Examination of the Effect of High School Students Physical Activity Levels on Their Problem Solving Skills

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A B S T R A C T

The purpose of this study is to be knowledgeable with demographic characteristics, Body mass index, physical activity levels, problem solving skills and sub-dimensions of the students receiving education at Anatolia High Schools and examine the effect of the physical activity levels of these students on their problem solving skills. The population of the study was included a total of 451 students (female=264; male=187) receiving education at the Anatolia High Schools in the Osmangazi district. In this study, the data was collected via the "International Physical Activity Questionnaire-Short Form" and the "Problem Solving Skill Scale" (PSS). It was determined that the males' physical activity values (3822.85 MET- min./week), were higher compared to those of the females (2103.17). On the contrary, the problem solving skills of the males (mean 2.91) were lower than those of the females (mean 2.95). The SPSS 23.0 for Windows program was used in the statistical analyses of the data. In order to see if the data distributed normally or not, Tabachnick and Fidell coefficients were used for the kurtosis and skewness values. For the comparison of the problem solving skills scores and the physical activity scores, the t test statistical method was used. In conclusion, no significant relationship at p<0.05 level was determined between the students' problem solving skills and their physical activity states.

Key words: Problem solving skill, Physical activity, High School student

Introduction

Activities performed within daily life via energy consumption by using our muscles and joints, increasing heart and breathing rates and ending in different intensities of fatigue are called physical activities (Bek, 2008). Life conditions, technology, exams and social factors affect physical activity levels of school-age children. In the world, approximately one of every three children is overweight and is struggling with the health problems caused by obesity. Children cannot find time to do physical activities and is pushed into inactive life. According to studies, students doing physical activities have better concentration and cognitive skills (Karabulut & Ulucan, 2011).

American College of Sports Medicine and Centers of Disease Control and Prevention suggests that children should do a physical activity of moderate and high intensity for 60 minutes and preferably 7 days a week (Cengiz & İnce, 2013). It was stated that activities are a good opportunity for both personal development and socialization and the experience which participants live creates opportunities for them both to reveal their leadership characteristics and develop their social skills such as problem solving, communication, confidence, locus of control (Çelebi & Özen, 2004. Cited by Özen, 2015).

Problem solving is a cognitive, affective and behavioral process which a person creates and develops in order to find the most effective way of coping with problematic situations encountered in daily life (D'Zurilla & Nezu, 1990). One of the best ways of an individual's developing his problem solving skills is doing exercise. It is an important phenomenon not only achieving individual and social developments but also having individuals acquire a democratic personality by giving people such emotions as self-control and ambition and diverting people's destructive, aggressive offending, primitive impulses again existing in human nature toward positive direction (Kuru, 1995). Doing a sport is not only a physical activity, but it also a process of socialization and adaptation to society (Başer, 1998. Cited by Özen, 2015). Individuals being obliged to make a decision in case of an experience or a problem are likely to use such strategies as depending on intuitions, delaying making decisions, behaving fatalistically, over thinking on a decision and wasting time, avoiding taking responsibility and risk related to decisions which they will make (Bowman, 1992; cited by Özen, 2015).

A great majority of students graduating from Anatolia high schools enter universities every year. Students are obliged to prepare for the Transition to Higher Education Examination and Higher Education Placement Examination. For the students, problem solving skills are of vital importance to pass those exams. The students preparing intensively for examinations and gradually falling away from physical activity, protecting body health through physical activity and eliminate negative situations. This study was carried out with the aim of determining the effect of the physical activity levels of the students receiving education at the Anatolia High Schools in the district of Osmangazi on their problem solving skills.

Methods

Research Group was composed of a total of 451 students (female=264; male=187) receiving education in the 2015-2016 educational year. The female students constituted 58.5% of the research group and the male students constituted 41.5% of it. The data analyzed was collected through using two different measurement tools, namely the Problem Solving Inventory and the International Physical Activity Questionnaire -Short Form.

Booth (1996) investigating into the relationship between the Health and Physical Activity Level organized a series of questionnaire studies and the International Physical Activity Evaluation Group developed the IPAQ based on this questionnaire. In order to determine the PALs of individuals, it was organized by Arabacı and Çankaya (2007) in a short and long form and its international validity and reliability studies were made by Craig et al. (2002) and its validity and reliability studies in Turkey were made by Karaca and Turnagöl (2007) (r=0.86). The questionnaire is composed of 7 questions and 4 separate sections and includes questions related to the physical activities done at least for 10 minutes in the last 7 days. In the questionnaire, it is determined that how many days in the last week and how long a day are; a) Heavy physical activities (HPA), b) Moderate intensity physical activities (MIPA), and c) Walking are done (W), d) In the last question, daily time spent without doing any exercise (sitting, lying down, etc.) is determined.

PA levels are determined in 3 categories; Those which are inactive: <600 MET min./week, Those which are minimum active: >600–3000 MET min./week, Those which are HEPA active: >3000 MET-min./week. In order to determine PA levels, the MET method is used. When resting, a person consumes 3.5 milliliters (ml) of oxygen per kilogram in a minute, that's MET=3.5 ml/kg/min. It is accepted that HPA=8.0 MET, MIPA=4.0 MET and W=3.3 MET are consumed in IPAQ. By determining how many days and for how long a person does HPAs, MIPAs and W's a week, the total amount of MET consumed is calculated from these three different PAs (Bozkuş et al., 2013).

The Problem Solving Inventory (PSI) was developed by Heppner and Petersen (1982) with the aim of determining how people perceive themselves in relation to their problem solving capabilities and the dimensions of the problem solving method by considering such problem solving stages as "general orientation", "definition of the problem", "producing alternatives", "making decisions" and "evaluation". The inventory was composed of 35 items and prepared in a 6-point Likert scale type. Some of the items were composed of positive statements and the others included negative statements. The scale gives a total score and scores related to sub-scales. The answers are given scores varying between 1 and 6. In the scoring, 3 items (the 9th, 22nd and 29th) are not scored. Again, in the scoring, the 1st, 2nd, 3rd, 4th, 11th, 13th, 14th, 15th, 17th, 21st, 25th, 26th, 30th and 34th items are scored inversely and the scoring is done over 32 items. The scores to be taken from the inventory ranged between 32 and 192. An increasing total score taken from the scale indicates an individual's perceiving him/herself as having insufficient problem solving skills. However, a decreasing total score taken from the scale indicates a person's having a positive perception of his/her problem solving skills. In the scoring of the sub-scales, too, it is considered that while decreasing scores taken from the sub-scales measuring problem solving approaches which can be described as positive-desired indicate that related approaches are more frequently used, decreasing scores taken from the sub-scales measuring the problem solving approaches which can be described as positive-ineffective (impulsive approach and avoidant approach) indicate that related approaches are less frequently used (Çağlayan & Taşğın, 2008)

The reliability and validity study of the Problem Solving Inventory was carried out. As a result of the factor analysis made by N.H Şahin, N. Şahin and Heppner (1993), it was stated that the inventory was composed of 6 factors, namely; Impulsive Approach: The 13th, 14th, 15th, 17th, 21st, 25th, 26th, 30th and 32nd items, α=0.78. Reflective Approach: The 18th, 20th, 31st, 33rd and 35th items, α=0.76. Avoidant Approach: The 1st, 2nd, 3rd and 4th items, α=0.74. Monitoring Approach: The 6th, 7th and 8th items, α=0.69. Self-Confident Approach: The 5th, 11th, 23rd, 24th, 27th, 28th and 34th items, α=0.64. Planfulness Approach: The 10th, 12th, 16th and 19th items, α=0.59.

Data Collection

The Problem Solving Inventory and the International Physical Activity Questionnaire-Short Form were administered to the students based on voluntariness principle in the classroom environment. Prior to the study, the students' parents were asked to sign a permission form. The administration started following the required explanations made by the researchers took about 20 minutes. Prior to the study, 480 questionnaire forms were handed out and 451 filled-out questionnaires returned. In the analysis of the data, the 'SPSS 23.0 for Windows' program was used. In relation to if the data distributed normally or not, for the kurtosis and skewness values, the Tabachnick and Fidell coefficients were used. For the comparison of gender and physical activity score, for the comparison of gender and problem solving skill, finally for the comparison of problem solving skill and physical activity score, t test statistical method was used.

Results

Total 264 (58.5%) of the participant students (n=451) were female and 187 (41.5%) were male. Average age is 16.3 with 15 minimum and 18 maximum years old.

Table 1. Body Mass Index and Active-Inactive Status of the Students

Age / Gender	Body Mass Index				Physical Activity Level		
	Under weight	Normal	Over weight	Obese	Inactive	Active	Very active
15	4	23	2	1	7	16	7
16	73	173	22	2	67	128	74
17	29	88	9	1	32	60	36
18	4	19	1	0	2	16	6
Female	77	169	17	1	75	142	47
Male	33	134	17	3	33	78	76
Total	110	303	34	4	108	220	123

In Table 1, the participants BMI and physical activity level is shown also the variation of those parameters according to genders is analyzed. The male students are more active than female students. Majority of the students has normal BMI and activity levels.

Table 2. Relationship between Problem Solving Skill and Age

Variable	Age	Mean Score	F	p
Problem solving inventory score	15	95.87	0.185	0.907
	16	94.08		
	17	93.34		
	18	93.12		
Problem solving confidence	15	29.72	1.819	0.143
	16	27.64		
	17	28.61		
	18	25.25		
Personal control dimension	15	14.75	0.499	0.683
	16	15.01		
	17	14.60		
	18	15.15		
Approach-Avoidant	15	39.43	0.542	0.653
	16	39.68		
	17	38.70		
	18	40.80		

In Table 2, if the students' problem solving skills differed according to their ages was examined, it was determined that p values were p>0.05 for all the sub-dimensions. It can be concluded that there was not a significant difference between the students' scores which they took from the problem solving inventory and its sub-dimensions depending on age.

When the problem solving confidence sub-dimension was examined, (p>0.05) was determined. There was not a statistical difference in terms of the students' ages. When the personal control sub-dimension was examined, no significant difference was found according to age since p value was found higher than 0.05. When the approach-avoidant sub-dimension was examined, the values indicate that there was not a statistical difference according to age.
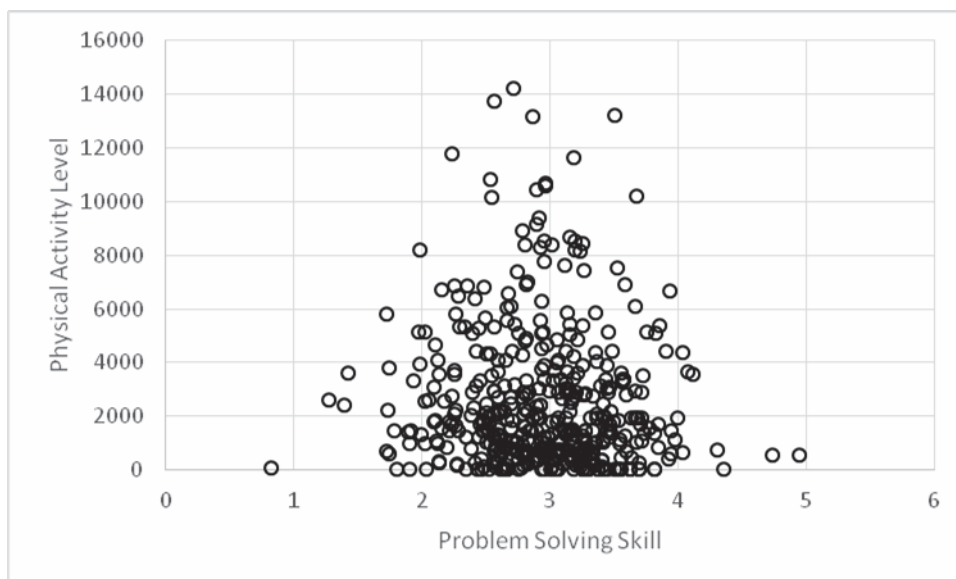
Figure 1. Comparison of the Students' Problem Solving Skill and their Physical Activity Scores

When the graph was examined in Figure 1, it was observed that the participants' problem solving skill levels were at moderate and high levels and their physical activity levels concentrated at moderate and low levels.

Table 3. Relationship between the Students' Problem Solving Skills and Activity Status

Problem Solving Skill	Physical Activity Status		
	Inactive	Active	Very active
Low	4	10	7
Moderate	101	207	113
High	3	3	3

When the problem solving skills were examined in terms of gender, it was observed that the means were close (female mean=2.95, male mean=2.91) and there was not a significant difference at the level of p>0.05. It was observed that there was a statistical difference between the students' activity scores according to their gender at the significance level of p<0.01. The males' activity status mean (2.23) was higher than the females' activity status mean (1.89).

The distribution of the participant's physical activity levels and problem solving scores is given in Table 3. according to this date distribution, it was concluded that there was not a relationship between PALSs and PSS levels. The problem solving confidence score of the participant students (n=451) was determined as 2.53, their approach-avoidance score was found as 2.97 and their personal control score was calculated as 3.28. From the total of the sub-scales, the problem solving skill total score was found as 2.92.

Discussion

It is determined that 28.78% of the female students were weak, 63.63% of them were normal, 6.43% of them were a bit fat and 0.37% of them were obese. It was also found that 17.64% of the male students were weak, 71.12% of them were normal, 9.09% of them were a bit fat and 1.60% of them were obese. The BMIs of the participant students were at normal level and the rate of obesity is low. 28.40% of the participant female students were inactive, 56.06% of them were active, 17.80% of them were very active and 17.64% of the male students were inactive, 41.71% of them were active, 40.64% of them were very active. It is considered that the students' participating in sport activities and doing physical activities had an effect on their BMIs. Depending on this, it is considered that the number of the students whose BMIs are obese is low. The study with elementary and high school students in Ankara, the obesity frequency was found similar in males and females. When the age groups of 6-11 and 12-17 were compared, it was found that the obesity frequency was significantly higher in the age group of 12-17, which indicates that the obesity frequency increase in the adolescence period. In the study made in Van, too, Yuca et al. (2010) found that the obesity frequency was similar in both genders (females 2.3%; males 2.1%).

The problem solving skill score mean of the students was found as 89.91±19.77; however, the score means of the sub-scales were calculated as follows: PSS=28.63±9.71, AA=45.74±10.89, PC=15.50±3.79. The scores to be taken from the PSS scale ranged between 32 and 192 and the low score indicates the behavior and attitude related to effective and successful problem solving (Savaşır & Şahin, 1997). Total PSS scale score mean calculated as 89.91±19.77 indicated that the students had nearly good level of problem solving skills. In our study, too, the PSS scale score mean was calculated as 93±31.3 and PSC was found as 27.93±10.53, AA as 47.74±12.59 and PC as 16.43±5.12.

Çağlayan (2007) found in a study aiming to investigate into the Problem Solving Skills of the students from the school of physical education and sports that the score mean of the students in relation to the sub-dimension of impulsive approach was X=29.80; the score mean belonging to the sub-dimension of reflective approach was X=11.67; the score mean of the sub-dimension of approach-avoidance was X=11.03; the score mean of the sub-dimension of monitoring approach was X=7.03; the score mean belonging to the sub-dimension of self-confident approach was X=18.00; the score mean of the sub-dimension of planfulness approach was X=9.00; the problem solving skills total score mean was X=86.56.

In this study, it was determined that there was not a significant difference between PSS and age (p<0.05). Although it is expected that individuals' problem solving skills will increase as they grow, thanks to experiences and as a result of observing different problem solving strategies used by other people, it was surprising to find no difference between the age groups. This finding can be interpreted in a way that since young people cannot evaluate their problem solving skills correctly, they perceive these skills better than they really are and fill out the scale accordingly.

The study made by Kapıkıran and Fiyakalı (2009) with high school students, total PSS score mean was low. Çağlayan and Taşğın (2008) found that the PSS sub-scale score mean with high school students doing a sport, was higher. The results found in the comparisons between PSS and age showed differences. Yıldırım, Hacıhasanoğlu, Karakurt and Türkleş (2011) determined that the students' PSS perceptions were better in the age group of 16-17 compared to the age group of 18 and over and it was determined that there was not a statistically significant difference between the ages of the students and their PSS scores. Çağlayan (2007) did not determine a significant difference between age and problem solving skills. In the study made by Işık, Kılıç and Kaplan (2016), the 10th and 11th grade students' problem solving skill levels were found higher than those of 9th and 12th grade students. Tümkaya and İflazoğlu (2000) found in a study with Çukurova University students' problem solving skill level that there was a significant relationship between the students from different years. The first year students stated that they perceived themselves as less sufficient compared to the fourth year students in terms of problem solving skills. Korkut (2002) determined that younger students were better at problem solving.

The results found in the comparisons between PSS and gender showed differences. In fact, Tümkaya and İflazoğlu (2000), Karabulut and Ulucan (2011) and Çağlayan (2007) did not determine a significant difference between gender and problem solving skill. On the other hand, in a study aiming to examine the students' problem solving skills, Korkut (2002) found a statistically significant difference between genders in terms of problem solving. When the means were examined, it was observed that the male students' problem solving skills were better than those of the female students. Differently, in a study aiming to examine the problem solving skills of the athletes playing basketball in the displacement league in Adana, İnce and Sen (2006) compared the athletes' genders and their problem solving skills and determined that the female athletes' problem solving skills (78.33±11.32) were better than those of the male athletes (92.57±20.85) and the difference was significant. In our study, it was determined that there was not a significant difference between PSS and gender (p<0.05).

When the PSSs are compared according to doing a sport or not doing a sport, previous studies support the finding that doing a sport had a positive effect on PSS. In a study made by Işık et al. (2016), it was determined that the problem solving skills of the students doing a sport problem developed more than those of the students not doing a sport. Kuru and Karabulut (2009) determined that the students taking the courses of rhythm training and dance had higher level of problem solving skills compared to the students not taking those courses. Similarly, Barut and Yılmaz (2000) report that individuals doing a sport are more flexible and comfortable in case of problems compared to those who do not do a sport. In a different study, Karabulut and Ulucan (2011) found that the scores of the students not doing a sport were higher compared to the students doing a sport. This indicates that the students not doing a sport exhibit a more avoidant approach in problem solving compared to the students doing a sport.

In conclusion, in our study, not a significant relationship was found between the students' problem solving skills and their physical activity levels. However, in the literature, it is ob-

served that active individuals have higher level of problem solving skills. It can be suggested that the sample size of the study should be increased and the data should be collected respect to the different sport activities.

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