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Original article

STUDY REGARDING THE ASSESSMENT OF FITNESS IN STUDENTS FROM THE "VASILE ALECSANDRI" UNIVERSITY OF BACĂU

MILON ALEXANDRA GABRIELA[1], VOROVENCI CARMINA MIHAELA[1]

Abstract

Objectives. This paper aims to highlight the level of fitness in students of the Faculty of Engineering and Faculty of Movement, Sports, and Health Sciences at the "Vasile Alecsandri" University of Bacău. This study tries to compare the values resulted from the Ruffier test, performed by first year students, first semester, from the academic year 2019-2020. The purpose is to compare the fitness level of the students of the two faculties involved in the study.

Method. The research was conducted on 60 students, 30 students of each faculty. The group formed of Faculty of Movement, Sports, and Health Sciences students have performed a regular program of physical activities 3 times per week (track and field, gymnastics, swimming), while the Faculty of Engineering students performed physical activities once every two weeks, during their physical education and sports lessons. The Ruffier test evaluates the fitness, being a selection test applied to beginners, without any risks.The research methods used were: the literature study, the testing method, the statistical-mathematical method.

Results. The results show a fitness that can be described as good in the Engineering students, while the results of the Faculty of Movement, Sports, and Health Sciences students were very good.

Conclusions. The conclusions are that the physical activity performed by the subjects over the course of the semester contributed to the improvement of their fitness. The Engineering students did not record significant progress, while the Faculty of Movement, Sports, and Health Sciences students record significant progress.

Key words: fitness, assessment, students.

Introduction

Physical effort is defined by multiple authors as an overwork of the body that leads to the modification of the homeostasis. The body modifications are found mainly in the respiratory and circulatory systems.

Effort is "the result of multiple demands (muscular, cardiorespiratory, endocrine-metabolic, mental, etc.) to which the human body is subjected while performing certain activities" (Dragnea, 2000). Physical adaptation to effort is important for every individual, because the lack of it can lead to functional modifications of the cardiorespiratory, muscular, and bone systems. Fitness is the ability to perform athletic activities, occupations, and daily life activities and is generally achieved through adequate nutrition moderate and vigorous, exercise and sufficient rest.

Fitness is defined as the body's ability to respond to the demands of the environment. Young people's ability "to maintain a physical effort depends on their physical and mental state, based on which they can perform various functions and activities: social, professional, familial, etc"(Dragnea 1996).

Young people's fitness depends on certain factors, such as: sex, age, and professional activity, and it can have a general and specific character.

An important aspect of fitness is the growth process, that in girls stops around the age of 17-19, and in boys around the age of 21-25. "Unequal and sometimes asymmetrical, arrhythmic, alternating, and differentiated gender growth and development is not random, but subjected to higher laws of coordination and balance on progress stages that gradually transform the child into a youth and the youth into an adult" (Benck, Cuttica, 2017).

Around the age of 18-19, the bones grow in length and get closer to the aspect and dimensions of adult bones, however they are still behind them in regards to endurance and hardness. During this period, the arm span compared to height is larger in men than in women. The thoracic perimeter "is considered to be fully grown around the age of 20, when it reaches, in average, 85 cm in men, and 80 cm in women" (Drake, Jones, Brown, and Shephard, 1968). Men have wider shoulders and a narrower pelvis, while the

[1]Department of Physical Education and Top Athletic Performance, "Vasile Alecsandri" University of Bacău, Romania
Corresponding author: alexandra.milon@ub.ro
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women have narrower shoulders and a wider pelvis. Women have a better balance, because they have a lower center of mass. "The upper limbs grow up until the age of 18 in women, and up until the age of 25 in men. Around the age of 18, muscle fibers with a high degree of differentiation and a large number of elongated and narrow nuclei are formed"(Lin, Zhang, Guo, 2015). Muscle mass and muscle strength are increasingly visible. "Muscle mass in women is approximately 13% lower than in men. Muscle strength, especially in the scapular girdle and upper limbs, is higher in men. Muscle properties, such as excitability, conductibility, contractility and tone gradually increase with age and training".

During this time, the musculoskeletal system starts to harden, the bones growing less in length and more in width. The body has a greater stability, and muscle strength increases. At this age, there is still room for functional and morphological development. The respiratory system is also developing at this age, the thorax is increased, the diaphragm is hardened, and the respiratory motions are amplified, thus increasing the vital capacity. The type of breathing is changing, becoming from abdominal, lower costal in men and upper costal in women. The gas exchanges between lungs and tissue become more effective. The trachea is 12 cm in an adult, the transversal diameter is 22 mm, and the anteroposterior diameter is 16 mm in men. In an adult, the respiratory rate is 16-18 breaths/min., while the respiratory volume is 400-500cm3. " (Netolitzchi, 2009).

The heart increases 20 times from birth up to around the age of 20. Heart contractions reach 85-86/min. at the age of 18. Heart volume is of 250-300cm3 . Blood pressure reaches 120/75 mm at the age of 18. The quantity of blood in relation to body weight is of 1/13. From a motor standpoint, actions become more complex and nuanced as a result of the development of one's ability to perceive the significant elements for an effective motor conduct. In regards to motor skills, they progress (especially in boys), even though schools do not do a great deal in this sense. The favorable premises for "the development speed, strength, endurance are insufficiently explored" (Raţă, Raţă, 2006),. The motor skills that are consolidated during previous stages must be perfected, looking to cover as best as possible the area of existent motor activities (educational, competitive, leisure time, etc.). At this level, motor skills are not just about the high school curriculum, but a complex way to adapt to various circumstances, to master one's own body, process information, construct certain reasonings and use various forms of expressions; learning each motion is an "experimental endeavor" that is felt in the body.

2. Materials and Methods

This study was conducted on a group of 60 students, 30 students of the Faculty of Movement, Sports and Health Sciences and 30 students of other faculties at the "Vasile Alecsandri" University, aiming to compare the values recorded during the Ruffier test, performed by first year students, first semester of the academic year 2019-2020.

The purpose of this paper is to assess the fitness level in the students of the two faculties involved in the study, Faculty of Movement, Sports and Health Sciences, and the Faculty of Engineering.

The working hypothesis was that "through the active participation of students in first year practical courses, their work capacity might be positively influenced".

The research methods used were: the literature study, the testing method, the statistical-mathematical method.

Subjects

The research was conducted on 60 students, 30 students of each faculty. The group formed of Faculty of Movement, Sports, and Health Sciences students have performed a regular program of physical activities 5 times per week, while the Faculty of Engineering students performed only occasionally physical activities, 3 times per week at the most. The subjects' age was between 18-25.

Test description

The Ruffier test "refers to the body's ability to adapt to effort, based on measuring the pulse in relation to a standard effort of 30 genuflections performed in 45". The pulse is measured during rest, over 15 seconds (P1), in the first 15 seconds right after performing the work (P2), and in the first 15 seconds of the second minute after performing the work (P3)"(https://www.superfit.ro/proba-ruffier/). All values are multiplied by 4 to get the heart beat/minute, then the following formula is applied:

[(P1 + P2 + P3) – 200]/ 10

The results are compared to the following norms:

- values lower than 0 (negative) = very good;
- values between 0 - 5 = good;
- values between 5 - 10 = average;
- values between 10 - 15 = satisfactory;
- values above 15 = unsatisfactory, which imposes supplementary cardiovascular investigations.

3. Results and Discussions

Table 1. Initial Ruffier test results for the witness group (engineering students)

Ruffier test - witness group	Initial pulse (rest)	Pulse after effort	Pulse after 1 minute
Arithmetical mean	88	132	101.5
Max	92	135	106
Val.	84	129	97

The initial results recorded by the Engineering students presented in table 1 show that their training level is satisfactory, with an average value of 12.15. Thus, there is an arithmetical mean of initial pulse of 88, of pulse after effort of 132, and after a minute, of 101.5.

Table 2. Final Ruffier test results for the witness group (engineering students)

Ruffier test - witness group	Initial pulse (rest)	Pulse after effort	Pulse after 1 minute
Arithmetical mean	83	122	95
Max	88	125	101
Val.	78	119	89

The final results recorded by the Engineering students presented in table 2 show that their training level is average, with an average value of 10. Thus, there is an arithmetical mean of initial pulse of 83, of pulse after effort of 122, and after a minute, of 95.

Table 3. Initial Ruffier test results for the experimental group (FMSHS students)

Ruffier test - experimental group	Initial pulse (rest)	Pulse after effort	Pulse after 1 minute
Arithmetical mean	64.5	101	80
Max	70	105	89
Val.	59	97	71

The initial results recorded by the FMSHS students presented in table 3 show that their training level is good, with an average value of 4.55. Thus, there is an arithmetical mean of initial pulse of 64.5, of pulse after effort of 101, and after a minute, of 80.

Table 4. Final Ruffier test results for the experimental group (FMSHS students)

Ruffier test - experimental group	Initial pulse (rest)	Pulse after effort	Pulse after 1 minute
Arithmetical mean	61.5	89.5	67
Max	68	93	71
Val.	55	86	63

The final results recorded by the FMSHS students presented in table 4 show that their training level is good, with an average value of 1.8. Thus, there is an arithmetical mean of initial pulse of 61.5, of pulse after effort of 89.5, and after a minute, of 67.

The graphical representation

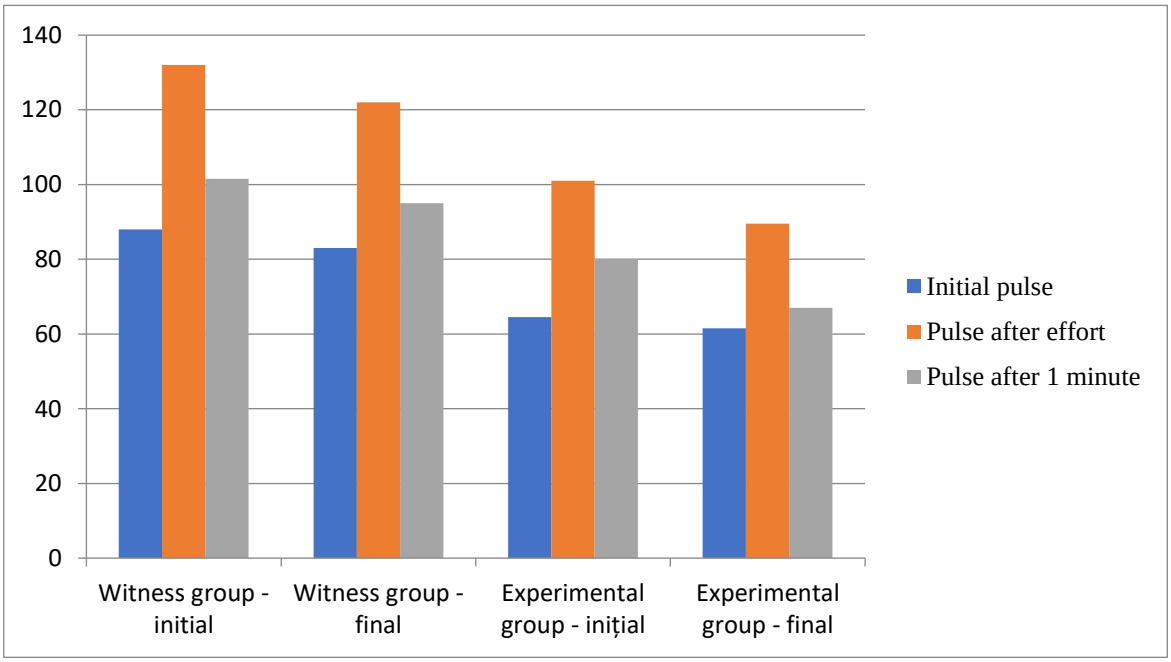

Figure 1. Ruffier test results

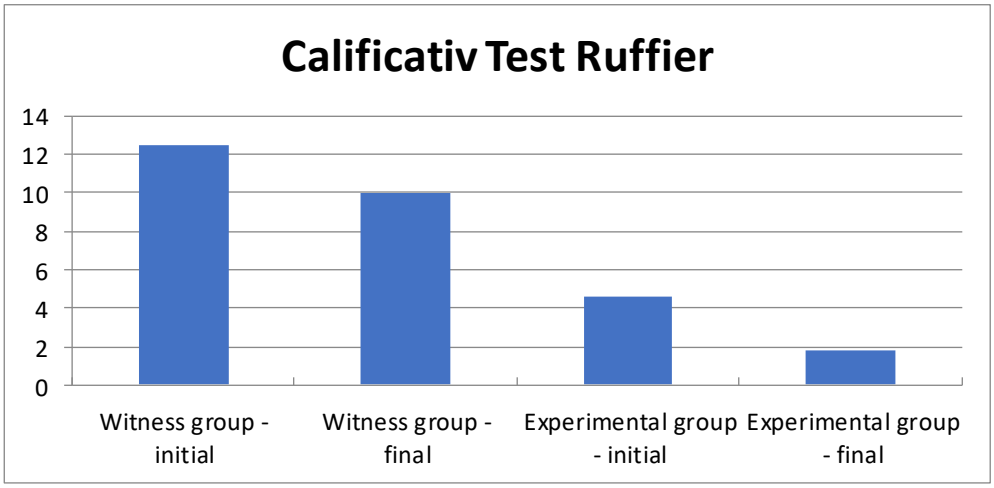

Figure 2. Interpretation of the Ruffier test results

Figure 2 shows that the Engineering students have a satisfactory training level, with an average value of 12.15 during the initial testing, and improving their fitness to an average level, with a value of 10. During the initial testing, the FMSHS students had a good training level, with an average value of 4.55, and during the final testing a good training level also, with an average value of 1.8.

Conclusions

At the end of the study, one can see that both groups made progress in regards to pulse, but more significant improvements were made by the experimental group.

Pulse improvements can provide important information regarding the students' health and makes them aware of the effects of exercise on improving/ maintaining their health.

The subjects of this study succeeded in improving their fitness. The results recorded during the Ruffier test suggest that exercise is effective and can improve fitness, that is why it is very important for the exercise to be performed systematically, in a controlled environment, during university classes, but especially individually, during leisure time, because it can have major beneficial effects on one's health.

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