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PHYSICAL ACTIVITY LEVELS AND MOTOR SKILLS OF 5th TO 7th GRADE STUDENTS IN NIGDE PROVINCE

Ruchan IRI, Zait Burak AKTUG & Serkan IBIS
School of Physical Education and Sports, Omer Halisdemir University, Nigde, Turkey

ABSTRACT

The physical activity (PA) and motor skill levels (MS) (flexibility, balance, speed, sit-up, hand grip strength, standing long jump) were determined for 5th to 7th grade students from central schools in Nigde Province, Turkey according to age and gender and to investigate the relationships. PAL was determined by means of Physical Activity Scale for Adolescents. MS included hand grip, standing long jump, flamingo balance, sit-and-reach and sit-up tests from Eurofit Test battery. Speed performance was tested with a 20-metre speed test. Independent samples t-test determined the difference between the males and females. One Way ANOVA test established the status of PAL and MS according to age. Source of difference Scheffe test was employed. Bivariate correlation determined the relationship between PAL and MS of gender groups. An inverse proportion was observed between age and PAL means for both genders. PAL of males was significantly higher than those of females. The relationship between the MS and PAL for males produced a negative relationship between PAL and BMI, but a positive significant relationship between sit-ups and standing long jump. For females, a negative significant relationship was observed between PAL and BMI and grip strength. Sit-ups, hand grip and standing long jump of males were significantly higher than those of females. MS increased significantly as age increased. PAL was higher for males than females and there was a decrease as age increased.

Key words: 5th to 7th Grade students; Physical activity; Motor skills; Gender and age differences.

INTRODUCTION

Migrations and unplanned urbanisation that emerged as a result of industrialisation and modernity level of societies, decreased physical activity (PA) and playing areas of children profoundly. Children have become less active, which leads to a decrease in sport activities and an increase in stationary activities (Cengiz & Ince, 2013). Moreover, the increase of screen time, which includes television, computers, smart phones and i-pads has led to the decreasing PA among the young. (Williams *et al*., 2002). According to previous studies, the reasons related to the increase in sedentary activities were parents taking their children to school or children travel to school by school bus and the increase in playing computer games or watching TV at home (Kuntzleman, 1993; Pate *et al*., 1995; Pate *et al*., 1996; Twisk, 2001). As a result, children were observed to consume 600kcal less energy on average than their peers 50 years ago (Williams *et al*., 2002).

Regular participation in PA in early childhood is essential for healthy growth, muscle, bone and cardiovascular development, as well as preventing obesity (Janz *et al*., 2004; Sääkslahti *et al*., 2004; Strickland, 2004; Burrows, 2007). Moreover, it was also mentioned that adequate and regular PA during childhood was beneficial for preventing certain diseases (cardiovascular system, respiratory system, immune system) during adulthood (Raitakari *et al*., 1994; WHO, 2004). Participation in regular PA has been known as having not only positive physical effects but also positive physiologic, cognitive and psychosocial effects in children (Strong *et al*., 2005; Cengiz & Ince, 2013). In this sense, participation in PA during childhood and doing regular activities lifelong, should be considered as a natural mechanism of both a short- and long-term healthy lifestyle (Oliver *et al*., 2010). The World Health Organisation reported that 60 minutes of medium to vigorous levels of PA should be performed daily by children (WHO, 2004).

Physical fitness (PF) is defined as the ability to perform the PA skills that people have or acquire. In other words, PA can conceptually be expressed as the ability to perform PAs successfully (Gutin *et al*., 1992; Tekelioglu, 1999). PF norms related to children, in general, have been used to supervise or observe PF changes within time and to write prescription for exercise and activity programmes, as well as evaluating MS (motor skill) of the children. In addition, the PF condition of the children are a good factor in predicting PA and MS levels (Ross *et al*., 1985; Ross *et al*., 1987).

Motor development in children consists of the development of activity and physical abilities. It is a combination of PF (muscle endurance, muscle strength, heart respiration stamina-endurance) and motor skills (speed, coordination, strength, balance, agility). The development level of motor skills determines physical ability. Motoric features improve depending on the natural growth and development process. That is, motor skills increase in direct proportion to age (Özer & Özer, 2005). It is known that there is a positive relationship between PAL and MS. Düzgün and Baltacı (2009) stated in their study that children with high PAL are more flexible than those with low PAL. In a similar study, Ignico *et al.* (1995) pointed out that flexibility values increased after a 10-week PA programme. Children who have high PAL and participate in sport have higher strength parameters than those who have low PAL and do not do sport (Polat *et al*., 2003; Saygın *et al*, 2005). In another study, it was seen that children who played tennis had better 10-metre speed values than those who did not play tennis (Aktaş *et al.*, 2011).

PURPOSE OF RESEARCH

Turning PA into a life-style starting from childhood has been one of the fundamental conditions of both short- and long-term healthy life programmes. In the light of the aforementioned information, the purpose of this study was to determine the PAL and MS of 5th to 7th grade students studying at central schools in the Nigde Province, Turkey.

METHODOLOGY

Subjects

The population for this study included students in Grades 5 to 7 studying at elementary schools affiliated to the Nigde Provincial National Education Directorate in Turkey. The study sample included 1718 volunteer students (female=767; male=951) selected from 16,243 students

enrolled in Grades 5 to 7 in elementary schools in the Niğde Province during the 2015-2016 academic year.

Measurements

Physical Activity Questionnaire for Adolescents (PAQ-A)

The PA of the students was determined by using the Physical Activity Questionnaire for Adolescents (PAQ-A) that was developed by Crocker *et al*. (1997) and adapted for Turkish students by Tanir (2014). The Cronbach-alpha coefficient of the Turkish version of the scale that was used in this study was 0.76. PAQ-A is used for remembering the activities performed within the last 7 days. It suggests an idea about the PA habits of the participants. In the PAQ-A, a score of 5 indicates the highest PAL, and 1 indicates the lowest. The average of all the questions is determined by calculating the PA score of the participants. The adolescents who participated in the research were classified as inactive, moderately active and active according to the reference values obtained from PAQ-A. The PAQ-A was used as it is a scale that has been used in many studies as it is valid and reliable in evaluating adolescents by means of the self-reporting method. The PAQ-A, which consists of 9 question, was preferred considering the possibility that the members of the subject group, who are between the ages of 12 and 14, may give wrong answers due to the distraction of too many questions.

Motor skills

Sit-ups (abdominal muscle strength), hand grip strength, standing long jump, flamingo balance test and the sit-and-reach flexibility test selected from the Eurofit Test battery were administered in order to determine the MS of the students who participated in the research (Council of Europe, 1998). Moreover, speed performance was evaluated by means of the 20m-speed test. The Eurofit Test Battery was first used in 1977 with a view to determine the PF of school children in Europe and set up a reference database. Tests were applied to more than 50,000 school children from 15 European countries and the results of these studies were discussed in the 5th seminar held in Formia in May 1986. Professionals at the seminar, organised by the Italian National Olympic Committee, evaluated the results through experimental tests and post-test tools. As a result, the tests were approved as applicable, valid, reliable and objective. The Eurofit test battery can be applied to males and females between the age of 6 to 18 years. Differences between genders and ages were taken into consideration.

Sit-ups

The subject lies on his back, places hands on the back of the neck, pulls knees (bent at 90 degrees) towards him and places the bottom of the feet on the mat. While lifting the upper trunk, the elbows must be forward and the subject touches the knees with the elbows maintaining the hands behind the neck. The subject does as many sit-ups as possible in 30 seconds. Every correct sit-up is scored 1 point and the total number is recorded.

20-metre speed run

The test is started with a whistle and finished after covering 20m. The subject is asked to make the run as quickly as possible and the time is recorded with a chronometer. The test was performed twice and the best score is recorded in seconds.

Hand grip strength

The dynamometer is held with about 30 degrees between arm and body and squeezed firmly twice with each hand. The higher score of the 2 trials is recorded. Grip Strength Dynamometer T.K.K 5101 Grip D (Japan) was used for this measurement in kilogram.

Flamingo balance

The subject tries to keep balance as long as possible on the preferred foot on a wooden balance tool which is 50cm in length, 4cm in height and 3cm in width. The subject stands like a flamingo by bending the other leg at the knee backward and holding the foot held close to the buttocks with the hand on the same side as the bent leg. The subject is allowed to support on the helper's arm to take up the balance position. The test starts the moment the subject let go of the arm of the helper to attempt to keep his/her balance for 1 minute. The test is interrupted whenever the subject lose balance. After every interruption the same procedure is applied and is continued this way until balance is held for 1 minute. The stopwatch is stopped each time when the person lose balance either by falling off the beam or letting go of the foot being held behind. The number of the balance losses within the 1 minute is recorded as the score.

Standing long jump

The subject stands behind the jumping line with the 2 feet slightly apart. Jump forward from the 2-foot stance as far as possible pushing off with the legs swinging the arms forward. The test was performed twice and the greater distance (from the starting line to the first contact point with the landing) in centimetre served as the score.

Sit-reach (flexibility)

The subject sits in front of a plate/box 35cm long, 35cm wide and 32cm high. The soles of the feet are placed flat against the box. Both knees should be locked and pressed flat to the floor. With the palms facing downwards, and the hands on top of each other or side by side, the subject reaches forward and pushes the ruler slowly forward along the measuring line as far as possible and keeps the position for 3 seconds. The farthest point that the subject can reach is recorded as the score. The test is performed twice and the best score is recorded.

Statistical analysis

After entering the obtained data into SPSS 16.0 package software, the independent samples t-test determined the difference between the males and females and the One Way ANOVA test was performed to determine the status of PAL and MS according to age. Scheffe test was employed to specify the source of the difference. Pearson correlation test was used to determine the relationship between PAL and MS of female and male students. Pearson correlation coefficient was accepted as low r-value between 0.00 and 0.30, medium between 0.31 and 0.70 and high between 0.71 and 1.00. In the study, the level of significance was accepted as $p<0.05$ and $p<0.001$.

RESULTS

In terms of the male students who participated in the research, average age, height and weight values were 12.47±1.39 years, 150.47±9.99cm and 43.89±12.14kg respectively; whereas the

average age, height and weight of the females were found to be 12.78±1.63 years, 151.21±9.43cm and 44.02±11.19kg respectively.

Table 1. **STATUS OF PAL AND MS ACCORDING TO GENDER GROUPS**

Variables	Gender	n	M±SD	t	p-Value
Total PAL	Male Female	951 767	3.12±0.72 2.94±0.72	5.128	**0.000*****
Height (cm)	Male Female	951 767	150.47±9.99 151.21±9.43	-1.570	0.117
Weight (kg)	Male Female	951 767	43.89±12.14 44.02±11.19	-0.225	0.822
Sit-ups (no./second)	Male Female	951 767	15.51±5.10 13.08±5.27	9.631	**0.000*****
Speed (sec)	Male Female	951 767	8.39±1.35 4.99±1.54	0.716	0.474
Hand grip (kg)	Male Female	951 767	18.69±4.88 17.46±4.53	2.929	**0.003****
Standing long jump (cm)	Male Female	951 767	125.54±23.50 113.53±20.72	11.094	**0.000*****
Flamingo balance (no./second)	Male Female	951 767	5.82±5.83 5.34±6.12	1.667	0.096
Sit-reach (cm)	Male Female	951 767	14.47±6.97 16.76±7.26	-6.646	**0.000*****

n=Number of participants M=Mean SD=Standard Deviation ***p<0.001 **p<0.01

In Table 1 it is clear that the total PAL ($t_{(1718)}$=5.128; p<0.001), sit-ups ($t_{(1718)}$=9.631; p<0.001), hand grip ($t_{(1718)}$=2.929; p=0.003) and standing long jump ($t_{(1718)}$=11.094; p<0.001) performances of males were better than the females. Although the females outperformed the males in flexibility ($t_{(1718)}$=-6.646; p<0.001), there were no gender differences between the height ($t_{(1718)}$=-1.570), weight ($t_{(1718)}$=-0.225), speed ($t_{(1718)}$=0.716; p<0.05) and flamingo balance ($t_{(1718)}$=1.667).

According to the results in Table 2, a significant difference was found between the PALs and the different age groups ($F_{(2\text{-}1716)}$=28.512; p<0.001) of the students. A Scheffe test was conducted to determine the reason for the difference, and the results showed that the difference was in favour of the older students. For example; the difference between the ages 12 and 13 was in favour of the age 13 and the difference between the ages 13 and 14 was in favour of the age 14. It was seen that age and PAL were inversely proportional to each other. It was also seen that a significant difference was found between the height ($F_{(2\text{-}1716)}$=366.118; p<0.001) and weight ($F_{(2\text{-}1716)}$=152.275; p<0.001), while the results of the Scheffe test determined that the

differences were not in favour of the 12 year age group when compared to the 12-, 13- and 14-year-old age groups.

Table 2. **ONE WAY VARIANCE (ANOVA): PAL AND MS ACCORDING TO AGE**

Variables	Comparison of groups	Sum of squares	df	Mean of squares	F	p-Value	#Source of diff. (Scheffe)
Height	Between	48848.925	2	24424.462			12-13
	Within	114410.917	1716	66.712	366.118	**0.000*****	12-14
	Total	163259.842	1718				13-14
Weight	Between	35612.480	2	17806.240			12-13
	Within	200543.215	1716	116.935	152.275	**0.000*****	12-14
	Total	236155.695	1718				13-14
Sit-ups	Between	724.174	2	362.087			12-13
	Within	47854.804	1716	27.904	12.976	**0.000*****	12-14
	Total	48578.978	1718				
Speed	Between	16393.292	2	8196.646			
	Within	16349292.841	1716	9533.115	0.860	0.423	
	Total	16365686.133	1718				
Hand Grip Strength	Between	9810.123	2	4905.061			12-13
	Within	119132.451	1716	69.465	70.612	**0.000*****	12-14
	Total	128942.574	1718				
Standing long jump	Between	80687.618	2	40343.809			12-13
	Within	834303.356	1716	486.474	82.931	**0.000*****	12-14
	Total	914990.974	1718				
Flamingo balance	Between	5.575	2	2.788			
	Within	61141.132	1716	35.651	0.078	0.925	
	Total	61146.708	1718				
Sit-reach	Between	233.107	2	116.553			
	Within	88606.388	1716	51.666	2.256	0.105	
	Total	88839.495	1718				
Total PAL	Between	29.129	2	14.564			12-13
	Within	876.052	1716	0.511	28.512	**0.000*****	12-14
	Total	905.181	1718				13-14

***p<0.001 # Difference between age groups

Also, when the 13 and 14 year age groups were compared, it was seen that the difference was in favour of the 13 year group. Furthermore, the findings in Table 2 indicate a significant difference between the students' ages for sit-ups ($F_{(2\text{-}1716)}$=12.976; p<0.001), hand grip ($F_{(2\text{-}1716)}$=70.612, p<0.001) and standing long jump ($F_{(2\text{-}1716)}$=82.931; p<0.001) performances. According to the results of the Scheffe test, the difference was not in favour of the 12 year age group when compared with the 13- and 14-year-old age group. However, no significant difference was observed between 13- and 14-year-old age groups. Regarding the difference between the age groups for speed ($F_{(2\text{-}1716)}$=0.860; p<0.001), flamingo balance ($F_{(2\text{-}1716)}$=0.078;

p<0.001) and sit-reach ($F_{(2\text{-}1716)}$=2.256; p<0.001) performances, no significant differences were found.

Table 3. **BIVARIATE CORRELATION: RELATIONSHIP BETWEEN PALS AND MS OF MALE AND FEMALE STUDENTS**

Variables		BMI	Sit-up	Speed	Hand grip	Stand. long jump	Flamingo balance	Sit-reach
Male	r#	-0.167**	0.168**	-0.006	-0.017	0.071*	0.036	0.041
PAL	p	0.000	0.000	0.850	0.602	0.029	0.270	0.210
Mean	n	951	951	951	951	951	951	951
Female	r#	-0.129**	0.088*	0.051	-0.127**	0.019	0.047	0.069
PAL	p	0.000	0.014	0.155	0.000	0.597	0.197	0.056
Mean	n	767	767	767	767	767	767	767

** p<0.001 * p<0.05 r#: 0.00-0.30=low; 0.31-0.70=medium; 0.71-1.00=high

According to Table 3, very high and negative relationships (r=-0.167) were found between PALs and BMIs of the males, while the relationship between their PALs and sit-ups performances was high and positive (r=0.168), as well as their PALs and standing long jump performances (r=0.071). However, there was no significant relation between PALs and speed, hand grip strength and flexibility performances. In the case of the females, the relationship between PALs and BMIs (r=-0.129) and PALs and hand grip strength (r=-0.127) was negative and very high. While a positive and highly significant relationship was found between the PALs and sit-ups performances (r=0.088). No significant difference was found between PALs and speed, standing long jump, flamingo balance and sit-reach performances.

DISCUSSION

PA and exercise not only increase the mental capacity of children, but are also required for physical development, coordination, growth, motivation, socialisation and health of children. Thus, PA and exercise are highly recommended for all (American Academy of Paediatrics, 1987).

PAL and MS of children differ according to age and gender. In this research where the gender groups were compared, the PAL scores of the male students were higher than that of the female students (Table 1). This result supports that of the findings of related studies in the literature (Karaca *et al*., 2009; Yabanci & Pekcan, 2010; Bergier *et al*., 2012; Jekauc *et al*., 2012; Vašíčková *et al*., 2012). In their study conducted on 4064 female and 3652 male Polish adolescent, high school and university students determined through the PAL IPAQ scale, Bergier *et al*. (2012) also found that the PAL of males was higher than that of females. In the study of Vašíčková *et al.* (2012) conducted with 275 female and 220 male Polish adolescents determined through PAL IPAQ scale, found the same result. In a similar study, Yabancı and Pekcan (2010) reported that the 120 male students spent more time doing PA. In addition, Karaca *et al.* (2009) found the same result in their study conducted with 1027 university students. This could be associated with males preferring activities with more action, such as

football, basketball, hide and seek and tag played in open areas, while females preferred more passive activities played in closed areas.

In the current study, the performance of the male students was better than the female students in sit-ups, hand grip strength and standing long jump. This could be attributed to the increase in the muscle strength of the males resulting from the fact that PALs of male students were higher than those of the female students (Table 1). Turan and Aydogan (2014) did a study on 501 adolescents and stated that the right and left hand grip, vertical and standing long jump values of males were higher than those of female students, which is similar to the results of the current study. During the childhood period, muscle strength increases as age increases in both genders (De Ste Croix *et al*., 2003). The basic reasons for the increase in the muscle strength include the increase in bodyweight, height (De Ste Croix *et al*., 2003) and muscle mass (Kanehisa *et al*., 1995). Although increase in muscle mass was observed in both genders as the age increased, no significant difference was found between the genders in muscle strength (De Ste Croix *et al*., 2003).

It was reported in previous studies (Maffulli *et al*., 1994; Payne *et al*., 1997; Hansen *et al*., 1999) that muscle strength and endurance in students performing PA were higher than their peers who did not do sport. Düzgün and Baltacı (2009) did a study on females and males between the ages 13 to 17 and observed that the flexibility values of females were higher than those of male students of the same age in both the active and the passive groups. Mendes *et al*. (2015) stated in their study they conducted on 99 male and 72 female adolescents who actively played football that the flexibility values of females were better than those of males. Branta *et al.* (1984) and Pratt (1989) stated in their studies that flexibility values of females were higher than those of males in all age groups and that the flexibility gap was at its highest level especially during adolescence. The increase in the lower extremity length during adolescence is possibly the reason for the low flexibility levels. In the current study, the flexibility values of females were higher than those of males, which support the results of the studies mentioned above.

Dumith *et al*. (2011) determined in their study in which they analysed 26 studies conducted between 1998 to 2009 regarding PA that PAL decreased 7% on average every year among adolescents. Also, when the studies conducted between 1997 and 2007 were analysed, it was concluded that the PAL of females between the ages 9 to 12 was higher than that of males of the same age, while the PAL of males between the ages 12 to 16 was higher than that of females of the same age. Furthermore, it was stated that PAL in females decreased as their age increased (Dumith *et al*., 2011). In a study on 2185 children between 9 and 15 years old, Riddoch and Boreham (2004) reported that PAL decreased as the age increased. PAL was determined through a self-reporting system. Although 9-year-old children were at required PAL, while PAL of the children at the age of 15 was determined to be below the norm (Riddoch & Boreham, 2004).

In a similar study, among 781 Swedish children aged between 7 and 14 years, the least active group was the 14-year age group (Raustrop *et al*., 2004). In a study conducted on 173 male and 116 female Irish children, the PAL of students in the 10- to 12-year age groups was higher than the PAL of the students in the 15-17 age group (Carrier & Herbert, 2003). The findings of the current study were similar to the findings of the studies in the literature, and it was found that

as the age of the students increased, a decrease in PAL was observed (Table 2). Spending too much time on the computer (Muslu & Bolisik, 2009) and television (Lowry *et al*., 2002; Vandewater *et al*., 2004) resulted in children spending less time participating in PAs, such as playing games (educational games, street football, hide and seek, tag, rope jumping) and taking part in sport, thus the decrease in PAL. Furthermore, long school hours, time to complete homework and attending private academic courses also played a role in the decrease in the time spent on PA.

The results of the current study showed that weight and height were in direct proportion with age. When ages and MS of the students who participated in the research were compared, it was observed that the performance values for hand grip strength, standing long jump and sit-ups of the 12-year-old students were lower than those of 13- and 14-year-old students (Table 2). This was associated with children being in a developmental period with an increase in muscle strength (Celik *et al*., 2013; Turan & Aydogan, 2014; Simsek *et al*., 2015).

In flexibility, balance and speed performance, no change occurred as the age increased (Table2). Fetz (1982) reported that the 20m speed performance was similar in boys between 9- and 13-years old. Also, the ability in speed continued to improve in the male adolescents but stopped in females in the same period. Speed performances, according to the age ranges of the students who participated in the current research, supported the results of the study by Fetz (1982). Bayındır and Kolayis (2015) conducted a study to determine the effects of gender and age on MS and found that the speed performance of males between the ages 11 and 13 was higher than that of females of the same ages. Besides, the best speed performance for both genders was observed at the age of 13, while the speed performance values of 11-year-old students were higher than those of 12-year-old students, which meant that speed performance was changeable and did not increase (Bayındır & Kolayis, 2015). When the literature was reviewed, it was noticed in several studies (Eriksson *et al*., 1973; Bencke *et al*., 2002; Loko *et al*., 2003) that anaerobic strength and capacity of the children with high PAL, who took part in the sport activities were higher than their inactive peers. No significant difference in speed performance between the age groups was found whether they actively did sport or not because speed was considered a hereditary feature.

Malina *et al*. (2004) reported that the flexibility of males decreased as age increased, minimised at 12 to 13 years old and increased again at the age of 18, based on the sit-reach test results. In terms of girls, the flexibility was constant between 5- and 11-years old, and it increased by the age of 14 (Malina *et al*., 2004). According to Simsek *et al*. (2015), the flexibility of 82 Turkish football players at the age of 9 and 10 years was good, at the age of 11 and 12 years it was low and at the age of 13, 14 and 15 it was high. No change in flexibility performance with age was observed in the current study, which could be related to the children being at a developmental period.

BMI in children and adolescents is an important indicator to assess health (Irena *et al*., 2012; Tanir *et al*., 2014). Two studies in the literature indicated a positive significant relationship between PAL and BMI (Irena *et al*., 2012; Tanir *et al*., 2014), which is similar to the results of the current study (Table 3). This could be explained by means of the fact that the increase in PAL decreases the body fat rate, while increasing body muscle percentage. A positive relationship was found between PAL and hand grip strength of female students. This was

considered to arise from the fact that the children have small hands and are unable to grip the hand dynamometer as they should and thus they cannot reveal their real strength.

No statistically significant relationship was found between PALs and speed, standing long jump, flamingo balance and sit-and-reach performances of the female students. Similarly, no statistically significant relationship was found between the PALs and flamingo balance, speed and sit-and-reach performances for the male students. Similar to the results of the current study, Tanir *et al.* (2014) in their study, with boys and girls at the average age of 15, as well as the results of Eriksson *et al*. (1973), Bencke *et al*. (2002) and Loko *et al*. (2003), found no significant relationship between PAL, sit-and-reach, sit-ups and push-ups. Tanir *et al*. (2014) mentioned that PAL could be affected by genetic structure, nutritional habits, hormones, skeleton structure and type of PA to be performed. They associated the results of their study to these facts (Tanir *et al*., 2014).

Lastly, a positive significant relationship was found between PALs and sit-ups and standing long jump performances of the male students. This could be related to the increase in muscle strength depending upon the high PAL of the male students. PA has been known to increase muscle strength in children (Maffuli *et al*., 1994; Payne *et al*., 1997; Hansen *et al*., 1999). Camliguney (2010) conducted a study to compare PAL and MS of students between the ages 8 and 10 years and determined their PAL through the PAQ-C questionnaire and pulse rate, while MS included balance, shuttle running and standing long jump. Camliguney (2010) found a positive relation between shuttle running and flexibility, while those with a high PAL was found to be better in standing long jump. In another study, Hekim (2015) compared PAL and MS of 31 primary school boys with the IPAQ questionnaire. In the current study, no significant difference was found between back-leg strength and PAL, while there was a significant difference between PAL and flexibility. Tanir *et al*. (2014) found a weak negative relationship between shuttle running and push-ups and the PAL PAQ-A scale, yet there was no significant relationship between PAL and flexibility.

CONCLUSION AND RECOMMENDATIONS

Strength-based MS of male students (hand grip strength, standing long jump, sit-ups and balance performance was higher than those of the female students. Height, weight, sit-ups, standing long jump, hand grip strength, and flamingo balance performance showed a parallel increase with an increase in age. Furthermore, the PAL of male students was higher than that of female students, and PAL decreased as age increased. Considering that students love and enjoy PA, providing environments that will encourage students to perform PA, increasing the physical education and sport programmes at schools and providing playing areas for the children will contribute towards producing healthy children.

It is recommended that future research should include a sample from both state and private schools from different regions all around the country, in order to obtain more generalizable results related to 12- to 14-year-old students. Moreover, similar studies with a longitudinal focus and developmental element, monitoring PAL and MS of children over a period of years, would provide significant data to assess the progress in raising healthy adolescents in the province where the current study was conducted.

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Prof Ruchan IRI: Nigde University, School of Physical Education and Sports, Nigde, Turkey, Tel.: +90 542 437 80 22, Email: ruchaniri@nigde.edu.tr

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