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Relationships Between Physical Activity Level, Health-Related Fitness, Academic Achievement, and Academic Self-Concept *

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Abstract

Recently, the time allocated for physical education and physical activities in schools is gradually decreasing. Because schools, in order to get high scores on national standardized academic achievement tests, devote more time to other academic courses instead of devote time for physical education or physical activity (Rasberry et al., 2011). In Turkey, this problem is mostly seen at eighth grades that is the transition class from middle school to high school. The purpose of this study is to examine the relationship between physical activity level, health-related fitness, academic achievement and academic self-concept at eight grade students who will attend the national standardized academic achievement test. In this research, the descriptive research method and purposeful sampling were used to determine the direction and level of change between the variables involved in the study. The relationship between variables was analyzed by Pearson correlation analysis (Karasar, 2017). The socioeconomic level that could affect physical activity and academic achievement variable were equalized. After the equalization process, seventy-six girls (51,7 %), seventy-one boys (48,3%) totally 147 eighth grade student have participated in the study. The personal information form, physical activity questionnaire for adolescents, Fitnessgram Test Battery, national standardized academic achievement test and the academic self-concept subdomain of Self-concept inventory-I was used for data gathering tools. In conclusion, there was a statistically meaningful, positive but weak correlation between physical activity, academic achievement, and academic self-concept level. In addition, there was a positive correlation between health-related physical fitness parameters and academic achievement score, while there was no significant relationship between health-related fitness parameters and academic self-concept scores in both girls and boys.

Keywords

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Introduction

In the name of seeking a better education for children, politicians, stakeholders, principals, and parents are dragging students into a sedentary lifestyle. Parents and principals force children to strive for academic success and high scores on standardized exams because parents want their children to be educated at a good high school or university, while principals want their school to be highly ranked (Burrows et al., 2014; Centers for Disease Control and Prevention, 2010). As children become less active and spend more time studying academic subjects, they fall into a sedentary lifestyle that adversely affects their holistic development (Özdoğru, 2018; Singh et al., 2019). Physical activity level and sedentary life style are the subjects on the agenda of almost every country (Blair, 2009; Howie & Pate, 2012; Janssen & LeBlanc, 2010). Also, The Program for International Student Assessment (PISA), which is held in Turkey and other member countries of the Organization for Economic Co-Operation and Development (OECD), is one of the biggest indicators to what extent member countries attach importance to students' academic achievement. According to the 2015 PISA results, Turkey has a lower average than other OECD member countries in almost all fields (Milli Eğitim Bakanlığı, 2015). On the other hand, the results of the Turkish Health and Nutrition Survey (TSBA) show that in Turkey, 71.9% of those aged 12–18 years (67.6% of males and 76.5% of females) did not exercise (T.C Sağlık Bakanlığı, 2014). This result indicates that students are sedentary and unsuccessful when compared to other OECD countries. Considering that one of the main aims of education systems is to increase the holistic (cognitive, affective, psychomotor) development of children, physical education and sports in schools and physical activities outside the school cannot be undeniable (Taras, 2005).

There are an increasing number of studies on school-based physical activity interventions (Burrows et al., 2014; Cengiz & Ince, 2013; Correa-Burrows, Burrows, Ibaceta, Orellana, & Ivanovic, 2014; Keleş & Alpkaya, 2016; Özdemir & Çorakçı, 2011; Strong et al., 2005; Trudeau & Shephard, 2008). School based physical activity interventions consist of, for instance, physical education lessons, recess, lunchtime, and after-school extracurricular studies (Centers for Disease Control and Prevention, 2010, 2013) . Research on these topics indicates that different types, times, frequencies, and intensities of regular physical activity affect academic achievement differently via enhancing children cognitive functions (Hillman, Erickson, & Kramer, 2008). However, it is still a question whether the increase in academic achievement is related to an increase in cognitive function due to physical activities or a coincidental development of students (Bouchard, Blair, & Haskell, 2012). Researchers link the relationship between physical activity and academic achievement to physiological and psychological changes caused by physical activities. Nutritional and oxygen uptake to the brain during the physical activity, reduction of stress, improvement in mood and development of synaptic flexibility (adaptation of brain cells to new tasks) are potentially considered as variables that increase academic achievement (Arslan, Alemdaroğlu, Öksüz, Karaduman, & Yılmaz, 2018; Singh et al., 2019). This age group spent most of the day in school. For this reason, schools and school-based physical activity interventions have considerable potential to increase students' physical activity level (Centers for Disease Control and Prevention, 2013). Concerning research investigating the impact of school-based physical activities on academic performance, the cognitive performance of 24 students ranging from 11 to 13 years of age was assessed before and after physical education and science lessons. The results of that research indicated that there was an increase in students' cognitive performance after physical education and science lessons (Raviv & Low, 1990). Other research indicated a high physical activity level was related to cognitive functions such as perceptual skills, intelligence, academic achievement, verbal and mathematical tests, memory, and academic readiness (Sibley & Etnier, 2003).

Physical fitness is directly affected by physical activity level. Physical fitness consists of two components, health-related and performance-related, and it affects students' general health directly and academic achievement indirectly (Correa-Burrows et al., 2014). The researches say that an increase in the health-related fitness level causes an increase in cognitive functions and sleep quality and a decrease in depression, anxiety, and stress, as a result, academic performance increased (Castelli, Hillman, Buck, & Erwin, 2007; Santana et al., 2017; Tomporowski, Lambourne, & Okumura, 2011). The researches

indicates that high-level health-related fitness is associated with better general health and academic performance. Among health-related fitness components, aerobic fitness is considered the most influential factor in academic achievement (Coe, Pivarnik, Womack, Reeves, & Malina, 2006). Another research indicates that in middle school students, aerobic physical fitness and muscular endurance correlated with high academic performance (Bass, Brown, Laurson, & Coleman, 2013). In another research, middle school students with high-and low-level aerobic fitness were compared in terms of cognitive functions like inhibition, cognitive flexibility, and working memory. The result of this research emphasized that students with a higher level of aerobic fitness showed better performance at cognitive tasks that affects academic performance (Chaddock et al., 2012).

Researchers assert that additional variables aside from physical activity and fitness could affect academic performance. One of them are academic self-concept (Areepattamannil, Freeman, & Klinger, 2011). Academic self-concept can be defined as students' self-thoughts and perceptions about their own school skills. It is thought to be a multidimensional and gradual structure that directly influences students' learning process, academic success, and school expectations (Marsh, 1990; Marsh, Byrne, & Shavelson, 1988; Marsh & Martin, 2011; Ordaz-Villegas, Acle-Tomasini, & Reyes-Lagunes, 2013; Rosen, Glennie, Dalton, Lennon, & Bozick, 2010). Furthermore, academic self-concept is considered a mediating variable for academic achievement (Duru & Balkıs, 2014; Liu, Wu, & Ming, 2015). According to the research, students with a high academic self-concept can better evaluate their own skills, accept struggle and competition, take risks, be eager to try new things, and produce multiple cognitive strategies. They are also more eager to complete challenging academic missions (Shephard, 1997). In addition, the most academically successful students have a higher academic self-concept level (Kenç & Oktay, 2002; Ordaz-Villegas et al., 2013).

A review of the literature shows that a sedentary lifestyle adversely affects children's holistic development. Some parents, politicians, and principals think that time allocated for physical activities can cause a decrease in academic performance and also that students who are tired from physical activity in school will not learn enough from their academic lessons (Hillman et al., 2008; Singh et al., 2019). The literature says that, on the contrary, school-based physical activities can increase academic performance (Bradley, Keane, & Crawford, 2013; Centers for Disease Control and Prevention, 2010; Rasberry et al., 2011). Much of the research conducted in this field investigated the relationship among physical activity, physical fitness, and academic achievement (Donnelly & Lambourne, 2011; Fedewa & Ahn, 2011; Rasberry et al., 2011), but confounding variables that could affect academic achievement, such as academic self-concept and socioeconomic status, were ignored (Donnelly et al., 2016; Singh et al., 2019). The original aspect of this research is that it compares the physical activity level, physical fitness, academic achievement, and academic self-concepts of students who are equalized in terms of educational opportunities and possibilities (parental education level, socioeconomic status, and private tutoring). Literature indicates that children learn by playing and moving; furthermore, active children have better general health, and healthier children have better academic performance (Centers for Disease Control and Prevention, 2010; Dobbins, Husson, DeCorby, & LaRocca, 2013; Ribeiro et al., 2010; Singh et al., 2019). In Turkey there have been only a few studies examining physical activity level, physical fitness, academic self-concept, and academic achievement (Alemdağ, Erman, & Yılmaz, 2014; Arslan et al., 2018; Duru & Balkıs, 2014; Keleş & Alpkaya, 2016; Yılmaz, Yiğit, & Kaşarcı, 2012). In this context, the need has arisen to investigate the relationship among physical activity level, physical fitness, academic self-concept, and academic achievement on eighth-grade students who will take the national standardized academic achievement test.

Method

In this research, the descriptive research method and purposeful sampling were used to determine the direction and level of change between the variables involved in the study (Karasar, 2017).

Participants

The eighth-grade students who will attend national academic achievement test were chosen for study group. This group of students tends to devote most of their daily time for studying other academic courses in order to get a high score from the exam. Two hundred and five eighth grade students from two different schools in a similar level of socio-economically similar districts (Gaziosmanpaşa and Beysukent) in Ankara, participated in the study. After the equalization process, a total of 147 students, 76 girls (mean age: 14.05 ± 0.27) and 71 males (mean age: 14,06 ± 0,23 years), were accepted for the study. Students were equalized in terms of parental education level, socioeconomic status, and enrolment in private lessons. They indicated their parents' income, profession, and education level, as well as their own private tutoring status in personal information form. Students who have a high socioeconomic level and high parental education level and were not taking private tutoring were included in the study. Socioeconomic status is not a clearly defined concept. Variables such as parental education level, profession, and the monthly average income of the family are the most important indicators of socioeconomic status (Duncan & Magnuson, 2003). To determine socioeconomic status, monthly average income, parental education level, and the socioeconomic status of the area where the school is located are frequently used. One study on this subject stated that socioeconomic status was best determined based on the monthly average income of the family, parental education level and profession, level of participation in social activities, and the socioeconomic level of the district where the school was located (Deniz, Uysal, Usal, & Akar, 2015). In this research, socioeconomic status was determined according to monthly average income, parental education level, and the socioeconomic level of the district where the school was located.

Instruments

In this research, a personal information form developed by researchers was used to determine demographic information such as socioeconomic status. A physical activity question form, the Fitnessgram test battery, national standardized academic achievement test scores, the academic self-concept subscale from the self-concept inventory was used for data gathering tools

Physical Activity Question Form

The original form was developed in 1997 by Kowalski et al. The work of Sert and Temel was translated into Turkish and made valid and reliable for a Turkish context. In this research, the Cronbach alpha of the form was 0.92.This form contains 9 items and examines the physical activities performed by students over the past seven days and the frequency of these activities. It examines the frequency of physical activities (soccer, basketball, volleyball, gymnastics, etc.), the level of participation in physical education and sport lessons, and recess, lunch, after-school, and weekend activities. This form is a 5-point Likert-type questionnaire; the scale is from 9 to 45 points (Sert & Temel, 2014).

Fitnessgram Test Battery

As head of Texas's physical education and health department, Charles L. Sterling recognized the need to assess and report the physical fitness of students. Thus, in 1977, he developed the Fitnessgram test battery. It is the most common assessment tool for determining students' physical fitness level in schools. It consists of 5 tests. These are cardiovascular system endurance, body mass index, muscular strength, upper body endurance, and flexibility (Meredith & Welk, 2010).

National Standardized Academic Achievement Test

Standardized exams are given for the transition from elementary school to middle school. It consists of 6 basic subjects and is given to eighth-grade students. The test date, place, score calculation, and other related subjects are stated in the guides prepared each year by the Education Ministry. There are standardized tests for various subjects, including language, mathematics, science, religious culture and ethics, the history of the Turkish Revolution and Kemalism, and foreign-language curriculum. The

questions are designed to assess students' critical thinking, analysis, problem-solving, conclusion and interpreting skills about learning outcomes (Milli Eğitim Bakanlığı, 2017).

Self-Concept Inventory

The original inventory was developed by Marsh in 1990 (Marsh, 1990). The academic self-concept subscale of the self-concept inventory was used, and the Cronbach alpha was found to be 0.82 in this research. This inventory has been chosen because it has been generally accepted in the literature to determine the multidimensional self-concepts of students and has been frequently used in national and international research. The inventory is in the form of a 5-point Likert-type scale. There is no total score for the inventory; the overall score on this inventory is calculated using the continuous scores of eight different subscales (Yıldız & Fer, 2008).

Procedure

In the research process, ethical approval for the research was granted by the Hacettepe University board of ethics (permission no: 76000689/431-1241) Permission for research in school was granted by the Ankara provincial national education directorate. Finally, students and parents signed the voluntary participation consent form for research. After all permissions had been given, all measurements were applied in physical education lessons weeks before the national standardized test in the spring semester of the 2015–2016 academic year. The national standardized academic achievement test scores were reported on e-school by the Ministry of National Education.

Data Analysis

In the analysis of the data, descriptive statistics were calculated, and normality distribution was checked. The Kolmogorov-Smirnov test were used to test the normal distribution. To examine the relationship between variables, the Pearson correlation coefficient was used.

This study design and protocol was approved by the institutional review board of the University of Hacettepe Health Science Institute. The approval number of research is 76000689/431-1241 Normality tests results were given in Table 1.

Table 1. Normality Tests

	Kolmogorov-Smirnov[a]		**Shapiro-Wilk**	
	Statistic	**p**	**Statistic**	**p**
Academic Achievement	,083	,200*	,953	,052
Academic Self-Concept	,064	,200*	,983	,234
Physical Activity Level	,065	,200*	,974	,060
BMI (cm/kg)	,095	,200*	,955	,059
Push-ups	,079	,200*	,912	,079
Crunches	,062	,200*	,941	,068
Flexibility	,081	,200*	,901	,093
Aerobic Fitness (VO2max)	,044	,200*	,989	,274

Results

Descriptive statistics of the participants are given in Table 2.

Table 2. Descriptive Statistics of Students

	GIRLS (n = 76)			BOYS (n = 71)		
	Healthy Fitness Zone	**Mean**	**Std. Dev.**	**Healthy Fitness Zone**	**Mean**	**Std. Dev.**
Age (year)		14.05	0.27		14.06	0.23
Academic Self-Concept	1–5	2.78	0.47	1–5	2.77	0.44
Physical Activity Level	9–45	23.95	6.88	9-45	24.83	7.53
Aerobic Fitness (VO2max) (ml/kg/dk)	>39	39.06	3.30	>42	43.93	4.21
Academic Achievement	0–500	395.97	65.98	0–500	368.83	82.90
BMI (cm/kg)	16–23	21.72	4.30	16–23	22.62	4.89
Push-ups (count)	>7	11.63	9.01	>14	10.50	10.01
Crunches (count)	>18	34.10	18.13	>24	44.29	21.58
Flexibility (cm)	>16	25.47	6.99	>12	18.61	6.80

* Healthy Fitness Zone values were determined by the Centers for Disease Control and Prevention.

Table 2 shows academic self-concept measured on a scale from 1 to 5 points. The girls have a score of 2.78 ± 0.27; the boys have a score of 2.77 ± 0.44. Both girls and boys have a moderate level of academic self-concept. Physical activity level is measured on a scale from 9 to 45 points; the girls have a score of 23.95 ± 6.88, and the boys have a score of 24.83 ±7.53. This means that both girls and boys have a moderate physical activity level. Physical fitness parameter values show that girls were in the Healthy Fitness Zone (Healthy Fitness Zone values were determined by the Centers for Disease Control and Prevention (CDC) in all parameters and boys were in the Healthy Fitness Zone in four parameters but not for push-ups. For the national standardized academic achievement test, girls' mean scores were 395.97 ± 66.00 points, and boys' mean scores were 368.83 ± 82.80 points. (The maximum score is 500 points.) Both the girls and boys have a moderate score on this test, but girls' academic achievement was higher than boys'.

Information on the relationship between students' physical activity level and academic achievement is given in Table 3.

Table 3. Pearson Correlation Analysis between Students' Physical Activity Level, Academic Achievement and Academic Self-Concept

			Academic Achievement	**Academic Self- Concept**
Physical Activity Level	Girls	Pearson Correlation	0.297(**)	0.203
		Sig. (2-tailed)	0.001	0.078
		N	76	76
	Boys	Pearson Correlation	0.304(**)	0.254(**)
		Sig. (2-tailed)	0.001	0.002
		N	71	71

** Correlation is significant at the 0.01 level (2-tailed).

Table 3 shows that there was a positive and statistically meaningful relationship between physical activity level and academic achievement in both girls and boys. Also, Table 3 shows that there was no relationship between girls' physical activity level and academic self-concept. But there was a positive relationship between boys' physical activity level and academic self-concept. This relationship seems similar to boys' physical activity level and academic achievement. Although there was no statistical relationship between girls' physical activity level and academic self-concept, the correlation coefficient strength is similar to girls' physical activity level and academic achievement. These results may be due to the fact that academic self-concept is a predictor of academic achievement.

Table 4. Pearson Correlation Analysis between Students' Fitness Parameters, Academic Achievement Scores and Academic Self Concept

N = 147			**Academic Achievement**	**Academic Self-Concept**
Aerobic Fitness (VO2max)	Girls	Pearson Correlation	0.227(*)	0.023
		Sig. (2-tailed)	0.049	0.843
	Boys	Pearson Correlation	0.264(*)	-0.176
		Sig. (2-tailed)	0.026	0.141
Body Mass Indeks (BMI)	Girls	Pearson Correlation	-0.082	-0.100
		Sig. (2-tailed)	0.479	0.392
	Boys	Pearson Correlation	-0.065	0.055
		Sig. (2-tailed)	0.592	0.651
Push Up	Girls	Pearson Correlation	0.63	-0.051
		Sig. (2-tailed)	0.589	0.660
	Boys	Pearson Correlation	0.293(*)	-0.209
		Sig. (2-tailed)	0.013	0.080
Crunch	Girls	Pearson Correlation	0.063	-0.084
		Sig. (2-tailed)	0.589	0.472
	Boys	Pearson Correlation	0.214	-0.222
		Sig. (2-tailed)	0.073	0.063
Flexibility	Girls	Pearson Correlation	0.108	-0.257(*)
		Sig. (2-tailed)	0.354	0.025
	Boys	Pearson Correlation	0.273(*)	-0.093
		Sig. (2-tailed)	0.021	0.440

* Correlation is significant at the 0.05 level (2-tailed).

Table 4 shows that the relationship between girls' aerobic fitness and academic achievement was positive and statistically meaningful. Furthermore, there was a positive relationship between boys' aerobic fitness, push-ups, flexibility, and academic achievement. Also, there was no relationship between both girls' and boys' fitness parameters and academic self-concept except for flexibility.

Discussion

Previous studies on physical activity, physical fitness, and academic achievement were examined. Many such studies found a positive relation between physical activity and academic achievement (Kalantari & Esmaeilzadeh, 2016), but some found no relation (Dagli, 2012). Concerning this inconsistency between studies, the literature says that the confounding variables play an important role. And it says that socioeconomic status is the most influential of these confounding variables (Kwak et al., 2009; Marques, Santos, Hillman, & Sardinha, 2018; Tomporowski et al., 2011). Additionally, the socioeconomic status of the area in which the school is located also has an effect on the relationship between physical activity and academic achievement (Donnelly et al., 2016). In this research, the confounding variables identified in the literature—socioeconomic status, parental education level, the area where the given school is located, and private tutoring—have been equalized. Similar research conducted in England indicated that as the level of physical activity of the students increases, reading achievement increases in both sexes, but mathematical achievement increases only in boys (Booth et al., 2014). In another research, in order to increase students' physical activity level, the number and duration of recesses was increased and the influence on academic achievement was investigated. The research found that the number and duration of recesses have no effect on academic achievement, but as the recesses' number and duration increase, the physical activity level and social interaction increase (Dagli, 2012). Based on the literature, it was expected that there would be a positive relationship between students' physical activity level and academic achievement. In this study, we have found a positive relationship between students' physical activity level and academic achievement, the Pearson correlation was r = 0.298. This correlation score indicates a positive but weak relationship between the variables. The reason there is not a strong relationship between the two variables can be attributed to the research method. In this study, the level of physical activity was determined by a recall questionnaire. It is possible that students may perceive their physical activity level as more or less than the actual level. For this reason, students may have understated their level of physical activity. The data show that students with high physical activity level have high academic achievement scores, and students with low physical activity level have low academic achievement scores. But some students with a low physical activity level have a high academic achievement score. This extraordinary situation can be explained by such students' intensive study habits. Students with low physical activity and high academic achievement scores might be spending much of their spare time for studying. For more accurate results, the physical activity level of students should be measured with objective methods such as accelerometers. In a study using direct measurement method, it was emphasized that increased physical activity within the school was not particularly effective on children with high academic achievement but it could be effective in increasing academic achievement of academically weak children (Resaland et al., 2016). When both the results of our study and other studies in the literature are examined, it is understood that increasing the level of physical activity does not mean increasing academic achievement. It is clear that there is a link between physical activity and academic achievement, but the impact of physical activity's type, duration, frequency and intensity on academic achievement is still unknown. According to the results of the research, there is a positive relationship between the level of physical activity and the academic achievement score, even if it is weak. For this reason, students should be free to participate in physical education lessons in school and play time during breaks, and students' opportunities for physical activity should be increased. Similar to physical activity level, physical fitness is thought to have an indirect effect on academic achievement.

The health related fitness is the part has the positive effect on academic achievement. Health-related fitness consists of; cardiovascular endurance (aerobic fitness), muscular endurance, muscular strength, body composition, and flexibility parameters. The relationship between health-related fitness

parameters, which is another variable of the research, and academic achievement is evaluated separately for each parameter. Aerobic fitness, one of the health-related fitness parameters, is recognized in the literature as one of the most important variables that can effect academic achievement (Chomitz et al., 2009; Van Dusen, Kelder, Kohl, Ranjit, & Perry, 2011). Dusen and others compared the health-related fitness and academic achievement of 12th-grade students using the Fitnessgram test. His research found a positive relationship between academic achievement and aerobic fitness, push-ups, crunches, and flexibility (Van Dusen et al., 2011). In another study conducted on the relationship between physical fitness and academic achievement in the United States with 838 middle school students, results similar to our research were obtained (Bass et al., 2013). The study found a relationship between academic achievement, aerobic fitness, push-ups, and flexibility in boys. It also found a relationship between academic achievement, aerobic fitness, and push-ups in girls. Aerobic fitness and push-up (body strength) parameter is expected to be associated with academic achievement, but the relationship between flexibility parameter and academic achievement is an unexpected finding. When the literature is examined, there is no research examining the relationship between flexibility and academic achievement. In our study, no logical relationship or inference was made between flexibility and academic achievement. In a remarkable study, it was stated that comprehensive physical activity implementations that increase health-related fitness can be used to increase cognitive functions and academic achievement in both boys and girls (Aadland et al., 2017). The Study emphasized that regular physical activities that increase aerobic fitness can affect children's physiology, which, in turn, can indirectly increase cognitive function (Best, 2010). Its thought that aerobic fitness have an effect on children's' brain structure like neurogenesis or regeneration of brain capillaries, also it affects children more than adults (Tomporowski et al., 2011). Furthermore, aerobic exercises can increase executive functions and attention, and in this way the students' academic achievement increases indirectly (Best, 2010; Donnelly et al., 2016; Kwak et al., 2009). To summarize, it is seen that comprehensive and regular physical activities that increase health-related fitness positively affect body physiology. This effect leads to such as increase in cognitive function and general health. Therefore, it can be said that increasing aerobic fitness may indirectly increase academic achievement. The results of our study indicate that there is a weak but positive relationship between aerobic fitness and academic achievement of both female and male students. This result is in line with the literature. Academic achievement is affected by too many confounding variables. Variables in psychomotor and cognitive dimensions have been mentioned up to this point. In addition, one of the affective factors that affect academic achievement is the concept of academic self.

Academic self-concept, which is the other variable of the research, is the individual's self-perception about his/her academic achievements. At this point this research, while examining the relationship between physical activity level and academic achievement, simultaneously examined the relationship between physical activity level and academic self-concept, which is the moderator variable that can influence academic achievement. According to the findings, there was a significant and positive relationship between physical activity level and academic self-concept ($r = 0.254$). This result indicates that the relationship between physical activity and academic self-concept was similar to that between physical activity and academic achievement. Not enough studies examined the relationship between the level of physical activity and one's academic self-concept. The studies in the field have generally focused on the relationship between physical activity level and general self-concept (Babic et al., 2014; Liu et al., 2015) and physical self concept (Aşçı, 2004). Research on academic self-concept emphasizes that academic self-concept is a sign of academic achievement (Kumari & Chamundeswari, 2013). In this research, we found a positive relationship among physical activity level, academic achievement, and academic self-concept. This result is consonant with previous studies in the field. In a study about

academic self, it was stated that students with high academic achievement had higher academic self-concept (Peralta Sánchez & Sánchez Roda, 2003). Marsh states that in his review, there is a reciprocal influence between academic achievement and the academic self-concept. According to Marsh, previous academic achievements raise the present academic self, and the present academic self helps the individual to accomplish challenging academic tasks in the future, thereby increasing future academic achievement (Marsh, 1990; Marsh et al., 1988; Marsh & Martin, 2011). There are few studies in the literature between physical activity and physical self-perception (De la Torre-Cruz, López-Serrano, Ruiz-Ariza, & Martínez-López, 2019; Lohbeck, Tietjens, & Bund, 2016) , physical activity and self (Tremblay, Inman, & Willms, 2000). When these studies are examined, it is observed that physical activities could raise children's physical self via helping the students to make a habit of physical activity, and improve self-regulation skills to help to control their behavior in the school environment. However, as a result of the investigations carried out within the scope of this research, no recent research has been found between the academic self-concept and physical activity level in the literature. This result can be interpreted in two ways. Previous studies may have ignored the relationship between these two variables or may not have found the relationship between the two variables important and logical. As a result of the analyzes conducted in this context, it cannot be said that there is a direct relationship between physical activity level and academic self-concept. As a result of the analyzes, a relationship between physical activity level and academic self was close to the level of physical activity level and academic achievement. This result can be interpreted as the academic self is the predictor of academic achievement or there is a direct proportional relationship between academic achievement level and academic self-concept. In summary; The level of physical activity may not directly affect the concept of academic self. The fact that there is a statistically significant relationship between academic self-concept and physical activity level should not be interpreted as a logical relationship between these two variables. When the research findings and literature are combined, it can be said that the relationship between physical activity and academic self is a reflection of the relationship between physical activity and academic achievement. In addition to the level of physical activity, the relationship between health-related fitness parameters and the academic self was examined. In the literature, any other study investigating the relationship between health-related fitness parameters and the academic self could not be found. The researchers focus on the self-concept of individuals who do sports or physical activities or the relationship between self-concept and academic achievement (Areepattamannil et al., 2011; Liu et al., 2015; Marsh & Martin, 2011; Ordaz-Villegas et al., 2013). As mentioned earlier, the concept of academic self is accepted as an intermediate variable for academic achievement. Therefore, in this study, it was thought that there might be a relationship between health related fitness and academic self of students. No statistically significant relationship was found between academic self-concept and any of the health related fitness parameters. This result may be due to the lack of a direct link between fitness and the concept of academic self. Health related fitness parameters are closely related to physical self-perception. When fitness level is increased with various applications, children's physical self-concept raises. Children with low physical self tend to not participate in physical activities therefore their fitness is also low (Marsh & Redmayne, 1994). Comprehensive physical activity interventions increase the fitness of children and increase their physical self-perception. Thus, children are willing to participate in more physical activity. However, the same relationship does not exist between physical activity, health-related fitness and academic self-concept. According to the results, academic self-concept is only related to academic achievement.

Conclusion and Suggestions

In conclusion, in parallel with the literature, the academic achievement of the students with high levels of physical activity was found higher than the students with low physical activity level. Also, positive but weak relationship have found between aerobic fitness and academic achievement. This research was done by controlling the socioeconomic status which is frequently mentioned in the literature about affecting physical activity and academic achievement. But, the socioeconomic status is not the only variable that could affect physical activity, academic achievement, and academic self-concept. Many different variables such as; individual differences, readiness, preliminary information can effect this relationship. In this research, the positive but weak relationship between main variables; physical activity, health-related fitness, and academic achievement have been found. But this is not enough to say that the students who have high physical activity level will be more successful in academic courses. Research suggests that physical activities are effective in controlling and improving cognitive, affective, and psychomotor behaviors and can be used to increase learning. The results of our study support the general judgment in the literature.

As a result, it can be said that children need physical activity for their cognitive, affective and physical development so directing children to physical activity, creating physical activity opportunities in the school environment and allocating more time to physical activities will not affect children academic achievement adversely. If a research similar to this study is desired, it is made more careful by determining the level of physical activity by objective methods and by controlling confounding variables such as school loyalty, readiness and previous academic achievements.

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