

**THE ANALYSIS OF PHYSICAL PERFORMANCE
CHANGE IN THE CASE OF STUDENTS FROM
THE UNIVERSITY OF PANNONIA, GEORGIKON
FACULTY**

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Abstract

The beneficial impact of sport was formerly justified by numerous national and international literatures, highlighting the correlation between exercise training and psychological condition, as well as that between physical and mental health. Nevertheless – as far as the authors know – the effects of a once-a-week, vigorous exercise training has not been examined yet; therefore, the area being a “terra incognita”, the results of the locally conducted survey can even have interesting scientific aspects. The discussed research primarily focussed on the following: the students of the University of Pannonia/Georgikon Faculty, originating from different settlements and schools have diverse physical fitness, and are either active or inactive concerning doing sports. The authors wanted to figure out, whether the weekly physical activity could possibly bring positive results in their performance; and in which kind of numerical data could it be recorded.

Key-words: physical fitness, exercise training, students, moderate to vigorous physical activity

Összefoglalás

A sport jótékony hatásait korábban számos hazai és nemzetközi szakirodalom igazolta, melyek összefüggéseket mutattak ki a fizikai aktivitás és a pszichés állapot, illetve a testi és lelki egészség kapcsolatrendszerében. Tudomásunk szerint azonban a heti egy alkalommal végzett komoly terheléssel járó fizikai aktivitás hatásait még nem kutatták le szakemberek – a terület ezáltal meglehetősen „ismeretlen föld” – így lokálisan végzett felmérésünk eredménye érdekességgel szolgálhat tudományos szempontból is. Jelen kutatásunk elsősorban arra irányult, hogy a különböző településekről, iskolákból a Pannon Egyetem Georgikon Karára érkező, s eltérő fizikai felkészültséggel bíró, a sportolást tekintve aktív és inaktív életet élő hallgatók heti rendszerességgel végzett mozgatása során érhető-e el teljesítményükben pozitív változás, s ha igen, milyen számszerűsíthető érték mutatható ki.

Introduction

The competences of a qualitative professional lifestyle do not evolve till the end of secondary education. Although the National Curriculum defines the requirements of prevention, living standards and health improvement, they need to be continuously developed parallel with the personal aspect. The initiation of higher education studies – including those of the students enrolled at the University of Pannonia/Georgikon Faculty – introduces an important change in lifestyle. Most of the students have to establish their way of living far from their residence, in a foreign environment, and the daily-weekly routine has to be adjusted to their studies.

They not only have to accommodate themselves to the new circumstances, but also have to independently solve essential activities like recreation, eating, physical activities, entertainment etc. within the limits of free time. The authors of this article conducted a three-year-long data collection and analysis (with 184 students), focussing on exercise training – particularly on compulsory PE lessons – and aim at the summary of general conclusions in connection with the effects of once-a-week sporting activities.

Materials and Methods

The research basically dealt with the following: the students originating from different settlements and schools have diverse physical fitness, and are inhomogeneous in terms of sporting activities. The authors wanted to figure out, whether the weekly physical activity could possibly bring positive results in their performance; and in which kind of numerical data could this be recorded. We consider it is very important to analyse the relationship of the university students to physical activities since in 2011 Ács, Borsos and Rétsági refers that 77% of the Hungarian population live a physically inactive life. According to the hypothesis, even a once-a-week MVPA (moderate to vigorous physical activity) can result in a quantitative performance increase in the human body.

At the University of Pannonia/Georgikon Faculty, Keszthely every student is required to attend compulsory PE lessons, within a period of 2-4 semesters. In the first semester, every full-time student participates in a general cognitive improvement lesson once a week, lasting 90 minutes, conducted and structured by an expert. During the forthcoming semesters, the students have to choose at least one out of the offered, optional branches of sport.

In the last couple of autumn semesters, full-time first-year students participating in BSc or Higher Education Trainings (Hungarian abbr. FSZ) were examined with various performance tests. During the 14 weeks of the semester, the body changes resulting from exercises were observed, i.e. the data of the same applied performance tests were collected and analysed at the beginning and at the end of the semester. The students were divided into smaller, co-educated groups, which actively participated in a 90-minute-long cognitive improvement lesson once a week. The occasions incorporated a warm-up, strengthening exercises, stretching and some games at the end of the lesson.

The physical performance tests applied at the beginning and at the end of the semester were chosen from the „HUNGAROFIT” measurements (<http://www.bdf.hu>).

The measurements included the following physical tests:

1. The aerobic fitness was measured with the “Cooper-test”, i.e. a 12-minute-long flat-race, on the university athletic field’s 400-metre-long running track. The accomplished distance was recorded in metres.
2. The measurement of the general physical strength/fitness was realized with 3 different tests.

The fitness of the shoulder girdle and arm muscles, as well as the static strength of the trunk muscle was defined with arm bending and stretching done during push-ups; the fitness of back muscles was shown through trunk raise from arse upwards; while the performance of the abdominal muscles was examined via sitting up from supination. In each case, the exercises lasted 30 seconds, and the number of the accomplished pieces was recorded. The measurements were carried out in the gym of the Faculty.

Results

The beneficial somatic effect of physical activity was proven by several national and international literatures (Ács, Borsos and Rétsági 2011, Bellocco, Jia, Ye and Lagerros 2010, Lee et ass. 2011, Stephens 1988), though the quantitative limits prevents the authors from further elaborating on their details. Nevertheless, among its impact mechanism on health, we should draw special attention to the components of health education and health behaviour. The attitude towards health is continuously changing through life, which is reflected in the applied tests and physical parameters adjusted to the personality change. A given condition can be interpreted only within the given environment and interaction, and requires a persistent activity aiming at the prevention and improvement of that given condition.

In connection with the topic, two closely related issues should be discussed. According to Csányi T. (2010), exercise training involves “every activity that is produced by the skeletal muscles, and is accompanied by energy consumption”. Therefore, he assumes energy use as the basis of exercise training. The formula of Caspersen, Powell and Christenson (1985) shows: „kcal sleep + kcal occupation + kcal conditioning + kcal household +kcal other – kcal total daily physical activity. Exercise training is a complex behaviour”. One can claim that the related scientific fields evolved a holistic approach regarding movement activities. It is impossible to extract the whole sporting activities from everyday activities and the complex lifestyle standards. This study deals with the exercise training and the related habits of a given generation. The higher education institutions also have to face the challenges originating from the characteristics of the generation “Z”.

The determinant foundation stones of generation research were laid down by Strauss and Howe (1991) in their work “Generations”. Based on this, their 1997 publication claims that each generation has a different

attitude. This deviation can also be detected in the movement activities, i.e. in terms of exercise training. The generation's main features can be best highlighted through their attitude towards the internet. As in the case of any other activity, exercise training is determined by the motivation structure. The action is defined by the external-internal control attitude. In case of the generation "Z", the values related to fatalism increase (Pais, 2013). Thus – during the acquirement of lifestyle competencies – this generation can be less effectively motivated by the traditional 'reward-penalty' method. The expression of self-efficiency as well as the increased desire to experience success becomes highlighted. Considering the above listed components, the Georgikon Faculty provides for its students appropriate PE lessons: it is a good opportunity to establish an effective self-definition, and to realise an anxiety-minimizing way of self-expression.

Several research results have already elaborated on the relation between exercise training and cognitive performance.

It is generally accepted and scientifically proven that exercise training causes noteworthy cognitive performance increase. The California Fitness Research 2002 (Grissom, 2005) examined approximately 900.000 students, and showed a significant correlation between physical fitness and reading, as well as mathematical performance.

In connection with strength improvement, numerous recent publications were released. Compared to the beginning of the '80s, it is already justified that a 9-13-week-long period can bring an average development of 30-40% in strength improvement (Payne et ass., 1997) – though there were no examinations related to the minimal number of trainings. Further to this, Faigenbaum and associates even showed a 74% increase in 2009. According to these, the authors' hypothesis should reveal a

measurable performance increase during a 14-week-long period, involving a once-a-week physical training/sporting activity.

The concrete examination involved three subsequent autumn semesters, during which data from a total number of 184 students were collected (69 people in 2011; 72 people in 2012; 83 people in 2013) at the beginning and at the end of the semester. The results of the three years were evaluated according to sexes, while the changes and improvement tendencies were also examined in the form of total values (%) (*Table 1*). In order to interpret the gained data, the average calculation was chosen. According to Ozsváth and Ács, out of the three index-numbers (median, modus, mean) mean is the most important, therefore it was being used in our research.

When considering the results of the performance tests separately, the data analysis reveals positive change, i.e. performance increase in the majority of the groups – out of the 104 group data, only 9 included a lower value in the second measurement. When the four tests were evaluated as a summarized group, all the 26 data show a detectable performance improvement. The distribution of increase varies between 1% and 22% extreme.

The distinct analysis of the test results shows a basically positive change in each of the four cases; these tendencies prove the efficiency of competence improvement.

The students' most significant performance development was registered in the case of *arm bending-stretching*. This exercise always preceded the other three, and showed a total increase of nearly 20% (19,9%). It is interesting to note that women reached a development outnumbering that of men by 4%.

The least development of the students' results was discovered in the case of the *Cooper-test* (12-minute-long flat-race): the total increase of a

modest 6% (5,9%) is accompanied with a much higher distribution; some group showed a 30% increase, while others suffered a 10% decrease. The development rate of men outnumbered that of women all the time, with a total value of 3%. The performance average values of the different women groups varied between 1700 and 2100 meters, while men accomplished 2100 to 2500 meters during the 12 minute-test (only a single group showed a value below 2000 meters).

Regarding the other two tests, there are no unambiguous correlations between sexes and the measured performance development values. On the whole, each test reveals a more than 10% increase in the data. Women reached a 3% higher development rate in *sitting up from supination*, while men performed better in *trunk raise from arse upwards* in the same extent.

Table 1. The physical performance change (%) of the students from the University of Pannonia/Georgikon Faculty, recorded on the PE lessons (2011-2013; first measurement=100%)

Groups	Performance tests				
	Cooper-test (running)	Arm bending-stretching	Sitting up from supination	Trunk raise from arse upwards	Total result
2011.					
Women 1.	105,7	148,52	106,5	106	116,4
Women 2.	120,3	125	102,61	113,22	114,63
Women 3.	90	122,1	112	106,27	107,6
Women 4.	101,8	140,23	111,7	114,89	117,15
Women 5.	96,42	102,94	114,84	91,7	101,48
Total average of women (24 people)	102,84	127,76	109,53	106,4	111,45
Men 1.	104,7	117,05	107,04	105,7	108,4
Men 2.	100	107,98	103,2	92,31	100,86
Men 3.	113,72	140,15	101,75	127,8	121,01

Men 4.	110,94	106,2	118	123,3	115,4
Men 5.	96,63	107,4	100,44	112,9	104,35
Total average of men (45 people)	105,2	115,75	106,1	112,4	110
Total average of students (69 people)	104	121,75	107,8	109,4	110,7
2012.					
Women 1.	104,13	127,63	107,76	111,25	112,89
Women 2.	111,5	123,15	117,14	110,57	115,59
Women 3.	91,18	119,51	103,92	109,58	106,05
Women 4.	100,37	90,41	117,6	151,39	115,25
Total average of women (35 people)	101,8	115,2	111,6	120,7	112,44
Men 1.	103,63	127,02	111,92	134,89	119,37
Men 2.	105,14	141,23	102,94	113,89	114,35
Men 3.	103,08	132,71	97,29	108,47	110,17
Men 4.	101,82	107,55	103,53	105,63	104,68
Total average of men (37 people)	103,42	127,1	103,9	115,7	112,14
Total average of students (72 people)	102,6	121,15	107,75	118,2	112,3
2013.					
Women 1.	108,42	114,11	108,1	100,95	107,9
Women 2.	112	118,67	118,17	112,45	115,32
Women 3.	108,44	122,9	116,71	108,8	114,21
Women 4.	107,23	137,15	120,8	114,7	117,53
Total average of women (49 people)	109,02	123,21	115,94	109,22	113,74
Men 1.	129,51	113,18	104,37	117,35	116,1
Men 2.	120,7	104,2	116,77	103,58	111,31
Men 3.	97,05	117,87	124,33	112,2	113,31
Men 4.	106,2	105,75	124,1	137,84	122,07
Total average of men (34 people)	113,36	110,25	117,4	117,74	115,7
Total average of students (83 people)	111,2	116,73	116,67	113,48	114,72

Regarding the total results of the three years, the average of the summarized data of all students shows a 12,5% improvement, confirming the above mentioned hypothesis, i.e. the once-a-week, more vigorous exercise training can cause a measurable performance improvement in the human body. Neither the total averages, nor the distribution values reveal important differences between the sexes (in the case of men, the study defined a 10-15,7% increase, while the same value was 11,4-13,7% with women) (Table 2.).

Table 2. The summarized physical performance change (%) of the students from the University of Pannonia/Georgikon Faculty, recorded on the PE lessons (2011-2013; first measurement=100%)

Year	Sex	Performance tests				
		Cooper-test (running)	Arm bending-stretching	Sitting up from supination	Trunk raise from arse upwards	Total result
2011	Women	102,84	127,76	109,53	106,4	111,45
2012	Women	101,8	115,2	111,6	120,7	112,44
2013	Women	109,02	123,21	115,94	109,22	113,74
2011-2013	Total for women	104,5	122,05	112,35	112,1	112,5
2011	Men	105,2	115,75	106,1	112,4	110
2012	Men	103,42	127,1	103,9	115,7	112,14
2013	Men	113,36	110,25	117,4	117,74	115,7
2011-2013	Total for men	107,3	117,7	109,13	115,28	112,6
2011-2013	Total for students	105,9	119,9	110,74	113,69	112,55

Fortunately, the total values of the subsequent three years highlight a constant rise in performance development (*Figure 1*). Nevertheless, the direction of this tendency, as well as the clarification of the uncertainty, whether this is due to the poorer and poorer physical condition of the Faculty's fresh-year students or not, is still to be dealt with during the forthcoming researches and detailed data evaluation.

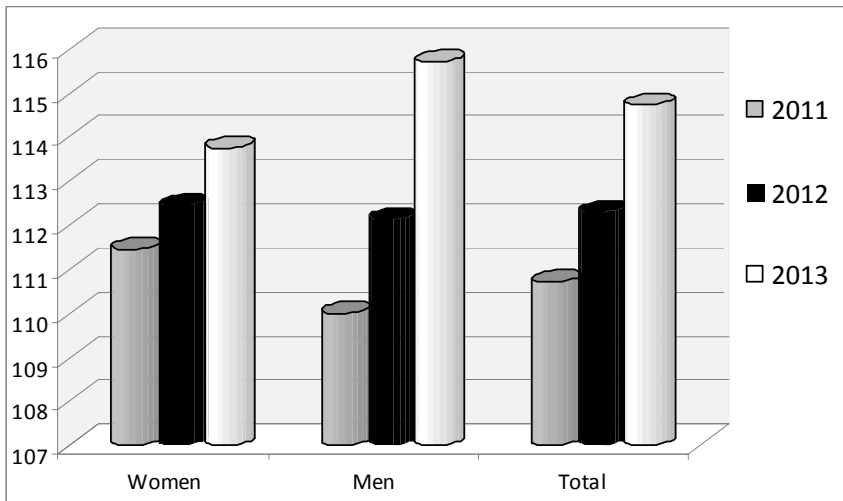


Figure 1. The physical performance change (%) of the students from the University of Pannonia/Georgikon Faculty (2011-2013; first measurement=100%)

Conclusions

The beneficial impacts of sport on physical and mental health were justified by several national and international literatures. This study focussed on members of a target group called generation 'Z', characterized by a considerably low level of physical activity: after secondary education, they arrive in higher education, and try to meet the expectations and new challenges. The aim of the study was to define the possible degree of physical

performance increase, as a result of a once-a-week competence improvement occasion, lasting throughout a whole semester. The students' conditional training of this kind brought interesting, novel results. Indeed, the authors assumed performance development, which was proven and justified by the total positive change in the form of an improvement rate above 12%.

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