland, only about 33% of students who indicated a preference for fitness PA (Kudlacek, Fromel, & Groffik,

2020). The global PA recommendations for adolescents and students are 60 min of moderate-to-vigorous intensity aerobic activity per day, plus three additional bouts of resistance exercise. The scientific literature presents data on the performance of female students' recommended weekly volume of PA only taking into account the mandatory attendance of PE classes (Marttinen et al., 2018). Compulsory physical education classes are not represented in the educational programs of female graduate students. The lack of regular PA adversely affects the level of physical fitness profile of female students (Osipov, Ratmanskaya, T., Nagovitsyn, R., Zhuikova, S., & Iermakov, 2020). We assume that many female students unreasonably indicate a higher level of PA in the IPAQ data. Activities to increase the motivation of female students for regular PE classes (Osipov et al., 2017) and to develop young people's interest in increasing the weekly volume of PA are needed (Bogdanov & Rychkova, 2019). Developing gender-specific programmes for promoting healthy lifestyle behaviours among students is recommended (Yahia et al., 2016). Foreign students studying at Russian universities emphasize the need for additional health fitness or sports (Tumakov, Fazleeva, Akberov, & Valeeva, 2018).

Experts indicated that university students have several modifiable risk factors associated with low levels of PA and excess weight (Concha-Cisternas et al., 2018; Grao-Cruces,

Ruiz-Ariza, De la Torre-Cruz, & Martinez-Lopez, 2018). The female students with low levels of PA had significantly higher body mass and body composition parameters: body mass index and per cent body fat (Podstawski et al., 2019). However, the scientific literature provides data on a significant number of students who have a low weekly PA level and body weight within normal limits (Galle et al., 2019). Some studies show a significant prevalence of healthy BMI in students with lower PA levels in Ukraine and the Visegrad countries (Bergier et al., 2018). Our research also shows the prevalence of normal BMI in most female graduate and undergraduate students. We assume that most female students associate appearance and body weight with a sufficient level of PA. The females happy with their appearance consider the weekly PA level positive and do not see the need for an increase in PA.

Given the results of our study, we can affirm that the cur-

rent conditions of student learning are characterized by a significant decrease in physical fitness indicators of female students. Experts say that the main reason is the low weekly PA level of female students. Significantly lower levels of weekly PA of Russian female students in comparison with those of female students of other European countries have been revealed. Most of the Russian female students have positive assessments of their weekly PA level. Similar assessments of the PA level are not completely objective. The prevalence of normal BMI in the majority of female students was also revealed. The female graduate students have significantly ( $P < 0.05$ ) higher rates of BMI in comparison with female undergraduate students. The female students with normal BMI have low results in functional fitness assessment tests. Increasing the total amount of weekly PA and improving the quality of PA of female students is recommended.

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#### Conflict of Interest

The authors declare that there are no conflicts of interest.

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