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ORIGINAL ARTICLE

Increased screen hours are associated with low school performance

Aumento de horas de pantalla se asocia con un bajo rendimiento escolar

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What do we know about the subject matter of this study?

Evidence indicates that screen time affects higher-order cognitive skills, related to performance and behavior. This issue has been studied in late adolescence and it is important to address it, with a preventive approach in childhood.

What does this study contribute to what is already known?

This study provides local data and the most updated evidence on the detrimental relationship between excessive screen time and academic performance in Chilean public schools.

Abstract

Objective: To analyze whether screen time is related to lower academic performance in second-cycle students and to determine differences by sex. **Subjects and Method:** Analytical, retrospective, and cross-sectional research. 733 students from the 5th to 8th year of public schools participating in the study "school health and performance survey in the Biobío province 2018" were recruited. The use of the screen was self-reported through daily hours in front of the TV, video games, and the internet. School performance was measured with the report card of reading, math, physical education, and the grade point average and through behaviors related to cognition in the school context. To determine the relationship between screen time and school performance, the Pearson's correlation coefficient was determined, and to measure the influence of sex and screen hours on the grades, a two-way ANOVA was performed. **Results:** The students spend 6.1 ± 5.3 hours in front of a screen daily. Boys spend more time playing video games and girls surfing the internet. Both boys and girls who spend more hours in front of a screen, mainly playing video games and surfing the internet, presented lower grades in mathematics, reading, physical education, grade point average, and had less memory, were

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slower in solving mathematical problems and had more difficulties in maintaining attention in class or solving complex tasks. **Conclusion:** Screen use is negatively associated with academic performance, as well as behaviors related to cognition in students of both sexes.

Introduction

Academic performance is a broad concept used to describe students' success in school[1,2]. It depends on factors such as cognitive and attitudinal skills, academic behaviors, and academic achievement[3]. In general, it is assessed based on academic achievement, by curriculum-based grades or specific scales, and academic behaviors such as homework participation, organization, or attendance[4].

Among the factors that could influence academic performance are personal components (intelligence, aptitudes, self-concept, motivation), psychosocial (socioeconomic and cultural level of the family, family aspects), and school (previous performance, school environment)[2], as well as environmental factors (schedule imposed by parents, shared rooms), social factors (use of internet and screen-based media), and emotional factors (mood swings and academic stress)[5,6]. Thus, screen time is defined as time spent watching television (TV) or other screen devices[7,8] and in children, it is recommended that it should not exceed two hours per day[9,10]. This time includes access to TV, computers, smartphones, video game consoles, tablets, and audio players[8].

Currently, 75% of young people have at least one screen device in their bedroom and 60% report regular use at least one hour before bedtime[11]. Studies indicate that 83.1% of school children spend more time than recommended for their age in front of a screen, with an average between 2.5 to 4 hours a day with a maximum of 8 hours[7-9], which is considered one of the main causes of sleep disorders in children and adolescents[12,13].

Screens affect sleep due to the delay of bedtime by the use of devices, the psychological stimulation of media content, and the effect of light from the screens[10,11,14]. This last aspect is of great interest to the scientific society since it has been demonstrated that in children, light exposure reduces melatonin secretion twice as much as in adults, altering the circadian cycle and the quality of sleep, affecting different areas such as physical, emotional, psychomotor, neurocognitive, academic, and neurocognitive[6,11].

Specifically in academic activities, schoolchildren show poor attendance, poor attention in class, decreased memory, and low grades due to decreased performance[5,6,10,15,16]. Research has shown that screen time affects higher-order cognitive skills, both performance and behavioral[6,12,13,17]. In this context, it is valuable to study the relationship between technology use and overuse on academic performance. This problem has been extensively studied in late adolescence and it is essential to address it, with a preventive approach in childhood and early adolescence[18,19]. The objectives of the study were to analyze whether screen time is related to lower academic performance in secondary educational cycle schoolchildren in public schools in the province of Biobío, Chile, and to determine whether there are differences according to gender.

Materials and Methods

Study design and population

Cross-sectional, analytical study. Data from the Health and School Performance Survey 2018 of the province of Biobío were used. The selected sample comprises schoolchildren from 5th to 8th grade of all public educational schools in a commune of the province of Biobío, Chile. 797 schoolchildren (12 ± 1.3 years) were included in a probabilistic and stratified sample with communal representativeness, who completed all the measurements, after signing the consent of the parents/legal guardian. 64 schoolchildren were excluded due to not attending the day of the measurements and not signing the informed consent form, therefore the sample was finally of 733 schoolchildren. For the calculation of the sample, a 5% error percentage and 95% confidence were considered.

Procedure

A collaboration was established between the research team and the Municipal Administration and Education Department of the commune evaluated, and then both the management team and teachers of the schools designed the study and selected the variables. Subsequently, teachers who applied the instruments were trained to reduce the risk of inter-evaluator bias. Data collection was carried out at the end of the first semester by the respective lead teacher of each class, in all schools, on the same day, and during the same class hours. Families, directors, and teachers were informed about the purpose of the study and agreed to participate in it. The project was approved by the Ethics Committee of the Vice-Rectory of Research and

Development of the *Universidad de Concepción*, Chile, and all procedures were carried out following the Declaration of Helsinki and Singapore.

Study variables

School performance: Schoolchildren's performance was evaluated through grade point average (GPA) and cognition associated behaviors in the school context.

a. Grade Point Average: The GPA of language arts, mathematics, physical education, and the cumulative GPA for the first academic semester of the current year were reported. Grades range from 1.0 to 7.0, where 4.0 is the passing grade. No differences in academic requirements were considered since all the schools were public and therefore subject to the same curricular bases and study programs issued by the Ministry of Education (MINEDUC)[20].

b. cognition associated behaviors in the school context: The researchers developed and applied a survey based on 5/18 items of the Daily Stress Inventory[21]. These items are associated with cognitive performance-related behaviors and have already been used in other studies[22]. The 5 questions were: *How good is your memory? how quickly do you solve a math problem at school? how well do you maintain attention in class without losing concentration? how well can you solve complex tasks at school?* and *how nervous do you get during a test?* They were scored from 0 to 10, where lower values indicated more problems in the evaluated behaviors and higher values, better behaviors, establishing 3 categories: 0-3 low, 4-6 medium, 7-10 high.

Screen time

Self-reported screen time was measured through 3 questions: *How many hours a day do you usually watch television? how many hours a day do you usually play video games on a tablet, computer, or cell phone*? and *how many hours a day do you usually use a tablet, computer, or cell phone for purposes other than gaming, for example, e-mailing, chatting, social networking, surfing the Internet or doing homework?* These questions have been used in different national and international studies[23]. The average screen time was calculated by summing these three questions. Screen time was categorized into low-medium < 2 hours/day and high ≥ 2 hours/day, following the recommendations of the American Academy of Pediatrics on this matter[24].

Socio-school data

The age, gender, and grade of each student were reported as well as whether they participated in the School Integration Program (SIP).

Statistical analysis

Qualitative data were presented as frequency and percentage and quantitative data as mean ± standard deviation. The distribution of the data was tested with the Shapiro-Wilk test, showing normality in all variables of analysis. In addition, equality of variances was verified with Levene's test, using parametric statistics. To establish the relationship between qualitative variables, bar graphs were used to present the grade point average given by the total number of hours of screen time per day (≤ 2 h/day, 3-4 h/day, 5-6 h/day, and > 6 h/day). To establish the association between nominal variables, the Chi-square test was used. The difference in means between two different groups was tested with the independent samples T-Student test. To determine the effect of gender and screen time on GPA, a 2x4 two-way ANOVA was performed (sex factor boy/girl; screen time factor ≤ 2 h/day, 3-4 h/day, 5-6 h/day, and > 6 h/day). To establish significant differences between the categories of the screen time factor, the Post hoc HSD test was performed. To establish the linear relationship between the variables of school performance/ cognition associated behaviors in the school context and screen time, Pearson's correlation coefficient was used. The significance levels used were $p \leq 0.05$ and $p \leq 0.01$.

Results

Table 1 shows the socio-school characteristics, cognition associated behaviors in the school context, and GPA according to gender. It was observed that the students in the secondary educational cycle are mostly boys (53.9%), with an average age of 12 years, and that only 19.2% participate in the SIP. Most of the students perceived themselves as having a good memory (60.4%), quick to solve mathematical problems (50.6%), with average attention span (40.9%), without problems in solving complex tasks (47.1%), and without nervousness during a test (52%). Boys were perceived as less slow to solve mathematical problems ($p = 0.024$), with fewer problems to solve complex tasks ($p = 0.04$), and less nervous ($p = 0.015$) than girls. Additionally, it was evidenced that girls had a better GPA in language arts and cumulative GPA than boys ($p = 0.007$; $p = 0.002$, respectively) (Table 1).

Table 2 shows the usual time schoolchildren spent daily in front of a screen. On average, it was observed that students in the secondary educational cycle spent more than 6 hours a day in front of a screen, either watching TV, playing video games, surfing the Internet, or doing homework. Boys spent more time playing video games ($p = 0.038$) and girls spent more time surfing the Internet (chatting, social networking, e-mailing, or doing homework) ($p = 0.002$) (Table 2).

Figure 1 shows the GPA in mathematics, language arts, physical education, and cumulative GPA according to the number of hours spent in front of the screen per day. It was observed that boys had a lower GPA in language arts ($p = 0.002$). This effect was higher in boys who spent more hours in front of the screen ($p = 0.001$). The greatest difference in GPA in language arts between boys and girls was observed in schoolchildren who spent between 4-6 hours a day in front of the screen ($p = 0.000$). Likewise, it was evidenced that boys had lower cumulative GPA ($p = 0.001$) and that as the daily hours in front of the screen increased, the cumulative GPA decreased ($p = 0.020$), where the lowest grades were observed in boys who spent more hours in front of the screen ($p = 0.044$). As with the GPA in mathematics, the greatest difference in the cumulative GPA between boys and girls was observed in schoolchildren who habitually spent between 4-6 hours per day in front of the screen ($p = 0.000$). Additionally, the largest difference in grades was observed between those who spent < 2 hours and > 6 hours in front of the screen ($p = 0.005$) (Figure 1).

Figure 2 shows the cognition associated behaviors in the school context according to daily hours in front of the screen. It was observed that boys who were < 2 hours and between 5-6 hours a day in front of the screen perceived themselves to be less slow in solving mathematical problems than girls ($p = 0.039$; $p = 0.001$, respectively), and when they were between 5-6 hours in front of the screen, they perceived themselves to be less nervous ($p = 0.033$) (Figure 2).

Table 3 showed the inverse association between the number of hours spent playing video games per day and behaviors associated with cognition in the school context and GPA. This implies that a greater number of daily hours playing video games was associated with the perception of having a poor memory ($p = 0.022$), less attention span in class ($p = 0.009$), and greater difficulty in solving complex tasks ($p = 0.004$), as well as lower GPA in mathematics ($p = 0.002$), language arts ($p = 0.003$), physical education ($p = 0.043$), and cumulative GPA ($p = 0.000$).

Additionally, it was observed that schoolchildren who spend more time surfing the internet (chatting, social networking or doing homework, etc.), perceived themselves to be slower in solving mathematical problems ($p = 0.011$), with more difficulties in maintaining attention span ($p = 0.004$), and solving complex tasks ($p = 0.002$) and presented lower grades in mathematics ($p = 0.002$), physical education ($p = 0.011$), and cumulative GPA ($p = 0.000$). When adding up all the hours schoolchildren spent per day in front of a screen, these associations remain. Thus, those who spent more hours per day in front of a screen, perceived themselves as slower in solving mathematical problems ($p = 0.011$), with more difficulties in maintaining attention span ($p = 0.000$) and solving complex tasks ($p = 0.000$), and obtained lower grades in mathematics ($p = 0.000$), language arts ($p = 0.005$), physical education ($p=0.008$), and cumulative GPA ($p = 0.000$). When analyzed independently in boys and girls, there were similar associations (Table 3).

Discussion

The main findings suggest that boys have a better self-perception in cognition-related behaviors in school than girls. However, girls obtained better grades in language arts and cumulative GPA. It was found that students spend a high number of hours daily in front of screens (6.1 ± 5.3 hours) as well as identified that schoolchildren who have the habit of prolonged screen use have lower grades in the subjects of language arts, mathematics, physical education, and cumulative GPA and perceive themselves as having lower competencies associated with cognition in their school environment.

Current evidence has indicated that gender-stereotyped socialization influences the gender differential construction of this self-perception, which could explain why girls perceive themselves with lower cognition-related behaviors than boys[25], although this does not affect their academic performance. Recommendations regarding screen time in school-age boys and girls coincide in indicating that it should not exceed two hours a day[9,10,24]. In this regard, the results obtained exceed the results of a study in Asian adolescents where the average screen time reaches 3.5 h/day and 67% exceeds the recommendation[26], or a study in Australia with an average of 3.6 h/day[27], even that reported in Chilean students who reach an average of 3.3 h/day[28] and 63.2% exceeds the recommendation[29]. The results establish a warning signal considering that excess exposure affects the quality of life of children, decreases physical activity, and increases the obesity rate[27,30,31].

Screen time has become a common form of leisure[32], which has led to an increase in sedentary behavior in the population[33]. Recent studies have suggested that sedentary behaviors have the potential to affect brain structure and, at the same time, intelligence in overweight and/or obese children[34], highlighting the complexity of the interrelationship between physical inactivity, sedentary behaviors and obesity, and their consequences in various areas[35-37].

Our results showed that the number of hours spent playing video games per day was inversely associated with GPA, indicating that the more hours spent playing video games per day, the lower the grades in mathematics, language arts, physical education, and cumulative GPA. Similarly, this occurs with the total

Table 1. socio-school characteristics, cognition associated behaviours in the school context, and GPA according to gender. n = 733

Variables	Boys	Girls	All schoolchildren
n (%)	395 (53,9)	338 (46,1)	733 (100)
Age (M ± SD)	12,1 ± 1,4	12,0 ± 1,2	12,0 ± 1,3
Grade			
Fifth grade	94 (23,8)	68 (20,1)	162 (22,1)
Sixth grade	98 (24,8)	89 (26,3)	187 (25,5)
Seventh grade	96 (24,3)	102 (30,2)	198 (27,0)
Eighth grade	107 (27,1)	79 (23,4)	186 (25,4)
School integration program (SIP)††			
Yes	88 (22,3)	53 (15,7)	141 (19,2)
No	307 (77,7)	285 (84,3)	592 (80,8)
Cognition associated behaviors in the school context			
Memory at school			
Bad memory	18 (4,6)	30 (8,9)	48 (6,5)
Average memory	133 (33,7)	109 (32,2)	242 (33,0)
Good memory	244 (61,8)	199 (58,9)	443 (60,4)
Quickness to solve a math problem at school††			
Slow to solve math problems	44 (11,1)	77 (22,8)	121 (16,5)
Average to solve math problems	124 (31,4)	117 (34,6)	241 (32,9)
Quick to solve math problems	227 (57,5)	144 (42,6)	371 (50,6)
Attention span in class without losing concentration			
Bad attention span	71 (18,0)	72 (21,3)	143 (19,5)
Average attention span	162 (41,0)	138 (40,8)	300 (40,9)
Good attention span	162 (41,0)	128 (37,9)	290 (39,6)
Solving complex tasks at school††			
With problems in solving complex tasks	45 (11,4)	64 (18,9)	109 (14,9)
With some problems in solving complex tasks	146 (37,0)	133 (39,3)	279 (38,1)
Without problems solving complex tasks	204 (51,6)	141 (41,7)	345 (47,1,)
Nervousness during a test†			
Very nervous during a test	72 (18,2)	89 (26,3)	161 (22,0)
Moderate nervousness during a test	101 (25,6)	90 (26,6)	191 (26,1)
Without nervousness during a test	222 (56,2)	159 (47,0)	381 (52,0)
Grade point average (GPA)			
Mathematics (1-7) (M ± SD)	5,2 ± 1,00	5,2 ± 1,03	5,2 ± 1,01
Language (1-7) (M ± SD)	5,0 ± 0,82	5,2 ± 0,80**	5,1 ± 0,82
Physical education (1-7) (M ± SD)	6,4 ± 0,55	6,4 ± 0,53	6,4 ± 0,54
Cumulative GPA (1-7) (M ± SD)	5,6 ± 0,57	5,7 ± 0,59**	5,6 ± 0,58

Qualitative data presented as frequency and percentage and quantitative data as mean ± standard deviation (M ± SD). Differences are significant with a *p ≤ 0.05 and **p ≤ 0.01. The significant association used was †p ≤ 0.05 and ††p ≤ 0.01.

Table 2. Self-reported screen time.

	Boys	Girls	All schoolchildren
Self-reported screen time (hours/day)			
Television (hours/day)	1.6 ± 1.5	1.7 ± 1.7	1.7 ± 1.6
Video games on a tablet, computer, or cell phone (hours/day)	2.4 ± 2.3*	2.0 ± 2.7	2.2 ± 2.5
Tablet, computer, or cell phone for purposes other than gaming, for example, e-mailing, chatting, social networking, surfing the Internet or doing homework (hours/day)	2.0 ± 2.5	2.6 ± 3.1**	2.3 ± 2.8
Average screen time (hours/day)	6.0 ± 4.5	6.3 ± 6.2	6.1 ± 5.3
Self-reported screen time (sorting)†			
0-2 (hours/day)	59 (14.9)	65 (19.2)	124 (16.9)
3-4 (hours/day)	116 (29.4)	95 (28.1)	211 (28.8)
5-6 (hours/day)	98 (24.8)	56 (16.6)	154 (21.0)
+ 6 (hours/day)	122 (30.9)	122 (36.1)	244 (33.3)

Qualitative data presented as frequency and percentage and quantitative data as mean ± standard deviation. Differences are significant with a*p ≤ 0.05 and **p ≤ 0.01. †The significant association used was p ≤ 0.05. n = 733.

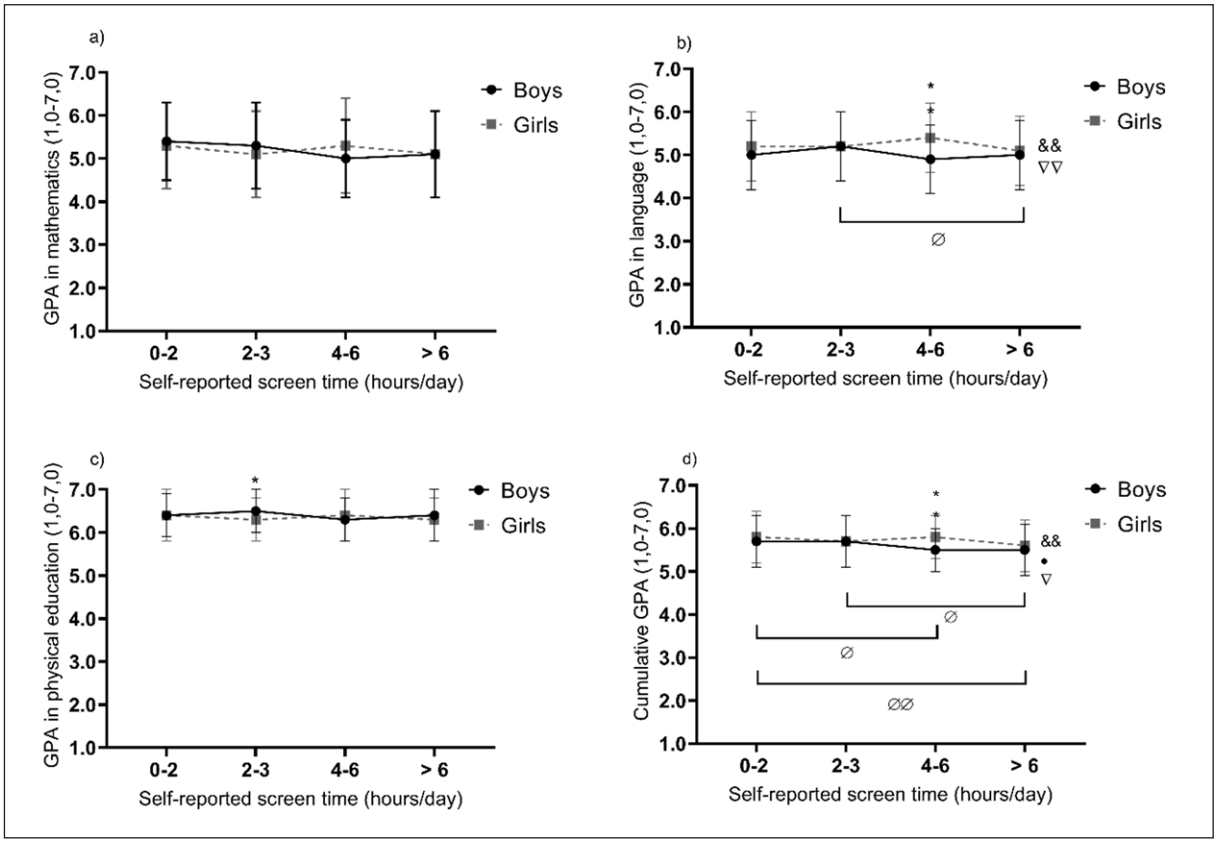

Figure 1. GPA according to the number of hours spent in front of the screen per day. a) GPA in mathematics, b) GPA in language arts, c) GPA in physical education y d) cumulative GPA. && = significant effect of the gender factor with a p < 0.01, · = significant effect of the screen hours factor with a p < 0.05, ∇∇ = significant effect of the interaction of the gender factor by screen hours factor with a p < 0.01, ∇ = significant effect of the interaction of the sex factor by screen hours factor with a p < 0,05**= Differences are significant between gender with a p < 0.01. ∅∅ = differences are significant between screen hours with a p < 0.01(post hoc MDS), ∅ = Differences are significant between screen hours with a p < 0,05 (post hoc MDS). Data presented as mean ± standard deviation (M ± SD). n = 733

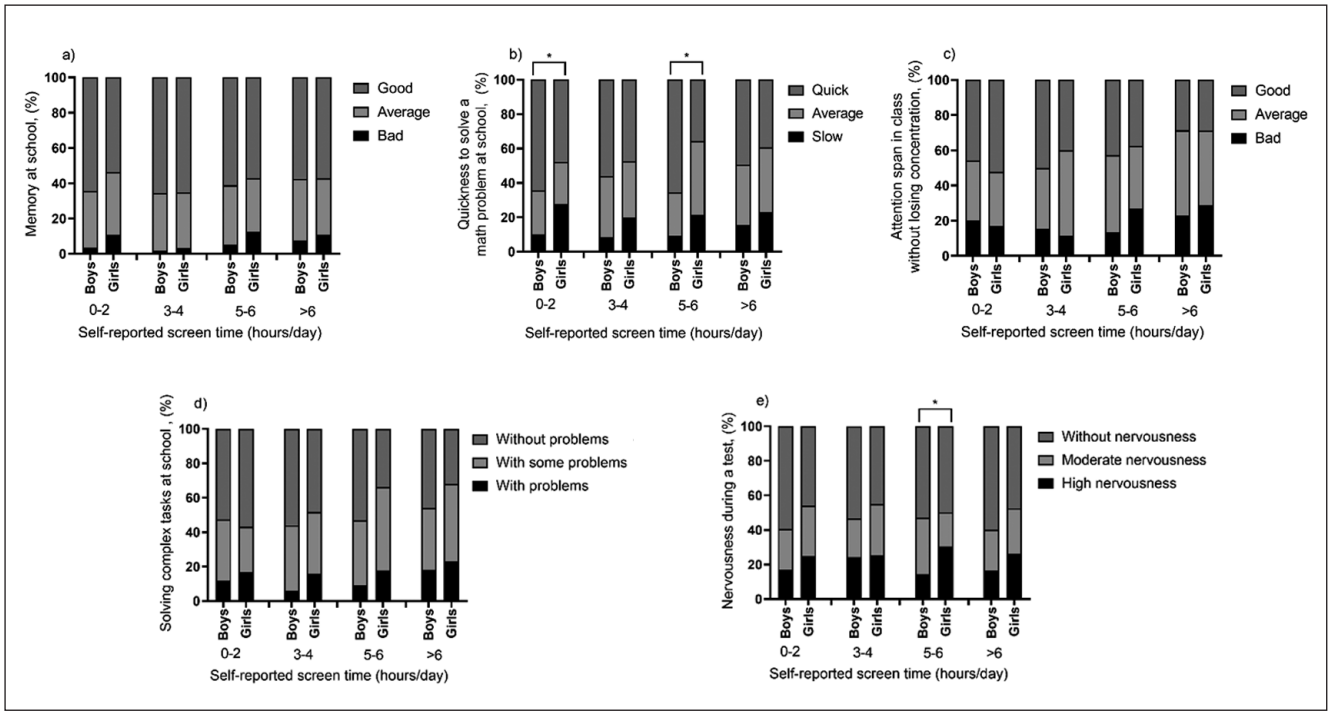

Figure 2. Cognition associated behaviors in the school context according to daily hours spent in front of the screen by gender a) memory at school, b) quickness to solve a math problem at school, c) attention span in class without losing concentration, d) solving complex tasks at school, e) nervousness during a test. *The association between gender and cognition associated behaviors in the school context is significant $p < 0,05$. Data presented as percentage. n = 733.

time spent in front of a screen per day, as reported by other studies[38,39].

In addition, it was observed that screen time was related to behaviors associated with cognition. In this sense, schoolchildren who spent more time per day in front of a screen (TV, video games, or computer), perceived themselves to be slower in solving mathematical problems, less attentive in class and had greater difficulty solving complex tasks at school. However, a recent study suggests positive relationships between the time spent using mobile devices and games, with language arts skills and scientific knowledge[40], orienting the discussion towards the type of activity or game that is performed during this time.

This study contributes with local information on the negative association of the high number of hours spent daily by schoolchildren in front of a screen (watching TV, playing non-educational video games, or surfing the Internet in social networks) on the grades obtained and behaviors associated with cognition in the school environment. Thus, it becomes the most updated evidence that shows the detrimental relationship of excessive screen time on the academic performance of schoolchildren in Chilean public schools. These results can provide evidence and be used in educational centers to reflect on the potential negative impact of overexposure to screens on school performance and behaviors related to cognition in the school environment.

Limitations of the study

The causes of poor school performance are multifactorial and cannot be limited to the number of hours schoolchildren spend in front of a screen. This research only studied the association between screen time and school performance and its differences by gender and did not analyze the causes of such poor performance, nor did it analyze other personal, family, or school context variables that could be associated with academic performance. Subsequent studies should further investigate current behaviors or lifestyles that may also be related to school performance, such as cell phone use, low levels of physical activity, sleep and eating habits, and routines. Recently, evidence has already suggested that increased adiposity, the presence of unhealthy eating habits, and low levels of physical activity are associated with poor academic performance in schoolchildren[41,42].

Conclusions

It was observed that girls have better school per-

Table 3. linear relationship between the variables of school performance/ cognition associated behaviors in the school context and screen time.

Self-reported screen time (hours/day)	Cognition associated behaviors in the school context					Grade point average (GPA)			
	1	2	3	4	5	Mathematics	Language	Physical education	cumulative GPA
All schoolchildren									
Television (hours/day)	0.031	-0.022	-0.061	-0.055	-0.002	-0.064	-0.044	-0.041	-0.063
Video games on a tablet, computer, or cell phone (hours/day)	-0.084*	-0.022	-0.097**	-0.106**	0.042	-0.112**	-0.110**	-0.075*	-0.156**
Tablet, computer, or cell phone for purposes other than gaming, for example, emailing, chatting, social networking, surfing the Internet or doing homework (hours/day)	-0.042	-0.094*	-0.107**	-0.116**	0.061	-0.116**	-0.072	-0.094*	-0.144**
Average screen time (hours/day)	-0.068	-0.094*	-0.176**	-0.167**	0.036	-0.133**	-0.103**	-0.097**	-0.169**
Boys									
Television (hours/day)	-0.020	-0.035	-0.057	-0.050	-0.026	-0.068	-0.033	0.014	-0.052
Video games on a tablet, computer, or cell phone (hours/day)	-0.195**	-0.139**	-0.082	-0.184**	0.008	-0.107*	-0.115*	-0.035	-0.122*
Tablet, computer, or cell phone for purposes other than gaming, for example, emailing, chatting, social networking, surfing the Internet or doing homework (hours/day)	-0.065	-0.109*	-0.148**	-0.126*	0.111*	-0.139**	-0.101*	-0.018	-0.149**
Average screen time (hours/day)	-0.143**	-0.144**	-0.143**	-0.181**	0.058	-0.155**	-0.126*	-0.023	-0.163**
Girls									
Television (hours/day)	0.067	-0.049	-0.207**	-0.070	-0.008	-0.060	-0.062	-0.093	-0.083
Video games on a tablet, computer, or cell phone (hours/day)	-0.102	-0.093	-0.166**	-0.150**	-0.082	-0.118*	-0.093	-0.124*	-0.174**
Tablet, computer, or cell phone for purposes other than gaming, for example, emailing, chatting, social networking, surfing the Internet or doing homework (hours/day)	-0.106	-0.152**	-0.207**	-.182**	-0.088	-0.096	-0.069	-0.158**	-0.171**
Average screen time (hours/day)	-0.080	-0.132*	-0.236**	-0.178**	-0.083	-0.118*	-0.093	-0.161**	-0.186**

1 = memory at school, 2 = quickness to solve a math problem at school, 3 = attention span in class without losing concentration, 4 = solving complex tasks at school, 5 = nervousness during a test. n = 733 (n = 395 boys; n = 342 girls). The significant association used was *$p \leq 0.05$ and **$p \leq 0.01$.

formance, although they have a lower self-perception of their cognition-related behaviors. Boys spend more time per day playing video games and girls spend more time surfing the Internet. It was found that those who presented the lowest cumulative GPA were the boys who spent more time in front of a screen each day. In addition, it was found that both boy and girl schoolchildren who spent more hours in front of a screen, mainly playing video games and surfing the Internet, had lower grades in mathematics, language arts, physical education, and cumulative GPA. They also perceived themselves as having less memory, slower in solving mathematical problems, with more difficulties in maintaining attention span in class or in solving complex tasks.

Ethical Responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

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References

1. Navarro RE. El rendimiento académico: concepto, investigación y desarrollo. REICE Revista Iberoamericana sobre Calidad, Eficacia y Cambio en Educación 2003;1(2):0.
2. Portolés A, Hernández JG. Rendimiento académico y correspondencias con indicadores de salud física y psicológica. Sportis: Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad 2015;1(2):164-81.
3. Rasberry CN, Lee SM, Robin L, et al. The association between school-based physical activity, including physical education, and academic performance: a systematic review of the literature. Prev Med. 2011;52 Suppl 1:S10-20.
4. Álvarez-Bueno C, Pesce C, Cavero-Redondo I, et al. Academic Achievement and Physical Activity: A Meta-analysis. Pediatrics 2017:e20171498.
5. Johansson AE, Petrisko MA, Chasens ER. Adolescent sleep and the impact of technology use before sleep on daytime function. Journal of pediatric nursing 2016;31(5):498-504.
6. Singh R, Suri JC, Sharma R, et al. Sleep pattern of adolescents in a school in Delhi, India: Impact on their mood and academic performance. The Indian Journal of Pediatrics 2018;85(10):841-8.
7. Carson V, Janssen I. Associations between factors within the home setting and screen time among children aged 0-5 years: a cross-sectional study. BMC Public Health. 2012;12(1):539.
8. Jari M, Qorbani M, Motlagh ME, et al. A nationwide survey on the daily screen time of Iranian children and adolescents: the CASPIAN-IV study. International journal of preventive medicine 2014;5(2):224.
9. Morowatisharifabad MA, Karimi M, Ghorbanzadeh F. Watching television by kids: How much and why? Journal of education and health promotion 2015;4.
10. Lissak G. Adverse physiological and psychological effects of screen time on children and adolescents: Literature review and case study. Environmental research. 2018;164:149-57.
11. Hale L, Kirschen GW, LeBourgeois MK, et al. Youth screen media habits and sleep: sleep-friendly screen behavior recommendations for clinicians, educators, and parents. Child and Adolescent Psychiatric Clinics 2018;27(2):229-45.
12. Martín-Perpiñá MdlM, Viñas i Poch F, Malo Cerrato S. Media multitasking impact in homework, executive function and academic performance in Spanish adolescents. Psicothema, 2019;vol 31,núm 1:81-7.
13. Peiró-Velert C, Valencia-Peris A, González LM, et al. Screen media usage, sleep time and academic performance in adolescents: clustering a self-organizing maps analysis. PloS one. 2014;9(6).
14. Schmidt RE, Van der Linden M. The relations between sleep, personality, behavioral problems, and school performance in adolescents. Sleep medicine clinics 2015;10(2):117-23.
15. Cohen-Zion M, Shiloh E. Evening chronotype and sleepiness predict impairment in executive abilities and academic performance of adolescents. Chronobiology international 2018;35(1):137-45.
16. Sivertsen B, Glozier N, Harvey AG, et al Academic performance in adolescents with delayed sleep phase. Sleep medicine 2015;16(9):1084-90.
17. Wang G, Ren F, Liu Z, et al. Sleep patterns and academic performance during preparation for college entrance exam in Chinese adolescents. Journal of School Health. 2016;86(4):298-306.
18. Pecor K, Kang L, Henderson M, et al. Sleep health, messaging, headaches, and academic performance in high school students. Brain and Development. 2016;38(6):548-53.
19. Russo PM, Biasi V, Cipolli C, et al. Sleep habits, circadian preference, and school performance in early adolescents. Sleep medicine 2017;29:20-2.
20. Cigarroa I, Sarqui C, Palma D, et al. Estado Nutricional, condición física, rendimiento escolar, nivel de ansiedad y hábitos de salud en estudiantes de

primaria de la provincia del Bío Bío (Chile): Estudio transversal. Revista chilena de nutrición 2017;44(3):209-17.
21. Encina Y, Ávila M. Validación de una escala de estrés cotidiano en escolares chilenos. Revista de Psicología (PUCP) 2015;33(2):363-85.
22. Solis-Urra P, Olivares-Arancibia J, Suarez-Cadenas E, et al. Study protocol and rationale of the "Cogni-action project" a cross-sectional and randomized controlled trial about physical activity, brain health, cognition, and educational achievement in schoolchildren. BMC Pediatrics 2019;19(1):260.
23. Moreno M, Rivera de los Santos F, Ramos P, et al. Estudio Health Behaviour in School-aged Children (HBSC): Análisis comparativo de los resultados obtenidos en 2002 y 2006 en España. 2008.
24. Communications Co, Media. Media and young minds. Pediatrics 2016;138(5):e20162591.
25. Orrego TM, Milicic N, García MJP. La autoestima en alumnos de 3º a 8º básico. Una mirada por nivel de escolaridad y género. Revista Iberoamericana de Evaluación Educativa 2017;10(2):111-25.
26. Chang F-C, Chiu C-H, Chen P-H, et al. Computer/mobile device screen time of children and their eye care behavior: the roles of risk perception and parenting. Cyberpsychology, Behavior, and Social Networking 2018;21(3):179-86.
27. Tsiros MD, Samaras MG, Coates AM, et al. Use-of-time and health-related quality of life in 10-to 13-year-old children: not all screen time or physical activity minutes are the same. Quality of Life Research. 2017;26(11):3119-29.
28. Delgado-Floody P, Jerez-Mayorga D, Caamaño-Navarrete F, et al. Bienestar psicológico relacionado con el tiempo de pantalla, la actividad física después de la escuela y el peso corporal en escolares chilenos. Nutrición Hospitalaria 2019;36(6):1254-60.
29. Aguilar M, Vergara F, Velásquez E, et al. Actividad física, tiempo de pantalla y patrones de sueño en niñas chilenas. Anales de Pediatría 2015: Elsevier.
30. Moreno-Villares JM, Galiano-Segovia MJ. El tiempo frente a las pantallas: la nueva variable en la salud infantil y juvenil. Nutrición Hospitalaria 2019;36(6):1235-6.
31. Ibarra Mora J, Hernández-Mosqueira C. Hábitos de vida saludable de actividad física, alimentación, sueño y consumo de tabaco y alcohol, en estudiantes adolescentes chilenos. Sportis 2019;5(1):70-84.
32. Pate RR, Mitchell JA, Byun W, et al. Sedentary behaviour in youth. British journal of sports medicine 2011;45(11):906-13.
33. Tremblay MS, LeBlanc AG, Kho ME, et al. Systematic review of sedentary behaviour and health indicators in school-aged children and youth. International journal of behavioral nutrition and physical activity 2011;8(1):98.
34. Zavala-Crichton JP, Esteban-Cornejo I, Solis-Urra P, et al. Association of Sedentary Behavior with Brain Structure and Intelligence in Children with Overweight or Obesity: The ActiveBrains Project. Journal of clinical medicine 2020;9(4):1101.
35. Cigarroa I, Sarqui C, Lamana RZ. Efectos del sedentarismo y obesidad en el desarrollo psicomotor en niños y niñas: Una revisión de la actualidad latinoamericana. Universidad y Salud 2016;18(1):156-69.
36. Soler-Lanagrán A, Castañeda-Vázquez C. Estilo de vida sedentario y consecuencias en la salud de los niños. Una revisión sobre el estado de la cuestión. Journal of Sport and Health Research. 2017;9(2):187-98.
37. Leiva A, Martínez M, Cristi-Montero C, et al. El sedentarismo se asocia a un incremento de factores de riesgo cardiovascular y metabólicos independiente de los niveles de actividad física. Revista médica de Chile 2017;145(4):458-67.
38. Faught EL, Ekwaru JP, Gleddie D, et al. The combined impact of diet, physical activity, sleep and screen time on academic achievement: a prospective study of elementary school students in Nova Scotia, Canada. International Journal of Behavioral Nutrition and Physical Activity 2017;14(1):29.
39. Badia M, Clariana M, Gotzens C, et al. Videojuegos, televisión y rendimiento académico en alumnos de primaria. Pixel-Bit Revista de Medios y Educación 2015(46):25-38.
40. Hu BY, Johnson GK, Teo T, et al. Relationship between screen time and Chinese children's cognitive and social development. Journal of Research in Childhood Education 2020;34(2):183-207.
41. Correa-Burrows P, Rodriguez Y, Blanco E, et al. Increased adiposity as a potential risk factor for lower academic performance: A cross-sectional study in chilean adolescents from low-to-middle socioeconomic background. Nutrients 2018;10(9):1133.
42. Correa-Burrows P, Rodríguez Y, Blanco E, et al. Snacking quality is associated with secondary school academic achievement and the intention to enroll in higher education: A cross-sectional study in adolescents from Santiago, Chile. Nutrients 2017;9(5):433.