



Submitted on: 02/24/2023

Approved on: 03/29/2023

REVIEW ARTICLE

Association between childhood screen exposure and pediatric obesity: a literature review

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Keywords:

Pediatric obesity,
Screen time,
Life style,
Sedentary behavior.

Abstract

Introduction: Most children are exposed to screens and digital media early and for a longer period than recommended by scientific societies. This phenomenon has several harmful consequences for the health and development of children. Pediatric obesity has been highlighted as one of these effects, which may be related to exposure to screens as a sedentary behavior. **Objectives:** To search for and describe the evidence in the literature on the relationship between pediatric obesity and exposure to screens in childhood. **Methodology:** A non-systematic literature review was performed including articles published between 2018 and 2022 in the following databases: Cochrane, PubMed, Scielo and Lilacs. The terms "screen time" and "pediatric obesity" were used as descriptors. **Results:** Associations were found between screen exposure time and increased waist circumference, body mass index (BMI) and childhood obesity stage. In addition, the use of screens mediated the positive relationship between obesity and the social status of the children's neighborhood, as well as the relationship between obesity and asthma. **Conclusion:** Most of the evaluated studies demonstrated a positive association between the use of screens by children and the occurrence of obesity in pediatrics.

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INTRODUCTION

Children's time in front of a screen has gained significant attention in recent years. This is partly due to the high prevalence of screen use by children of all ages. In 2018, a survey found that 86% of Brazilian children aged between nine and 16 were connected to the Internet¹. In 2021, Arantes and de-Morais published a study in the Federal District of Brasília reporting that all participating children between zero and six years of age used digital media devices daily².

Another important aspect concerning screen use in childhood is the excessive hours children spend using various digital media devices. Experts agree that the screen time for children of school age and adolescents should be at most two hours a day^{1,3}. Nevertheless, data from the United States show that only 32% of young people report spending less than two hours a day in front of a screen⁴. In Brazil, a study published in 2022 revealed that 87.3% of children under six used screens for more than one hour daily, which exceeds national recommendations².

Recent studies demonstrate that these factors combined harm children's health and development. A Brazilian literature review published in 2022 described significant neurodevelopmental impairments, including cognitive deficits, behavioral and language disorders, and emotional problems⁵. Other harmful effects include decreased sleep duration and quality, high blood pressure, reduced HDL (high-density lipoprotein) levels, eye fatigue, lower bone mineral density, inadequate posture, behavior consistent with attention deficit and hyperactivity disorder, and digital media dependency^{6,7}.

A global childhood obesity epidemic runs parallel to the widespread use of screens by children. Data released in 2019 by the World Obesity Federation revealed that there were an estimated 124 million obese children and adolescents in the world, with a projected increase to 250 million by 2030 unless substantial measures are taken⁸. In Brazil, studies have shown that the prevalence of childhood obesity varies regionally from 10.4% to 28.8% among individuals aged two to 19 years⁹.

A highly prevalent condition, childhood obesity also carries a series of negative health implications, including blood sugar dysregulation, high blood pressure, dyslipidemia, metabolic syndrome, nonalcoholic fatty liver disease, polycystic ovary syndrome, sleep apnea, musculoskeletal pain, gastroesophageal reflux, psychiatric disorders, and learning disorders¹⁰.

As an acquired condition, obesity results from an imbalance between energy intake and expenditure and can be influenced by the patient's lifestyle¹¹. As exposure to screens is considered sedentary behavior, it may interfere with energy balance by reducing energy expenditure. Thus, a relationship is established between obesity and screen exposure in childhood¹². This association was the subject of study in several publications, which sought to identify and

record the presence of a relationship between the two and elucidate their potential mediating mechanisms.

Given the above facts, this study provides input to help prevent obesity and excessive screen time in children and evidence concerning the association between the two.

METHOD

This non-systematic literature review comprised a comprehensive search for articles in the Cochrane, PubMed, Scielo, and Lilacs databases. The descriptors, based on DeCS (Health Sciences Descriptors), used in the search were "tempo de tela" and "obesidade pediátrica," combined using the Boolean operator "and" as well as their corresponding English terms ("screen time" and "pediatric obesity") combined using the Boolean operator "and." Studies published in the last five years (2018 to 2022) in English, Portuguese, and Spanish linking screen time and pediatric obesity were selected.

A total of 141 publications were found. The analysis of titles and abstracts excluded publications that described ongoing studies, studies that did not investigate the association between screen time and childhood obesity, studies that enrolled adults, consensus statements, reviews, positioning statements of scientific societies, guidelines, and duplicate studies. Ten articles were thus included in the review.

RESULTS AND DISCUSSION

Chart 1 briefly describes the selected articles. Next, a discussion is presented about the results and the criteria used in each article.

Screen time as a mediator of the effect of interventions for the prevention and treatment of childhood obesity

A Norwegian study published in 2022 investigated the factors potentially involved in the results of an intervention program designed to decrease the BMI (body mass index) of obese children between six and 12 years of age. Two years into follow-up, a more significant increase was observed in children's waist circumference with more screen time. However, screen time and BMI were not statistically associated¹³. Despite the absence of an association with the body mass index, the association between screen time and waist circumference is significant in obesity, as this measure is used to assess visceral fat, which, when altered, indicates the risk of central adiposity²³.

An intervention program called Time2bHealthy was used to study the factors potentially mediating BMI decreases. The program focused on preventing childhood obesity through lifestyle changes. Eighty-eight Australian preschoolers were included in the study. The BMIs of the individuals enrolled in the intervention program decreased, but screen time was not considered a significant mediator of this improvement¹⁸.

Chart 1. Selected articles.

Title	Authors/Year	Study design	Objectives	Results
Age, income and sleep duration were associated with outcomes in children participating in weight management	Kjetsa, Halvorsen e Kokkvoll 2022 ¹³	Follow-up of 62 obese children participating in a single-blind randomized controlled trial to evaluate obesity interventions	Explore the association between baseline factors (including screen time) and weight-related outcomes	There was a borderline statistically significant trend toward a greater increase in waist circumference with increased screen time
Association between Physician-Diagnosed Asthma and Weight Status among Chinese Children: The Roles of Lifestyle Factors	Lai et al. 2020 ¹⁴	A cross-sectional study including 16,837 children that collected data on asthma, obesity, and lifestyle factors	It investigated the association between asthma and weight in Chinese children and explored the mediating role of lifestyle factors in this association	Children with asthma have a significantly higher risk of obesity; the risk was even higher in children with screen time greater than two hours a day
Associations between the Neighborhood Social Environment and Obesity Among Adolescents: Do Physical Activity, Screen Time, and Sleep Play a Role?	Saelee et al. 2020 ¹⁵	A cross-sectional study including 12,692 adolescents participating in a National Longitudinal Adolescent Health Study collected data about local social variables, physical activity, screen time, sleep duration, and obesity, among others	Investigate the impact of the local social environment on obesity in adolescents and whether screen time and short sleep duration affect this association	Screen time was significantly associated with obesity in women and men. Screen time (>2 hours/day of television) was associated with local socioeconomic status and obesity
Edmonton obesity staging system among pediatric patients: a validation and obesogenic risk factor analysis	Grammatikopoulou et al. 2018 ¹⁶	A case-control study with 361 children, obese and non-obese, with assessment of body weight status, obesity staging, and lifestyle factors	An obesity staging system was applied in a pediatric cohort and the risk factors associated with each stage were analyzed	Screen time was positively associated with obesity and increases in stage of obesity
Electronic Gaming Characteristics Associated with Class 3 Severe Obesity in Youth Who Attend the Pediatric Weight Management Programs of the COMPASS Network	Phan et al. 2019 ¹⁷	This cross-sectional study included 412 obese children	The study describes the association between game characteristics and the degree of adiposity in young people enrolled in weight control programs	More severe cases (class III) of obesity were observed among individuals who spent more time playing electronic games
Investigating the mediators and moderators of child body mass index change in the Time2bHealthy childhood obesity prevention program for parents of preschool-aged children	Hammersley et al. 2019 ¹⁸	This longitudinal study included 88 children, with mediation and moderation analyses performed on the data of a parallel randomized two-arm controlled study	The study explored the factors that mediated or moderated the effect of an obesity prevention program on the body mass index (BMI)	The intervention group saw improvements in their BMIs, but the reduction in screen time cannot be considered a mediator of this improvement
Lifestyle-Related Determinants of Obesity Among Omani Children	Al Yazeedi <i>et al.</i> 2020 ¹⁹	This cross-sectional study included 197 children aged 6 to 10 years	The study examined the relationship between body mass index (BMI) z-scores and lifestyle factors	No significant relationship was found between the children's BMI z-scores and food intake, moderate-to-vigorous physical activity time, or screen time
Screen Time Parenting Practices and Associations with Preschool Children's TV Viewing and Weight-Related Outcomes	Neshteruk <i>et al.</i> 2021 ²⁰	This longitudinal study included 252 pairs of parents and children in a randomized, parent-focused childhood obesity prevention trial	It examined the associations between parental screen time and child television viewing time with child weight and weight status	The children of parents who used screen time more often as a reward had higher BMI z-scores while limiting/monitoring screen time was associated with lower BMI z-scores and reduced waist circumference

The Association Between High Body Mass Index and Technology Use Among Female Elementary School Students	Jari AM et al. 2020 ²¹	This cross-sectional study included 681 school-age girls	It investigated the association between having a high BMI and time spent using electronic devices	Increases in BMI were not significantly related to the time spent using electronic devices, the use of electronic devices before bed, or the type of device used. There was a significant association between having a high BMI and only one type of electronic device: television
Weight status and meeting the physical activity, sleep, and screen-time guidelines among Texas children: results from a population based, cross-sectional analysis	Bejarano <i>et al.</i> 2022 ²²	This cross-sectional study analyzed the data from 320,005 children	It analyzed whether a child's weight status was associated with fulfilling physical activity, screen time, and sleep guideline recommendations	Compared to children with an unhealthy weight, children with a healthy weight had the highest prevalence of fulfilling the recommendations of either guideline, independently and concurrently

Source: Prepared by the author (2023).

Neshteruk et al.²⁰ conducted a longitudinal study with 252 children aged two to five years in a randomized trial focused on preventing childhood obesity. At the end of the 59-week follow-up, the authors found that the BMI z-scores of children whose parents used screen time as a reward were higher. On the other hand, children whose parents limited or monitored screen time had smaller waist circumferences and lower BMI Z-scores²⁰.

The role of screen time as a mediator of other factors in childhood obesity

In 2020, Saelee et al.¹⁵ published a study in which the impact of some mediators, including screen time, on the association between childhood obesity and the economic status and lack of local social organization was assessed. The authors concluded that spending more than two hours per day in front of a screen mediated the relationship between obesity and neighborhood socioeconomic status. Watching television was correlated with obesity¹⁵.

Role of exposure to screens in the association between childhood obesity and other diseases

Due to its prevalence and morbidity, asthma is a very important disease in the pediatric age group. A Chinese study that included 16,837 children between six and 12 years of age found that individuals with asthma were at a higher risk of becoming obese. The risk was greater among asthmatic children engaged in moderate to vigorous physical activity for less than 60 minutes daily and children with screen times greater than two hours a day¹⁴.

Relationship between exposure to screens and different degrees of childhood obesity

The Edmonton Obesity Staging System for Pediatrics (EOSS-P)¹⁰ describes the severity of obesity based on the prevalence of complications. A group of 361 Greek children

aged between two and 14 was evaluated based on the EOSS-P. Some lifestyle variables and their association with different degrees of obesity were also measured.

The analysis demonstrated a positive association between screen time and obesity and increased obesity severity according to the EOSS-P¹⁶.

Another study that associated screen time with the severity of obesity was carried out with obese adolescents aged 11 to 17 years. Time spent playing electronic games was the object of analysis in this study. The authors described a gradual association between gaming time and severe obesity (class III), with teens who played electronic games for more than four hours a day having 1.94 times more chances of having severe obesity compared to young people who played electronic games for less than four hours a day¹⁷.

The direct relationship between screen time and childhood obesity

A cross-sectional study in Oman evaluated the relationship between children's BMI Z-scores and lifestyle-related variables. The study included 197 children selected from public schools and community centers aged between 6 and 10. The results indicated no significant relationship between BMI Z-scores and screen time. The daily screen time of approximately 80% of the children included in the study was less than 120 minutes¹⁹.

A cross-sectional study that included 681 girls from Saudi Arabia investigated the association between behaviors related to screen use and BMI. The results showed no statistically significant association between increases in BMI and time spent using electronic devices. Having a high BMI was associated only with watching television²¹.

Bejarano et al.²² analyzed data from 320,000 children in the United States to investigate a potential association between obesity and following the recommended guidelines for physical activity, sleep, and screen time. The authors found

that children within the healthy weight range complied more often with these recommendations than children with an unhealthy weight ²².

CONCLUSION

Most studies investigating the potential association between screen time and childhood obesity-related anthropometric parameters found a positive association.

The two articles included in this review in which such association was not found were cross-sectional studies with some methodological limitations, such as enrolling small populations and including particular groups, which may limit the external validity of their results.

Further research is needed to determine the individual impact of screen time on the prevention and treatment of childhood obesity. The isolated effects of screen time are difficult to measure since exposure to screens beyond the time recommended in guidelines occurs concurrently with other lifestyle factors that may also affect childhood obesity, such as insufficient time spent performing physical activity, low quality or quantity of sleep, and eating high-calorie, processed or ultra-processed foods. Furthermore, the high prevalence of obese and nonobese children with excessive screen time hinders the assessment of screen time as a risk factor for obesity.

Excessive exposure to screens is a critical issue. Pediatricians must be aware of its high prevalence and harmful consequences for children's health, including childhood obesity. Pediatricians should advise families on the subject to help decrease the time the children under their care spend in front of screens.

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