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BEHAVIORAL SYMPTOMS, PHYSICAL AND HORMONAL CHANGES IN CHILDREN ASSOCIATED WITH SCREEN TIME

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Abstract: Objective: To analyze the behavioral, physical and hormonal changes in children associated with the use of screens. **Methods:** This is an integrative literature review. Articles were selected through the PubMed platform based on the guiding question formulated by the PEO strategy. The search used the following Health Sciences Descriptors (DeCS/MeSH): "Child", "Behavioral symptoms", "Screen time", "Hormones", "Endocrine system", "Emotional regulation". After obtaining the data, the filters "Free ful text" and "2020 - 2025" were applied. **Results:** The results of this study show that the excessive use of screens by children causes behavioral changes, such as increased anxiety, hyperactivity and insufficient sleep; physical changes, such as sedentary lifestyles, childhood obesity, poor posture and risk to eye health; and hormonal changes, such as dysregulation of leptin levels. **Conclusion:** The integrative review highlights the various behavioral, physical and hormonal changes related to screen time in children. Therefore, appropriate professional guidance, together with parental intervention by limiting screen time, is an essential factor in improving children's physical and mental well-being.

Keywords: Child, Behavioral symptoms, Screen time.

INTRODUCTION

In recent decades there has been a significant increase in the use of electronic devices such as televisions, smartphones, tablets and computers, not only among adults, but also among pre-school and school children. The length of exposure to screens and the age range of children who use this technology is a subject that been widely discussed by the World Health Organization (WHO) and the American Academy of Pediatrics (APA), and so health professionals aim to reinforce the negative effect and impact of this technology on children's health (Alrahili et al., 2021).

When discussing the possible explanations and causes of this scenario, there is still little literature on this issue. There are few in-depth reports on possible hypotheses about parents' permissiveness in the face of screen use by children. In this context, it has been observed that the behavior of unconscious fathers and depressed mothers are contributing factors to the abusive use of screens by low-income children, which has resulted in negative effects on children's behavior. However, in a scenario where parents were affectionate, emotionally balanced and used quality educational programs, the time spent using technology was beneficial to the child's educational development. In this way, a correlation can be made between the mental well-being of parents, healthy parental interaction with children and socio-economic conditions as possible contributing factors to the negative or positive consequences of children's digital exposure (Niiranen et al., 2024).

Excessive screen time can affect various areas of health, leading to the development of physical, behavioral and hormonal pathologies, such as postural problems, sedentary lifestyles, childhood obesity, sleep disorders and psychosocial impacts. The exorbitant amount of time spent in front of screens corroborates sedentary lifestyles and lack of physical activity, resulting in greater adiposity and future cardiometabolic risks, as demonstrated in a study carried out in Ecuador (Reis et al., 2024). Another very relevant particularity to be discussed is the relationship between screen time and the incidence of behavioral disorders such as Conduct Disorder, Oppositional Defiant Disorder and Autism Spectrum Disorder. Chinese preschool children, before the age of 3, showed a higher risk compared to those who were never exposed to screen-based media (Xiang et al., 2022).

Some research has shown disastrous outcomes and bad consequences for the mental health of children who are overexposed to these media. These inappropriate habits will result in self-regulation difficulties, contributing to functional, personal, family, social and school problems for these individuals. (Nagata et al., 2023) The relationship between screen use and physical, behavioral and hormonal changes in children is complex and multifactorial. It is undeniable that technology offers important benefits, however, it requires attention from parents, educators and health professionals, as it can compromise the health of this child as a whole. In view of the above, the aim of this literature review is to analyze the main behavioral, physical and hormonal changes in children using screens.

MATERIAL AND METHOD

STUDY DESIGN AND RESEARCH QUESTION

This is an integrative literature review, which followed the following steps: identification of the thematic axis and structuring of the research question; definition of inclusion criteria and exclusion criteria; search and selection of articles in scientific databases; analysis of the selected studies; interpretation of the results and presentation of the integrative review.

To structure the research question, we used the PEO strategy - an acronym for: population, exposure and outcomes - shown in Table 1, which guided the formulation of the following guiding question: What are the behavioral, physical and hormonal changes associated with the use of screens in children?

P - Population	Children
E - Exposure	Use of screens
O - Outcome	Behavioral, physical and hormonal changes

Chart 1: Definition of terms for structuring the research question using the acronym PEO.

SEARCH STRATEGY

Initially, the following descriptors were selected: “Screen time”; “Child”; “Hormones”; “Endocrine system”; “Behavioral symptoms”; “Emotional regulation”.

After selecting the descriptors, for a broader search of the literature, two search strategies were constructed using the Boolean operators “AND” and “OR”: Search strategy 1: (Screen time) AND (Child) AND ((Hormones) OR (Endocrine system)*)*. Search strategy 2: (Screen time) AND (Child) AND ((Behavioral symptoms) OR (emotional regulation)).

The Pubmed database was used to search for the two strategies. The following filters were applied to the Pubmed database for both searches: “Free ful text”, “2020 - 2025”.

The two flowcharts of the article search and selection process are shown in Figures 1 and 2. Figure 1 refers to search strategy 1 and figure 2 refers to search strategy 2.

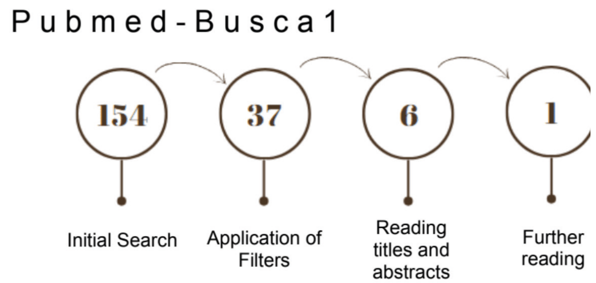

Figure 1: Flowchart of the application of search strategy 1 and the selection process.

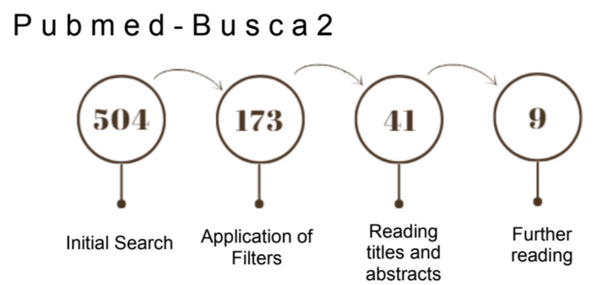

Figure 2: Flowchart of the application of search strategy 2 and selection process

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SELECTION CRITERIA

The review included cross-sectional and cohort study articles and excluded literature reviews and case reports. Other selection criteria used were: The study population is children aged 0 to 12, so studies that provided information on children together with populations over 12 were excluded. Studies with a weak method or outside the thematic axis were also excluded.

Once the articles had been identified using the initial search strategy, the selection process was carried out by "8" independent evaluators in two stages. In the first stage, the articles were selected by reading the titles and abstracts. In the second stage, the articles were selected after reading and analyzing the full texts, and the articles were screened according to the inclusion and exclusion criteria mentioned above.

DATA EXTRACTION AND PRESENTATION OF RESULTS

Data extraction considered information on: author(s); sample characteristics; study design; statistical data for the outcome of interest.

Results were extracted on behavioral, physical and hormonal changes in children associated with the use of screens. The results of these changes were presented by mean and standard deviation; percentage; beta coefficient; prevalence ratio. When available, the p-values associated with the statistics were presented, as well as the confidence interval values.

RESULTS

The studies in this review investigated a total sample of 22,553 children, ranging in age from 1 to 12 years, which allowed an assessment of the characteristics, variables and contexts present in the different samples, providing a solid basis for understanding the trends and patterns observed. With regard to screen time, (Alrahili et al., 2021) states that most children use screens for more than three hours a day, and that a smaller proportion use them for an hour or less, which is in line with the study by (Nagata et al., 2024) in which the average screen time varies between 3.2 and 4 hours a day. In relation to age group and screen use, (Zhao et al., 2024) showed that the age group with the most screen time was between 11 and 12 years old and (Kim et al., 2020) showed that some of the children in their study started using cell phones before they were 24 months old.

In the context of behavioral changes, (Alrahili et al., 2021) showed that an almost equal proportion of children had problems with social chatting and poor understanding of non-verbal communication, and a smaller sample had problems with active communication. (Nagata et al., 2023) showed that exposure to more than two hours of screen time a day was associated with oppositional defiant disorder and exposure to more than four hours a day was associated with a higher prevalence of conduct disorder, followed by oppositional defiant disorder.

In addition, the article by (Xiang et al., 2022) shows that excessive screen time was significantly associated with worse scores on their tests, as well as with each type of behavioral problem, and was also associated with an increased risk of conduct problems, learning problems, psychosomatic problems, impulsive-hyperactivity, anxiety and hyperactivity index. The articles by (Nagata et al., 2024) and (Nagata et al., 2023) showed an increase in depressive symptoms, followed by conduct symptoms, somatic symptoms, an increase in attention deficit/hyperactivity symptoms, as well as an increase in conduct disorders and oppositional disorder.

(Kim et al., 2020) presented comparisons on various sleep issues between a group with excessive cell phone use and another with controlled use, with the excessive group showing greater resistance to sleep, sleep latency, nocturnal awakenings, sleep anxiety and daytime

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Author (citation)	Sample size and age	Study design	
(Alrahili et al., 2021)	308 children aged 4 to 6.	Transversal	- Screen time: * 51% more than three hours a day; * 33.1% two hours a day; * 15.9% one hour or less daily. - 20.4% problems with social chat. - 20.1% poor understanding of non-verbal communication. - 7.7% problems with active communication. - The average SCQ score was 9.26 ± 5.19 - 44 (14.3%) respondents had a high SCQ score, defined as a score ≥15.
(Kim et al., 2020)	330 caregivers of children aged 2 to 5. - Excessive cell phone use (cell phone for more than one hour/day): 70 - Control: 260	Prospective cohort	- 28.9% started using smartphones before they were 24 months old. - The TST of the excessive smartphone use group (9.51 ± 0.84 hours). - TST of the control group (9.82 ± 0.77 hours; $P < 0.05$. - Sleep resistance (Medium): * Excess screen group: 11.71 * Control group: 11.54 - Sleep latency (Average): * Excess screen group: 1.43 * Control group: 1.28 - Night waking (Average): * Excess screen group: 4.06 * Control group: 3.65 - Sleep anxiety (Average): * Excess screen group: 6.93 * Control group: 6.60 - Daytime sleepiness (Average): * Excess screen group: 11.01 * Control group: 10.50
(López-Gil et al., 2020)	1561 children aged 8 to 12	Transversal	- Children who reported less than 2 hours of ST per day had a higher SR.
(Nagata et al., 2024)	9,538 children aged 9 to 10.	Prospective cohort.	- Average screen time 4.0 ± 3.2 h per day, mostly watching TV shows/movies; - Depressive symptoms: B = 0.10, 95% CI 0.06-0.13, p < 0.001 - Behavioral symptoms: B = 0.07, 95% CI 0.03-0.10, p < 0.001 - Somatic symptoms: B = 0.06, 95% CI 0.01-0.11, p = 0.026 - Attention deficit/hyperactivity disorder (ADHD) symptoms: B=0.06, 95% CI 0.01-0.10, p = 0.013
(Nagata et al., 2023)	11,875 children aged 9 to 10	Prospective cohort	- Conduct disorder - Prevalence ratio (95% CI) p: 1,07 (1,03-1,11) <0,001 -Oppositional defiant disorder- Prevalence ratio (95% CI) p: 1,05 (1,03-1,08) <0,001 - Exposure to >2 hours compared to ≤ 2 hours of daily screen time was associated with oppositional defiant disorder. - Exposure to >4 hours a day was associated with a 69% higher prevalence of conduct disorder and a 46% higher prevalence of oppositional defiant disorder.
(Niiranen et al., 2024)	671 children aged 05	Cohort	- 66.8% watched programs for > 60 min/day. - More screen time for children is related to attention and concentration difficulties, hyperactivity, internalizing and externalizing symptoms; - Parental behavioral control was a significant predictor of children's internalizing symptoms; - Parental stress was a significant predictor of hyperactivity and externalizing symptoms;

(Reis et al., 2024)	186 children aged 06 to 11	Transversal	- BMI: *1 hour of MVPA: B: -2.104; CI: -4,071 -0,137; p: 0,036. *1 hour of sleep: B: -1.293; CI: -2,286 -0,299; p: 0,011. *20 minutes of MVPA: B: -0.702; CI: -1,357 -0,046; p: 0,036. *20 minutes of sleep: B: -0.431; CI: -0,762 -0,100; p: 0,011. *1 minute of MVPA: B: -0.035; CI: -0.068 -0.002; p: 0.036. *1 minute of sleep: B: -0.022; CI: -0.038 -0.005; p: 0.011. *There was no statistical significance in BMI when replacing screen time with LPA. - Waist circumference: *1 hour of sleep: B: -2.690; CI: -5.150 -0.230; p: 0.032 *20 minutes of sleep: B: -897; CI: -1,717 -0,077; p: 0,032. *1 minute of sleep: B -0.045; CI: -0.086 -0.004; p: 0.032. *There was no statistical significance in WC when replacing screen time with MVPA or LPA. -PAS: *1 hour of MVPA: B: -14.044; CI: -21.267 -6.820; p <0.001. *1 hour of sleep: B: -3.841; CI: -7,261 -0,422; p: 0,028. *20 minutes of MVPA: B: -4.682; CI: -7.090 -2.274; p <0.001. *20 minutes of sleep: B: -1.281; CI: -2.421 -0.141; p: 0.028. *1 minute of MVPA: B: -0.234; CI: -0,355 -0,114; p <0,001. *1 minute of sleep: B: -0.064; CI: -0,121 -0,007; p: 0,028. *There was no statistical significance in SBP when replacing screen time with LPA. - PAD: *1 hour of MVPA: B: -10.426; CI: -18.366 -2.485; p: 0.010. *20 minutes of MVPA: B: -3.474; CI: -6,121 -0,827; p: 0,010. *1 minute of MVPA: B: -0.174; CI: -0,306 -0,041; p: 0,010. *There was no statistical significance in DBP when replacing screen time with sleep or ALI. - Fat percentage: *1 hour of MVPA: B: -8.029; CI: -14.577 -1.481; p: 0.016. *1 hour of sleep: B: -3.075; CI: -5,732 -0,418; p: 0,023. *20 minutes of MVPA: B: -2.275; CI: -4,858 -0,492; p: 0,016. *20 minutes of sleep: B: -1.025; CI: -1,910 -0,139; p: 0,023. *1 minute of MVPA: B: -0.134; CI: -0,243 -0,025; p: 0,016. *1 minute of sleep: B: -0.051; CI: -0,96 -0,007; p: 0,023. *There was no statistical significance in the percentage of fat when replacing screen time with LPA. - Leptin: *1 hour of MVPA: B: -6.896; CI: -12.557 -1.235; p: 0.017. *1 hour of sleep: B: -2.730; CI: -4,622 -0,837; p: 0,005. *1 hour LPA: B: -1.718; CI: -3,044 -0,392; p: 0,011. *20 minutes of MVPA: B: -2.298; CI: -4,184 -0,412; p: 0,017. *20 minutes of sleep: B: -0.910; CI: -1,541 -0,279; p: 0,005. *20 minutes LPA: B: -0.573; CI: -1.015 -0.131; p: 0.011. *1 minute of MVPA: B: -0.115; CI: -0,209 -0,021; p: 0,017. *1 minute of sleep: B: -0.046; CI: -0,077 -0,014; p: 0,005. *1 minute LPA: B: -0.029; CI: -0,051 -0,007; p: -0,011.

			- C-reactive protein: *1 hour of MVPA: B: -2.441; CI: -4,455 -0,428; p: 0,017. *20 minutes of MVPA: B: -0.814; CI: -1.485 -0.143; p: 0.017. *1 minute of MVPA: B: -0.041; CI: -0,074 -0,007; p: 0,017.
(Xiang et al., 2022)	4985 children aged 3 to 6	Transversal	- 11.9% started using screens before the age of 2; - The parents of children with excessive screen time were younger, less educated and had lower monthly per capita incomes; - Excessive screen time was significantly associated with worse HRQOL scores in all dimensions and summary scales, as well as each type of behavioral problems (all p-values < 0.05). - Those who started using screens before the age of 2 had lower emotional functioning scores (β: - 2.13, 95% CI: - 3.17, - 1.09) and psychosocial health summary scores (β: - 0.82, 95% CI: - 1.54, - 0.10) on the HRQOL, as well as higher risks of conduct problems, learning problems, psychosomatic problems, impulsivity-hyperactivity index and hyperactivity, which were independent of excessive screen use. - Behavioral problems were also significantly higher in children with early screen exposure, who were more likely to have conduct problems, learning problems, psychosomatic problems, impulsivity-hyperactivity and hyperactivity. - Excessive screen time was associated with an increased risk of conduct problems, learning problems, psychosomatic problems, impulsive-hyperactivity, anxiety and hyperactivity index;
(Zhao et al., 2024)	2,359 adolescents aged 9 to 12	Cohort	- Higher SMA at 9-10 years predicted shorter sleep duration at 10-11 years; - Externalizing symptoms at 10-11 years predicted higher DIMS and more SMA at 11-12 years; - Both SMA and sleep duration at 9-10 years predicted externalizing problems at 10-11 years; - Longest total screen time in 11-12 years - Children aged 10 to 11 who are exposed to screens find it more difficult to initiate and maintain sleep;
(Pasi et al., 2023)	278 children aged between 1 and 12. - Under 5 years old: 82 - From 5-12 years: 196	Transversal	-Agression of 103 (37.05%): 26 (25.24%) in the under 5 age group, while it was 77 (74.76%) in the 5 to 12 age group. -Birras in 76 (27.34%): 29 (38.16%) children in the under 5 age group and 47 (61.84%) in the 5 to 12 age group. -Apathy in 25 (8.99%): 3 (12%) children under the age of 5, while 22 (88%) children between the ages of 5 and 12. - Sleep problems: 12.94% talk in their sleep, 6.84% suffer from night terrors, 5.4% have confused arousal; -Sleep problems were significantly associated with screen time among children under 5. - A study observed an increase in the frequency of sleep problems with more screen time in children aged 5 to 12, but without statistical significance. - Vision problems were not associated with screen time in either age group.

Chart 2: Results of data extraction from the selected articles after reading the full text.

Notes: SCQ: Social communication questionnaire; SR: Self-regulation; ST: Screen time; MD: Mediterranean diet; MVPA, moderate to vigorous physical activity; BMI, body mass index; MVA, light intensity physical activity; WC, waist circumference; SBP, systolic blood pressure; DBP, diastolic blood pressure; MVA: light intensity physical activity; CRP: C-reactive protein; CVRS: children's behavior and the quality of health-related life; DIMS: Difficulties in initiating and maintaining sleep; SMA: screen media activity; TST: Total sleep time; B: Beta coefficient.

sleepiness. In addition, (Reis et al.,2024) exchanged screen time for sleep time, showing an improvement in BMI, waist circumference, systolic blood pressure, fat percentage, leptin and C-reactive protein. The article by (Zhao et al., 2024) showed that children aged 10 to 11 exposed to screens have greater difficulty initiating and maintaining sleep. In addition, (Pasi et al., 2023) analyzed that mainly children under the age of 5 have sleep problems due to screen use, and furthermore, evaluated an increase in the frequency of sleep problems in children aged 5 to 12, with the majority talking in their sleep, followed by those suffering from night terrors and nightmares, and a smaller portion presenting confused arousal.

One of the problems highlighted was issues related to children's physical health and the changes they experience with the use of screens. The article (Reis et al.,2024) made some changes in relation to the use of screens, and found some changes such as BMI, in which the exchange of screen time for moderate physical activity or more sleep had significant impacts. Waist circumference also showed positive results when screen time was replaced by sleep time. Systolic blood pressure changed when screen time was replaced by sleep and moderate physical activity, while diastolic blood pressure only changed when screen time was replaced by moderate physical activity. Body fat percentage changed significantly when screen time was replaced by sleep time and moderate physical activity. In addition, (Pasi et al., 2023) showed that vision problems were negatively associated with screen time in children under 5 and children aged 5 to 12.

Finally, it was also possible to note hormonal and systemic effects in children, as in the article by (Reis et al.,2024) which showed that both leptin and C-reactive protein had a positive impact when screen time was replaced by moderate physical activity, and leptin was positively associated with screen time being replaced by sleep time and light physical activity.

DISCUSSION

This integrative review aimed to investigate the impacts of screen time on child development, with an emphasis on behavioral symptoms, physical and hormonal changes. The excessive use of digital technologies in childhood has become a growing issue, with implications for various aspects of children's development. Although there are many studies on this phenomenon, the results are still conflicting, which makes a detailed examination of the available evidence essential.

The findings of this review corroborate evidence already established in the literature on the impacts of screen time on children's behavior. Studies indicate that prolonged exposure to screens is associated with an increased incidence of symptoms of anxiety, attention deficit and hyperactivity (Niiranen et al., 2024). Children who spend more time on digital activities, especially without parental supervision, tend to have less emotional control, lower self-regulation skills and difficulties in social interaction (Pasi et al., 2023).

In addition, a comparison between different studies has revealed that the type of content accessed can modulate behavioral effects (Zhao et al., 2024), indicating that excessive violent or stimulating content can intensify impulsive and aggressive reactions, while educational programs tend to have less of a negative impact. However, even educational content, when consumed in excess, has been associated with difficulties in maintaining attention and less active play time (Pasi et al., 2023).

A relevant factor identified was the influence of the family context on the impact of screen time. (Niiranen et al., 2024) pointed out that children who have a structured family environment, with clear rules about the use of devices, have fewer negative impacts. On the other hand, children who use digital devices as their main form of entertainment tend to have more difficulties in developing social and emotional skills.

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(Pasi et al. 2023) showed that children who spend more than three hours a day in front of screens have a higher incidence of sleep disorders, including increased sleep latency and shorter total sleep time. On the other hand, (Zhao et al. 2024) suggests that the use of screens close to bedtime can affect the production of melatonin, making it more difficult to fall asleep. These findings reinforce the importance of controlling screen time, especially at night.

The effects of screen time on children's physical health have also been shown in several studies. The sedentary lifestyle induced by excessive screen time has been widely linked to an increase in body mass index (BMI), favoring childhood obesity (Niiranen et al., 2024). In comparison with previous studies, there was a significant convergence between the findings on the relationship between screen time and the risk of overweight.

Another area of physical impact relates to eye health and posture. (Xiang et al., 2022) reported that prolonged exposure to screens can contribute to eye fatigue and the development of visual problems, since the reduction in time dedicated to outdoor activities limits exposure to natural light, which is essential for eye health. In addition, studies point to an association between prolonged use of digital devices and an increase in musculoskeletal complaints in children. According to (Niiranen et al., 2024), children who spend more time in front of screens, especially in inappropriate postures, have a higher prevalence of neck and back pain. This finding suggests the need for greater attention to body positioning and the encouragement of active breaks during screen use.

Although the hormonal effects of screen time are still less explored, the evidence points to relevant impacts, mainly related to the regulation of leptin. (Reis et al., 2024) demonstrated that interventions that replace screen time with periods of physical activity or quality sleep promote improvements in the regulation of leptin, a hormone that is crucial for modulating appetite and energy metabolism. Dysregulation of leptin, as indicated by (Xiang et al. 2022), can contribute to disordered eating patterns and consequently to an increased risk of childhood obesity, which consequently leads to an increased risk of cardiovascular disease.

Prolonged exposure to digital devices, coupled with sedentary behavior, can interfere with hormonal signaling, creating a scenario conducive to metabolic imbalances. (Xiang et al., 2022) suggests that early and excessive exposure to screens is related to an increased risk of developing learning and behavioral problems, which may be indirectly associated with hormonal changes, including in the regulation of leptin. These data reinforce the hypothesis that hormonal balance, especially with regard to leptin, may be a marker of the metabolic impacts of high screen time in childhood.

An important limitation of this review refers to the methodological heterogeneity and variability in the quality of the studies included. Despite a rigorous selection process, differences in methodological approaches, research designs and sample characteristics can compromise the consistency of the results. This diversity can influence the generalizability of the conclusions, suggesting the need for more studies with standardized methodologies and representative samples to deepen the understanding of the impacts of screen time on child development. In addition, differences in the age groups of the populations analysed make it difficult to generalize the findings, since the impact of screen time can vary according to the stage of child development (Niiranen et al., 2024).

Another relevant factor is the influence of socio-economic and cultural conditions in each country. Unequal access to technology, different patterns of screen use and variations in parenting practices can modify the observed effects, making it challenging to extrapolate the results to different contexts. Thus, future studies with more standardized methodologies and more representative samples are essential for a deeper understanding of the impact of screen time in childhood.

Growing evidence suggests that excessive use of digital devices can have substantial consequences for children's mental health and physical well-being, highlighting the need for early interventions and appropriate clinical guidance. Practicing physical activities and controlling screen time should be emphasized by professionals, as they help prevent diseases such as obesity and psychosocial disorders (Pasi et al., 2023), (Niiranen et al., 2024). Guidance for parents on the proper use of devices, along with psychological and pediatric monitoring, is essential to reduce negative impacts and promote healthy habits, directly reflecting on the well-being of the child population (Zhao et al., 2024).

In addition, educational strategies aimed at parents and caregivers can help establish healthy limits for screen use. Creating technology-free spaces within the home environment, encouraging outdoor play and implementing specific times for device use are strategies that can mitigate the negative impacts of screen time (Pasi et al., 2023).

CONCLUSION

In view of the above, the findings of this review were consistent with the evidence already established in the literature, and it is clear that the excessive use of screens by children is directly associated with various behavioral, physical and hormonal changes. With regard to behavioral changes, it was observed that prolonged exposure to screens, especially without proper parental supervision, is related to difficulties in social interactions, greater impulsivity and less capacity for emotional control, especially when digital devices are used as the main form of entertainment. In addition, the type of content consumed by children proved to be a determining factor in the potency of behavioral impacts, with violent or excessively stimulating content tending to intensify aggressive behavior, while educational content has less impact, although it can still impair attention and reduce the time dedicated to physical activities.

As far as physical changes are concerned, there was a significant correlation between screen exposure time and a sedentary lifestyle, the negative impact of which was seen in an increase in Body Mass Index (BMI), waist circumference, obesity and the appearance of problems linked to the locomotor system, such as neck and back pain.

Finally, with regard to hormonal changes, studies have shown that excessive exposure to screens interferes with the deregulation of leptin, a hormone that is fundamental for controlling appetite and energy metabolism, culminating in the development of disordered eating patterns and corroborating the increased risk of childhood obesity. In addition, prolonged exposure to screens and a sedentary lifestyle have an impact on hormonal signaling, which justifies possible metabolic imbalances and hormonal changes, indirectly linked to behavioral problems. Furthermore, the review points out that reducing screen time, combined with physical activity and improved sleep quality, contributes to the normalization of hormonal regulation, reducing the risk of childhood obesity and eating disorders.

Thus, this review demonstrates the relevance of understanding the effects of excessive use of electronic devices on child development, a problem that is on the rise in contemporary times. In this sense, this review contributes to the body of scientific evidence by elucidating the potential risks to the mental and physical health of this vulnerable population, reinforcing the need to understand the current panorama in order to devise strategies to modify it, in view of its possible effects.

For clinical practice, it is recommended that health professionals advise parents and guardians on the importance of limiting screen exposure time, ensuring an appropriate balance between the use of electronic devices, regular physical activity and quality sleep. In addition, we suggest that future research delves deeper into the hormonal changes associated with excessive screen use, considering its relevance and the scarcity of studies relating this behavior to metabolic disorders and hormonal dysregulation. It is also recommended that new studies be directed at specific age groups, in order to provide more precise knowledge for each stage of child development, since the current data covers a wide age range, which could compromise the practical applicability of the results. Implementing these suggestions could help mitigate the adverse effects of excessive use of digital devices, thus promoting healthier child development.

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