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Investigation of the Relation Between the Level of Motor Skills and the Quality of Life in Turkish Children

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Abstract Aim of this study was to examine motor skills and quality of life values of Turkish children according to age and gender factor, and to examine the relationship between motor skills and quality of life values. The sample of the study comprised of 434 students in 8–10 age group ($\bar{X}$ = 9.17±0.80 years; BMI = 17.46±3.05 kg/m2; Weight = 32.45±8.30 kg; Height = 135.19±10.18 cm) who attended the primary schools in the city center of the province of Usak, Turkey. Health-Related Quality of Life Questionnaire-Family Form (KINDL-FF) and Bruininks-Oseretsky Test of Motor Proficiency-2nd Version (BOT-2)-Short Form were employed in order to evaluate the students' quality of life and their motor skills. Mann-Whitney U test, Kruskal-Wallis test and Spearman Correlation test were applied to analyze variables. There was a significant difference between all of the motor skill values except manual dexterity and family sub-dimension of quality of life by gender (p< .05). A significant difference was found between all motor skills' parameters and school sub-dimension by age factor (p < .05). While a positive correlation was found between the total quality of life and the fine motor precision, fine motor integration, balance, running speed & agility and total motor skill values (p< .05), no correlation was found between the other parameters (p> .05). In line with the data obtained from the present study, children of the 8–10 age group should be directed to perform various physical activities that will support motor skills and health. Increasing their health behaviors that will positively affect the motor skills may improve their quality of life as well.

Keywords: *Motor skills, quality of life, school, children, family*

1. Introduction

Motor skills promote cognitive and perceptual development in children also contribute to their ability to participate into life of their homes, schools, and community environments (Piek, Baynam, & Barrett, 2006). Motor skills involve body movements (Abdullah, Jaafar, & Ayub, 2012), growth, development, active lifestyle (Lubans, Morgan, Cliff, Barnett, & Okely, 2010; Hadders-Algra, 2018), self-care, feeding, dressing (Van der Linde et al., 2015; Gaul & Issartel, 2016), game, education and social interaction and contribute to necessary areas for life (Cools, Martelaer, Samaey, & Andries, 2009; Lee, Zhang, Chu, Gu, & Zhu, 2020). These skills were ideally developed in preschool and early school years (Barnett et al., 2016). Life quality of children with poor skills decreases. Quality of life is also recognized as an important indicator of individuals' physical, mental and social well-being (Dumuid et al., 2017).

Quality of life covers individuals ' perceptions, beliefs, behaviors, skills, development, attitudes, expectations and experiences depending on their social and physical health (Testa & Simonson, 1996; Gil-Lacruz, Gil-Lacruz, & Gracia-Pérez, 2020). It is stated that children who are physically active show better self-confidence than inactive children and suffer less mental problems (Biddle & Asare, 2011). Correlation between health-related quality of life and physical activity, sleep and healthy diet in children is positive (Wu, Ohinmaa, & Veugelers, 2012; Lacy et al., 2012). Although there are studies indicating that participation in physical activity can improve motor skills in children and thus affect quality of life (Serra-Paya, Ensenyat, Serra-Paya, & Blanco-Nespereira, 2015), the relationship between motor skill and quality of life without being associated with any activity has not been studied much.

There are differences in motor skills between children depending on age and gender (Bala, Jalsić, & Katić, 2009). For this reason, children are first directed to basic movement skills in later ages to play skills (Smith, 2016). Lives of children with motor skill deficiencies are affected negatively (WHO, 2001). In Turkey, physical activity level of children decreases for various reasons (Güneş, Koca, & İmamoğlu, 2019). Decrease in physical activity

leads to the appearance of many chronic diseases, especially obesity, at an early age (Garikagaoglu et al., 2009; Erem, 2015). Although there is a study indicating the relationship between age and gender in children of 7-10 age group (Shams & Vameghi, 2018), there is no detailed study in which fine and gross skills and life quality on this age group are evaluated together in Turkey. For this reason, in the study it is tried to answer the questions: 1. Is gender effective on motor skills and life quality? 2. Does age have an impact on motor skills and quality of life? 3. Is there any relation between motor skills and life quality?

2. Method

2.1. Participants

The sample of the study includes 434 healthy students with normal development (BMI= 17.46±3.05 kg/m2; Weight= 32.45±8.30 kg; Height= 135.19±10.18 cm) in 8-10 age group ($\bar{X}$ =9.17±0.80 years). Students from four primary schools in the city center of the province of Usak, Turkey participated voluntarily in the study. Of the participants, 50.9% were female (n = 221) and 49.1% were male students (n = 213). Students' parents were invited to the school to answer questions about quality of life. Of the family members involved, 69.1% were mothers (n = 300), 29.1% were fathers (n = 129), and 1.2% were other family members (n = 5). Before the study, permission was obtained from Usak Provincial Directorate of Education concerning the schools where the study would be conducted, and the parents' consent was also received. In addition, the approval of the Scientific Research and Publication Ethics Committee was also obtained with the date of September 28, 2016, and the number of 2016-39. The school administration, the parents of the participating students, as well as the participating students themselves, were informed about the scales and tests to be applied.

2.2. Measurements

2.2.1. Bruininks-Oseretsky Test of Motor Proficiency-2nd Version (BOT-2)

Bruininks-Oseretsky Test of Motor Proficiency-2nd Version (BOT-2) was developed in 1978 and it was revised later. The revised second version measures motor functions of children aged 4–21. It is a reliable test that measures children's motor skills. The standardization of the test was achieved with the participation of 1520 students, whose ages ranged from 4 to 21. The duration for the application of the test for one person is approximately 40–60 min. The long form of the test consists of 8 sub-dimensions and 53 items. Total motor skill score is obtained by collecting score of all items. The short form of the test consists of 8 subtests and a total of 14 items. Subtest 1: Fine Motor Precision (2 items), Subtest 2: Fine Motor Integration (2 items), Subtest 3: Manual Dexterity (1 items), Subtest 4: Bilateral Coordination (2 items), Subtest 5: Balance (2 items), Subtest 6: Running Speed and Agility (1 items), Subtest 7: Upper Limb Coordination (2 items), Subtest 8: Strength (2 items) (Bruininks & Bruininks, 2005). The short form of BOT-2 was also used in this research. Motor skill tests were applied by two researchers in physical education courses at the schools, respectively. Before the application, students were informed about each test.

2.2.2. Health-Related Quality of Life Questionnaire - Family Form (KINDL-FF)

Health-Related Quality of Life Questionnaire - Family Form (KINDL-FF) was utilized in order to evaluate the students' quality of life in this study. "German quality of life questionnaire (KINDL)" was developed by Ravens-Sieberer and Bullinger in 1998. Baydur, Saatli, Eser, and Yuksel (2007) conducted validity and reliability studies for the KINDL-FF for the 8–16 age group. Cronbach alpha values of domains were between 0.57–0.80. The total quality of life scale was 0.84. The findings show that the Turkish version of the 8–16-year-old KINDL-FF was a valid and reliable scale. KINDL-FF is a general-purpose scale of the quality of life, which is used in evaluating the physical well-being, emotional well-being, self-esteem, family, school and social state of children and which has high levels of validity and reliability. It is a 5-point Likert type scale. A total score of KINDL-FF can be calculated from all 24 items. Scores were ranged from 0 to 100, higher score means better quality of life (Ravens-Sieberer & Bullinger, 1998; Baydur, Saatli, Eser, & Yuksel, 2007). Parents of the subjects were invited to the schools during school hours to answer the questions about the life quality of the students, and they were also informed about the study.

2.3. Statistical Analyses

In the examination of the statistical tests, the Statistical Package for the Social Sciences (SPSS version 21.0 statistical program) was used. For the statistical analyses, the results were expressed as mean values and standard deviations, significance level of p =.05 was taken as a basis in comparisons. The normality test was analyzed by the Kolmogorov Smirnov test (N > 50) and showed a non-normal distribution of the data. Therefore, Mann Witney U, Kruskal Wallis and Spearman Correlation tests, which are nonparametric tests, were used to evaluate the data. The motor skills and quality of life values of the individuals according to gender were evaluated by using Mann Whitney U test. Motor skills and quality of life values of the individuals according to age groups were evaluated by Kruskal Wallis test. In addition, the relation between the overall quality of life of the individuals and their motor skills' score was examined by the Spearman Correlation test.

3. Results

Results of female students were statistically better in fine motor precision (U = 18765.50, p < .01) and fine motor integration (U = 20725.00, p < .05) parameters than male students. Male students gained statistically better score in bilateral coordination (U = 19172.00, p < .01), balance (U = 21120.50, p < .05), running speed and agility (U = 15253.50, p < .01), upper limb coordination (U = 17753.50, p < .01), strength (U = 9098.00, p < .01) and total motor skill scores (U = 16381.00, p < .01) compared to female students. Statistically no significant difference was found in manual dexterity scores according to gender (U = 21091.50; p > .05) (Table 1).

There was statistically no significant difference in physical well-being (U = 21978.00), self-esteem (U = 23091.50), social contacts (U = 21553.00), school (U = 22322.00), emotional well-being (U = 22687.00) and overall quality of life values (U = 22136.00) according to gender (p > .05), while female students got better score in family sub-dimension than male students (U = 20229.50; p < .05) (Table 2).

When the test results were evaluated by age groups, older children gained statistically higher scores in fine motor precision ($X^2_{(2,434)}$ = 38.87), fine motor integration ($X^2_{(2,434)}$ = 12.55), manual dexterity ($X^2_{(2,434)}$ = 38.32), bilateral coordination ($X^2_{(2,434)}$ = 63.06), balance ($X^2_{(2,434)}$ = 19.10), running speed & agility ($X^2_{(2,434)}$ = 101.01), upper limb coordination ($X^2_{(2,434)}$ = 88.99), strength ($X^2_{(2,434)}$ = 109.29) and total motor skills values ($X^2_{(2,434)}$ = 146.39) than younger ones (p < .01, Table 3).

Also, there was statistically no significant difference in the physical well-being ($X^2_{(2,434)}$ = 1.18), self-esteem ($X^2_{(2,434)}$ = .96), family ($X^2_{(2,434)}$ = 4.48), social contacts ($X^2_{(2,434)}$ = 5.94), emotional well-being ($X^2_{(2,434)}$ = .64), and the total quality of life ($X^2_{(2,434)}$ = 4.58) scores according to age groups (p > .05), a statistically significant difference was found in the school sub-dimension ($X^2_{(2,434)}$ = 6.25) (p < .05, Table 4).

A positive correlation was found between the overall quality of life of the individuals and the fine motor precision (r = 0.104; p < .05), fine motor integration (r = 0.118; p < .05), balance (r = 0.132; p < .01), running speed & agility (r = 0.110; p < .05) and the total motor skills values (r = 0.111; p < .05), no correlation was found between the other parameters (p > .05, p > .01, Table 5).

4. Discussion

In order to perform daily life activities properly at an adequate level, fine motor skills need to be developed (Surrey et al., 2001). When we examined the results of the study, we found differences in fine and gross motor skills between girls and boys (Table 1). Similarly, in another study, it was found that fine motor skills were higher in female children compared to males, while male children scored higher in gross motor skills compared to female children (Morley, Till, Ogilvie, & Turner, 2015). Males' score was generally higher in measurements such as running speed and agility, throwing the ball to a target and strength compared to females in the studies measuring the motor development levels of children (Wrotniak, Epstein, Dorn, Jones, & Kondilis, 2006), it was stated that this gender difference resulted from environmental factors (Okely & Booth, 2004). Moreover, there are studies which have found no difference between male and female children in terms of their motor skills (Fisher et al., 2005). When all the data are examined, it can be suggested that there is a parallelism between the results of these studies and the data obtained from the present study, and the

Table 1. *Mann-Whitney U test results for the motor performance values of the individuals by gender*

	Groups	N	Mean Rank	Sum of Ranks	U	Z	p
Fine Motor Precision	Female	221	239.09	52838.50	18765.50	-3.838	.000*
	Male	213	195.10	41556.50			
Fine Motor Integration	Female	221	230.22	50879.00	20725.00	-2.249	.025*
	Male	213	204.30	43516.00			
Manual Dexterity	Female	221	206.44	45622.50	21091.50	-1.913	.056
	Male	213	228.98	48772.50			
Bilateral Coordination	Female	221	197.75	43703.00	19172.00	-3.820	.000*
	Male	213	237.99	50692.00			
Balance	Female	221	206.57	45651.50	21120.50	-2.464	.014*
	Male	213	228.84	48743.50			
Running Speed & Agility	Female	221	180.02	39784.50	15253.50	-6.621	.000*
	Male	213	256.39	54610.50			
Upper Limb Coordination	Female	221	191.33	42284.50	17753.50	-4.713	.000*
	Male	213	244.65	52110.50			
Strength	Female	221	152.17	33629.00	9098.00	-11.196	.000*
	Male	213	285.29	60766.00			
Total Motor Score	Female	221	185.12	40912.00	16381.00	-5.485	.000*
	Male	213	251.09	53483.00			

*p < 0.05

Table 2. *Mann-Whitney U test results for the quality of life values of the individuals by gender*

	Groups	N	Mean Rank	Sum of Ranks	U	Z	p
Physical Well-being	Female	221	210.45	46509.00	21978.00	-1.202	.230
	Male	213	224.82	47886.00			
Self-esteem	Female	221	219.51	48512.50	23091.50	-.342	.732
	Male	213	215.41	45882.50			
Family	Female	221	232.46	51374.50	20229.50	-2.556	.011*
	Male	213	201.97	43020.50			
Social Contacts	Female	221	226.48	50051.00	21553.00	-1.531	.126
	Male	213	208.19	44344.00			
School	Female	221	223.00	49282.00	22322.00	-.935	.350
	Male	213	211.80	45113.00			
Emotional Well-being	Female	221	221.34	48917.00	22687.00	-.655	.512
	Male	213	213.51	45478.00			
Total Life Quality Score	Female	221	223.84	49468.00	22136.00	-1.073	.283
	Male	213	210.92	44927.00			

*$p < .05$

Table 3. *Kruskal-Wallis test results for the motor performance values of the individuals by age groups*

	Groups	N	Mean Rank	SD	X^2	p	Mean Difference
Fine Motor Precision	8 Age	110	170.63	2	38.87	.000*	8-9, 8-10, 9-10
	9 Age	139	202.67				
	10 Age	185	256.51				
Fine Motor Integration	8 Age	110	189.43	2	12.55	.002*	10-9, 10-8
	9 Age	139	210.71				
	10 Age	185	239.29				
Manual Dexterity	8 Age	110	161.18	2	38.32	.000*	8-9, 8-10, 9-10
	9 Age	139	215.41				
	10 Age	185	252.56				
Bilateral Coordination	8 Age	110	147.70	2	63.06	.000*	10-8, 9-8
	9 Age	139	228.23				
	10 Age	185	250.94				
Balance	8 Age	110	184.15	2	19.10	.000*	10-8, 9-8
	9 Age	139	224.08				
	10 Age	185	232.39				
Running Speed & Agility	8 Age	110	128.10	2	101.01	.000*	8-9, 8-10, 9-10
	9 Age	139	213.95				
	10 Age	185	273.32				
Upper Limb Coordination	8 Age	110	133.34	2	88.99	.000*	10-9,10-8,
	9 Age	139	218.01				9-8
	10 Age	185	267.16				
Strength	8 Age	110	113.92	2	109.29	.000*	10-9,10-8,
	9 Age	139	232.92				9-8
	10 Age	185	267.50				
Total Motor Score	8 Age	110	103.22	2	146.39	.000*	10-9,10-8,
	9 Age	139	217.16				9-8
	10 Age	185	285.71				

*$p < .05$

Table 4. *Kruskal-Wallis test results for the quality of life values of the individuals by age groups*

	Groups	N	Mean Rank	SD	X^2	p	Mean Difference
Physical Well-being	8 Age	110	209.26	2	1.18	.552	
	9 Age	139	226.18				
	10 Age	185	215.88				
Self-esteem	8 Age	110	207.96	2	.96	.616	
	9 Age	139	218.10				
	10 Age	185	222.72				
Family	8 Age	110	195.83	2	4.48	.106	
	9 Age	139	224.39				
	10 Age	185	225.21				
Social Contacts	8 Age	110	193.78	2	5.94	.051	
	9 Age	139	231.65				
	10 Age	185	220.97				
School	8 Age	110	194.25	2	6.25	.044*	8-9
	9 Age	139	233.90				
	10 Age	185	219.01				
Emotional Well-being	8 Age	110	209.76	2	.64	.724	
	9 Age	139	222.35				
	10 Age	185	218.46				
Total Life Quality Score	8 Age	110	195.82	2	4.58	.101	
	9 Age	139	228.22				
	10 Age	185	222.34				

*$p < .05$

Table 5: *The Relation between the total quality of life and the motor performance values of the individuals*

(N = 434)		FMP	FMI	MD	BC	B	RSA	ULC	S	TMP
TQL	R	.104*	.118*	.017	.041	.132**	.110*	.000	.041	.111*
	P	.030	.014	.722	.392	.006	.022	.994	.389	.021

**. Correlation is significant at 0.01 level. *. Correlation is significant at the 0.05 level

Total Quality of Life (TQL); Fine Motor Precision (FMP); Fine Motor Integration (FMI); Manual Dexterity (MD); Bilateral Coordination (BC); Balance (B); Running Speed & Agility (RSA); Upper Limb Coordination (ULC); Strength (S); Total Motor Performance (TMP).

gender factor affects the motor skills in various sub-dimensions. This may result from environmental or physical conditions. When the quality of life was examined depending on gender factor, previous studies suggested that there was no difference between the dimensions of friends, school, personal environment and self-esteem depending on gender factor (Casas et al., 2007; Goldbeck, Schmitz, Besier, Herschbach, & Henrich, 2007). When we analyzed results of life quality, only family scores differed in favour of girls (Table 2). In the present study, a difference in favour of female students was found only between the family values. This may be a result of the fact that girls are raised in their socialization process to be individuals who are more organized, more obedient and more ready to live for others, and that male children are raised to be strong, independent and authoritarian individuals (Aslan & Cansever, 2007).

The age interval of 7–12 is considered to be a suitable period for the development of motor skills, and motor skills vary with increasing age. Depending on the increase in the age, the muscle mass, strength, endurance, the metabolic level and the body size also increase throughout the childhood period. Accordingly, an increase occurs in the anaerobic capacity and speed as well (Kosar & Demirel, 2004). When our study was evaluated by age groups, motor skills increase as getting aged (Table 3). A study on importance of age suggested the balance skills improve among the children of 6–10 age group depending on the increasing age (Figura, Cama, Capranica, Guidetti, & Pulejo, 1991), it was also stated that the scores in a test comprising various combinations of endurance, strength, agility, balance and motor coordination increase depending on the increase in the age (Fjortoft, Pedersen, Sigmundsson, & Vereijken, 2011), and differences were found in various motor functions between the 9 years of age group and the 8 years of age group (Szpala, Rutkowska-Kucharska, & Syrewicz, 2014). It can be considered as important data supporting the present study. And this, in turn, can be interpreted that motor skills improve in children of 8–10 age group, and this improvement should be supported with various physical activities. When life quality was evaluated according to age, only the school subdimension was different (Table 4). Motor skills are considered necessary for academic

achievement among primary school children and they can prevent future problems to diagnose any problem related to them (Pacheco, Gabbard, Ries, & Bobbio, 2016). In addition, positive relations found between motor skill and academic performance in previous studies (Bobbio, Gabbard, Gonçalves, Filho, & Morcillo, 2010; Fernandes et al., 2016) can be interpreted that the academic achievement and life quality in school will also increase depending on increasing motor skills.

Motor skills are considered to be among the common properties present in all children, and they are vitally required for ensuring the quality of life. Motor skills are acquired in parallel with the development of the neuromuscular system. Acquisition of the motor skills enables the performance of goal-oriented movements in the later years of the life (Erceg, Zagorac, & Katic, 2008). Children with inadequate motor skills avoid physical problems they encounter during daily life. Besides forcing them to a sedentary lifestyle can cause a number of health problems as well. This, in turn, can directly affect their life quality (Okely, Booth, & Patterson, 2001). A positive correlation was found between the total quality of life and the fine motor precision, fine motor integration, balance, running speed & agility and total motor skill values, no correlation was found between the other parameters (Table 5). Quality of life is a multidimensional factor covering the physical functions of the individual (Carr & Higginson, 2001), and healthy progress of the motor skills' development has positive effects on the quality of life (Papavasiliou, 2010). The fact that a supporting factor is shown between motor proficiency and health-related life quality (Zhang, Lee, Chu, Chen, & Gu, 2020) can be considered important for the relationship between motor skills and life quality.

Consequently, the present study conducted to find out the relation between motor skills and the quality of life suggests that female children of the 8–10 age group have better fine motor skills, while the male children of the same age group have better gross motor skills and better total motor skills. Motor skills and the quality of life increase depending on increasing age. The individuals with better levels of motor skills have higher quality of life. In line with the data obtained from the present study, children of the 8–10 age group should be directed to perform various physical activities that will support motor skills and hence the health. Increasing their health behaviors that will positively affect motor skills may improve their quality of life as well.

When the strengths of the study are examined, the most remarkable aspect is the determination of the relationship between motor performance and quality of life. Therefore, more in-depth information should be obtained by using other tests and methods that may explain this relationship in more detail. There were several limitations in our study. Although the groups of boys and girls were very close to each other (girls= 221; boys= 213), this balance had to be observed in the age groups as well. Besides, numerical imbalance between age groups had to be taken into account (8 Age: 110; 9 Age: 139; 10 Age: 185). Sample sizes of different ages may have influenced the findings and limited the research. Therefore, future intervention studies should take into account balanced participants among groups. Size of physical mobility that can directly affect motor skill was not included in this study. This may have prevented us from revealing clearly the motor skill differences between boys and girls, particularly those who are more physically active. For this reason, physical activity levels can also be included in future studies. In our study, a short version of BOT-2 was used to evaluate motor skills. That may have caused our motor skills data to be limited. In future studies, more in-depth information can be obtained by using the whole of the test. Finally, the quality of life scale was evaluated for children by their parents or relatives. The fact that it was evaluated by different parents also limits the study. In addition, the child's perception of life quality and the parent's may not be the same. Therefore, the child's thoughts could also be taken and a separate evaluation could be made while planning this type of exercise.

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