THE RELATIONSHIP BETWEEN ELEMENTARY SCHOOL EIGHTH GRADE STUDENTS' PHYSICAL ACTIVITY LEVEL AND VARIOUS ANTHROPOMETRIC CHARACTERISTICS WITH THEIR ACADEMIC ACHIEVEMENT

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ABSTRACT

The purpose of this study is to evaluate the relationship between elementary school eight grade students' physical activity level, their various anthropometric characteristics and their academic achievement. The participants of the study includes randomly chosen 324 volunteer eight grade students (n=168 female, n=156 male) from 12 different elementary schools located in the central towns of the city, Konya (Selçuklu, Meram, Karatay) in 2011-2012 Academic Year.

The students' physical activity levels were assessed through the Turkish adaptation version of the Physical Activity Questionnaire for Older Children (PAQ-C 4-8) developed and tested in terms of validity and reliability by Crocker et al (1997). To determine the students' anthropometric characteristics, measurement of length and weight as well as bioelectiric impedence analysis (BIA) were utilized. As an indicator of the students' academic achievement, the students' results in The National Placement Exam in 2012 were used.

It was observed that there is no significant relationship between the students' physical activity level, their various anthropometric characteristics (their length) and their academic achievement (*r*=.11 ve .13; *p*<.05 respectively). In terms of sex, it was found that there is a low relationship between physical activity level and academic achievement in male students (*r*=.23; *p*<.05); however, there is no significant relationship between physical activity level and academic achievement in female students (*r*=.05; *p*>.05). It was observed that in male students, there is a low relationship between their length and academic achievement (*r*=.21; *p*<.05) and there is an insignificantly low relationship between their body weight and academic achievement (*r*=.18; *p*<.05). In female students, it was concluded that there is an insignificantly low relationship between their length and academic achievement (*r*=.15; *p*<.05). It was seen that there is no relationship between the students' body weight (except the male students), BKİ, body fat rate and their academic achievement (*r*=.09; .03 ve .10; *p*>.05 respectively).

Key Words: Academic Achievement, Anthropometric Characteristics, Physical Activity, Physical Harmony, Participation in Sports.

İLKÖĞRETİM 8. SINIF ÖĞRENCİLERİNDE FİZİKSEL AKTİVİTE DÜZEYİ VE BAZI ANTROPOMETRİK ÖZELLİKLERİN AKADEMİK BAŞARI İLE İLİŞKİSİ

Bu çalışmanın amacı ilköğretim 8. sınıf öğrencilerinde fiziksel aktivite düzeyi ve bazı antropometrik özellikler ile akademik başarı arasındaki ilişkinin değerlendirilmesidir. Çalışmanın örneklemi 2011-2012 eğitim öğretim yılında Konya ili merkez ilçelerinde (Selçuklu, Meram, Karatay) 12 farklı ilköğretim okulunda rastgele ulaşılan 324 (n=168 kız, n=156 erkek) gönüllü 8. sınıf öğrencisinden oluşmaktadır.

Öğrencilerin fiziksel aktivite düzeyleri Crocker ve diğ. (1997) tarafından geliştirilen ve geçerlilik güvenilirlik çalışmaları yapılan Physical Activity Questionnare for Older Children (PAQ-C 4-8) ölçeğinin araştırma kapsamında Türkçeye uyarlanmış hali olan Çocuklar için Fiziksel Aktivite Ölçeği (ÇFAÖ) ile değerlendirilmiştir. Öğrencilerin antropometrik özelliklerinin belirlenmesinde boy uzunluğu ve vücut ağırlığı ölçümleri ile bioelektrik impedans analizinden (BİA) yararlanılmıştır. Akademik başarının ölçütü olarak öğrencilerin, 2012 yılı haziran ayında yapılan Seviye Belirleme Sınavı'ndan (SBS) aldıkları puanlar kullanılmıştır.

Öğrencilerin fiziksel aktivite düzeyleri ve bazı antropometrik özellikleri (boy uzunluğu) ile akademik başarıları arasında önemsenemeyecek kadar düşük bir ilişki olduğu görülmüştür (sırasıyla r=.11 ve .13; p<.05). Cinsiyete göre erkeklerde fiziksel aktivite düzeyi ile akademik başarı arasında zayıf bir ilişkinin olduğu (r=.23; p<.05); ancak kızlarda fiziksel aktivite düzeyi ile akademik başarı arasında herhangi bir ilişkinin olmadığı sonucuna ulaşılmıştır (r=.05; p>.05). Erkeklerde boy uzunluğu ile akademik başarı arasında zayıf bir ilişkinin olduğu görülürken (r=.21; p<.05); vücut ağırlığı ile akademik başarı arasında önemsenemeyecek kadar düşük bir ilişkinin olduğu belirlenmiştir (r=.18; p<.05). Kızlarda boy uzunluğu ile akademik başarı arasında önemsenemeyecek kadar düşük bir ilişkinin olduğu anlaşılmıştır (r=.15; p<.05). Öğrencilerin vücut ağırlıkları (erkekler hariç), BKİ ve vücut yağ yüzdesi (VYY) değerleri ile akademik başarıları arasında herhangi bir ilişkinin olmadığı görülmüştür (sırasıyla r=.09; .03 ve .10; p>.05).

Anahtar Kelimeler: Akademik Başarı, Antropometrik Özellikler, Fiziksel Aktivite, Fiziksel Uygunluk, Spora Katılım

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INTRODUCTION

Although parents believe that their children might become more successful when they get their education in so-called "good" schools, there are a great number of other factors that influence students' academic achievement such as physiological and psychological factors that indicate student's physical situation, health situation, cognitive and affective situation, social factors like teacher effectiveness and school organization that are the results of the environment that the school is located, the external conditions like social support, infrastructure and family environment (Peternelj, Skof, and Strel, 2009).

Besides these, what other factors may affect student achievement and whether there is a relationship between students' physical activity level and their academic achievement have long been a matter of discussion among teachers, administrations and parents. These discussions have been caused by the different results of the studies conducted to find out the relationship between the physical activity level and academic achievement. Although most of the results obtained from the previous studies showed that there is a relationship between physical activity and academic achievement (Grissom, 2005; Castelli, Hillman, Buck, and Erwin, 2007; Reed et al., 2010; Singh, Uijtdewilligen, Twisk, Van Mechelen, and Chinapaw 2012), there are a great number of studies showing that there is no relationship or there is no significant relationship between physical activity and academic achievement (Tremblay, Inman, and Willms, 2000; Keeley and Fox, 2009; Trudeau and Shephard, 2010).

understand to what extent physical activity has an impact on academic achievement. One of the potential variables that may affect students' academic achievement is anthropometric characteristics. In literature, there are plenty of studies whose results put forward that there is a relationship between students' anthropometric characteristics and their academic achievement (Crosnoe and Muller, 2004; Hillman, Castelli, and Buck, 2005; Florin, Shults, and Stettler, 2011; Rashmi and Jaswal, 2012).

The main motive behind this study that aims to assess the relationship elementary school eight grade students' physical activity level, their various anthropometric characteristics and their academic achievement is the anticipation that there may be a positive relationship among these variables. Students have difficulties deciding upon how to manage their time, for they are forced to become academically successful by their parents, teachers, school administrators and their social environment. Defining the effects of physical activity and its components on cognitive performance and determining the level of the possible relationship between physical activity, anthropometric characteristics and academic achievement may help students n their decision-making process. This study is significant in terms of examining the content and frequency of physical education course and physical activity programmes as well as related national state policies in a comprehensive way. Furthermore, the study may contribute to the development of educational and public health policies for the students in elementary schools.

Owing to the high course intensity during the preparation process for the national central placement exams, students' motivation towards physical education and sports course, and physical activity programmes in and out of schools. It is thought that the results that will obtain at the end of this study may contribute to increase the students' motivation level towards physical and school administrators understand the physical activity concept related to health better.

METHOD

Research Group

The participants of the study includes randomly chosen 324 volunteer eight grade students (n=168 female, n=156 male) from 12 different elementary schools located in the central towns of the city, Konya (Selçuklu, Meram, Karatay) in 2011-2012 Academic Year. Table 1 shows the frequency distribution according to the participants' sex and age

Table 1. Descriptive Statistics

Demographic Characteristics		n	%	Total
Gender	Female	168	51.9	
	Male	156	48.1	324
Age Group	13	32	9.9	
	14	270	83.3	324
	15	22	6.8	

Data Collection Tools
The Physical Activity Questionnaire for Older Children

The participants' physical activity levels were assessed through the Turkish adaptation version, Çocuklar için Fiziksel Aktivite Ölçeği (ÇFAÖ) of the Physical Activity Questionnaire for Older Children (PAQ-C 4-8) developed and tested in terms of validity and reliability by Crocker, Bailey, Faulkner, Kowalski and McGrath (1997). In the process of adapting the related questionnaire to Turkish, PAQ-C 4-8 was translated into Turkish by four experts. By comparing these four translations, the best Turkish version of the original questionnaire was formed. The items related to the activities that are not common or never performed in Turkey in the original questionnaire were excluded in the adaptation process. In this process, the English version of the questionnaire PAQ-C 4-8 was applied to 46 (n=20 female, n=26 male) eight grade students in Konya Selçuklu Private Bahçeşehir Elementary School. The questionnaire translated into Turkish and reformed was applied to the same students again 15 days later. The results obtained from the English and Turkish versions of the questionnaire were analyzed through SPSS 20.0 Package Programme and correlation studies on the results were done. A meaningful relationship between the English and Turkish versions of the PAQ-C 4-8 questionnaire ($r=.71$). In the process of testing the reliability of the adapted questionnaire, the Cronbach-alpha coefficient was calculated as .76. The Turkish version of the PAQ-C 4-8 questionnaire, ÇFAÖ, is a valid and reliable questionnaire that can be used to determine the physical activity level of the 4th-8th grade Turkish students at the age of 8-14.

Anthropometric Measures

During the study, the anthropometric measures were realized in the school gyms, multipurpose halls and classrooms according to the facilities schools have.

To measure the students' body-mass index, the students' lengths were determined through FB 721 Body Analyzer. Before the measurements, the students were asked to take off their shoes and socks and wear light clothes. During the measurements, the students were instructed to breathe deeply and stick their heels together, hold their body high and their head on the Frankfort plane and keep their posture.

The participants' body compositions were determined through BC–418 Tanita Body Composition Analyzer, which is a bioelectrical impedance analysis device. The data about sex, length and age were registered to the device and related measurements were realized and at the end of the measurements, the students'

body mass indexes, body fat rates and total body water values were obtained.

Academic Achievement Level Identification

To determine the participants' academic achievement level, their results from the Placement Exam prepared and applied nationwide by National Education Ministry Educational Technologies General Management in June, 2012 were used.

In this exam, the sixth grade students are asked 80 questions, the seventh 90 and the eighth 100. The timing in these exams are 80, 110 and 120 minutes respectively. The questions are prepared according to the course contents of each course the students take in the related academic year. These tests assess the students' acquirement level of the objectives specified for each course in the teaching and learning programmes. In each test, the points are calculated by subtracting one third of the mistakes from the number of the questions students answer correctly. For each student, five raw scores for five tests are calculated (MEB, 2012). Table 2 shows the weight coefficients used to calculate the Placement Exam scores.

Table 2. The Weight Coefficients Used to Calculate the Placement Exam Standard Points

TESTS	NUMBER OF QUESTIONS			TEST WEIGHT COEFFICIENTS		
	6. Grade	7. Grade	8. Grade	6. Grade	7. Grade	8. Grade
Turkish	19	21	23	4	4	4
Math	16	18	20	4	4	4
Science and Technology	16	18	20	3	3	3
Social Science	16	18	20	3	3	3
Foreign Language	13	15	17	1	1	1
Total	80	90	100			

Data Analysis

To get information about the participants, the frequency distributions obtained from the students' sex, age and some anthropometric measurements, arithmetic averages, standard deviations, median, the highest scores and the lowest scores were calculated. Owing to the lack of a recognized classification about body compositions according to the body mass indexes for children and adolescents, percentile method was utilized to classify the students in terms of their body compositions.

In the study, Kolmogorov-Smirnov Test was utilized to test whether the data was in harmony with the normal distribution. Owing to the fact that it was seen that the data show a normal distribution, when comparing two or more independent groups, The Significance of the Difference

Between two Averages Test and One-way Variance Analysis from parametric tests were used. To compare more than two groups consisting of qualitative data, non-parametric Manifold Chi Square Test was utilized. To assess the relationship between the participants' physical activity levels, various anthropometric characteristics and their academic achievement, Pearson Correlation Coefficient (r) was used.

The statistical analysis used in the study was realized with 95 % reliability and with .05 and .01 mistake levels

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Table 3. Descriptive Statistics about the Students' Various Anthropometric Characteristics

Variables	Minimum	Maximum	Arithmetic Mean	Standard Deviation	Median
Height (cm)	1.34	1.89	1.58	.08	1.58
Weight (kg)	30.3	100.8	54.13	12.4	52.2
BMI (kg/m²)	13.6	35.5	21.3	3.8	20.5
Fat (%)	8.9	61.2	23.06	7.4	22.6
FFM (kg)	26.6	68.3	41.18	8	40
TBW (kg)	19.5	50	30.14	5.9	29.3

Note. BMI: Body Mass Index, FFM: Fat free mass, TVS: Total Body Water

Table 3 shows the participants' various anthropometric measures and the statistical values obtained from the measures through Tanita Body Composition Analyzer. For all the parameters in the table, the number of the observations is 324.

Table 4. The Relationship Between the Students' Physical Activity Levels and Their Academic Achievement

Variables		Physical Activity Level		
		n	r	p
	Female	168	.05	.507
	Male	156	.23**	.003
NPE 8	Total	324	.11*	.032

Not. NPE: National Placement Exam, * *p* <.05, ** *p* <.01.

In Table 4, it can be understood that there is a insignificantly low relationship between the students' physical activity level and their academic achievement (*r*=.11; *p*<.05). The students' physical activity levels account for 11 % of the variable related to their results in the Placement Test. It is seen that for male students, there is a low relationship between their physical activity levels and academic achievement (*r*=.23; *p*<.05) whereas for female students, there is no relationship between their physical activity levels and academic achievement(*r*=.50; *p*>.05). The male students' physical activity levels account for 23 % of the variable related to their results in the Placement Exam.

Table 5. The Relationship Between The Students' Various Anthropometric Characteristics and Their Academic Achievement

Variables			Height (cm)		Weight (kg)		BMI		Fat (%)	
		n	r	p	r	p	r	p	r	p
NPE 8	Female	168	.15*	.040	.00	.944	-.06	.403	.00	.961
	Male	156	.21**	.006	.18*	.023	.11	.140	.11	.141
	Total	324	.13*	.012	.09	.104	.03	.527	.10	.051

Note. * *p*<.05. ** P <.01; NPE: National Placement Exam, BMI: Body Mass Index.

From Table 5, it can be concluded that there is an insignificantly low relationship between the students' length and academic achievement (*r*=.13; *p*<.05). The students' lengths account for 13 % of their results in the Placement Test. In terms of sex, there is a low relationship between the male students' length and their academic achievement (*r*=.21; *p*<.05) and there is an insignificantly low relationship between their body weight and academic achievement (*r*=.18; *p*<.05). For the female students, it can be said that there is an insignificantly low relationship

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between their length and academic achievement (r=.15; p<.05). The male students' length and body weight account for 21% and 18% of their results in the Placement Test respectively. The female students' length accounts for 15% of their results in the Placement Test. It was seen that there is no statistical relationship between thes tudents' body weights, body mass indexes, body fat rate.

DİSCUSSİON

In the study, as it is understood that the relationship between the students' physical activity levels and academic achievement is insignificantly low, it cannot be said that there is a relationship between eighth grade students' physical activity levels and their academic achievement. On the other hand, it can be said that the eighth grade students' physical activity levels have no negative impact on their academic achievement.

The reasons why there is an insignificantly low relationship between the participants' physical activity levels and their academic achievement may be many in number. According to Gürdal (2011), students' academic achievement is affected by a lot of factors such as self-perception, motivation, cognitive skills, exam anxiety, sex, parents attitudes, school structure, teacher and study methods. It can be thought that the relationship between these possible factors and the participants' academic achievement is much higher than the relationship between their physical activity levels and academic achievement. For the male participants, there is a low relationship between their physical activity levels and academic achievement but for the female participants there is no relationship between their physical activity levels and academic achievement. It is thought that the reason lying behind this difference between male and female participants may be because the female students' physical activity levels are statistically significantly lower than the male students' physical activity levels.

In the scope of this study, a great number of studies on the relationship between physical activity, exercise, physical harmony, physical education and academic achievement were examined. Peternelj et al (2009), Fox, Barr-Anderson, Neumark-Sztainer and Wall (2010), in their studies, state that physical activity is related to brain functions and increased physical activity contributes to children and adolescents' school performances. On the

other hand, Keeley and Fox (2009), Trudeau and Shephard (2010) state that there is no relationship or there is an insignificantly low relationship between physical activity and academic achievement. Pate, Heath, Dowda, and Trost, (1996), Sigfusdottir, Kristjansson, and Allegrante, (2007), Kwak et al., (2009), Lumpkin and Favor (2012), in their studies, find out that there is a relationship female or male students' physical activity levels and their academic achievement in terms of sex.

Kantomaa et al. (2013) suggest that there is a positive relationship between physical activity and high grade average. Erwin, Fedewa, and Ahn (2012) put forward that physical activity increases students' mathematics and reading points in a short time. In another study, Telford, Cunningham, Telford, and Abharatna (2012) allege that there is a positive and strong relationship between physical activity and academic achievement.

Haapala (2012), in his study in which he examined the studies published in The Cochrane Register of Controlled Trials, Medline, Eric, CINAHL, PsychINFO, and ISI Web of Knowledge databases note that five studies suggest that physical activity has positive effects on attention, concentration and memory functions; three studies show that physical training of 14-64 weeks contributes to the improvement of the verbal skills and

arithmetical skills. From these results stated in these eight studies, he concluded that physical exercise may contribute to increase academic performance and learning regarding its effects on cognitive functions. In another literature review study, Donnelly and Lambourne (2011) find out that there is a statistically meaningful relationship between physical activity, cognitive functions and academic achievement.

Some studies in the literature focus on the intensity of physical activity. Davis et al. (2011) state that in sedentary and overweight children, the intension of the exercises results in an increase in brain's management functions and mathematical points. Similarly, Kwak et al. (2009) find out that in female students, there is a statistically meaningful relationship between intensive physical activity and academic achievement.

It is possible to find studies whose results show there is a insignificantly low relationship or there is no relationship between physical activity and academic achievement in literature. Tremblay et al. (2000) in their studies suggest that there is a low relationship between the students' physical activity levels and academic achievement. Reed et al. (2010) state that the English, Mathematics, Science, Social Sciences points of the students attending physical activity programmes are high but when their points from these classes are compared with the ones of the students not attending physical activity programmes, there is no statistically meaningful difference observed.

Although in this study, an insignificantly low and weak relationship was observed between the male students' lengths and body weights and their academic achievement (Table 5), it is impossible to suggest that eighth grade male students who are long and have ideal body weight according to their age and sex are more successful academically.

In many studies examined in the scope of this study, similar results to this study were stated whereas in some of the studies, clashing results were observed. These differences and similarities may be due to the participants' different socioeconomic situations, dietary habits, personal characteristics, ethnical backgrounds and social environments.

Kantomaa et al. (2013) state that childhood obesity may affect academic achievement in the adolescence period negatively. Telford et al. (2012) state that there is a negative relationship between their participants' body fat rates and academic achievement. Rashmi and Jaswal (2012) in their studies find out that there is a negative relationship between female and male students' body mass indexes and their academic achievement. It was seen that the academic achievement of the students with normal weight are higher than that of the obese students.

Davis and Cooper (2011), in their studies, state that fattiness is related to the low academic achievement. Florin et al. (2011) suggest that there is a negative relationship between the perceived obesity and academic achievement in the adolescents at the age of 14-17. Do and Finkelstein (2011) put forward that there is a negative relationship between obesity and school performance in the secondary and high school students.

Joshi, Howat, and Bryan (2011) allege that the mathematics and reading points of the students who have normal body mass indexes according to their sex and age are higher than those of the overweight or obese students. Guerieri (2009) state that there is a meaningful relationship between academic performance and body composition. Castelli et al. (2007), in their studies, allege that there is a positive relationship between body mass indexes and achievement in reading and mathematics; one point standard deviation increase in the body mass index causes 0.13-0.16 decrease in the students' achievement in reading and mathematics. Sabia (2007) state that in the white girls at

the age of 14-17 there is a negative relationship between body mass index and class points averages. Kaynak (2006), in his study, found out that in male students, there is a positive relationship between body fat rates and academic achievement. Crosnoe and Muller (2004) in their study, suggest that there is a strong relationship between the risk of obesity and academic achievement in the secondary and high school students; participation in the extracurricular activities is low in the school with many obese students and the possibility of low academic achievement in such schools is high.

Kim et al. (2003) state that in the primary fifth grade and elementary eighth grade students, there is a positive but weak relationship between length and academic performance and there is no relationship between the students' body weight and academic performances.

In literature, there is almost no study whose results prove no relationship between anthropometric characteristics and academic achievement.

Abdelalim et al. (2012) state that in the fifth grade students there is no statistically meaningful relationship between academic achievement and obesity. Kaestner, Grossman, Yarnoff, and National Bureau of Economic (2009) put forward that in the youngsters and adolescents at the age of 14-18, the educational acquisitions of the overweight and obese students are almost the same as the ones with normal body weight. Gunstad et al. (2008) state that although there is a risk of decreasing in the memory power of the physically weak girls, there is no relationship between body mass indexes and cognitive performances of the healthy children and adolescents.

SUGGESTİONS

In this study, according to the obtained results, it is possible to make some suggestions to parents, teachers, school administrators, and scientists and academicians planning to conduct studies on the relationship between physical activity, anthropometric characteristics and academic achievement:

As it is seen that the increase in the students' physical activity levels may contribute little to their academic achievement, when parents, teachers, and school administrators lead students to participate in physical activity programmes and extracurricular exercise activities, their academic achievement may increase a little.

As it is found that participation in physical activity programmes, physical education classes, and curricular or extracurricular sport activities has no negative effects on students' academic achievement, it is thought it is unnecessary for parents, teachers and school administrators to have such worries as " Students' participation in physical activities and sports causes a decrease in their academic achievement by preventing them from studying their lessons".

It is thought that as there are a great number of factors influencing the participants' physical activity levels, anthropometric characteristics and academic achievement, the obtained results should be commented carefully and therefore, no generalization should be made about the results of the study.

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