



Science, Movement and Health, Vol. XIV, ISSUE 2 Supplement, 2014
September 2014, 14 (2, Supplement): 481-486
Original article

THE COMPARISON OF CERTAIN BIOMOTORIC CHARACTERISTICS OF THE 11-14 YEAR-OLD SEDENTARY CHILDREN

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Abstract

The purpose of this study is to compare certain biyomotoric characteristics of the 11-14 year old children who are sedentary.

Methods. 280 boys and 221 girls (Boys; age: 12,8 years, height: 158,1 cm, weight: 50,2 kg and Girls; age: 12,7 years, height: 155,6 cm, weight: 48,7 kg) volunteered to participate in this study. Independent T test was applied in order to determine whether the differences among the level of hands grip strength, leg strength, the height of vertical jump and long jump by standing of test subjects are significant or not according to gender variable, and one way Anova test was applied in order to determine whether all of these differences are significant or not according to age variable.

Results. Test results showed that right hand grip, left hand grip, leg strength, vertical jump height and standing long jump height of the boys were significantly higher than girls. ($p < 0,05$). There were significant differences found for height, right hand grip, left hand grip and standing long jump of test subjects according to age variable. ($p < 0,05$).

As a result of this study, there were significant differences found for certain biometric characteristics of the 11-14 year-old sedentary children. It is estimated that these differences are cause of each age groups have result from different development features

Key Words: biyomotoric characteristics, age, gender.

Introduction

Growing means to grow up, to change in an orderly manner in terms of body structure and characteristics of emotional quotient and means to reach the level of doing the duty imposed. Growing is defined as all changes that occur in the system of a human from birth till death. It is known that posture and biyomotoric characteristics of human, which are the statements of body structure and its functions, undergo change in development stages of people. Motor development is to facilitate optional movement to the system in parallel with physical growing and development of central nervous system. The term "motor" is used to lay emphasis on mechanic factors such as biologic power, balance, speed, flexibility, durability and certain factors that affect movement such as age and gender. Motor development, social consciousness, skeleton structure, body proportion, energy level and muscle strength in 7-9 old year children starts to show similarities with adults. (Belmann, Peile, 2006) As the motor development of children is analysed in the sense of nerve musculature, it is seen that motor behaviours progress coordinated but complicated and related to aging. The most typical characteristics of 6-12 old year children in which they start school is to progress of motor and sensory system towards bigger organization and increasing in length and weight is stable and slow. This period goes on puberty in which girls reach until about 12 ages, boys reach until about 13 ages. Fast growing stages start at

when girls get to about 9 age, boys get to about 11 ages. This period goes on until 11 ages for girls, about 14 ages for boys.

Strength is the amount of power produced during one unit of muscle or muscle group contraction. Muscular force is all important for productive ability to move, balanced working of joints, and minimization of injury risks. (Winnick, Short, 1985) Anatomic field of muscles or muscle groups, type of its fibril, its distribution, tension ability of particular muscle that is affected from the quantity of incapable contract structures, the number of active motor unit and mechanic factors cause differences in the strength of muscle. (Miller at al. 1993) According to Meusel, strength is the basis characteristic of human; he can move something, he can go beyond resistance, or he can resist with muscle strength. (Sevim, 1997) It is emphasized observing that muscle strength of children and adolescences prominently increase with age and the biggest development occur in adolescence. In girls, strength rate increase until 17 age in the ratio of $\frac{1}{4}$ whereas in boys, the children and adolescences is $\frac{2}{3}$ although their weights and powers are the same practically until 13-14 years old. (Moğulkoç et al., 1997)

Jumping force can be defined as jumping up of sportsmen to the as far as possible (horizontal) and as high as possible. (vertical). Jumping force is a combined ability and it is directly related to explosive force of extensor muscle, flexibility of muscles that

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Received 24.04.2014 / Accepted 25.05.2014



take part in jumping and jumping technique.

The basis biomotoric characteristics of human are the total of body power, ability and complicated qualification of a person. It is the ability of practicing the movements such as strength, endurance, speed, flexibility, coordination and activity. They change according to adaptability and efficiency ratio of organism. These characteristics are in essence, they cannot be learned; however they can be developed (Sevim, 1995)

It can be seen that the motoric characteristics of children have influence on joining to the branch of sports in the view of such information in literature. The purpose of this study is to compare the strength of right hand grip, left hand grip, foot, the characteristics of vertical jumping, standing long jump according to gender and age of sedentary children at between 11 -14 ages with the light of those information.

Method

Research Group: 280 boys and 221 girls who do not do sport volunteered to participate in this study. (Boys; age: 12,8 years, height: 158,1 cm, weight: 50,2 kg and Girls; age: 12,7 years, height: 155,6 cm, weight: 48,7 kg)

The body weights of subjects were measured using tefal (a trade mark) weighing machine of which accuracy degree is 0,001 and their tall statures were measured using fixed stadiometer of which accuracy degree is 0,001. (Holtain Ltd, UK).

Physical Tests Out to Sportsmen: Takei hand dynamometer (a trademark) was used in order to determine the maximal grip force of left and right hands. Maximal grip strength was measured by starting from right hand when the sportsman was standing and his hand's position was stretched and with 15 degree angle. Each measurement was done over three time and sportsmen had a rest during thirty seconds between each measurement. The maximum measurement value was recorded as the result of measurements among three of them.

Takei (a trademark) leg dynamometer was used in order to determine the isometric leg strength. After subjects crossed their legs on dynamometer table by bending their knees softly, they hold bar which was tied to chains on a line with their pelvis bone in such a way that their heads and backs were upright. Subjects pulled the bar applying maximum force. Each measurement was done over three time and sportsmen got rest during thirty seconds between each measurement. The maximum measurement value was recorded as the result of measurements among three of them.

Sargeant jump test was used in order to measure maximal vertical jumping distance. When the test was applying, the belt of the instrument was tied to loin of subject and subjects were supposed to jump as high as possible by standing up to their arms which were downward and their legs bended from their knees. Each measurement was done over three time and sportsmen got rest during thirty seconds between each measurement. The maximum measurement value was recorded as the result of measurements among three of them.

Tape measure was used in order to measure the best long jump distance. When the test was applying, the subjects were supposed to jump to onwards with their feet as far as possible by bending their knees, their feet were close and their hands were downward. Each measurement was done over three time and sportsmen got rest during thirty seconds between each measurement. The maximum measurement value was recorded as the result of measurements among three of them.

Data Analysis

Descriptive statistics dependent to all variables were given in table ($X \pm SS$) by calculating as standard deviation (SS) and arithmetic mean (\bar{X}). Onaway ANOVA was applied in the level of $\alpha=0.05$ to the test subjects in order to determine whether the differences between physical and biomotoric characteristics of subjects are significant or not according to age variables. When any differences were found at the result of the variance tests, tukey test was used in order to determine which age group causes these differences.

Independent T test was applied in order to determine whether the differences among the level of hands grip strength, leg strength, the height of vertical jump and long jump by standing are significant or not according to gender variable, and one way Anova test was applied in order to determine whether all of these differences are significant or not according to age variable.

All statistics process were done in SPSS 15 packaged software for Windows and level of significance was used as $p<0,05$.

Findings

The physical characteristics of test subjects were presented in table 1. The average of boy's age was founded as 12.8, average of height was founded as 158.1, average of body weight was founded as 50,2 while the average of girl's age was founded as 12.7, average of their height was founded as 155.6 average of body weight was founded as 48.7. (see table 1)

Table 1: The physical characteristics of test subjects

Variables	Gender	N	X	±	SS
Age	Boy	280	12,8		1,02
	Girl	221	12,7		1,01
Height	Boy	280	158,1		9,6
	Girl	221	155,6		7,6
Weight	Boy	280	50,2		12,3
	Girl	221	48,7		12,1

T test in the level of $\alpha=0.05$ was applied in order to determine whether the differences among the level of hands grip strength, leg strength, the height of vertical jump and long jump by standing of test subjects are significant or not.

Table 2: Biyomotoric characteristics of test subjects according to their gender

Variables	Gender	N	X	±	S.S.	t
Height (cm)	Boy	280	158,1		9,6	3,189*
	Girl	221	155,6		7,6	
Weight(kg)	Boy	280	50,2		12,3	1,373
	Girl	221	48,75		12,1	
Right grip strength (kg)	Boy	280	22,1		6,6	6,387*
	Girl	221	18,6		4,9	
Left grip strength (kg)	Boy	280	21,9		6,7	6,943*
	Girl	221	18,2		4,7	
Leg strength (kg)	Boy	280	66,9		22,8	11,287*
	Girl	221	46,7		15,3	
Vertical jumping (cm)	Boy	280	36,1		8,9	9,157*
	Girl	221	29,4		7,1	
Long jump by standing (cm)	Boy	280	174,6		27,7	10,536*
	Girl	221	149,9		23,5	

$P<0,05^*$

The results of the test showed that the levels of the height, the right hand grip, the left hand grip, leg strength, vertical jumping and long jump by standing of boys are significantly higher than girls. ($p<0,05$)

Table 3: The physical and biyomotoric characteristics of test subjects according to age variables

Variables	Age	Average	SS	F
Height (cm)	11	155,72	8,28	3,768*
	12	155,89	7,40	
	13	157,11	8,70	
	14	158,83	9,79	
Weight(kg)	11	48,24	10,57	1,981
	12	48,05	11,28	
	13	50,84	15,13	
	14	50,75	11,46	
Right hand grip strength (kg)	11	19,75	4,66	2,857*
	12	19,74	6,07	
	13	20,79	6,83	



	14	21,60	6,49	
	11	19,34	4,48	
Left hand gripstrength(kg)	12	19,15	5,73	4,916*
	13	20,41	6,97	
	14	21,63	6,38	
	11	54,81	16,55	
Leg strength (kg)	12	56,52	21,93	1,038
	13	58,72	23,71	
	14	59,84	23,10	
	11	31,73	8,25	
Vertical jumping (cm)	12	34,10	7,87	2,442
	13	33,24	8,41	
	14	34,22	9,75	
	11	158,35	26,25	
Long jump by standing (cm)	12	162,94	24,66	5,041*
	13	162,12	32,23	
	14	170,46	28,66	
P<0,05*				

The results of the test showed that the differences in the levels of the height, the right hand grip, the left hand grip, leg strength, vertical jumping and long jump by standing of test subjects according to age variable are significant. ($p < 0,05$) (see table 3).

The results of the tukey test showed that 14 age test subjects' levels of tall stature and long jump by standing are significantly higher than 11 age test subjects; and also 14 age test subjects' levels of right hand grip and left hand grip are significantly higher than 12 age test subjects. ($p < 0,05$).

Discussion

The number of girl test subjects is 221, the number of boy test subjects is 280 and they are studying in Kütahya Elementary School and they do not do sport. The average of boys' tall stature was founded as ($158,1 \pm 9,6$ cm), average of body weight was founded as ($50,2 \pm 12,3$ kg), average of right hand grip strength was ($22,1 \pm 6,6$ kg), average of left hand grip strength was ($21,9 \pm 6,7$ kg), average of leg strength was ($69,9 \pm 22,8$ kg), average of vertical jumping height was ($36,1 \pm 8,9$ cm) average of long jump by standing was ($174,6 \pm 27,7$ cm) while the average of girls' tall stature was founded as ($155,6 \pm 7,6$ cm), average of body weight was founded as ($48,7 \pm 12,1$ kg), average of right hand grip strength was ($18,6 \pm 4,9$ kg), average of left hand grip strength was ($18,2 \pm 4,7$ kg), average of leg strength was ($46,7 \pm 15,3$ kg), average of vertical jumping height was ($29,4 \pm 7,7$ cm), average of long jump by standing was ($149,9 \pm 23,5$ cm).

When it is analysed according to gender variable, the levels of the tall stature, the right hand grip

strength, the left hand grip strength, leg strength, vertical jumping height and distance of long jump by standing of boys are significantly higher than girls ($p < 0,05$) whereas there was no significant differences between their body weight. ($p > 0,05$).

When it is analysed according to age variable, the significant differences were found among the levels of the tall stature ($F=3,768$; $P < 0,05$), the right hand grip strength ($F=2,857$; $P < 0,05$), the left hand grip strength ($F=4,916$; $P < 0,05$) and the distance of long jump standing ($F=5,041$; $P < 0,05$) of test subjects while there were no differences among their body weight ($F=1,981$; $P > 0,05$), leg strength ($F=1,038$; $P > 0,05$) and vertical jump height. ($F=2,442$; $P > 0,05$) The second test, Tukey test was applied in order to understand which group cause the differences in terms of tall stature, right hand grip strength, left hand grip strength, distance of long jump standing. The results of the tukey test showed that 14 age test subjects' levels of tall stature and long jump by standing are significantly higher than 11 age test subjects; and also 14 age test subjects' levels of right hand grip and left hand grip are significantly higher than 12 age test subjects. ($p < 0,05$).

In their research, Yüksel et al., 2006, proved that the boys' strength of right hand grip ($41,011 \pm 7,7735$ kg) were much more than ($22,800 \pm 3,86$ kg) girls'. ($t.05$; $1,325$; $P < 0,01$). In the same research it was also stated that the boys' strength of left hand grip ($38,344 \pm 6,6667$ kg), were much more than ($22,113 \pm 2,8488$ kg) girls'. ($t.0,5$; $7,016$; $P < 0,01$). This research shows parallelism with our research.

In their research, Fişekçioğlu et al. 2008, did not find any significant differences between the



average of boys' (19,31±5,72 kg) and girls' (18,50±5.35 kg) right hand grip ($t=1,113$, $P<0,05$). This can be probably related to the fact that their test subjects' number was very few.

According to Aslan's research, 2008, the average of boys' leg strength was 110,76±23,34 while the average of girls' leg strength was 58,14±14,59. This showed the significant difference between them. ($t=19,23$, $P<0,005$) This research supported our research showing parallelism with ours.

In their research, Yüksel et al. 2006, found that the levels of boys' jumping were as (46,778±6,8333 cm) while the levels of girls' jumping were as (38,750±5,8002 cm). This showed the significant difference between them ($t.05;0,008$; $P<0,05$) This research supported and showed parallelism with our research..

The research of Kalkavan et al. 2006, was put forward that there were no significant differences between girls and boys. ($F=0,222$; $P>0,005$). This was because of applying bi-directional Anova test. This did not support our research.

In his research, Pekel, 2006, presented that the average of boys' long jumping was as 181,2±16,2 while the girls' was as 170,8±20,8. This showed the significant difference between them. ($t=2,76$; $P<0,01$).

In his research, Zeybek ascertained that the average of boys' long jumping by standing was (15,90), while the girls' was (14,57). There were no any significant differences between them according to results. This did not show any parallelism with our research. This was because the motoric characteristics of test subjects were at beginner level.

In their research, Gürsoy et al., 2011, proved that ($p<0,05$). the average of boys' right hand grip strength (43,12 ±6,6 kg) was much more than (28,73±4,74 kg) the average of girls' right hand grip strength. In the same research, they put forward that ($p<0,05$) the average of boys' left hand grip strength (43,47±7,05 kg) was much more than (26,33±4,59 kg) the average of girls' left hand grip strength. They also stated that ($p<0,05$) the leg strength of boys (71,76±35,20kg) were much more than the leg strength of girls. (25,40±13,69 kg) Finally, they claimed that ($p<0,05$) the average of boys' vertical jumping (49,76±8,37 cm) was much more than the average of girls' vertical jumping (41,73±7,23 cm). This research showed parallelism with our research.

Yorulmaz, 2005, stated in his research that ($p<0,05$) the average of boys' vertical jumping (57,20±6,14 cm) was much more than the average of girls' vertical jumping (41,90±6,63 cm). In the same research, he put forward that ($p<0,05$) the distance of boys' long jump by standing (227,45±18,13 cm) was much more than (189,15±20,9 cm) the distance of girls' long jump by standing. This research showed parallelism with our research.

In his research Albayrak, 1991, showed that ($p<0,05$) the average of boys' vertical jumping (63,66 cm) was much more than the average of girls' vertical

jumping (53,60 cm). This research showed parallelism with our research.

Tınazcı 2004, proved in his researches that ($t.05$; -2,130; $P<0,05$) the average of boys' right hand grip strength (17,90±2,74) was much more than (15,47±2,99) the average of girls' right hand grip strength. In the same research, he put forward that. ($t.05$; -2,015; $P<0,05$) the average of boys' left hand grip strength (16,61±2,87) was much more than (14,32±2,66) the average of girls' left hand grip strength. This research showed parallelism with our research.

In his research, Günay et al., 1994, 2011, stated that the strength of girls' right hand grip (22,61±4,84) was much more than boys (21,40±4,28). Secondly, he also proved that the strength of girls' left hand grip (21,55±3,6) was much more than boys (20,91±2,76). According to this research, there were not any significant differences between them.

In his research, Saygın et al 2006, found that the strength of boys' legs (60,98±15,53) was much more than girls' leg strength (45,76±11,40) and this showed parallelism with our research. In the same research, he found that the strength of boys' vertical jumping (27,73±5,09) was much more than girls' strength (24,04±4,86) but he did not find any significant differences between them. This did not show any parallelism with our research. It is thought that this was because test subjects had spent their physical and mental energy during training.

In his research, Güler 2006, proved that the average of 14 age test subjects' height (1,53±0,08) was much more than the average of 11 age test subjects' height. (1,42±0,07) This research showed parallelism with our research.

Conclusion

As a result of this study, there were significant differences found for certain biometric characteristics of the 11-14 year-old sedentary children. It is estimated that these differences are cause of each age groups have result from different development features.

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