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THE USE OF TECHNOLOGY AND SLEEP TIME IN PRESCHOOL CHILDREN BEFORE AND DURING TIMES OF SARS-COV-2

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Abstract

Screen-based games and television are increasingly prevalent nowadays and are associated with poor health outcomes. Accordingly, the SARS-COV-2 disease 2019 (COVID-19) pandemic disrupted life for all, with the closure of non-essential businesses and schools. For preschool children, this limited opportunities for movement and social life, disturbed daily schedules and routines. The present study aims to understand and compare the screen time and sleep time on preschool children, conducted at 6 kindergartens, selected for convenience, in two different regions from Portugal (Bragança and Gondomar) before COVID-19 pandemic and during the lockdown related to COVID-19. For data collection, two phases were considered: the first one, before COVID-19 pandemic, the children's parents were interviewed using a questionnaire to evaluate the time spent watching television and playing video games, both during the week and weekend, as well as the number of hours of sleep; the second one, during the lockdown related to COVID-19 pandemic, were used the same questionnaire in an online form. A total of 352 children participated in this study. In the first moment, 230 children, of which 103 girls (mean age of 4.51 ± 0.82 years) and 127 boys (mean age of 4.48 ± 0.81 years), and in the second moment 122 children, of which 65 girls (mean age of 4.80 ± 0.66 years) and 57 boys (mean age of 5.00 ± 0.96 years).

There were no significant differences between girls and boys regarding time spent watching TV during the week and during the weekend, time playing video games during the week and during the weekend, and sleep time, within each moment of data collect. When comparing the use of technology by girls and boys between the first moment and the second, there was a significant increase in the time spent watching TV during the week ($p=0.000$), as well as playing video games during the week ($p=0.000$) and during the weekend ($p=0.000$), both for girls and boys. In the number of hours of sleep there were no significant differences between both moments. However, during the first moment, 14.8% of children do not comply the WHO recommendation, and the same occurs on the second moment, with 32.0% of children not complying. Considering the WHO recommendation about screen time of 1 hour/day or less, 82.6% follow the recommendation during the week in the first moment of the study, compering to only 23.8% during lockdown. On weekend, the percentage of children that comply the recommendation of screen time was similar between the first and the second moment (51.3% and 52.5%, respectively). It was already expected that during COVID-19 lockdown, children spend more time on screen activities, namely watching TV and using their computer to assist school classes.

In conclusion, our study suggests that preschool children, due to confinement, spent more time in front of the screen (watching TV and playing video games), with a vast majority of children not meeting the maximum recommended sedentary screen time during weekdays.

Keywords: Preschool children, sleep time, screen activities, sedentary behavior.

1 INTRODUCTION

Consumer technology, as television (TV), computers, smartphones, tablets, video game consoles and others, have become increasingly available for children. In fact, children are one of the largest consumer groups of technology [1], starting using it at the age of two [2]. The increasing exposure to these devices may affect children's sleep time, as well as the quality of sleep [2]. Data suggest that increased technology used at bedtime, namely, television, smartphones, video games and computers, is associated with a decrease in the amount of sleep children are getting [3]. For example, children watching television before going to bed were more likely to be texting in the middle of the night than children who did not watch television before bedtime [1]. In addition, children who watch more TV tending to have an overweight or obese body mass index (BMI) [4, 5]. The data also suggest that these children are more likely to have trouble falling asleep and trouble staying asleep than their normal BMI counterparts [1]. Sleepiness can also affect children ability to pay attention, and poor sleep-in childhood may carry future cardiovascular risks in the form of obesity, diabetes, high blood pressure, anxiety and depression [6]. Obesity is, indeed, a major health problem. Obesity is a chronic disease that has reached epidemic proportions in both developed and developing countries [7]. Portugal is one of five European countries with the highest prevalence of childhood obesity. Data for 2018–2019 reveal a 29.6% prevalence of overweight in children and adolescents and childhood obesity of 12.0%, that represents a combined prevalence of 41.6% [8, 9]. This reality has a negative impact on children's health and may be associated with several co-morbidities, such as hypertension, dyslipidemia, type 2 diabetes mellitus, sleep apnea, as well as orthopedic and psychosocial problems, including discrimination, social isolation and low self-esteem [10].

The etiology of overweight and obesity at these ages are multivariate, and the main causes are lack of physical activity (PA), time spent watching TV and playing videogames, excess energy intake, as well as parental and environmental influences [11, 12]. It has been shown, also, a positive association between parental and preschoolers' obesity. Normally obese parents have obese children [13], as well parent's PA and sedentary behavior's influence childhood behavior [14].

Additionally, during current days, the coronavirus SARS-CoV-2 disease 2019 (COVID-19) pandemic disrupted life for all, with the closure of non-essential businesses and schools. For preschool children, this limited opportunities for movement and social life, disrupted daily schedules and routines. For pre-school children, PA is essential for the development of psychosocial and motor skills and is vital for establishing lifelong PA [15].

Altogether, promoting children health needs a multifactorial approach, covering all these aspects that shows some degree of interrelationship.

To our knowledge, this is the first cross-sectional study aim to evaluate and compare the screen time and sleep time of preschool children, conducted at 6 kindergartens, selected for convenience, in two different regions from Portugal (Bragança and Gondomar) before and during the lockdown related to COVID-19 pandemic.

2 METHODOLOGY

For data collection, two phases were considered: the first one, before COVID-19 pandemic (before COVID-19), which the children's parents were interviewed using a questionnaire to evaluate the time spent by their children watching TV and playing video games, both during the week and during the weekend, as well as the number of hours of sleep. The second one, during the lockdown related to COVID-19 pandemic (during COVID-19 lockdown), were used an online questionnaire to assess the same information before COVID-19 and during COVID-19 lockdown decreed by the government of Portugal.

Participated in the first moment of the study (before COVID-19), 230 healthy children, of which 103 girls (mean age of 4.51 ± 0.82 years) and 127 boys (mean age of 4.48 ± 0.81 years).

In the second moment (during COVID-19 lockdown), participated 122 healthy children, of which 65 girls (mean age of 4.80 ± 0.66 years) and 57 boys (mean age of 5.00 ± 0.96 years).

It was asked to parent and guardians to answer a questionnaire to categorize the children's sedentary behaviors and the sleeping hours, with issues related to "time spent watching television" and "playing

video games”, both during the week and at the weekend, as well as the “number of hours of sleep”, adapted from Baecke et al (1982) questionnaire.

The parents and guardians of all children that participated in the present study signed an informed consent, and the study was approved by the local education authorities, and the General Directorate of Education - Ministry of Education.

Data were analyzed for normal distribution using Kolmogorov–Smirnov test. The mean, standard deviation and 95% confidence interval were calculated as descriptive statistics. Independent samples t-test was used for comparison between groups (girls and boys), and then between moments (before COVID-19 and during COVID-19 lockdown). Differences were considered significant when $p \leq 0.05$. All statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 23.0 statistical software for Mac (IBM, Armonk, NY, USA).

2 RESULTS

The Table 1 shows the differences between girls and boys regarding to age, height, body mass, BMI, time spent watching TV during the week and during the weekend, time playing video games during the week and during the weekend, and sleep time, in the first (before COVID-19) and second moment (during COVID-19 lockdown).

Table 1. Mean \pm standard deviation, by sex, of characterization variables, time spent watching TV (TV), time playing video games (PVG), both during the week and during the weekend, and the sleep time (Sleep) of all preschool children in the first (before COVID-19) and second moment (during COVID-19 lockdown).

Variable	First moment (n=230)			Second moment (n=122)		
	Girls(n=103)	Boys(n=127)	<i>p</i>	Girls(n=65)	Boys(n=57)	<i>p</i>
Age (years)	4.51 \pm 0.82	4.48 \pm 0.81	0.779	4.80 \pm 0.66	5.00 \pm 0.96	0.261
Weight (Kg)	18.85 \pm 3.92	19.26 \pm 3.02	0.425	19.02 \pm 3.71	20.27 \pm 3.55	0.060
Height (m)	1.06 \pm 0.13	1.09 \pm 0.06	0.028*	1.10 \pm 0.09	1.10 \pm 0.08	0.557
BMI	16.27 \pm 1.84	16.10 \pm 1.46	0.486	15.65 \pm 3.24	16.56 \pm 1.94	0.061
TV Week (hours)	1.46 \pm 0.77	1.47 \pm 0.81	0.939	2.68 \pm 1.71	2.61 \pm 1.58	0.834
TV Weekend (hours)	2.63 \pm 1.64	2.30 \pm 1.30	0.217	2.44 \pm 1.66	2.35 \pm 1.36	0.732
PVG Week (hours)	0.51 \pm 0.66	0.61 \pm 0.08	0.406	2.14 \pm 2.10	2.26 \pm 1.70	0.721
PVG Weekend (hours)	0.84 \pm 0.88	1.09 \pm 1.03	0.163	1.97 \pm 1.98	2.18 \pm 1.97	0.566
Sleep (hours)	10.07 \pm 0.87	10.03 \pm 0.84	0.885	10.44 \pm 2.93	10.18 \pm 1.30	0.536

* $p \leq 0.05$

The results show that there are no differences between girls and boys regarding age, body mass, BMI, time spent watching TV during the week and during the weekend, time playing video games during the week and during the weekend, and sleep time, within each moment of data collect. Only height was different between both sexes ($p=0.028$), with boys being taller than girls in the first moment of the study.

On the Table 2 shows the comparison, by sex, of the time spent by children watching TV (TV) and playing video games (PVG), both during the week and during the weekend, as well as the number of hours of sleep (Sleep) between the first (before COVID-19) and the second moment (during COVID-19 lockdown).

Table 2. Comparison between the first (before COVID-19) and the second (during COVID-19 lockdown) moment, by sex, of the time spent by children watching TV (TV) and playing video games (PVG), both during the week and during the weekend, as well as the number of hours of sleep (Sleep).

Variable	Girls			Boys		
	First Moment (n=103)	Second Moment (n=65)	<i>p</i>	First moment (n=127)	Second moment (n=57)	<i>p</i>
Sleep (hours)	10.07±0.87	10.44±2.93	0.408	10.03±0.84	10.18±1.30	0.462
TV Week (hours)	1.46±0.77	2.68±1.71	0.000*	1.47±0.81	2.61±1.58	0.000*
TV Weekend (hours)	2.63±1.64	2.44±1.66	0.538	2.30±1.30	2.35±1.36	0.820
PVG Week (hours)	0.51±0.66	2.14±2.10	0.000*	0.61±0.08	2.26±1.70	0.000*
PVG Weekend (hours)	0.84±0.88	1.97±1.98	0.000*	1.09±1.03	2.18±1.97	0.000*

**p* ≤ 0.05

When comparing the use of technology by girls and boys between the first and the second moment, it's very expressive the increase in time spent watching TV during the week for girls (before COVID-19 1.46±0.77; during COVID-19 lockdown 2.68±1.71; *p*=0.000), and for boys (before COVID-19 1.47±0.81; during COVID-19 lockdown 2.61±1.58; *p*=0.000), as well as playing video games during the week (*p*=0.000) and during the weekend (*p*=0.000). In fact, on average, parents and guardians reported that children (girls and boys) spent, at least, an hour more by day in the weekdays watching TV during the COVID-19 lockdown, compared to before COVID-19. The same increase size was reported to the time spent playing video games during the week (before COVID-19 0.51±0.66; during COVID-19 lockdown 2.14±2.10; *p*=0.000) for girls, and (before COVID-19 0.61±0.08; during COVID-19 lockdown 2.26±1.70; *p*=0.000) for boys; during the weekend (before COVID-19 0.84±0.88; during COVID-19 lockdown 1.97±1.98; *p*=0.000) for girls, and (before COVID-19 1.09±1.03; during COVID-19 lockdown 2.18±1.97; *p*=0.000) for boys.

Our results are in line with those from Cordovil et al. [16], where they found that the children up to 5 years of age spent 72.10% on sedentary activities during the day, of which 27.03% of that time on playful screen time during the COVID-19 pandemic. Other studies also indicate that children's daily routines were more sedentary after the pandemic, with a decrease in physical activity behaviors [17, 18], and an increase in screen time [19]. Some increase in the time spent on screen activities was already expected during the lockdown related to COVID-19 pandemic. Children tend to spend more time on screen activities, namely watching TV and using their computer to assist school classes online. This significant increase in the time spent on screen activities should be a factor of great concern by children at this age, with respect to promote their health and lifestyles. Despite the fact that we didn't find significant differences in the sleeping time between both periods, this didn't mean that didn't have a significant impact on the quality of sleep. The instrument that we used to assess this variable, don't have sensitivity enough to address this issue.

Notwithstanding the importance of the acquisition of technology skills, it is extremely important to control and measure the time spent by children on screen activities so as not to compromise their development. In this sense, other health outcomes should be explored in futures studies, namely anxiety, stress, irritability, inattention and emotional regulation difficulties and feelings. These acute symptoms may also be related with the new daily routine motivated by the lockdown during COVID-19 [20].

The percentage of children who meet and not meet the WHO recommendations [21] regarding to the time spent on screen activities and sleep time, both during the week and during the weekend of this study, before COVID-19 and during COVID-19 lockdown, are described in figure 1.

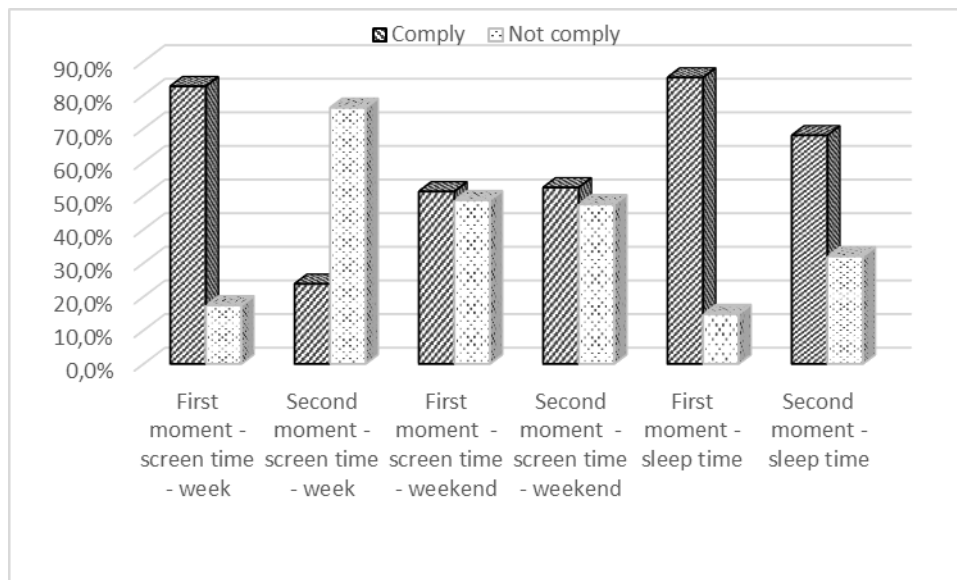


Figure 1. Percentage of children who meet and not meet WHO recommendations on screen activities time and sleep time, both during the week and during the weekend, in first and second moments (before and during the lockdown related to COVID-19 pandemic).

According to WHO recommendations [21], the time in sedentary screen activities should be no more than 1 hour, and less is better. Based on these recommendations, our results show that, before COVID-19, 82.6% follow the recommendation during the week, and 51.3% during the weekend. During COVID-19 lockdown, just 23.8% follow the recommendations during the week, and 52.5% during the weekend.

According to the sleep time recommendation between 10 and 13 hours per day for this age, before COVID-19, 85.2% of children sleep more than 10 hours, and during COVID-19 lockdown, 68.0% follow the recommendation. The decrease in the percentage of children who complied with the recommended hours of sleep between before and during the lockdown, is a worrying health risk problem since sleep time is a salient feature of health and wellbeing that impacts multiple aspects of early childhood development.

Healthy habits and behaviors are typically established during early childhood. Evidence suggests that these behaviors track into later life [22]. Children spend up to half of their after-school period with sedentary behaviors, such as screen activities. It has been recommended to limit the time spend by children in these kinds of activities, namely not be restrained for more than 1 hour at a time (e.g., prams/strollers) or sit for extended periods of time. Sedentary screen time should be no more than 1 hour; less is better. When sedentary, engaging in reading and storytelling with a caregiver is encouraged. Spend at least 180 minutes in a variety of types of physical activities at any intensity, of which at least 60 minutes is moderate-to vigorous intensity physical activity, spread throughout the day; more is better [21].

3 CONCLUSIONS

In conclusions, our study indicates that preschool children, due to confinement, spent more time in front of a screen (both watching TV and playing video games), especially during the weekdays. The number of hours of sleep was not statistically different before and during the lockdown related to COVID-19.

Despite the importance of the acquisition of technology skills by children, it is extremely important to control and measure the time they spend on this kind of activities in order to comply with the WHO recommendations.

As a limitation of the present study is the fact that preschool children are dependent on parent's decisions regarding their lifestyle, as well the questionnaires were answer according to parent's perception.

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