Physical activity, screen time, and nutritional status in adolescents in Banyumas

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ABSTRACT

Background: The prevalence of obese adolescents is increasing rapidly followed by an increase in the prevalence of screen time activities. Excessive screen time is related to the consumption of foods that are high in energy and fat and lack of physical activity which results in a positive energy balance resulting in weight gain in adolescents.

Objective: To find out the relationship between physical activity and screen time with macronutrient intake and nutritional status in adolescents.

Method: The study design used a cross-sectional design of 200 students. Nutritional status is measured based on the ratio of body weight and height in units of kg/m². Screen time is measured by the length of time teens playing gadgets based on questionnaires. Intake of macronutrients was obtained based on the results of interviews using semi-qualitative FFQ.

Results: Most participants had an adequate intake of macronutrients and only a small proportion of participants had excessive macronutrient intake. Most participants had normal nutritional status, but there were 37 participants or 18.5% who had overweight. High screen time activity in participants was very high at 88.5% and moderate physical activity of high participants was 97.5%. The relationship between daily screen time and carbohydrate intake had a significant effect with p= 0.04 (p<0.05).

Conclusions: The relationship between screen time, physical activity, macronutrient intake, and nutritional status had no significant relationship except in screen time and carbohydrate intake.

Keywords: adolescence, nutritional status, nutritional intake, screen time


INTRODUCTION

Low physical activity in adolescents is a major global public health problem because it has a negative impact on the health and growth of adolescents [1]. In China, obesity in adolescent showed increased rapidly from 0.2% in 1985 to 8.1% in 2010 [2] followed by the increasing prevalence of screen time activities in adolescents, especially men. Sedentary behavior is an activity with low energy expenditure (≤1.5 MET) which is usually sitting or lying position, such as watching television, using a computer, sitting in school, talking to friends, among other similar activities [3]. One of the methods most often used to assess sedentary behavior in adolescents is to measure the time spent to watch television, play video games, use computers, and mobile phones called screen time [4]. The recommended maximum screen time for teenagers is 2 hours/day [5]. There are 56-65% of teenagers in Europe and North America spend 2 hours or more per day watching television and doing sedentary behavior [6], even in Brazil about 78% of students are television for 2 hours or more a day.
Nutrition in adolescents is very important for growth and development and the main requirement in achieving optimal growth. When adolescents grow and development rapidly, the adequacy of both macro and micronutrient nutritional intake becomes very important. Adolescents exposed to excessive screen time have an effect on several health problems, such as being overweight, obesity, abnormal blood sugar and cholesterol values, poor learning performance, and low levels of physical activity [7]. In addition, excessive screen time in adolescence can survive until adulthood [8]. The relationship between excessive screen time and overweight in adolescents is associated with increased consumption of unhealthy foods, such as sweet soft drinks, snacks and sweets in front of television and exposure to fast food advertisements because television presents advertisements [9] that influence food intake factors and diet quality resulting in a positive energy balance which results in increased weight [10]. In addition, sedentary activity in the form of excessive screen time activity can change body composition, which is to reduce body fat and increase lean body mass. Specifically with exercise, it will reduce abdominal fat [11]. The Youth-Physical activity Towards Health (Y-PATH) report a correlation between physical activity and daily television viewing was evident among girls and significant interaction was apparent when examining daily physical activity and overall screen time in the prediction of early adolescents’ body mass index [12]. Banyumas Regency with a ratio of adolescents compared to the total population of more than 25% (BPS, 2013) makes adolescents an age group that influences the quality of the population in the next 10-15 years for Banyumas Regency. One group of adolescents with almost reached 41,653 people who attend vocational high school (SMK) have various levels of physical activity and their influence on nutritional status. From the theory above, we want to know the relationship screen time and physical activity with nutritional status and nutritional intake in vocational high school students in Banyumas.

METHODS

The type of study was a quantitative study using a cross-sectional design. The study was conducted in vocational high school (SMK) 1 Banyumas with total respondents 200 students who chosen randomly with inclusion criteria are currently in grade 10 dan 11, aged 14-20 years old and in a healthy condition. Screen time is the length of time to watch TV, play games, use electronics such as laptops, computers, tablets, and mobile phones in one day. The duration of each activity is recorded in units of minutes per day, low screen time (LST) if ≤120 minutes/day and high screen time (HST) if > 120 minutes/day. Physical activity data were obtained from modified IPAQ questionnaire, moderate if the activity score is 600-2999 MET-min/week and high if the activity score is >3000 MET-min/week. Nutritional status is a comparison of body weight in kilograms with the square of height in meters. The measurements of the body mass index is using tread scales and height with microtoise, which underweight if BMI/age < -2 standard deviation (SD), normal BMI/age -2 SD until +1 SD, overweight BMI/age 1 SD until 2 SD and obese if BMI/age > -2 SD. Intake of macronutrient is the amount of energy (kcal), protein (grams) and fat (grams) consumed by adolescent in a day, uses semi-qualitative FFQ obtained by interview, adequate intake if <110% of dietary reference intakes in Indonesia called Angka Kecukupan Gizi (AKG), and excessive if > 110% AKG. Data management consist of editing, coding, data entry, and analysis. Univariate and bivariate analysis was done for data analysis. Characteristic data of the respondent described as frequency distribution and percentages, while the correlation between the two variables in this study was analyzed by using chi-squared test but if one expected value is less than five, we use Fisher Exact test.

RESULTS

The participants of this research is 200 students taken from 6 classes at vocational high school in Banyumas taken through purposive sampling. The characteristics of the research subjects were age, screen time, physical activity, and macronutrient intake in Tabel 1. The average age of the participants was 16.38 ± 1.1 years and the average daily screen time of participants was 311.01 ± 178.6 minutes/day (min /d). In children aged 5-11 years and adolescents 12-17 years, the recommended daily screen time must be limited to no more than 2 hours per day [13]. While reports on school-age children aged 13-15 years show that 65% of children watch television for more than 2 hours per workday [14] and only 1% in Ireland children who fulfill screen time recommendations of 2 hours per day [15].
Tabel 1. Descriptive data for socio-demographic characteristic

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ± SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>16.38 ± 1.1</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>Screen time (minutes/day)</td>
<td>311.01 ± 178.6</td>
<td>60</td>
<td>910</td>
</tr>
<tr>
<td>Physical activity (MET)</td>
<td>1839.49 ± 425.5</td>
<td>984</td>
<td>3924</td>
</tr>
<tr>
<td>Energy intake (kcal)</td>
<td>1620.28 ± 391.7</td>
<td>884.9</td>
<td>2672.4</td>
</tr>
<tr>
<td>Protein intake (gram)</td>
<td>50.61 ± 18.8</td>
<td>21.3</td>
<td>124.3</td>
</tr>
<tr>
<td>Fat intake (gram)</td>
<td>41.59 ± 18.9</td>
<td>7.09</td>
<td>104.03</td>
</tr>
<tr>
<td>Carbohydrate intake (gram)</td>
<td>258.98 ± 61.6</td>
<td>117.9</td>
<td>439.5</td>
</tr>
</tbody>
</table>

Figure 1. Cross-tabulation between macronutrient intake and screen time

Based on Figure 1, it can be seen that most participants had an adequate intake of macronutrients and only a small proportion of participants had excessive macronutrient intake. The intake of macronutrients tested is <5 so that we using the Fisher Exact test. Based on the results of the Fisher Exact test showed that the relationship between screen time, physical activity, and macronutrient intake had no significant relationship except in carbohydrate intake. Daily screen time activities affect carbohydrate intake with p = 0.04 (p<0.05) according to Table 2.

Table 2. The p-value of the relationship between screen time, physical activity and macronutrient intake

<table>
<thead>
<tr>
<th>Variable</th>
<th>Energy</th>
<th>Protein</th>
<th>Fat</th>
<th>Carbohydrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen time</td>
<td>0.28</td>
<td>0.53</td>
<td>0.42</td>
<td>0.04</td>
</tr>
<tr>
<td>Physical activity</td>
<td>0.23</td>
<td>0.16</td>
<td>0.83</td>
<td>0.47</td>
</tr>
</tbody>
</table>

*there is a significant relationship (p<0.05)

Table 3. The p-value of the relationship between screen time, physical activity and nutritional status

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overweight</th>
<th>Normal</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen time</td>
<td>Hst</td>
<td>31</td>
<td>146</td>
</tr>
<tr>
<td></td>
<td>Lst</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Moderate</td>
<td>36</td>
<td>159</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
DISCUSSION

This finding contradicts with research on adolescents regarding screen time activity and nutritional status is mediated by energy intake. If the level of high carbohydrate intake significantly mediates the screen time relationship with BMI, fat and protein intake does not mediate significantly [16]. Previous studies demonstrated that TV viewing was linked to a less healthy diet such as a lower intake of fruit and vegetables, the higher consumption of energy-dense, snacks, fast food, and higher total energy intake in adolescent [17]. These findings show that there is a relationship between TV viewing and dietary intake [18]. There is another explanation that adolescents who often carry out screen time activities are exposed to many advertisements that can affect the type of food consumed [19]. Previous research reported that frequent advertisements were fast food, sweet drinks, and high-calorie snacks and lack of fruit and vegetable intake [20]. Most participants had normal nutritional status, but there were 37 participants or 18.5% who had overweight. High screen time activity in participants was very high at 88.5% and moderate physical activity of high participants was 97.5%. Based on the results of the Fisher Exact test there was no relationship between screen time, physical activity, and nutritional status (p> 0.05) seen from Table 3.

This finding contradicts with European studies which state that adolescents aged 10-12 years in Europe with severe physical activity and low screen time associated with normal nutritional status [21]. A cohort study showed that adolescents and early adults were associated with high BMI due to frequent viewing of TV [22] and based on the results of a survey in Norway showing watching TV, playing computer was also a risk factor for overweight in 13-year-olds [23]. In addition, the low level of adolescent physical activity and high daily screen time will affect adolescents' BMI [24]. Surveillance data from Europe shows that the level of adolescent physical activity has decreased substantially together with the proportion of obese adolescents which increased dramatically in the last 30 years [25]. The high frequency of food when watching TV has an impact on energy balance and affects weight gain [26]. In screen time activities, teens often do it together with drinking sweet foods that affect weight gain [27] and that affects screen time with obesity. This current research finding can be compared with previous studies [28] who also did not find a significant relationship between physical activity, screen time, and nutritional status in the adolescent group.

There were other previous cross-sectional and longitudinal studies [29] that had found insignificant associations of physical activity, screen time, and nutritional status. The findings support the argument that adolescent sedentary behavior and PA are not related. Recently, systematic review studies have shown that they have observed children and adolescents with high activity and low sedentary behavior associated with having a measure of normal adiposity and heart health. The limitations of the current study include simple non-invasive anthropometric measurements carried out by trained field staff to determine the nutritional status of adolescents, the use of BMI as an indicator of weight status can also be considered a limitation. If alternative measures such as the fat mass index have been used, researchers may be able to obtain additional information about body compartment fat mass in adolescents [29].

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