Association Between Bruxism and Screen Time in Adolescents

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Abstract: Adolescents are constantly using new technologies, and excessive screen use is known to have mental consequences, such as anxiety, depression, and stress, which also configure triggering factors for bruxism. The aim of this study is to analyze the association between bruxism and screen time in adolescents. A cross-sectional study was conducted with 2,433 students aged 14–19 years and enrolled in Brazilian public schools. Adolescents answered a questionnaire regarding their sociodemographic characteristics, bruxism, and screen time. The questions used to collected data were obtained from the Brazilian National School Health Survey, the Youth Risk Behavior Survey, and the Research Diagnostic Criteria for Temporomandibular Disorders. STATA 12.0 for Windows, EPI INFO 7.2.2.16, and Excel 2010 were used for information analysis. Absolute and relative frequencies were calculated to assess students' profiles. The chi-squared test was applied to verify associations between categorical variables. The prevalence ratio was calculated with a 95% confidence interval. Results will be analyzed considering a 5% significance level. Results show that among the participants, 32.4% had bruxism, 59.7% used screens excessively, 53% were aged 14–16 years, and 56.1% were girls. "Screen time" (p-value 0.008), "gender" (p-value 0.009), and "school grade" (p-value 0.001) were associated with bruxism. Regarding screen time, "paternal education" (p-value 0.037), "*Bolsa Família*" (p-value 0.034), and "monthly family income" (p-value 0.001) were associated with bruxism. Thus, bruxism and screen time had significant associations among the surveyed adolescents.

Keywords: Adolescent; Attitude in front of computers; Bruxism; Mental health; Screen time.

Associação entre Bruxismo e Tempo de Tela em Adolescentes

Resumo: Os adolescentes fazem uso constante de novas tecnologias, e o uso excessivo de telas pode gerar consequências mentais, como estresse, ansiedade e depressão, os quais também são fatores desencadeadores do bruxismo. Partindo desse pressuposto, objetiva-se analisar a associação entre bruxismo e tempo de tela em adolescentes. Foi feito um estudo transversal envolvendo 2.433 adolescentes estudantes de escolas públicas brasileiras na faixa etária de 14 a 19 anos. Eles responderam ao questionário contendo perguntas sobre características sociodemográficas, bruxismo e tempo de tela. Os dados foram coletados por meio de questões contidas no instrumento utilizado na Pesquisa Nacional de Saúde do Escolar (PeNSE), Youth Risk Behavior Survey (YRBS) e Critérios Diagnósticos de Pesquisa em Disfunção Temporomandibular (RDC/TMD). Para análise de informações foram utilizados os softwares STATA 12.0 para Windows, EPI INFO 7.2.2.16 e o Excel

2010. Para avaliar o perfil dos alunos foram calculadas as frequências absoluta e relativa. Foi aplicado o teste Qui-Quadrado para verificar a existência de associação para as variáveis categóricas. A Razão de Prevalência (RP) foi calculada com intervalo de confiança de 95%. Todas as conclusões foram tiradas considerando o nível de significância de 5%. Entre os pesquisados, 32,4% eram bruxistas, 59,7% faziam uso excessivo de telas, 53% tinham entre 14 e 16 anos, e 56,1% eram do sexo feminino. "Tempo de tela" (p-valor 0,008), "Sexo" (p-valor 0,009) e "Série" (p-valor 0,001) tiveram associação com o bruxismo. Já com relação ao tempo de tela, "Escolaridade do Pai" (p-valor 0,037), "Bolsa Família" (p-valor 0,034) e "Renda familiar mensal" (p-valor 0,001). Conclui-se que bruxismo e tempo de tela tiveram associação significante entre os adolescentes pesquisados.

Palavras-chave: Adolescente; Atitude frente aos computadores; Bruxismo; Saúde mental; Tempo de tela.

Asociación entre Bruxismo y Tiempo de Pantalla en Adolescentes

Resumen: Los adolescentes hacen uso constante de las nuevas tecnologías, y el uso excesivo de la pantalla puede generar secuelas mentales, como estrés, ansiedad y depresión, que también son factores desencadenantes del bruxismo. A partir de esto, el objetivo de este estudio es analizar la asociación entre bruxismo y tiempo de pantalla en adolescentes. Se realizó un estudio transversal con 2.433 adolescentes de entre 14 y 19 años de edad, estudiantes de escuelas públicas brasileñas. Los participantes respondieron el cuestionario que contenía preguntas sobre características sociodemográficas, bruxismo y tiempo de pantalla. Los datos fueron recolectados de preguntas que constan en el instrumento utilizado en la Encuesta Nacional de Salud Escolar (PeNSE), la Encuesta de Comportamientos de Riesgo en Jóvenes (YRBS) y los Criterios de Diagnóstico de Investigación sobre Trastornos Temporomandibulares (RDC/TMD). Para el análisis de la información se utilizó el *software* STATA 12.0 para Windows, EPI INFO 7.2.2.16 y Excel 2010. Para evaluar el perfil de los estudiantes se calcularon frecuencias absolutas y relativas. Se aplicó la prueba de chi-cuadrado para verificar la existencia de asociación para variables categóricas. Se calculó la razón de prevalencia (RP) con un intervalo de confianza del 95%. Todas las conclusiones se extrajeron considerando el nivel de significancia del 5%. Entre los encuestados, el 32,4% eran bruxistas, el 59,7% hacían uso excesivo de pantallas, el 53% tenían de entre 14 y 16 años y el 56,1% eran mujeres. El "tiempo de pantalla" (p-valor 0,008), "sexo" (p-valor 0,009) y "serie" (p-valor 0,001) se asociaron con bruxismo. En cuanto al tiempo de pantalla, la asociación estaba entre "educación del padre" (p-valor 0,037), "Bolsa Família" (p-valor 0,034) e "Ingreso familiar mensual" (p-valor 0,001). Se concluye que el bruxismo y el tiempo de pantalla tuvieron una asociación significativa entre los adolescentes encuestados.

Palabras clave: Adolescente; Actitud hacia el uso de las computadoras; Bruxismo; Salud mental; tiempo de pantalla.

Introduction

Digital natives are individuals who were born familiar with modern technology; they comprise Y, Z, and Alpha Generations, as the current adolescent generation (Novaes, 2018). Regarding behavioral characteristics, these individuals are involved in multimedia interactions that are carried out in an increasingly agile way. As a result, there is a strong emotional appeal in the face of the imminent need for agility in responses (Resolução CNE/CP, 2017).

Over the last 10 years, the use of electronic devices has increased excessively (Cui, Hardy, Dibley, & Bauman, 2011; Minges et al., 2015) and exposure to screens is highly widespread among adolescents (Grøntved et al., 2015). By definition, screen time is the period in which the child or adolescent uses electronics for

entertainment and the recommended limit is two hours per day (American Academy of Pediatrics [AAP], 2001). However, studies have indicated that adolescents consume digital media at an average of seven hours per day (Rideout, Ulla, Foehr, & Roberts, 2010; Wallace, 2015).

Thus, excess screen time is a reality in the adolescent population and the tendency is that the daily period destined for the use of electronics will increase over the years. The consequences of this event are diverse and can be both physical and mental. Regarding mental problems, anxiety, depression, and stress stand out (Anjos et al., 2020). In contrast, the literature argues that bruxism is a multifactorial disease associated with the same previously mentioned factors (Anjos et al., 2020). However, to the best of our knowledge, no field research has associated bruxism and screen time in adolescence.

In this context, this study aims to evaluate the association between bruxism and screen time in school adolescents aged 14–19 years from the state education system of Olinda, in the state of Pernambuco, Brazil.

Methodology

This cross-sectional, school-based analytical study is part of a larger project entitled "*Saúde bucal e comportamentos de risco à saúde modificáveis na adolescência - acompanhar para prevenir*" (Oral Health and modifiable health risk behaviors in adolescence – monitoring to prevent). The target population was school adolescents regularly enrolled in teaching units of the state education network of Olinda, in the state of Pernambuco (PE), aged 14–19 years of both sexes.

The formula for proportion in finite population sampling was employed to estimate sample size considering a 95% confidence interval, a margin of error of 2%, the total number of students of 8,902, a standard normal quantile of 1.96, expected bruxism prevalence of 33%, and expected prevalence of students who would not suffer from bruxism of 67%. The minimum sample size was estimated at 760 individuals; however, as it is an integrated project, the total sample was composed of 2,433 adolescents.

All students from the 27 schools selected for the study were invited to participate in the research and provided informed consent forms signed by their parents/guardians in addition to their own assent forms. For those who were over 18 years old, only the signed consent form was required. A total of 2,500 forms were returned, with the contribution of nearly all classrooms (91%) from the participating schools.

The eligibility criteria for the research were that students had participated in data collection stages by filling in the questions involving bruxism and screen time. Those with disability or dysfunction that impaired the self-completion of the questionnaire were excluded.

Data collection was conducted by administering three questionnaires, namely, the Brazilian National School Health Survey (PeNSE), the Youth Risk Behavior Survey (YRBS), and the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD), which together totaled 119 questions. The instrument used in PeNSE was administered to obtain sociodemographic data regarding age (14–16 and 17–19 years), school grade (first/second/third year of high school), sex (female/male), religion (yes/no), maternal education (less than 11 years / more than 11 years), paternal education (less than 11 years / more than 11 years), *Bolsa Família* (Family Allowance) (yes/no), and monthly household income (up to 1 minimum wage, 1 to 2 minimum wages, or more than 2 minimum wages).

In the YRBS, questions regarding screen time were used with excess screen time being considered as more than two hours per day. It collected information on how many hours of television, video game, computer, tablet, and smartphones were dedicated to non-school activities during the week. Data on the presence of bruxism were collected using the RDC/TMD, developed by Dworkin and LeResche (1992) and validated in Brazil by Lucena, Kosminsky, Costa, and Góes (2006). The questions used encompassed whether respondents noticed or were alerted by someone that they grind their teeth during the night or day and if they felt their jaw tired/painful when waking up. Positive diagnosis was considered when participants reported grinding or clenching their teeth and if they met one or more of the three criteria mentioned in the instrument (American Academy of Sleep Medicine [AASM], 2005).

For information analysis, the STATA 12.0 software for Windows, EPI INFO 7.2.2.16 and Excel 2010 were employed. To assess the students' profile, absolute and relative frequencies were estimated. The chi-square test was applied to verify the existence of association for categorical variables. Prevalence ratio (PR) was estimated with a 95% confidence interval. Results were analyzed considering 5% significance level.

The research was developed in accordance with resolution 466/2012, of the Brazilian National Health Council of the Ministry of Health, where it was submitted to and approved by the Research Ethics

Committee of the University of Pernambuco under CAAE 76609817.1.0000.5207.

Results

Table 1 shows the general characteristics of the included adolescents. In the sample, 32.4% of students had bruxism, 59.7% used screens excessively, 53% were aged 14–16 years, 37.5% were in the first year of high school, 56.1% were female, 68.7% had some religion, 55.4% of mothers had less than 11 years of schooling, 55.6% of fathers had less than 11 years of schooling, 54.3% did not receive the *Bolsa Família* benefit, and 58.4% reported monthly household income of up to 1 minimum wage.

Table 1
General sample data.

Characteristic	N	%
Bruxism		
Yes	789	32.4
No	1,648	67.6
Screen time (more than 2 h)		
Yes	1,455	59.7
No	982	40.3
Age		
14 – 16	1,291	53.0
17 – 19	1,146	47.0
School grade		
1st year of high school	900	37.5
2nd year of high school	698	29.0
3rd year of high school	806	33.5
Sex		
Female	1,335	56.1
Male	1,046	43.9
Religion		
Yes	1,656	68.7
No	755	31.3
Maternal schooling		
< 11 years	1,097	55.4
11 or more years	882	44.6
Paternal schooling		
< 11 years	853	55.6
11 or more years	682	44.4
Bolsa Família		
Yes	1,080	45.7
No	1,284	54.3
Monthly income		
Up to 1 minimum wage	929	58.4
From 1 to 2 minimum wages	451	28.3
More than 2 minimum wages	211	13.3

Table 2 presents the associations between bruxism and the dependent variables of the research. Among them, only "Screen time," "Sex," and "School grade" were associated with bruxism. Regarding screen time, we found that excess screen time generated a 17% greater risk of bruxism, with 95%CI PR ranging from 1.04 to 1.32 and significant p-value (0.008). Females showed 17% higher risk of bruxism, with 95%CI PR ranging from 1.04 to 1.32 and significant p-value (0.009). As for school grade,

being a second-year high-school student genera-ted a 11% higher risk of bruxism, with 95%CI PR ranging from 0.97 to 1.27 and significant p-value (0.001); as well as p-value corresponding to each year of high school being significant only for the second year (0.023).

Table 2
Bivariate analysis corresponding to association between bruxism and independent variables.

Characteristic	Bruxism				
	Yes n (%)	No n (%)	PR	95%CI PR	p-value *
Screen time (more than 2 h)					**0.008**
Yes	501 (34.4)	954 (65.6)	1.17	1.04 – 1.32	
No	288 (29.3)	694 (70.7)	1.00	---	
Age					0.068
14 – 16	439 (34.0)	852 (66.0)	1.11	0.99 – 1.25	
17 – 19	350 (30.5)	796 (69.5)	1.00	---	
School grade					**0.001**
1st year of high school	298 (33.1)	602 (66.9)	1.00	---	
2nd year of high school	256 (36.7)	442 (63.3)	1.11	0.97 – 1.27	0.137
3rd year of high school	226 (28.0)	580 (72.0)	0.85	0.73 – 0.98	**0.023**
Sex					**0.009**
Female	464 (34.8)	871 (65.2)	1.17	1.04 – 1.32	
Male	311 (29.7)	735 (70.3)	1.00	---	
Religion					0.921
Yes	534 (32.2)	1,122 (67.8)	1.00	---	
No	245 (32.5)	510 (67.5)	1.01	0.89 – 1.14	
Maternal schooling					0.562
< 11 years	368 (33.5)	729 (66.5)	1.00	---	
11 or more years	285 (32.3)	597 (67.7)	0.96	0.85 – 1.09	
Paternal schooling					0.283
< 11 years	291 (34.1)	562 (65.9)	1.00	---	
11 or more years	215 (31.5)	467 (68.5)	0.92	0.80 – 1.07	
Bolsa Família					0.971
Yes	350 (32.4)	730 (67.6)	1.00	0.89 – 1.12	
No	417 (32.5)	867 (67.5)	1.00	---	
Monthly household income					0.364
Up to 1 minimum wage	294 (31.6)	635 (68.4)	1.00	---	
From 1 to 2 minimum wages	160 (35.5)	291 (64.5)	1.12	0.96 – 1.31	0.156
More than 2 minimum wages	70 (33.2)	141 (66.8)	1.05	0.85 – 1.30	0.667

Table 3 presents associations between screen time and research-dependent variables. Among dependent variables under study, only "Paternal Schooling," "*Bolsa Família*," and "Monthly Household Income" were asso-ciated with screen time. As for paternal schooling, we found that schooling greater than 11 years generated a 9% greater risk of excess screen time, with 95%CI PR ranging from 1.01 to 1.18 and 0.037 p-value. We found that being benefited by the *Bolsa Família* Program is a protec-tive factor for excessive screen time, 95%CI PR ranging from 0.87 to 0.99 and 0.034 p-value. Monthly household income greater than two minimum wages generated a 21% greater risk of excessive screen time, with 95%CI PR ranging from 1.09 to 1.34 and 0.001 p-value.

Table 3
Bivariate analysis corresponding to the association between screen time and independent variables.

| Characteristic | Screen time (more than 2 h) | | PR | 95%CI PR | p-value * |
| | Yes | No | | | |
	n (%)	n (%)			
Age					0.132
14 – 16	789 (61.1)	502 (38.9)	1.05	0.98 – 1.12	
17 – 19	666 (58.1)	480 (41.9)	1.00	---	
School grade					0.169
1st year of high school	523 (58.1)	377 (41.9)	1.00	---	
2nd year of high school	438 (62.8)	260 (37.2)	1.08	1.00 – 1.17	0.060
3rd year of high school	482 (59.8)	324 (40.2)	1.03	0.95 – 1.11	0.479
Sex					0.320
Female	790 (59.2)	545 (40.8)	0.97	0.91 – 1.03	
Male	640 (61.2)	406 (38.8)	1.00	---	
Religion					0.196
Yes	976 (58.9)	680 (41.1)	1.00	---	
No	466 (61.7)	289 (38.3)	1.05	0.98 – 1.12	
Maternal schooling					0.180
< 11 years	644 (58.7)	453 (41.3)	1.00	---	
11 or more years	544 (61.7)	338 (38.3)	1.05	0.98 – 1.13	
Paternal schooling					**0.037**
< 11 years	497 (58.3)	356 (41.7)	1.00	---	
11 or more years	433 (63.5)	249 (36.5)	1.09	1.01 – 1.18	
Bolsa Família					**0.034**
Yes	625 (57.9)	455 (42.1)	0.93	0.87 – 0.99	
No	798 (62.1)	486 (37.9)	1.00	---	
Monthly income					**0.001**
Up to 1 minimum wage	539 (58.0)	390 (42.0)	1.00	---	
From 1 to 2 minimum wages	291 (64.5)	160 (35.5)	1.11	1.02 – 1.21	**0.021**
More than 2 minimum wages	148 (70.1)	63 (29.9)	1.21	1.09 – 1.34	**0.001**

Discussion

Bruxism

In this research, 32.4% of students had bruxism, a result similar to those found in other studies on bruxism in adolescents, ranging from 5.3% to 47.5%, during both night and day (Arman, Petruninaitė, Grigalauskienė, & Slabšinskienė, 2016; Thomaz, Cangussu, & Assis, 2013; Carra et al., 2011; Emodi Perlman et al., 2016; Itani et al., 2013; Murrieta et al., 2014; Prado et al., 2018; Sousa et al., 2018; Türkoğlu, Akça, Türkoğlu, & Akça, 2013; Van Selms, Visscher, Naeije, & Lobbezoo,

2012). It is difficult to compare prevalence studies on the subject due to the variation of age groups, different diagnostic methods, and non-specification of the type of bruxism. Another point that must be considered is the population profile under study. In addition, many studies do not correctly distinguish age groups, and childhood and adolescence are frequently found in the same group. This is not adequate, as occlusal adjustment occurs during childhood, which can change the prevalence described in studies when not considered.

We found that the prevalence of bruxism varies greatly, with the lowest value (5.3%) found by

Itani et al. (2013). The author had already conducted four studies with identical methodology in Japanese adolescents and the bruxism percentage was low in all outcomes. Moreover, in addition to bruxism, the author also evaluated arousal disorders and obtained an expressive value. The highest value (47.5%) was reported by Murrieta et al. (2014), who investigated the prevalence of bruxism, dental class, and their association in Mexican adolescents. Perhaps this high percentage is due to the clinical examination of the oral cavity, although the author justifies the result by considering the genetic factor.

When comparing studies with similar methodology and population to our study, we found similar prevalence. As in this work, Serra-Negra et al. (2018), who developed their research in Brazil, diagnosed bruxism only based on self-administered questionnaire. The author obtained a 36.8% prevalence of bruxism in their sample and attributed the value to poor sleep quality among university students. Another Brazilian study conducted by Prado et al. (2018) points to a 23.9% prevalence of bruxism, but the author only analyzed adolescents aged 12 years, which hinders further comparisons. Sousa et al. (2018) also developed their research in northeastern Brazil and followed the same methodology as the other referenced works, obtaining a 22.2% prevalence of bruxism in their sample. This represents a reduction of more than 10% in affected individuals compared to this study, despite the fact that both studies were conducted in Brazil and in the same region.

Regarding the age group surveyed (14–19 years old), we found no significant difference (p-value 0.068) between age groups of 14–16 and 17–19 years. However, despite the fact that more than one third attend the first year of high school, we found that being a second-year high school student generated greater risk of bruxism (p-value 0.001). When analyzing the p-value corresponding to each year of high school, we found a significant value only for the second year (0.023). This can be explained by the population profile, in which many students were in grades below their age and needed to develop work activities to provide extra income. Thus, it could be inferred that these individuals carry more responsibilities than other adolescents and are possibly under greater emotional burden, which corroborate the hypothesis of this research.

The studies conducted on bruxism show a long period of diagnosis of the parafunctional habit, ranging from 12 to 20 years (Emodi Perlman et al., 2016; Serra-Negra et al., 2018; Solano, Molina, & Hernández, 2019; Sousa et al., 2018; Türkoğlu et al., 2013; Van Selms et al., 2012). Corroborating this research, Serra-Negra et al (2018) found the age of 17 years, but it should be highlighted that the author only studied adolescents aged 16–18 years. This is due to the fact that the collection was conducted at a university where individuals have more responsibilities and tasks, possibly contributing to the development of arousal disorders. Solano et al. (2019) studied a broader age group compared to Serra-Negra et al. (2018) and found a higher prevalence of bruxism for the age group of 15–20 years, justifying the fact using the same aspects mentioned by the latter author. Van Selms et al. (2012) and Emodi Perlman et al. (2016) found 14.5% and 15.1%, respectively. Both studies were carried out in schools and without the inclusion of adolescents up to 19 years of age. Thus, the findings corroborate those of the other aforementioned studies, considering that the most advanced age group of the sample was the one that presented the highest bruxism percentage. In agreement with the World Health Organization (WHO), Sousa et al. (2018) and Türkoğlu et al. (2013) showed average of 12 years; however, both included only individuals aged 12 years in their studies.

Regarding sex, more than half respondents were female and presented higher risk of bruxism (p-value 0.009). Van Selms et al. (2012), Itani et al. (2013), and Solano et al. (2019) observed that bruxism was higher among females. Itani et al. (2013) justify this fact by concluding that female individuals tend to have higher frequency of arousal disorders, one of which is bruxism. Although Solano et al. (2019) did not point to an explanation for the fact, it was found that their studied sample showed predominance of female respondents. It is also noteworthy that Van Selms et al. (2012) only detected the prevalence of females in sleep bruxism but there was no difference in the daytime bruxism. The author did not provide an explanation for this fact.

Sousa et al. (2018) found prevalence of males and justified the finding by assuming that males are more agitated and motivated to contain their emotions. In this way, the practice of involuntary movements would be an emotional escape. In contrast, other studies have concluded that there is no difference between sexes (Arman et al., 2016; Emodi Perlman et al., 2016; Türkoğlu et al., 2013). In fact, the

work by Türkoğlu et al. (2013) was carried out with two groups (bruxism and no bruxism) and both had similar characteristics, including sex and age. The author points out in the text that no difference was observed between sex and bruxism, regardless of age group.

Regarding schooling, more than half of mothers and fathers had less than 11 years of schooling, that is, they did not complete the educational cycle. As for maternal education, the bruxism percentage among children was similar (p-value 0.562). Among the most recent studies on the subject, only Sousa et al. (2018) also analyzed this variable and found that 38.7% of mothers had seven years of schooling and 46.5% of them had schooling that ranged from 7 to 11 years. In agreement, both Brazilian studies showed that the general schooling was less than 11 years.

Among participants, most were not benefited by the *Bolsa Família* program, although the monthly household income was up to one minimum wage. Data seem to be contradictory but a possible explanation for the fact is the fear of jeopardizing their eligibility and, consequently, their family in some way when filling out the questionnaire, as individuals may not always meet all the inclusion criteria for the program. We found similar household income among participants (one and two minimum wages) and even with salary stratification, there was not a marked salary discrepancy. We found no significant association between bruxism and the *Bolsa Família* benefit (p-value 0.971) and monthly household income in minimum wages (p-value 0.364).

Screen time

Screen time of up to two hours per day has been advocated as ideal by the American Academy of Pediatrics since 2001 (AAP, 2001); however, a more recent study by Hu et al. (2018) suggested three hours per day. Despite the addition of one hour, these is still well below the average use of the population, with six to seven and a half hours per day (Rideout et al., 2010; Wallace, 2015). In this work, the value described by AAP (2001) was considered, which is applied in other studies on the subject (Feng, Zhang, Du, Ye, & He, 2014; Maras et al., 2015; Saunders & Vallance, 2016; Wu, Tao, Zhang, Zhang, & Tao, 2015). In the researched sample, 59.7% excessively used of screens, with values being similar to those found in other studies, such as those by Feng et al. (2014), reporting 72.2%; Saunders et al. (2016), 50%; and Wu et al. (2015), 48.2%.

We found that more than half of participants aged 14–16 years used screens excessively. In this age group, most cases of bruxism were also found, a result that corroborates the hypothesis of this research. Other authors conducted their work in university environments and participants had average age of 18–18.96 years (Feng et al., 2014; Wu et al., 2015; Zeeni, Doumit, Kharma, & Sanchez-Ruiz, 2018). Research carried out in schools indicated average age of 12.34–14.1 years (Maras et al., 2015; Merritt, LaQuea, Cromwell, & Ferguson, 2016). Notably, studies cover one of the phases of adolescence and, regardless of location, individuals have an average age in agreement with that established in this research. However, we found no statistically significant difference between screen time and age group (p-value 0.132).

Regarding bruxism, we noticed that most second-year high-school students had excess screen time, followed by third-year and first-year students. The findings referring to the second year corroborate Tenório et al. (2010), who found prevalence of almost half, compared to 1st, 2nd, and 3rd high-school students, both during the week and weekends. However, in this study, screen use by third-year students was slightly higher. Tenório et al. (2010) justifies that these students are focused on their studies and dedicate themselves to preparatory courses, so they have less time to using screens. Although university admission is still the goal for most students, we highlight that teaching methods have varied over the past 10 years. Therefore, the increase in the use of screens for educational purposes is plausible. This fact would also justify why screen time is greater among third-year students than among first-year students. However, we found no statistically significant association between screen time and high-school year (p-value 0.479).

We found no statistically significant difference between screen time and sex (p-value 0.320). These findings agree with other studies that evaluated the same variables and did not observe sex differences (Feng et al., 2014; Zeeni et al., 2018). On the other hand, some studies have concluded that males use screens more, especially during weekends (Tenório et al., 2010) and spend greater time using computers/video games (Rey-López, 2011). In contrast, Wu et al. (2016) found that females spend more time using screens due to social media use.

We noticed that more than half of participants had some type of religion, and the prevalence of

excess screen time was also more than half, regardless of having a religion or not (p-value 0.196). Although both values are close, we found a slight increase among those who did not have a religion. A possible justification for this is the fact that some religious doctrines limit access to electronic devices. This topic has not been discussed in other studies, thus limiting the debate on the subject.

We also noted that more than half of mothers whose children exceeded the recommended screen time studied for up to 11 years, with the percentage of mothers who studied for more than 11 years being slightly higher (p-value 0.180). As for paternal education, we observed that schooling greater than 11 years generated greater risk of excessive screen time (p-value 0.037). Data suggest that longer parental schooling led to longer screen time by adolescents. These findings are different from those described in literature, as Atkin et al. (2014) found longer screen time among those whose parents had lower schooling. Sousa and Silva (2017) pointed that adolescents with guardians who studied less than eight years were more likely to watch television in excess. Tenório et al. (2010) reported that 45.1% of students with screen time longer than recommendations had mothers with more than eight years of schooling. According to Rey-Lopes et al. (2011), adolescents whose parents completed higher education watch less television, whereas those whose parents only completed high school have more screen time, as they watch more television and use more computers and video games. Babey, Hastert, and Wolstein (2013) correlated screen time devoted to television with parents' lower educational levels. The discrepancy in results when compared to literature may be due to the profile of participants, in which higher educational level leads to improvement in the financial condition and, thus, an increase in access to electronic devices.

In this study, most individuals who used screens in excess did not receive the *Bolsa Família* benefit, and monthly household income above two minimum wages generated a greater risk of excessive screen time (p-value 0.001). Thus, it seems that better financial condition is directly proportional to the use of screens. However, the findings differ from the literature, as Sousa and Silva (2017) reported that those with lower economic levels were more likely of experiencing excessive total screen time. Smith-Menezes, Duarte, and Silva RJS (2012) also associated the excessive use

of computers, television, and video games with low-income adolescents, as well as Babey et al. (2013), who associated time spent watching television to lower household income. This discordance of results can be explained by the different screen time criteria used. Babey et al. (2013) and Smith-Menezes et al. (2012) reported screen use but did not include smartphones, for example, in addition to the use of different methods and sociodemographic characteristics.

Association between bruxism and screen time

We found that excessive screen time generated a greater risk of bruxism (p-value 0.008). Despite no other field research being found in the literature on the topic, a recent integrative review carried out based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria concluded that anxiety, stress, and depression are associated with bruxism and screen time in adolescence (Anjos et al., 2020). In another study, published by the latter original author, the same mental factors were associated with bruxism in adolescents. However, cause and effect cannot be determined since most studies included in both reviews adopted a cross-sectional design (Anjos et al., 2020).

Conclusion

We found an association between bruxism and screen time in school adolescents. The prevalence of bruxism was higher in the age group of 14–16 years and females were mostly affected, showing a higher risk of developing bruxism. The prevalence of excess screen time was higher in the age group of 14–16 years, found most among males.

Limitations

The questionnaires used for data collection had to be interpreted by students, which may affect the prevalence indicators. However, this type of research via self-report and anonymity contributes to the collection of more reliable data.

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