DIFFERENCES IN MOTOR ABILITIES AMONG THE STUDENTS OF THE DEPARTMENT OF KINESIOLOGY IN OSIJEK

Daria Župan Tadijanov
Faculty of Education, Josip Juraj Strossmayer University of Osijek

Abstract

The aim of this research was to determine the differences in motor abilities between two generations of students of the Kinesiology Department with the Faculty of Education in Osijek, as part of Basic Kinesiological Transformations course and also to determine the differences based on gender.

Subject sample consisted of 112 students of Kinesiology, of which 53 subjects were from the first generation and 59 subjects from the second. Tests for assessment of motor abilities of repetitive power and strength were pull-ups, sit-ups, chest presses and back squats.

A significant difference in motor abilities between the two generations of Kinesiology Department students was observed only in the motor test for assessment of repetitive power – pull-ups - among male students, whereby male students of the second generation achieved significantly better results.

Differences between the two generations of female students have not been observed in any of the assessment tests. While analysing the differences based on gender, it has been observed that male students achieve significantly better results than female students in all the assessment tests of power and strength, except in sit-ups. The reason for the significant differences observed between the two generations of students of the Kinesiology Department only in the test for assessment of repetitive power – pull-ups – probably lies in the fact that the pull-ups, because of the complexity needed for executing them correctly, have caused a higher degree of motivation while training, whereas other tests did not appear to be equally motivating. The differences observed based on gender correspond to standard differences which appear as a result of sexual dimorphism, even though the subjects in question were a homogenised group of kinesiology students.

Key words: motor abilities, power, strength, students

INTRODUCTION

According to Sekulić and Metikoš (2007), Basic Kinesiological Transformations is a scientific-teaching discipline that studies the most effective kinesiological transformation processes which make it possible to improve and maintain the achieved level of functional, motor and changeable morphological (anthropometric) dimensions of humans, independent of age, gender and previous development of their anthropological features (abilities, characteristics and motor knowledge) and relationships among these anthropological features. Anthropological features can be divided into characteristics (cognitive, morphological, health and social) and abilities (cognitive, motor and functional). None of these groups of characteristics and abilities are unambiguously determined; within each of them there is a number of "sub-abilities" (sub-basements). In other words, if we measure one of the groups or subgroups, we have indeed measured just one of them. Only if we measure all of them, then we have measured the overall

anthropological status. However, it is not objectively possible to measure the overall anthropological status, but depending on the needs, it can be defined and measured in accordance to our interests. As a part of Basic Kinesiological Transformations course, three dimensions of anthropological status – motor abilities, functional abilities and morphological characteristics – are the most important. The reason is that only these three dimensions of anthropological status can be changed under the influence of kinesiological stimuli. All three groups of abilities and characteristics are extremely well connected among themselves and they influence one another to a greater or lesser extent. They can be correlated positively (the increase of one characteristic and/or ability entails an increase in another, and also a decrease in one conditions the decrease in another) and negatively (increase of one characteristic and/or ability entails a decrease in another or vice versa). Due to this, it is important to know the relationships between them and to anticipate the consequences which will occur with other abilities if we change one of them (Sekulić and Metikoš, 2007). As a part of Basic kinesiological transformations course students are acquainted with the above mentioned knowledge in theory and practice. Therefore, with educational aims, initial and final states of motor abilities, functional abilities and morphological characteristics are tested as part of the course. Seeing how Kinesiology Department is very young, every year the tests used for assessments of listed abilities and characteristics are changed in order to find the best way to monitor transformations of these abilities and characteristics. In view of the above, this paper will compare results achieved in an assessment test of those abilities which had not been changed for two years in a row.

Aim od the research

The aim of this research was to determine the differences in motor abilities between two generations of students of the Kinesiology Department at the Faculty of Education in Osijek, as a part of Basic Kinesiological Transformations course and also to determine differences based on gender.

Methods

Subjects

Subject sample consisted of 112 students of Kinesiology, out of which 53 subjects belong to the first generation (G1; n:53), with 31 male students and 22 female students. The second generation consisted of 59 students (G2:59), with 45 male students and 14 female students. The requirement for participation in the research was that all subjects had to be enrolled in Basic Kinesiological Transformations course and that they had fulfilled all of their duties within the course.

Variables

Variable sample encompassed the motor tests for assessment of repetitive power – sit-ups (SU), pull-ups (PU) and strength assessment test – bench presses (BP), back squats (BS).

Sit-ups

The purpose of this test is the assessment of repetitive power of the front torso, which is defined as the core muscles' ability for the prolonged performance in an isotonic workout regime.
Aids: 1 stop-watch, 1 thin exercise mat

Description: a subject lies on their back, knees bent in a 90° angle, while feet remain apart, hip wide. Subject's hands are crossed at the chest with palms on opposite shoulders. This position is first demonstrated to the subject. An assistant examiner pins the subject's feet to the floor. The task is performed for 60 seconds. On the mark, the subject rises to a sitting position, elbows touching the thighs and lies back down. After one minute the task is finished. The examiner counts the correctly performed sit-ups and records the total number (Neljak, Novak, Sporiš, Višković and Markuš, 2011).

Pull-ups

The purpose of this test is the assessment of repetitive upper body power, that is, the upper parts of back, shoulders and arms.

Aids: bar, two exercise mats, chair, stop-watch

Description: the test is performed on an elevated bar under which two mats are placed. There is a chair on the mat, which the subject uses to climb up on the bar. With both hands, the subject grabs hold of the bar, at shoulder-width, with a pronated grip. Body and legs are vertically sprawled and the chair is removed. The task is to bend the arms at the elbows from the starting position, so that the chin rises to bar height. The body remains in a vertical position throughout the exercise. The result of the test is the highest possible number of correctly performed repetitions from the beginning until the subject stops performing the task correctly, that is, until s/he starts pausing between the repetitions for two long or cannot pull one's body to the designated height. The task is performed once. It is not allowed to use one's body and legs in order to lift them. The result is recorded as a total number of correctly performed repetitions (Metikoš, 1989).

Chest-presses

The purpose of this test is the assessment of upper body strength, that is, chest, shoulders and arms. Strength is defined as the ability to generate maximum force during one muscle contraction.

Aids: bench, bar, weights

Description: the starting position is lying down on one's back so that the forehead is vertically levelled with the barbell. Legs are half-bent at the knees, feet rested on both sides of the bench. The barbell is grabbed with a full grip, at shoulder-width, palms perpendicular on the wrist, shoulder blades pushed together and tightened downwards. The barbell is pressed upwards, extending the arms until the elbows are locked out. The task is to lower the barbell on the chest and lift it back up until the arms are fully extended. The result of the test is the weight of one work maximum expressed in the percentage of subject's total body weight (Metikoš, 1989).

Back squat

The purpose of this test is the assessment of lower body strength, that is, posterior chain (gluteus, hamstrings, back and hip flexor).

Aids: 2 racks for a barbell with weights, barbell, weights

Description: the starting position is a wide stance in a quarter squat under the rack with the barbell. The subject grabs the barbell with a pronated grip as closely as possible, leans the barbell on rear shoulders behind the head and stands up straight. The subject takes one step back and starts the task. From the starting position the subject descends to a squat at a height where the thighs are parallel to the floor and then stands up straight until the legs are fully extended. The result of the test is the weight of one work maximum expressed in the percentage of subject's total body weight (Metikoš, 1989).

Measuring protocol

In order to measure the results of the assessment tests of motor abilities and their publishing for scientific purposes, consent forms have been obtained for all subjects. Persons performing the measuring were teaching assistants at the Basic kinesiological transformations course at the Kinesiology Department. The measurement has been conducted during the exercise classes of applied kinesiology in the sports hall of the Faculty of Education in Osijek.

Data processing methods

Descriptive parameters have been calculated for the listed variables. The Kolmogorov-Smirnov test was used to test normality of distribution, and analysis of variance (ANOVA) was used to test the difference based on generation and gender in the listed variables. Software package *Statistica 12* was used for statistical analysis.

RESULTS

It is visible from Table 1 that female students of the first generation achieve lower average results in the following tests: pull-up, sit-up, and chest press, while in the back squat test they achieve higher average results than students of the second generation. However, when examining the differences, it is observed that only in the pull-up test students of the first generation achieve significantly lower results, while in other tests the observed differences are not significant.

Table 1. Differences in motor abilities assessment tests between two generations of female students

VARIABLES	GENERATION	n	Mean	SD	t-test	p
PULL-UP	G1	22	2,00	2,070	-3,075	,004
	G2	14	4,57	2,954		
SIT-UP	G1	22	55,45	5,755	-1,795	,082
	G2	14	58,86	5,187		
BENCH PRESS	G1	22	73,18	12,644	-,008	,994
	G2	14	73,21	11,670		
BACK SQUAT	G1	22	121,50	20,891	1,294	,205
	G2	14	113,64	10,973		

G1 – first generation, G2 – second generation, n – number of subjects, Mean – arithmetic mean, SD – standard deviation, p – significance level, *p<0.05

When measuring motor abilities of students, it is observed that students of the first generation achieve lower average results in pull-up and chest press tests, while in sit-up and back squat test they achieve higher average results than female students of the second generation (Table 2). When examining the differences, no significant differences have been observed between the female students of the first generation and the second generation.

Table 2. Differences in motor abilities assessment tests between two generations of students

VARIABLES	Generation	n	Mean	SD	t-test	p
PULL-UP	G1	31	9,35	3,210	-1,822	,072
	G2	45	10,91	3,936		
SIT-UP	G1	31	59,29	6,273	,483	,630
	G2	45	58,58	6,351		
BENCH PRESS	G1	31	102,16	17,926	-,465	,644
	G2	45	103,87	11,729		
BACK SQUAT	G1	31	142,00	24,297	,860	,394
	G2	45	137,82	14,279		

G1 – first generation, G2 – second generation, n – number of subjects, Mean – arithmetic mean,
SD – standard deviation, p – significance level, *p<0.05

When examining the differences based on gender, it is observed that male students achieve higher average results than female students in all of the motor abilities assessment tests (Table 3). However, the observed differences based on gender have proved to be significant in three motor abilities tests – pull-up, bench press and back squat, while in the sit-up test the observed difference has not proved to be significant.

Table 3. Differences in motor abilities assessment tests based on gender

VARIABLES	GENDER	n	Mean	SD	t-test	p
PULL-UP	F	36	3,00	2,726	-11,682	,000
	M	76	10,28	3,715		
SIT-UP	F	36	56,78	5,718	-1,691	,094
	M	76	58,87	6,287		
BENCH PRESS	F	36	73,19	12,104	-10,755	,000
	M	76	103,17	14,490		
BACK SQUAT	F	36	118,44	17,936	-5,587	,000
	M	76	139,53	18,974		

F – female students, M – male students, n – number of subjects, Mean – arithmetic mean,
SD – standard deviation, p – significance level, *p<0.05

Discussion

The results of this research show that in motor abilities subjects of two generations of the Kinesiology Department do not demonstrate significant differences in the achieved results. One significant difference has been observed between the two generations of female students in the repetitive power test – pull-ups. Power as a motor ability has a very small quotient of innateness (h^2=0.50), which means that we can improve it significantly, that is, it is possible to influence it over the course of our lives with regular physical exercise. Therefore, all the existing research on power mostly concern determining influences of different training programs on power development. The comparison of power between generations of the same study programme is almost non-existent. Thus, the results of this research can be only partially compared with the research of Cvenić (2020) who has compared the results acquired on the enrolment in the Undergraduate University Study of Kinesiology at the Faculty of Education

Josip Juraj Strossmayer University of Osijek. Cvenić (2020) has also observed that both male and female students of the first generation of applicants achieve significantly lower results in pull-ups test. Considering how pull-ups are an exercise which includes synchronised work of numerous muscles (latissimus dorsi, teres major and minor, infraspinatus, trapezius, deltoid posterior, biceps brachii, brachialis, brachioradialis) and also a great power of these muscles, pull-ups often present a problem to perform and demand a methodical approach to exercising until they are done correctly. Seeing how students of the second generation of Kinesiology Department knew which motor tests would be conducted as part of Basic Kinesiological Transformations course, this may be the reason for the significantly better results achieved in the mentioned test. The reason why there were no significant differences in other tests is probably because the pull-up, for its complexity when done correctly, demanded the greatest motivation while exercising, while other tests did not seem as motivating. Furthermore, this paper shows significant differences based on gender in both tests used for assessment of strength and in one of the tests used for assessment of repetitive power (pull-up). The differences in motor abilities based on gender have, from an early age, been the aim of multiple research. For example, Cetinić and Petrić (2010) have observed that boys in 1st - 4th grade of elementary school achieve significantly better results in power assessment tests, and that girls achieve better results in flexibility assessment test. Pavić (2012) has also observed significant differences in motor abilities based on gender among subjects in 5th - 8th grade of elementary school. Boys have achieved significantly better results in almost every motor ability except in flexibility, while the girls were significantly better. As far as gender differences go, Prskalo, Nedić, Sporiš, Badrić and Milanović (2011) have observed significant differences in motor abilities among older school children. Boys have achieved significantly better results in coordination, explosive power, repetitive power and quickness of movement, while girls have achieved better results only in flexibility. As determined in prior researches, differences based on gender in motor ability of power exist since early childhood. As far as strength is concerned, according to Matković (Mišigoj-Duraković, 2008, page 172.), the increase of muscle is linear, from birth to childhood. Since the beginning of puberty, the size of muscle mass starts to differ significantly based on gender. With young men this increase is linear up to the age of about 20, while it stagnates with girls. Also, the muscle strength growth curve follows a pattern of muscle power development based on gender and age. With boys, the strength increase is linear until puberty, after which it starts to increase dramatically and slows down again in adolescent age. With girls, the strength increase is linear even after the onset of puberty, without any significant increase.

Therefore, it can be concluded that differences based on gender which have been observed in this research correspond to standard differences which appear as a result of sexual dimorphism, even though subjects in question were a homogenised group of kinesiologists.

Conclusion

The aim of this research was to determine the differences in motor abilities between two generations of students of the Kinesiology Department at the Faculty of Education in Osijek, as a part of Basic Kinesiological Transformations course and also to determine differences based on gender.

The reason for the significant differences observed between the two generations of students of the Kinesiology Department only in the test for assessment of repetitive power – pull-ups – probably lies in the fact that pull-ups, because of the complexity needed for executing them correctly, have caused a higher degree of motivation while training, whereas other tests did not appear to be equally motivating. The differences observed based on gender correspond to standard differences which appear as a result of sexual dimorphism, even though the subjects in question were a homogenised group of kinesiology students.

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