The role of relative age effect on fundamental movement skills in boys and girls

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The role of relative age effect on fundamental movement skills in boys and girls

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Abstract

This study aims to investigate the effect of relative age effect on the development of fundamental movement skills in boys and girls. Data were collected from primary school first grade 22 boys and 33 girls students aged 5-6 years. Three age groups have been formed as 68-76, 77-80 and 81-89 months for boys, 71-75, 76-80 and 81-84 months for girls, respectively. Fundamental movement skill levels have been determined by the Test of Gross Motor Development. This study showed that the body height of boys and the body mass index of girls were significantly differentiated according to age groups. Only leap in male and side gallop skill in females were also significantly differentiated according to age groups. The limited effect of the relative age effect in this study may be due to the inactive lifestyle of children, the lack of pre-school movement education, and interactions between inadequate socio-economic and environmental conditions in Turkey.

Keywords: Relative age, fundamental movement skills, children.

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1. Introduction

The relative age effect show the months differences in age among children born in the same calendar year (Barnsley, R. H., Thompson & Barnsley, P.E., 1985). Relative age effect can influence coaches decisions related to talent selection and development process in many sports. The differences of 10-12 months between children early and late born can leads to strong effect on talent selection and sporting performance (Balyi, 2001). It is clear that early and late mature children need a special approach in training programs considering with possible 4-5 years of maturation differences. So, the understanding of children's performance development parallel with their maturation process is critically important for a coach and parents in the regulation of training, and in the meeting of their expectations.

Fundamental movement education is necessary to develop skills needed in lifelong physical activity or sport performance. This education consists of fundamental movement skills, fundamental motor skills and sport specific skills. All motor and sport skills are built on fundamental movement skills including locomotor and object control abilities at the beginning of movement education (Balyi, 2001; Payne & Isaacs, 2002; Gallahue & Donnelly, 2003). Examples of locomotor skills are sprint, hop, leap and side gallop while two hands strike, catch, kick and throw are classified as object control skills. The building process of fundamental movement skills is important than the result of the skill. It is not important how high or long a child jumps, but whether he/she can perform that skill correctly by providing all the criteria.

The physical activity level of children is important factor for enhancing of their physical and mental health status. All skill necessary for lifelong physical activity or sport performance are built on fundamental movement skills including locomotor and object control abilities at the beginning of movement education (Balyi, 2001; Payne & Isaacs, 2002; Gallahue & Donnelly, 2003). Early starting movements education is the critical period in reaching children's biological potential; delays in starting this program are not entirely compensated for in subsequent developmental periods (Balyi, 2001). It is important for teachers and coach to understand whether there was relative age effect on the effectiveness of the fundamental movement skills education in primary school children. In the execution of movement education and training, grouping children born in first and second half of the same year in contrast to chronological age may increase the effectiveness of physical education and sports activities until puberty. Thus, this study aims to investigate the effect of relative age effect on the development of fundamental movement skills in boys and girls in children aged 5-6 years.

2. Material and Method

Data were collected from primary school first grade students aged 5-6 years including 22 boys and 33 girls were randomly assigned in this study. Three age groups have been formed according to months as 68-76 (FG=First Group), 77-80 (SG=Second Group) and 81-89 (TG=Third Group) months for boys, 71-75 (FG=First Group), 76-80 and 81-84 (TG=Third Group) months for girls, respectively. Fundamental movement skill levels have been determined by the Test of Gross Motor Development second edition (TGMD-2). This test was developed by Ulrich (2000) and was adapted by Tepeli (2007) for Turkish population. The definitions of locomotor and object control skills are necessary for understanding to this study. Sprint is considered to be an extension of short-distance walking with maximum effort, except for the flight phase where both feet are in the air. Hop as a continuous and asymmetrical skill with one leg lifting and placing on the ground requires greater leg strength and

dynamic balance than leap, and only one foot and small support surface is used to push the body. Leap is a long step that takes place by taking off with one foot as the body increasingly moves upwards and forwards in the flight phase and landing on the ground with the other foot. Side gallop is a continuous displacement movement performed sideways as a combination of walking and leap. Throwing the ball with two-hand strike is the ability to hit the ball by using a part of the body or an object through swinging movement. Catch is to get the ball in front of the chest with two hands while the arms are extended towards the moving object and then quickly moved in the same direction with it, or when the arms are bent from the elbows. Kick is to move an object up and forward by applying force to the object with the foot. Throw is a strong swing forward of an object out of the hands (Department of Education, 1999). In the assessment of each skill, movement phases ranging from three to five in the scale constitute the performance criteria of the motor skills. Each of the motor skills is repeated twice and is coded as one point if the movements are done correctly or as zero point if the movements are done incorrectly. During the application of the test, each phase was recorded with the camera and a more detailed assessment was made in a more detailed manner, and the errors caused by the rating were reduced to the minimum.

IBM SPSS 21 software program has been used for the calculations. Statistical significance level has been determined as $p < 0.05$. After normality test, one way ANOVA with tests with post-hoc Scheffe were used for comparisons among three groups. Also, Pearson correlation coefficients were computed among variables.

3. Results and Discussion

The means of age variable for three groups were classified with respect to months in order to understand relative age effect among groups. The mean age difference between FG and SG was 4.1 months in boys and 4.35 months in girls. This difference between FG and TG was 8.6 months in boys and 10 months in girls. Also, the mean age difference between SG and TG was 4.5 months in boys and 5.65 months in girls. Result of this study showed that the mean age of FG (68-76 months) was bigger than those of SG (77-80 months) and TG (81-89 months) in boys. On the other hand, the mean age of FG (71-75 months) was bigger than those of SG (76-80 months) and TG (81-84 months) in girls.

Results of this study showed that the body height of boys and the body mass index of girls were significantly differentiated according to age groups (Table 1). In boys, the mean body height of FG was significantly smaller than TG. In girls the mean body mass index of FG was significantly higher than those of SG and TG. Of locomotor skills, only leap in male and side gallop skill in females were also significantly differentiated according to age groups (Table 2). In boys, the mean leap of FG was significantly lower than that of SG. In girls the mean side gallop of FG was significantly lower than that of TG. No significant difference was observed in object control among the age groups. Although there was no significant difference, the means in the locomotor skills was linearly increased from the lower to higher age groups (Table 1).

The relative age effect was well correlated with body height ($r=.597$, $p<.01$) in boys while the relative age effect were significantly correlated with body mass index ($r=-.412$, $p<.05$), leap ($r=-.370$, $p<.05$), side gallop ($r=-.428$, $p<.05$) and TGMD-2 ($r=-.366$, $p<.05$).

The physical activity level of children is important factor for enhancing of their physical and mental health status. All skill necessary for lifelong physical activity or sport performance are built on fundamental movement skills (Balyi, 2001; Payne & Isaacs, 2002; Gallahue & Donnelly, 2003). Months

differences in age among children born in the same calendar year can negatively influence the efficiency of fundamental movement education in early ages. This study investigates the relative age effect on the development of fundamental movement skills in boys and girls.

Results of this study showed that the body height of boys and the body mass index of girls were significantly differentiated according to age groups. Of locomotor skills, only leap in male and side gallop skill in females were also significantly differentiated according to age groups. Although there was no significant difference, the means in the locomotor was only linearly increased from the lower to higher age groups. Pearson correlations analysis showed that the relative age effect was well correlated with body height in boys while the relative age effect were significantly correlated with body mass index, leap, Side gallop and TGMD-2.

Early starting movements education is the critical period in reaching children's biological potential; delays in starting this program are not entirely compensated for in subsequent developmental periods (Balyi, 2001). Our study showed that there was limited relative age effect on the effectiveness of the fundamental movement skills education in primary school children. In the execution of movement education and training, it was not necessary grouping children born in first and second half of the same year in contrast to chronological age. In generally, relative age effect in mixed groups or class at the age of 5-6 years did not influence the effectiveness of physical education and sports activities.

It was accepted that early and late mature children need different approach in training programs considering with possible 4-5 years of maturation differences. Our results showed that training and practicing together in mixed class was suitable for boys and girls. The 5 to 6 age group was early period to see relative age effect related differences in physical characteristics and movement ability.

Further research is required to assess whether there was relative age effect related differences in fundamental movement skills in large number of participants during short and long-term training programs in early and late born children in the same calendar year.

Table 1. Comparison of physical characteristics and TGMD scores among age groups in males and females.

			MALES							FEMALES					
Variables	Groups In Months	N	M	SD	F	Sig.	Scheffe	Groups In months	N	M	SD	F	Sig.	Scheffe
Age (Months)	FG (68-76)	5	73,40	2,07	63,36	,00**	G1<G2, G3; G2<G3	FG (71-75)	6	73,00	3,16	39,294	,00**	G1<G2, G3; G2<G3
	SG (77-80)	8	77,50	0,76				SG (76-80)	20	77,35	1,18			
	TG (81-89)	9	82,00	1,41				TG (81-84)	7	83,00	2,89			
	Total	22	78,41	3,69				Total	33	77,76	3,78			
Body Height (cm)	FG (68-76)	5	116,20	4,97	5,48	,013*	G1<G3	FG (71-75)	6	118,33	5,85	,045	,956	N.D.
	SG (77-80)	8	119,25	4,33				SG (76-80)	20	118,00	4,10			
	TG (81-89)	9	124,56	5,08				TG (81-84)	7	118,57	4,58			
	Total	22	120,73	5,73				Total	33	118,18	4,40			
Body Weight (kg)	FG (68-76)	5	21,70	5,95	2,51	,108	N.D.	FG (71-75)	6	24,17	4,37	3,135	,058	N.D.
	SG (77-80)	8	20,81	3,45				SG (76-80)	20	20,52	3,04			
	TG (81-89)	9	25,54	4,65				TG (81-84)	7	20,66	2,45			
	Total	22	22,95	4,89				Total	33	21,21	3,41			
Body Mass Index (BMI)	FG (68-76)	5	15,90	3,03	1,37	,277	N.D.	FG (71-75)	6	17,13	1,82	5,676	,008**	G1>G2, G3;
	SG (77-80)	8	14,57	1,65				SG (76-80)	20	14,70	1,72			
	TG (81-89)	9	16,42	2,44				TG (81-84)	7	14,65	0,89			
	Total	22	15,63	2,38				Total	33	15,13	1,83			
Locomotor	FG (68-76)	5	14,20	1,64	,41	,671	N.D.	FG (71-75)	6	14,00	4,65	2,684	,085	N.D.

	Groups	N	M	SD	F	Sig	Scheffe	Groups	N	M	SD	F	Sig	Scheffe
	SG (77-80)	8	15,63	2,88				SG (76-80)	20	16,60	2,64			
	TG (81-89)	9	15,67	3,87				TG (81-84)	7	17,57	1,27			
	Total	22	15,32	3,06				Total	33	16,33	3,04			
	FG (68-76)	5	12,20	3,96	,49	,620	N.D.	FG (71-75)	6	11,00	2,28			N.D.
Object Control	SG (77-80)	8	12,13	1,73				SG (76-80)	20	11,70	2,39	,883	,424	
	TG (81-89)	9	13,33	2,74				TG (81-84)	7	10,43	1,81			
	Total	22	12,64	2,68				Total	33	11,30	2,26			
	FG (68-76)	5	26,40	5,27	,44	,653	N.D.	FG (71-75)	6	25,00	5,59			N.D.
TGMD 2	SG (77-80)	8	27,75	3,54				SG (76-80)	20	28,30	3,03	2,029	,149	
	TG (81-89)	9	29,00	5,98				TG (81-84)	7	28,00	2,89			
	Total	22	27,95	4,91				Total	33	27,64	3,67			

* Significant difference at 0.05 level, ** Significant difference at 0.01 level. Degree of freedom is 2 for comparison among groups..

Table 2. Comparison of locomotor and object control skill values among age groups in males and females.

Variables	MALES							FEMALES						
	Groups	N	M	SD	F	Sig.	Scheffe	Groups	N	M	SD	F	Sig.	Scheffe
Sprint	FG (68-76)	5	3,40	1,67				FG (71-75)	6	4,33	1,51			
	SG (77-80)	8	3,75	1,28	,196	,824	N.D.	SG (76-80)	20	4,00	1,41	2,019	,150	N.D.
	TG (81-89)	9	3,89	1,36				TG (81-84)	7	3,00	0,58			
	Total	22	3,73	1,35				Total	33	3,85	1,35			
Hop	FG (68-76)	5	4,00	1,23				FG (71-75)	6	4,00	1,55			
	SG (77-80)	8	4,88	1,36	,413	,667	N.D.	SG (76-80)	20	5,05	1,40	2,472	,101	N.D.
	TG (81-89)	9	4,22	2,44				TG (81-84)	7	5,71	1,25			
	Total	22	4,41	1,82				Total	33	5,00	1,46			
Leap	FG (68-76)	5	2,80	1,10				FG (71-75)	6	3,17	1,17			
	SG (77-80)	8	4,13	0,84	4,329	,028*	G1<G2	SG (76-80)	20	3,45	0,89	,577	,568	N.D.
	TG (81-89)	9	3,56	0,53				TG (81-84)	7	3,71	0,76			
	Total	22	3,59	0,91				Total	33	3,45	0,91			
Side Gallop	FG (68-76)	5	4,00	1,23				FG (71-75)	6	2,50	1,38			
	SG (77-80)	8	2,88	1,73	1,203	,322	N.D.	SG (76-80)	20	4,10	2,00	3,486	,044	G1<G3
	TG (81-89)	9	4,00	1,73				TG (81-84)	7	5,14	1,46			
	Total	22	3,59	1,65				Total	33	4,03	1,94			
Two hand strike	FG (68-76)	5	3,60	1,82				FG (71-75)	6	3,33	1,03			
	SG (77-80)	8	4,50	1,20	,617	,550	N.D.	SG (76-80)	20	4,30	1,56	1,095	,348	N.D.
	TG (81-89)	9	4,22	1,39				TG (81-84)	7	4,00	1,16			
	Total	22	4,18	1,40				Total	33	4,06	1,41			
Catch	FG (68-76)	5	3,40	0,89				FG (71-75)	6	3,33	1,21			
	SG (77-80)	8	3,00	1,07	,513	,607	N.D.	SG (76-80)	20	3,20	1,06	,130	,878	N.D.
	TG (81-89)	9	3,44	0,88				TG (81-84)	7	3,43	0,98			
	Total	22	3,27	0,94				Total	33	3,27	1,04			
Kick	FG (68-76)	5	3,80	0,84				FG (71-75)	6	3,67	1,37			
	SG (77-80)	8	3,63	1,06	1,979	,166	N.D.	SG (76-80)	20	3,40	1,14	,950	,398	N.D.
	TG (81-89)	9	4,44	0,73				TG (81-84)	7	2,86	0,69			
	Total	22	4,00	0,93				Total	33	3,33	1,11			
Throw	FG (68-76)	5	1,40	1,67				FG (71-75)	6	0,67	0,82			
	SG (77-80)	8	1,00	0,93	,184	,834	N.D.	SG (76-80)	20	0,80	1,01	1,440	,253	N.D.
	TG (81-89)	9	1,22	1,09				TG (81-84)	7	0,14	0,38			
	Total	22	1,18	1,14				Total	33	0,64	0,90			

* Significant difference at 0.05 level, ** Significant difference at 0.01 level. **N.D.=**No Difference.

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