

Analysis of the Use of Electronic Games, Physical Activity Level and Overweight Among Schoolchildren

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Abstract:

Objective: To analyze the level of physical activity, use of electronic games and overweight in schoolchildren.

Methods: field study with an exploratory, descriptive and quantitative approach, with 339 male and female students. The level of physical activity was determined using the PAQ-C. The use of electronic games was determined by the PVP scale. Weight and height were measured to calculate the body mass index (BMI).

Results: 34.5% of students were insufficiently active. Based on BMI, 16.5% were overweight and 10.3% were obese. 32.2% of the total sample (41% of boys and 24.2% of girls) were classified as likely dependent players. The PVP score was 4.24 ± 2.23 among students classified as insufficiently active and 3.03 ± 1.88 among those classified as sufficiently active ($p < 0.0001$). Overweight ($p < 0.0001$) and obesity ($p < 0.0001$) students played games more than those classified as underweight or in the ideal range. Probably, dependent players had a higher average BMI (19.46 ± 3.5) compared to "social" players (17.51 ± 2.86) ($p < 0.0001$).

Conclusions: the time spent on electronic games is directly related to the level of physical activity, overweight and obesity in children, emphasizing the need to encourage regular physical activity and adopt a healthier lifestyle.

Keywords: Video games. Lifestyle. Overweight. Physical activity

1. INTRODUCTION

The use of electronic devices with access to the internet and virtual games has increased considerably in recent years among all age groups (children, adults and seniors). In 2016, the Brazilian Institute of Geography and Statistics published data on the use of the internet and television and the possession of a cellular mobile telephone for personal use and found that 64.7% of children older than 10 years of age used the internet [1].

When not monitored and guided, internet use can result in changes in lifestyle, leading to a sedentary behavior. The children of the "digital era" are gradually losing or changing their ways of playing and interacting socially. In 2013, the Brazilian Institute of Geography and Statistics began to identify not only access to the internet through a microcomputer at home, but also through cellular telephones, tablets, television and other electronic equipment [2].

According to Espíndola et al. [3], the increase in leisure activities in front of a television, the use of videogames and the increase in violence in urban centers are the main reasons for the high level of physical inactivity among children. Studies conducted by the World Health Organization (WHO) report that the number of obese children and adolescents (five to 19 years of age) has increased tenfold in the last four decades [4].

The school setting is an environment in which children tend to unite and play during recess. However, the mode of playing is being replaced by videogames on cellular telephones and tablets, the effect of which is the loss of opportunities to practice physical activity and a consequent increase in the risk of excess weight [5].

Overweight is defined as the abnormal or excessive accumulation of fat that can be harmful to one's health [6]. The prevalence of overweight and obesity has been increasing throughout the world in recent years. Changes in eating patterns and physical activity in many societies have contributed to the increase in overweight in populations [7].

Studies conducted by the WHO point to physical activity as a means for promoting health and preventing disease, with specific recommendations for different age groups regarding the time to be spent practicing such activities [6]. For children and adolescents, 60 minutes of moderate to intense physical activity per day is recommended.

Regular physical activity provides numerous health benefits and constitutes a proactive way of preventing diseases in the future. In children, physical activity plays a fundamental role in physical fitness as well as both psychological and mental development. According to Bois et al. [8], the practice of physical activity can enhance self-esteem, social acceptance and a sensation of wellbeing among children.

Santos et al. [9] state that the probable factors of the increase in excess weight among children are a reduction in physical activity level and exposure to activities with a low energy expenditure, such as activities performed sitting or lying down (video games, watching television, etc.). Sarment and Pilati [10] also highlight the time spent on sedentary activities (videogames and television), the number of meals, etc.

The practice of videogames has become one of the most important leisure activities among children in recent decades due to a number of factors, such as the increase in vehicular traffic, the increase in crime, technological advances, etc. Thus, the time spent on videogames in this population contributes to the development of a sedentary lifestyle [11]. Activities with low calorie expenditure are generally practiced in sitting or lying positions. The use of videogames falls into this category and prolonged use can lead to dependence [12].

Dependence occurs when social activities are replaced by virtual games practiced several hours per day, which can contribute to a sedentary lifestyle, overweight and obesity [13]. Therefore, the aim of the present study was to analyze the level of physical activity, time spent on videogames and overweight among schoolchildren eight to 12 years of age.

2. MATERIAL AND METHODS

This study was conducted with 339 students eight to 12 years of age at 10 schools (seven in the public system and three in the private system).

Physical activity level was determined using the Physical Activity Questionnaire for Older Children (PAQ-C), which has been validated for use in Brazil by Guedes and Guedes [14]. The PAQ-C is composed of nine items addressing physical activity in the previous seven days. A score of more than 2.5 is considered indicative of "sufficiently active" (SA) and a score lower than 2.5 is considered indicative of "insufficiently active" (IA).

The use of videogames was evaluated with the Problem Video Playing PVP scale, which has been validated for use in Brazil by Carvalho et al. [15]. The PVP scale is used to determine the problematic use of electronic games and has nine questions (each scored 1 point) addressing the use, time spent playing and attitudes before and during a game. A score of up to 4 points is indicative of a "social" player, whereas a score higher than four points is indicative of possible dependence.

Weight and height were measured for the determination of the body mass index (BMI), which was classified based on the recommendations of the Brazilian Ministry of Health for the age range considered in the present study [16]: $\leq 16.99 \text{ kg/m}^2$ = underweight; 17.00 to 20.00 kg/m^2 = ideal range; $\geq 20.03 \text{ kg/m}^2$ = overweight; and $\geq 23.7 \text{ kg/m}^2$ = obese.

The Kolmogorov-Smirnov test was used to determine the equality of variance of the groups. Comparisons between two groups (lifestyle and use of games) were performed using the t-test for independent samples. The comparison of four groups (BMI) was performed using one-way analysis of variance (ANOVA) followed by Tukey's post hoc test for multiple comparisons. The results were expressed as mean and standard deviation values. All statistical tests were performed with the aid of SPSS version 20, with the level of significance set to 5% ($p < 0.05$).

This study received approval from the Human Research Ethics Committee of the Center for Biological and Health Sciences of the Pará State University (certificate number: 89982318.1.0000.5168) and was conducted in accordance with Resolutions 466/12 and 510/2016 of the Brazilian National Board of Health.

3. RESULTS

Three hundred thirty-nine children participated in the present study. Girls accounted for 52.5% of the sample and boys accounted for 47.5%. Mean age was 9.85 ± 1.19 years. A total of 68.7% of the students attended public schools and 31.3% attended private schools.

Table1. Descriptive statistics of lifestyle, BMI and use of videogames according to sex and type of school

Variables	Male(n=161)	Female(n=178)	Public(n=2)	Private(n=10)	Total(n=3)
Lifestyle SA	65.8%	65.2%	68.2%	59.4%	65.5%
IA	34.2%	34.8%	31.8%	40.6%	34.5%
BMI (kg/m ²) Underweight	39.1%	41.6%	41.2%	40.4%	40.5%
Ideal range	32.9%	32.6%	34.3%	32.7%	32.7%
Overweight	20.5%	12.9%	16.7%	16.5%	16.5%
Obesity	7.5%	12.9%	7.7%	10.3%	10.3%
Use of games Social player	59.0%	75.8%	67.8%	67.9%	67.8%
Probable dependent player	41.0%	24.2%	32.2%	32.1%	32.2%

SA: Sufficiently active; IA: Insufficiently active; BMI: Body mass index

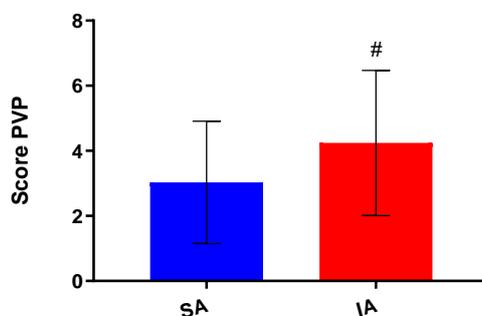


Figure1. Comparison of PVP scale score and classification of physical activity. # $p < 0,0001$ vs. SA; SA: Sufficiently active; IA: Insufficiently active.

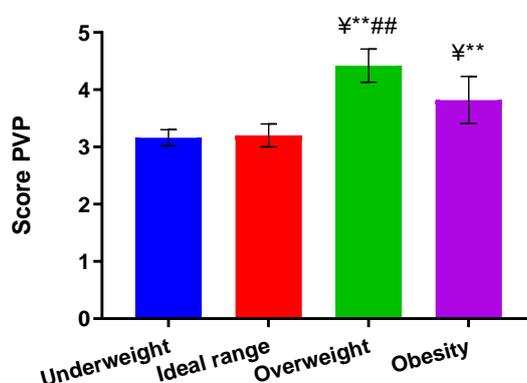


Figure2. Comparison of PVP scale score and BMI classification. ¥ $p < 0,0001$ vs. Underweight; ** $p < 0,0001$ vs. Ideal range; ## $p < 0,0001$ vs. Obesity.

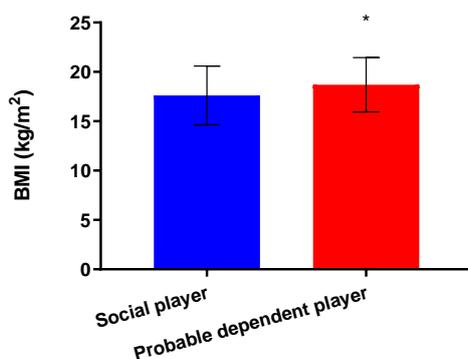


Figure3. Comparison of BMI among boys and classification of video game use. * $p < 0,0001$ vs. social player; BMI: Body mass index;

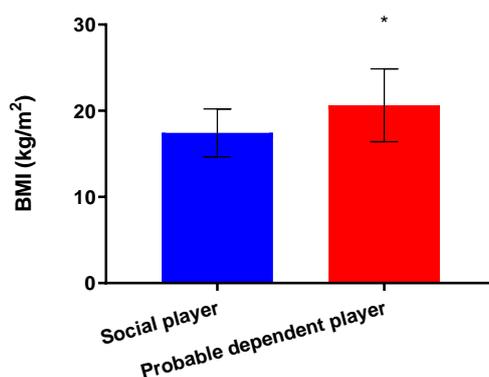


Figure4. Comparison of BMI among girls and classification of video game use. * $p < 0,0001$ vs. social player; BMI: Body mass index;

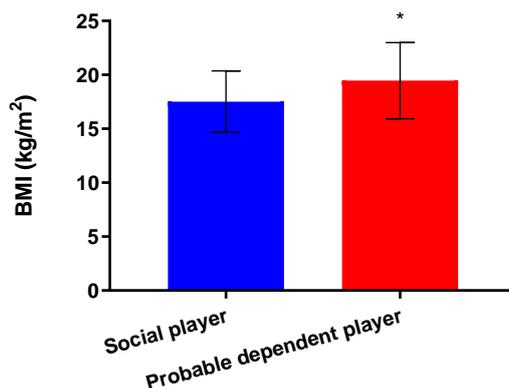


Figure5. Comparison of BMI and classification of video game use. * $p < 0,0001$ vs. social player; BMI: Body mass index;

4. DISCUSSION

The prevalence of a sedentary lifestyle was high in the present study (34.5% in the overall sample). Data from the WHO [6] indicate that 20% of adults and 80% of adolescents throughout the world do not practice exercise with the frequency and intensity considered adequate for their age group. Thus, four out of every five adolescents between 11 and 17 years of age are considered insufficiently active. The lack of studies conducted with children makes it necessary to compare the present findings to data on adolescents and adults, considering the need to discuss the extent to which this information is important to preventing a future sedentary life.

According to Brito et al. [12], the easy access to videogames, the increase in crime in cities and the reduction in open public spaces in urban centers contribute to the reduction in physical activity among children, favoring the practice of sedentary activities, such as watching television, playing videogames and using computers. In a study by Smith-Menezes, Duarte and Silva [17], the prevalence of sedentary

behavior among youths was 37.35% and was directly associated with an excessive number of hours/day of “screen time” (television, computer or videogames).

In the study Dutra et al. [18], the prevalence of sedentary behavior was 70% among children with the habit of watching television for two or more hours per day; this habit was inversely associated with the practice of physical activity and positively associated with excess weight. In the present study, the prevalence of sedentary behavior was lower (approximately one-third of the sample), but was also directly associated with excess weight and insufficiently active children played videogames more (greater amount of time spent in front of electronic devices). Among the alarming data displayed in Table 1, the prevalence of sedentary behavior was nearly 10% higher among students attending private schools compared to those attending public schools, which suggests an association between socioeconomic status and an insufficiently active lifestyle. Dutra et al. [18] also found a positive association between this variable and screen time.

Regarding BMI, nearly one-third of the students were classified as either overweight or obese. The prevalence of overweight was higher among the boys and the prevalence of obesity was higher among the girls. Studying data from a population of adolescents in Portugal between 10 and 18 years of age, Santos et al. [9] found a similar trend to that reported in different countries, in which the prevalence of overweight/obesity ranged from 21.6 to 32.7% in girls and 23.5 to 30.7% in boys.

Physical activity plays an important role in combatting overweight/obesity by exerting an influence on the energy expenditure, weight and body fat. Moreover, when established in childhood, the habit of practicing physical activity tends to be maintained in adulthood. Overweight/obesity is a risk factor for a number of diseases, especially when combined with unhealthy eating habits, physical inactivity and excessive time spent on videogames [19]. The WHO [6] reports that the prevalence of overweight/obesity among children and adolescents five to 19 years of age increased dramatically from 4% in 1975 to more than 18% in 2016, with similar figures for both sexes.

The present data demonstrate that a large portion of the students exhibited behavior indicative of a probable dependence with regard to playing videogames, especially the boys, with no significant difference between those who attended public or private school. The practice of videogames has become one of the most important leisure activities of children and adolescents in recent decades and the excessive practice of videogames contributes to the development of a sedentary lifestyle in this population [11].

The PVP score was 3.03 ± 1.88 among the sufficiently active students and 4.24 ± 2.23 among the insufficiently active students. This difference was statistically significant ($p < 0.0001$). Lemos, Conti and Sougey (2015) also report that the excessive practice of videogames is directly related to sedentary behavior due to the fact that such games become one of the main choices of leisure activity.

Pitanga et al. [20] analyzed indicators of sedentary behavior in school-age children and adolescents and found that the increase in time spent in the sitting position was associated with an increase in the percentage of fat as well as gains in body weight and BMI. Throughout the world, the practice of physical activity is considered a fundamental element to the prevention and control of chronic diseases, such as arterial hypertension, diabetes and obesity [6]. According to Carvalho et al. [15], sedentary behavior is associated with technological advances and the use of technological resources, such as cellular telephones, tablets, access to the internet and videogames, as children and adolescents spend a greater amount of time in the sitting and lying positions when using these resources.

The presents findings show that the insufficiently active students played videogames more than the sufficiently active students, which may be the main reason for the lower level of physical activity. According to Pinheiro et al. [21], the excessive use of videogames necessarily leads to the replacement of other social activities. The compulsive player spends hours per day on an activity with little energy expenditure. In contrast, the practice of at least 60 minutes per day of physical activity offers physical benefits (prevention of arterial hypertension, weight control, increased bone density, increased endurance and muscle strength and the normalization of the lipid profile) as well as psychological benefits, such as enhanced self-esteem, increased sensation of wellbeing and reductions in stress and depression. Thus, an increase in daily physical activity is exerts a direct influence on the health and quality of life of children [6].

Analyzing the PVP score according to the BMI classification, the students with overweight ($n = 56$;

mean PVP score: 4.42 ± 0.29) and obesity ($n = 35$; mean PVP score: 3.81 ± 0.41) had higher scores compared to those classified as underweight or within the ideal range. Dependence with regard to playing videogames is evidenced by excessive thinking about the game, an increase in the time spent playing the game and playing in secret (hiding the activity from parents). Greater screen time is closely related to a number of harmful effects on health in children and adolescents, such as overweight and obesity, as it leads to an increasingly less amount of time practicing physical activity [22].

Dutra et al. [18] found that approximately 60% of children who spend more than two hours a day watching television were overweight or obese. In the present study, probably dependent players had a higher mean BMI (19.46 ± 3.5) compared to “social” players (17.51 ± 2.86) ($p < 0.0001$), likely due to the greater time spent in front of a screen due to the excessive practice of videogames. According to Lemos, Conti and Sougey [23], dependence is considered when the time spent playing videogames leads to the replacement of social activities (children’s games) due to the greater screen time, consequently leading to an increase in body weight.

A healthy lifestyle results in the promotion of health and the prevention of disease throughout one’s entire life and, like other habits, the regular practice of physical exercise is a habit that children carry with them into adulthood [24]. In contrast, the excessive use of videogames is associated with a set of factors linked to dependence [25] and can lead to overweight in children [9]. Indeed, the children with higher PVP scores in the present study also had a BMI indicative of overweight and obesity.

In the analysis of the practice of video games by boys, the mean BMI was 17.62 ± 2.98 kg/m² among those classified as “social” players and 18.69 ± 2.75 kg/m² among those classified as probably dependent players. While both groups were in the ideal range, the probably dependent players had a higher BMI. This is likely to the fact that the use of video games is linked to screen time [20] and associated with excess weight, as demonstrated in the present study. Although within the ideal range, the higher BMI in the group of probably dependent players could lead to overweight in the future. Ferrari et al. [26] found that overweight/obesity (evaluated based on BMI) was associated with the socioeconomic status of the family, number of siblings, a sedentary lifestyle and screen time (time spent in front of a television, computer or videogames). The WHO [6] stresses physical activity for children in the form of playing games, sports, biking and physical education in the context of family, school or community activities for a period of 60 minutes per day, with higher intensity activities offering better health benefits, such as the non-emergence of diseases, overweight and obesity.

In the analysis of the practice of video games by girls, the mean BMI was 20.64 ± 4.23 among those classified as probably dependent players, indicating overweight. The increase in the prevalence of excess weight in children is worrisome due to the greater risk of persisting into adolescence and adulthood. Overweight exerts a negative impact on quality of living throughout one’s lifetime [26]. Miranda et al. [27] report a 20.7% prevalence of overweight among adolescent girls. Pitanga et al. [20] also identified a direct relationship between screen time and overweight among adolescent girls. It is evident that the long-term practice of videogames can have a negative impact on health and the change in lifestyle contributes to an increase in the prevalence of excess weight in children.

The easy access to technologies (videogames) has exerted a negative impact on the development of motor activities among children and the use of computers, tablets and cellular telephones in the home and school settings has reduced the frequency of social interactions [12]. Besides motor and affective issues, overweight and obesity are considered a global epidemic, affecting all age groups, especially children [6].

In the overall sample, mean BMI was 17.51 ± 2.86 kg/m² among social players and 19.46 ± 3.5 kg/m² among the probably dependent players. Although both groups were classified in the ideal range, the BMI was higher among the probably dependent players, who spent more hours practicing videogames, which leads to a reduction in the practice of physical activity as well as an increase in body weight. While not yet classified as overweight, the higher BMI in the group that spent more time playing videogames could signify a future problem with excess weight due to the insufficient energy expenditure and lack of practicing physical activity [12].

Using the PVP scale, Ferreira and Sartes [28] found that 15.8% of the students analyzed had problems related to the harmful use of videogames. The authors states that the excessive use of such games is associated with several problems, such as overweight/obesity, violence, poor academic performance,

low psychosocial wellbeing and sleep deprivation. In partial support of these statements, the probably dependent players in the present study had a higher BMI compared to social players, since videogames have become one of the major leisure activities for children, changing how they play and leading to both a sedentary lifestyle and an increase in weight.

The non-practice of regular physical activity is associated with several diseases. Indeed, a sedentary lifestyle is considered one of the main factors associated with overweight, obesity and other diseases, especially those linked to the cardiovascular system. In contrast, the regular practice of physical activity can directly contribute to the prevention and treatment of chronic non-communicable diseases as well as other benefits, such as an improvement in self-esteem.

5. CONCLUSIONS

The present finding demonstrates a dangerous relationship between excessive videogame playing/screen time and overweight/obesity due to the fact that probably dependent players spend more time on activities with little energy expenditure, thereby increasing the risk of disease, such as arterial hypertension, diabetes, metabolic syndrome, etc. Physical education classes may be an important strategy for combatting overweight and obesity in children and adolescents, especially if health promotion and disease prevention actions are developed. The present study has no definitive function, but the findings may encourage the development of future projects, research and public policies aimed at increasing the level of physical activity and reducing time spent on sedentary activities among children, thereby improving their health.

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5.2 Disclosure statement: No author has any financial interest or received any financial benefit from this research.

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