The Effect of Body Mass Index on Physical Activity Level in Children between 10-11 Years of Age

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Abstract
The aim of this study was to investigate the effect of body mass index on physical activity (PA) level in children between 10-11 years of age. This research is an experimental study. While the universe of the research is composed of children studying in primary schools in Ankara province in 2017-2018 education and academic year, the sample is composed of students studying and teaching in Gazi Primary School in Yenimahalle district. The study included 271 students between the ages of 10 and 11 who voluntarily participated. The necessary permissions were obtained from school principals and student parents before the investigation. This research were taken weight (kg), height (m), PA level (pedometer) and BMI (kg/height²) measurements. SPSS 23 package program was used in the analysis of the obtained data. The mean age of children was 10.57±0.49, mean height was 1.42±0.45 and body weight was 38.33±10.91. BMI was 17.64±3.07 in 10 age group and 19.43±3.94 in 11 age group. The level of PA was determined as 1228±1687 for 10 years and 1132±1721 for 11 years. There was a significant difference between the two groups (p<0.001). There was found to be negatively correlation with PA (r=-0.269) p<0.001, whereas a significant correlation was found between BMI level (r=0.240) p<0.001. A significant correlation was found between BMI and PA level (r=0.817) p<0.001. As a result, it can be said that the body mass indexes of children between 10-11 years of age are in good level and their PA levels are generally active.

Keywords: BMI, Physical activity, Sedantery, Pedometry, Fitness, Children.

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Introduction

PA is associated with numerous immediate and long-lasting health benefits in children (Loprinzi et al., 2012) and an increased amount of physical activity generally increases the benefits (Kliki et al., 2013). PA is energy expenditure as a result of the body’s movement through the skeletal muscles. Any PA requires energy expenditure. PA can be varied in different ways according to the characteristics of the training (aerobic, anaerobic or static, dynamic, etc.) PA is perceived synonymous with the word “sport” in the majority of society. However, physical activity is defined as activities that take place in daily life using muscles and joints with energy expenditure, increase heart and respiratory rate and result in fatigue at different intensity. In this context, as well as sports activities, exercise, games and various activities during the day are considered physical activity (Kutlu and Civi, 2013). Current recommendations on physical activity for children endorsed by the European Commission and the World Health Organization are for a minimum 60 minutes of daily moderate to vigorous physical activity (World Health Organization, 2010; Demirtas et al., 2017).

The reported proportion of children actually achieving the recommendation varies across studies, partly due to dissimilarities in the factors measured (e.g. income or education). Also seasonal factors may explain some of the differences (Rich et al., 2012). This factor could be especially important in a Scandinavian context with large seasonal variations in weather conditions, temperature and hours of daylight (Hjorth et al., 2012). Characteristics of the neighbourhood environment of children are likely to differ between countries and contexts. A majority of previous research that has found a relation between neighbourhood resources and physical activity in children has been performed in North America, while studies reflecting north European contexts are scarce (Gonzalez Donohoue, 2004). In addition, lack of physical activity leads to obesity (Simşek, 2005).

Obesity is a disorder of energy metabolism resulting from excessive fat storage in the body, which can cause physical and mental problems. Taking more energy than consumed is the most important cause of obesity (Donohoue, 2004). The regulation of adipose tissues in the body and the etiology of obesity are multi-factor and are influenced by genetic structure, environmental warnings and developmental phenomena (Popkin, 2001). Changes in eating and activity habits cause obesity to be seen more frequently. Especially in genetically predisposed children, obesity is known to be caused by environmental factors (Donohoue, 2004). It is shown in a variety of studies in which the child’s nutritional intake is shaped by the eating habits during the infancy period, the parents’ nutritional properties and the family environment may cause obesity (Birch and Fisher, 1998). On the other hand, obesity and being overweight are closely related to sedentary lifestyle and lack of physical activity (Martinez-Gonzalez et al., 2001).

The aim of this study was to investigate the effect of body mass index on physical activity level in children.

Methods

Participants

This research is an experimental study. While the universe of the research is composed of children studying in primary schools in Ankara province in 2017-2018 education and academic year, the sample is composed of students studying and teaching in Gazi Primary School in Yenimahalle district. The study included 271 students between the ages of 10 and 11 who voluntarily participated. The necessary permissions were obtained from school principals and student parents before the investigation.

Height (cm) and Weight (kg) Measurements

Height was measured to the nearest 0.1 cm by using a stadiometer. Weight was measured to the nearest 0.1 kg on an electronic scale (Seca Corp, Birmingham, United Kingdom).

Measurement of Physical Activity Level

Physical activity levels were measured on 5 weekdays and 2 weekend days using Kenz LifeCorder pedometer. Pedometers were placed on the hip and they were checked against any problems by taking a few steps before the measurements. They were made to wear these pedometers after getting up and kept them until going to bed. Daily step standards graphics were developed for youth by Tudor-Locke et al. (2008).
2.4. BMI (Body Mass Index)

BMI was calculated as body mass in kilograms divided by height in meters squared (kg/m²). Body Composition was evaluated by using Body Mass Index criteria which were designed by Welk et al. (2000).

Table-2. Body Mass Index Classification.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Too low</th>
<th>Borderline</th>
<th>Good Fitness</th>
<th>Overweight</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>12 or less</td>
<td>13-16</td>
<td>17-25</td>
<td>26-30</td>
<td>30+</td>
</tr>
<tr>
<td>Female</td>
<td>12 or less</td>
<td>13-16</td>
<td>17-25</td>
<td>26-30</td>
<td>30+</td>
</tr>
</tbody>
</table>


2.5. Statistical Analysis

SPSS 23 package program was used in the analysis of the obtained data. The mean and standard deviation values of the subjects’ age, height and body weight were calculated. Independent t test was applied according to age variables. Also a correlation analysis was performed to determine the relationship between physical activity and BMI.

3. Findings

According to Table 3, mean age of children was 10.57±0.49, mean height was 1.42±8.45 and body weight was 38.33±10.91.

Table-3. Mean age, height and body weight of children.

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>271</td>
<td>10.57</td>
<td>.496</td>
</tr>
<tr>
<td>Height</td>
<td>271</td>
<td>142.30</td>
<td>8.454</td>
</tr>
<tr>
<td>Weight</td>
<td>271</td>
<td>38.33</td>
<td>10.91</td>
</tr>
</tbody>
</table>

Table-4. Comparison of BMI and physical activity level by age.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Age</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>10</td>
<td>116</td>
<td>17.64</td>
<td>3.07</td>
<td>-4.046</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>155</td>
<td>19.49</td>
<td>3.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>116</td>
<td>12288.05</td>
<td>1687.77</td>
<td>4.578</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>155</td>
<td>11328.44</td>
<td>1721.98</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table-5. Relationship between age, BMI and physical activity levels of children.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Methods</th>
<th>Age</th>
<th>Physical Activity Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>Pearson Correlation</td>
<td>-.269**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Physical Activity Level</td>
<td>Pearson Correlation</td>
<td>-.240**</td>
<td>-.817**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

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

According to Table 5, there was found to be negatively correlation with physical activity (r=-0.269) p<0.01, whereas a significant correlation was found between BMI level (r=0.240) p<0.001. A significant correlation was found between BMI and physical activity level (r=-0.817) p<0.01.

4. Conclusion and Discussion

In our study, a significant difference was found at the level of p <0.001 in physical activity level and BMI values according to age. According to our research, as the level of physical activity increases, BMI is decreasing. As the age increases, the level of physical activity decreases and the BMI increases. In our study, the mean age of the children was 10.57 ± 0.49, the mean height was 1.42 ± 8.45 and the body weight was 38.33 ± 10.91. In our study, BMI was determined as 17.64 ± 5.07 for children aged 10 years and 19.43 ± 3.94 for 11 years. Physical activity level was determined as 12288 ± 1687 for 10 years and 11328 ± 1721 for 11 years. A significant difference was found between BMI and physical activity level at the level of p <0.01 according to age variable. A negatively significant correlation was found between age and physical activity (r = -0.269) at a p <0.01 level while positively significant correlation with BMI (r=0.240) p<0.01. A negatively significant correlation was found between BMI and physical activity level (r=-0.817) p <0.01.

Belton et al. (2010) has been determined that the height values of children between 6-9 years of age are 1.31 m, body weight 29.2 kg and BMI 17 kg/m². As Duncan et al. (2007) the height values of children between 8-11 years
of age are 1.39 m., body weight 33.3 kg and BMI 17.5 kg/m². As Kolle et al. (2009) the height values of children in 9 years of age are 1.39 m., body weight 33.9 kg and BMI 17.2 kg/m². As Deforche et al. (2009) BMI of children between 6-10 years of age are 15.7 kg/m². As Gorely et al. (2009) BMI of children between 7-11 years of age are 17.5 kg/m². As Rodgers et al. (2007) the height values of children’s years of age are 1.33 m., body weight 31.9 kg and BMI 17.8 kg/m². According to Stein et al. (2007) the height, body weight and BMI values of children between 10-12 years old have increased with the age. In the study of Komata (2002) conducted to 10 years old children with 6 months intervals it is indicated that the height and the body weight of boys have increased in terms of the age. Le-Masurier et al. (2005) indicated that there was a negative correlation between BMI and body weight and physical activity levels, and that physical activity steps and levels from childhood to old age showed a steady decline.

According to Belton et al. (2010) the physical activity levels of 6-9 boys were defined as 16821 steps, Duncan et al. (2007) stated the physical activity levels of 8-11 year-olds as 12263 steps. Duncan et al. (2006) children have a level of 14124 daily steps. Gorely stated the physical activity level steps of children as 9789 per day. Raustorp and Ludvigsson (2007) indicated that children had a daily step level of 15591-16273. Cox et al. (2006) stated the average daily step levels of men as 15606, Craig et al. (2010) as 12259 steps. Deforche et al. (2009) indicated the physical activity levels of boys of 6-10 years of age as gold.

Tudor-Locke and Bassett (2004) indicated in the study named “how many steps are enough?” that 5000 steps and below sedentary, 5000-7459 steps are low active group, 7500-9999 steps are a little active, 10000-12499 steps are active, and 12500 steps and above are high active. Locke stated that children taking physical activity steps between 12000-15000 daily have a healthier and more positive BMI level, as well as children have an average of 8000-12000 steps, and men have an average of 13000 daily steps.

In the study of Tudor-Locke and Bassett (2004) they indicated that 5000 steps and below have really bad life quality, between 5000 and 7499 have sedentary, between 7500 and 9999 have low life quality, 10000 steps and above have good quality life. According to our research; for the protection or enhancement of physical activity; it is recommended to make physical activity more fun and to create activities appropriate for age groups. The duration of use of television, computer and smartphone should be reduced, and regular sleep times should be encouraged. Foods sold in school canteens should be inspected and banned food such as cola and chips should be encouraged. Increasing the number of physical activity areas in playgrounds in schools and after school will play an important role in children's physical activity habits.

As a result, it can be said that the body mass indices of children between 10-11 years of age are in good level and their physical activity levels are generally active.

References


