



The Impact of A Lifestyle with Limited Physical Activity on Child Growth and Development in The Digital Era

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Abstract

The rapid development of digital technology has significantly transformed children's daily activities, with screen-based engagement increasingly replacing physical movement and direct social interaction. This shift has contributed to the early emergence of sedentary lifestyles, which may negatively affect children's overall development. This study aims to examine the impact of low physical activity in the digital era on children's physical, motor, psychological, and social development, as well as to identify strategies for balancing technology use with active behaviors. A Systematic Literature Review (SLR) was conducted using the Scopus database with the keywords physical inactivity, digital era lifestyle, sedentary behavior, and child development. Following PRISMA guidelines, the review process included identification, screening, eligibility, and inclusion stages. Of the 89 studies initially identified, 15 met the inclusion criteria and were analyzed. The findings indicate that increased exposure to digital media such as smartphones, online games, and social media is associated with reduced physical activity. This condition increases the risk of obesity, decreased motor competence, sleep disturbances, and psychological issues such as stress and loneliness. School-age children and adolescents are particularly vulnerable to these effects. Family supervision, digital parenting, and supportive environments play key roles in mitigating these risks. Overall, balanced technology use and active lifestyles are essential for children's healthy development.

How to Cite

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INTRODUCTION

The rapid development of digital devices has drastically reshaped children's daily routines, with screen-based activities increasingly replacing opportunities for physical movement and direct social interaction (Borges et al., 2025). This behavioral shift promotes the formation of sedentary lifestyles from an early age and poses a serious threat to children's growth and development, which should be supported by physical activity (Harverson et al., 2025). Although digital lifestyles with limited physical movement are becoming more common, their harmful consequences are not always recognized by parents and educators (Borges et al., 2025). Accordingly, this phenomenon has been labeled a "silent epidemic" due to its far-reaching impact that receives insufficient public attention (Harverson et al., 2025).

More concerning, childhood is a sensitive period during which motor, social, and emotional development is strongly influenced by environmental stimulation and physical activity habits (Borges et al., 2025). Excessive use of digital devices reduces opportunities for motor exploration and social interaction both of which play essential roles in fostering self-confidence, emotional regulation, and motor competence (Harverson et al., 2025). When physical activity is neglected, children exhibit declines in motor ability and social skills, which may increase psychological vulnerability (Borges et al., 2025). Therefore, the growing dominance of digital lifestyles during developmental years requires urgent attention from both health and education sectors (Harverson et al., 2025).

Recent empirical evidence demonstrates that high levels of digital device use are associated with increased adiposity, disrupted sleep quality, and reduced motor competence in children (Borges et al., 2025). These negative effects were even more pronounced in younger age groups, suggesting that the earlier sedentary digital habits emerge, the greater the risk to developmental trajectories (Borges et al., 2025). Thus, empirical data indicate that digital lifestyles play a significant role in influencing children's biological development (Pombo et al., 2021).

Recent longitudinal research further confirms that children's motor competence did not return to pre-pandemic levels even after mobility restrictions were lifted, signaling slow and incomplete recovery (Carballo-Fazanes et al., 2022). This suggests that the consequences of sedentary digital behavior do not disappear

automatically and may persist without appropriate intervention (Borges et al., 2025). In addition, the increasing trend of early exposure to digital devices heightens the possibility that passive lifestyles may persist into adolescence, thus prolonging risks to both physical and psychosocial well-being (Carballo-Fazanes et al., 2022). These patterns reinforce that sedentary digital lifestyles constitute a public health concern among children (Borges et al., 2025).

Analyses reveal that prolonged screen time displaces physical activity, disrupting biological pathways related to hormones, metabolism, and inflammation in children (Borges et al., 2025). This may increase the risk of unhealthy metabolic development and future physical growth disorders (Borges et al., 2025). From a psychological perspective, sedentary digital lifestyles are also closely linked to increased anxiety, depression, and social withdrawal among children and adolescents (Harverson et al., 2025). Therefore, the consequences extend beyond physical domains and include psychological and social dimensions of child development (Harverson et al., 2025).

If sedentary digital lifestyle patterns continue unchecked, children risk experiencing impaired motor development, metabolic dysfunction, and emotional vulnerability that may persist into adolescence and adulthood (Borges et al., 2025). Research emphasizes that the longer sedentary habits are maintained, the more difficult they are to reverse due to neurobiological and psychosocial processes formed early in life (Harverson et al., 2025). Without timely intervention, children may experience reduced physical and mental resilience as well as increased potential for long-term health problems (Borges et al., 2025). Therefore, immediate measures are necessary to prevent long-term consequences.

Urgency is heightened by evidence indicating that sedentary digital exposure begins at increasingly younger ages and intensifies as children grow older (Carballo-Fazanes et al., 2022). Without preventive action, passive digital lifestyles may become permanent into adulthood, undermining physical health, social development, and emotional well-being (Borges et al., 2025). Researchers emphasize that delays in intervention increase the difficulty of restoring physical activity patterns and motor development (Harverson et al., 2025). Therefore, intervention strategies must be implemented early and grounded in scientific evidence (Borges et al., 2025).

Although research on digital media use in

children continues to grow, most interventions still suffer from methodological limitations, short follow-up periods, and limited cultural contextualization, which prevent comprehensive understanding of long-term effects (Harverson et al., 2025). Moreover, few studies have developed digital sedentary-reduction strategies using an interdisciplinary approach that simultaneously integrates physiological, psychological, and social dimensions (Borges et al., 2025).

The novelty of this study is the identify gamification-based and personalized interventions as promising digital approaches for improving children's engagement in physical activity and supporting psychological well-being, particularly when accompanied by parental mediation and behavior-change techniques (Wang et al., 2025). In addition, hybrid school-based programs that combine direct physical activity with technological support have shown the most significant impact in sustaining motivation and consistency of physical activity among children and adolescents.

This study aims to analyze the impact of limited physical activity within digital lifestyle contexts and formulate evidence-based strategies to integrate technology with movement activities to optimally support children's physiological, psychological, and social development.

METHOD

This study employed a Systematic Literature Review (SLR) approach to identify, examine, evaluate, and interpret all available research relevant to the phenomenon under investigation and the formulated research questions (Triandini et al., 2019). The literature search was conducted using the Scopus online database with the keywords Physical Inactivity; Digital Era Lifestyle; Sedentary Behavior; Child Development. The SLR procedure consisted of several stages, including formulating research questions, searching the literature, determining inclusion and exclusion criteria, selecting the literature, presenting data, processing data, and drawing conclusions.

In an SLR, the primary objective is to identify, evaluate, and interpret all relevant research findings related to a specific research question, topic, or phenomenon being investigated (Dewi & Lim, 2024). To ensure methodological rigor, this study followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol, which encompasses the processes of identification, screening, eligibility assessment, and inclusion of studies for further

analysis.

The systematic review was carried out through a structured sequence following PRISMA guidelines: (1) data identification, (2) data screening, (3) eligibility assessment, and (4) final inclusion of relevant studies. The screening and selection process was supported by the Covidence platform (https://app.covidence.org/sign_in), which facilitated article management and filtering. The literature search in the Scopus database returned 89 articles. However, only 74 records were retained after screening, while 15 records were excluded due to duplication.

The next step was the screening stage, in which 39 documents were excluded because they were not relevant to the research focus retrieved from Scopus, including files that could not be accessed or downloaded. As a result, 35 articles were accepted to proceed to the next stage, namely the quality assessment phase.

The third step was the eligibility stage, during which the remaining articles were evaluated through a full-text review. The assessment was carried out based on the predetermined inclusion and exclusion criteria.

Tabel 1. Inclusion and Exclusion Criteria

Category	Inclusion Criteria	Exclusion Criteria
Topic Relevance	Studies on the impact of low physical activity / sedentary lifestyle in children in the digital era	Studies on physical activity without a digital context, or technology without a physical activity context
Outcome / Variables	Measures child development or growth (physical, motor, cognitive, psychosocial, health)	Does not assess developmental outcomes
Population / Subjects	Children aged 10–20 years	Adult or elderly population
Type of Study	Empirical articles, systematic reviews, meta-analyses	Editorials, opinions, commentaries, theses/ dissertations
Intervention / Exposure Design	Sedentary lifestyle / screen time / use of digital devices	Physical activity without a digital context
Publication Period	2019–2025	Before 2019
Document Accessibility	Full-text available	Full-text not available, abstract only

In this systematic literature review, the collected journal articles were screened using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) method. The flow of the literature review process is illustrated in the PRISMA flow diagram below, which guided the stages of this study.

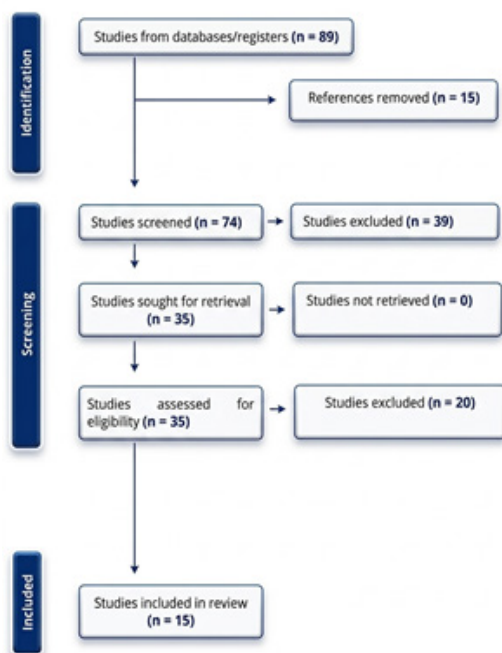


Figure 1. Flowchart PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis).

RESULTS AND DISCUSSION

The researchers conducted an article search through the Scopus database using the keywords “Physical Inactivity; Digital Era Lifestyle; Sedentary Behavior; Child Development.” The initial search yielded 89 articles. At the identification stage, duplicate records and document completeness were examined. A total of 15 articles were removed due to duplication, resulting in 74 articles moving to the next phase.

The subsequent stage was the screening process, which was carried out based on the title, abstract, and document accessibility. In this stage, 39 articles were excluded because they were not relevant to the research focus, such as studies that did not examine children’s physical activity within the context of the digital era or documents that were not fully accessible. Therefore, 35 articles met the criteria to proceed to the quality assessment phase.

During the quality assessment (eligibility stage), an in-depth evaluation was conducted to examine the alignment of each article with the inclusion criteria, focusing particularly on the relevance of developmental outcomes, the clarity of research design, and the relationship between digital exposure and reduced physical activity among children. At this stage, 20 articles were excluded because they did not meet scientific eligibility standards or were not consistent with the

direction of the research. The final selection stage resulted in 15 articles that fully met the inclusion criteria and were deemed suitable for analysis. These fifteen studies formed the basis of the synthesis to evaluate the impact of a low-physical-activity lifestyle on children’s growth and development in the digital era.

Tabel 2. The analysis of the 15 selected articles indicates that low physical activity (physical inactivity) and sedentary behavior resulting from increased exposure to digital technology have become an increasingly concerning phenomenon among children and adolescents across various countries. The studies consistently demonstrate that the intensity of digital device use such as smartphones, computers, tablets, and video games is closely associated with a decline in children’s daily physical activity levels (Domoff, et al. 2019, Lizandra, et al. 2019). This pattern contributes to reduced physical fitness, an increased risk of obesity, and suboptimal motor development (Barros, Silva and Souza 2022).

Beyond physical consequences, several studies also highlight psychological and social impacts, including heightened stress, social isolation, loneliness, and a decline in mental well-being (Nakshine, et al. 2022). Family environmental factors also emerge as significant determinants, including parental supervision, family exercise habits, and access to physical activity facilities (Kamionka, et al. 2023). These findings reinforce the notion that uncontrolled digital lifestyles have created an imbalance in children’s activity patterns, in which prolonged screen-based behavior replaces essential physical movement required for healthy development.

Furthermore, the synthesis reveals variations in the severity of the impact based on age, gender, geographic conditions, and socioeconomic status. School-age children and adolescents appear to be the most vulnerable to sedentary lifestyles due to high engagement with social media and digital gaming (Dishion and Tipsord 2011). In addition, sedentary behavior through remote learning and increased dependence on digital devices for entertainment (George and Dhull 2023).

Overall, the synthesis of the studies demonstrates that a digital lifestyle characterized by low physical activity poses a substantial threat to children’s physical and psychosocial development. These conditions underscore the urgency of developing interventions at the family, school, and digital ecosystem levels to promote a healthy balance between technology use and children’s physical activity (Rahayu, et al. 2024).

Tabel 2. Quality Assessment

Journal	Title	Conclusion
Journal of Child and Adolescent Psychiatric Nursing	Perceived Stress, Loneliness, and Resilience in Relation to Game Addiction Among Adolescents in Bangkok	The study showed that stress and loneliness were positively associated with gaming addiction in adolescents, while resilience acted as a protective factor that reduced the risk of addiction..
Acta Psychologica Journal	The mediating factor of psychological well-being between cyberbullying experience and sedentary behaviour among university students	These findings show that digital victimization affects physical activity patterns, emphasizing the importance of psychological interventions to address its behavioral health impacts.
Mental Health and Physical Activity Journal	Cross-sectional and longitudinal associations between sedentary behavior and behavioral problems in children with overweight/obesity	Longitudinal design with a large sample; uses accelerometer-measured data (objective); strong statistical analysis controlling for multiple covariates including MVPA.
Journal of Elementary Education	From Digital Technology to Healthy Habits: Interdisciplinary Foundations for Developing Training Programs for a Healthy Lifestyle Among Children	This article explores the impact of digital technology on children's development, focussing on the physical, cognitive, and emotional domains. This approach aims to promote healthier lifestyle choices.
Journal of Developmental and Physical Disabilities	Association Between Physical Activity, Sedentary Time, and Technology Use in Autistic Adults	Technology has been used as an educational and social intervention tool for autistic individuals, yet it is also associated with low PA and high sedentary time (ST) in the neurotypical population.
Plos One Journal	Assessing the relationship between digital technology use and physical health, fitness, and exercise levels among Chinese youth: The moderating effect of parental monitoring	The study investigates how digital media use, parental supervision, and attitudes towards physical activity influence young Chinese individuals' physical health and exercise level
SciELO Brasil Journal	Association between parental supervision and sedentary behavior and physical inactivity and among Brazilian adolescents	Adolescents were sedentary and physical inactive when they spent ≥ 3 hours/day sitting and practiced less than 60min/day of physical activity, respectively.
Retors Journal	A model of physical literacy, parental involvement, and social factors on motor development in children with social development as a moderator	Early motor development is crucial for children's growth, but inactivity, lack of parental awareness, and excessive screen time hinder progress. Urgent interventions are needed to promote active lifestyles from an early age
Frontiers in Psychology	Beyond the pandemic: physical activity and health behaviors as predictors of well-being among Filipino tertiary students	Uses multiple regression analysis and has a very large sample size. However, it is cross-sectional and based on self-reported data.
Journal of Technology in Behavioral Science	The Impact of Fitness Influencers on Physical Activity Outcomes: A Scoping Review	Follows a systematic scoping review methodology (e.g., PCC framework) with comprehensive database searches.
Journal of Preventive Medicine and Public Health	The Influence of Family Adversities on Longitudinal Changes in Physical Inactivity Among Korean Adolescents	These findings suggest that adolescents who experience parental rejection are more likely to report an increase in sedentary behaviors
Journal of Physical Activity and Health	Global Physical Activity, Active Commuting to School, and Sedentary Behavior Among Latin American Adolescents: Global School-Based Student Health Survey and the National School Health Survey	Health promotion policies must include guidelines that encourage and promote a more active and less sedentary lifestyle among young people in Latin America, considering specific groups, the local socio-economic context, and differences between countries.
Scientific Reports	Comparison of enjoyment and energy expenditure of exergame with and without blood flow restriction in men and women	Controlled crossover design with objective measurements (energy expenditure), reducing inter-subject variability.
BMC Public Health	Hotspots and trends in health-oriented physical literacy research: a visual analysis based on the WOS database	based on the results of the visual analysis, we propose that proper health is built on the sense of physical literacy and further construct the circular path of physical literacy, physical activity, and physical health improvement.
Journal of Functional Morphology and Kinesiology	The Effects of Physical Activity and the Consequences of Physical Inactivity in Adult Patients with Congenital Heart Disease	Compares pre- and post-pandemic data within the same patients, but without a randomized control group and focused on a specific clinical population.

CONCLUSION

Based on the synthesis of the 15 systematically selected articles, this study concludes that a low level of physical activity among children in the digital era has developed into a silent epidemic that substantially affects children's growth and development. The increasing intensity of digital device use including smartphones, social media, computers, tablets, and digital-based games has been shown to directly contribute to sedentary behavior and reduced daily physical activity. The most affected groups are school-aged children through adolescents (around 10–18 years), who exhibit the highest intensity of digital engagement and, consequently, the greatest vulnerability to a sedentary lifestyle.

The negative impacts identified are not limited to physical aspects, such as decreased fitness, increased risk of obesity, and hindered motor development, but also extend to psychological and social domains, including stress, social isolation, reduced quality of life, and weakened mental health. Family environmental factors, including the level of parental supervision and physical activity habits at home, also play a key role in reinforcing or mitigating the effects of digital lifestyles.

Overall, the findings reveal that the imbalance between physical activity and digital technology use presents a real threat to children's development in both the short and long term. Continued research and the implementation of interventions at the family, school, and community levels are critically important to ensure that technological engagement is balanced with children's physical activity needs. Strategic approaches may include digital parenting education, screen time regulation policies, and the provision of engaging physical activity opportunities that align with modern lifestyles. Thus, supporting children's health and development in the digital era does not require eliminating technology, but ensuring its responsible, measured, and balanced use alongside adequate physical activity.

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