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The Relationship Between a Sedentary Lifestyle and Gross and Fine Motor Development in Children Aged 2–12 Years: A Literature Review

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ABSTRACT

Children spend more time in front of screens every year, and more of that time sitting still. Between ages 2 and 12, gross and fine motor skills take shape and later affect how children move and relate to others. This narrative literature review examines how a sedentary lifestyle, screen time above all, relates to motor development in children aged 2 to 12 years. We searched Google Scholar, PubMed, ScienceDirect, Wiley Online Library, and national journal portals using Indonesian and English keywords: "sedentary behaviour," "screen time," "motor development," "gross motor skills," "fine motor skills," and "children." Screening ran in three stages: keyword identification, title and abstract reading, then full-text checks against the inclusion criteria (empirical studies or reviews linking sedentary behavior, screen time, or physical activity to motor development, in children aged 2–12 years, published 2021–2025). Seventeen articles passed and were synthesized narratively by age group and type of sedentary behavior. Longer screen time went with weaker gross and fine motor outcomes, most clearly in early childhood, though correlations ran from weak to moderately strong. Physical activity and active play protected motor development. The link was uneven, however: it shifted with the content, duration, and context of device use, and some studies found no significant association or a small benefit from interactive use. Motivation and self-confidence kept children moving, and the COVID-19 pandemic showed how quickly motor skills slip. We recommend keeping screen time within health guidelines, scheduling regular play in early childhood, and running longitudinal studies with standardized motor assessments.

Keywords: sedentary lifestyle; screen time; motor development; gross motor skills; fine motor skills; children

INTRODUCTION

Gross and fine motor skills are among the first competencies children build, and their reach goes well beyond the playground. Gross motor skills rely on large muscle groups and show up when a child runs, jumps, climbs, or throws a ball. Fine motor skills depend on small muscles and hand-eye coordination, as in writing, drawing, or picking up a small object. Both feed into cognition. In the UK Millennium Cohort Study, which followed 3,188 children from 9 months to 11 years, gross motor skills were positively associated with spatial working memory, and fine motor skills predicted better English and science results (Zhou & Tolmie, 2024). (Lopes et al., 2020) go further and describe motor competence as a foundation for an active lifestyle, tied to weight status, physical fitness, mental health, and cognitive development. The years between 2 and 12 matter most here, because they cover the move from early childhood into primary school, when children refine basic movements and start to depend on them for learning and independence.

Daily life, however, is pulling children toward sitting. Sedentary behavior means any waking activity with low energy expenditure in a sitting, reclining, or lying posture, and screen time is one of its most common forms. Digital devices reach children earlier every year, and

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changes in family routines have pushed screen exposure up with them. In Kupang, East Nusa Tenggara, for example, 54.5% of 55 children aged 24–60 months exceeded 60 minutes of screen time per day, and 63.6% showed fine motor development below what their age requires (Ndun et al., 2025). The COVID-19 pandemic made the risk easier to see: among kindergarten children aged 4–5 years, gross motor skills fell from the "average" to the "poor" category after stay-at-home restrictions cut physical activity and outdoor play (Pranoto et al., 2023). The World Health Organization has responded with guidelines on physical activity, sedentary behavior, and sleep for children under five, advising families to limit long periods of sitting and screen viewing and to build active play into the day.

What the research says about this problem is less settled than the concern around it. Most studies report that more screen time goes with weaker gross and fine motor skills. A systematic review of 24 studies found a significant negative association in 17 of them (Bakht et al., 2025), yet the same review noted that moderate use of interactive touchscreens was slightly linked to better specific fine motor skills. (Dutra et al., 2025) reported a similar spread: some studies found harm to gross motor skills and visuomotor integration, others found possible gains in fine motor skills, and others found no significant association. The strength of the relationship varies as well, from weak ($r = -0.252$ in children aged 8–10 years; (Páez-Herrera et al., 2025) to moderately strong ($r = -0.546$ in children aged 2–3 years; (Pratama & Naufal, 2023). Duration, content, frequency, and context of use all appear to shape the result (Dutra et al., 2025). For parents and teachers, this mix of findings makes it hard to know what to do.

Part of the difficulty lies in how the evidence is organized. Among the sources we reviewed, existing systematic reviews cover narrow age bands: 0–7 years (Bakht et al., 2025), 0–6 years (Dutra et al., 2025), and children under eight (Panjeti-Madan & Ranganathan, 2023). Evidence on older children sits in separate individual studies, such as those on 6–7 year-olds (Broze et al., 2022a) and 8–10 year-olds (Páez-Herrera et al., 2025). Few syntheses set early childhood and school age side by side, and fewer still read the sedentary-behavior findings together with physical activity as a protective factor and with psychosocial influences such as motivation and self-confidence (Ramdini & Yaswinda, 2021). Without that wider view, it stays unclear whether the pattern holds as children grow older or changes with age, type of activity, and setting.

This literature review addresses that gap. It examines what studies report about the relationship between a sedentary lifestyle and gross and fine motor development in children aged 2 to 12 years; it looks for patterns across age groups, types of sedentary activity, and research contexts; and it draws out practical implications for parents, educators, and policymakers. The aim is to give readers a clearer basis for deciding how much sitting is a problem, which activities deserve attention, and how to protect children's motor development while digital devices continue to spread.

METHOD

We carried out a narrative literature review on how a sedentary lifestyle relates to gross and fine motor development in children aged 2–12 years. The included studies differ too much in design, age band, type of sedentary behavior, and motor test for their results to be pooled statistically, so we chose a narrative approach over a meta-analysis. We borrowed the reporting logic of PRISMA 2020 for searching and screening, but the review is not registered as a systematic review. The search ran in across Google Scholar, PubMed, ScienceDirect, Wiley Online Library, and Indonesian national journal portals, and it covered articles published from

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2021 to 2025 in English or Indonesian. Three keyword groups were joined with AND: exposure (sedentary behaviour, sedentary lifestyle, screen time, physical inactivity), outcome (motor development, motor skills, gross motor, fine motor), and population (child, preschool, school-age), plus Indonesian equivalents such as perilaku sedentari, waktu layar, motorik kasar, and motorik halus. We then went through the reference lists of key articles by hand to catch anything the databases missed.

The target population was typically developing children aged 2–12 years. Samples sitting wholly inside that range qualified automatically. Studies reporting wider age bands (0–7 years, 0–6 years, or 9 months–11 years, for example) qualified only when their findings applied to children aged 2–12, while studies limited to children under 2 or adolescents over 12 were out. One study of children with intellectual disability (Sedaghati et al., 2022)stayed in as a complementary source, and we discuss it separately. An article also had to examine sedentary behavior, screen time, or physical (in)activity; report gross motor, fine motor, or overall motor development as an outcome; be a peer-reviewed empirical study (cross-sectional, cohort, descriptive, or correlational) or a literature or systematic review; appear in 2021–2025; and be written in English or Indonesian. We excluded articles that said nothing about sedentary behavior or physical activity, those covering only cognitive, language, or psychosocial outcomes with no motor component, opinion pieces, editorials, case reports, conference abstracts, unpublished theses, and anything without full-text access.

The 17 articles appeared in 2021= 2, 2022= 2, 2023 = 3, 2024= 5, and 2025= 5. Eleven were primary studies, two of them cohort studies and nine cross-sectional, correlational, or descriptive. They came from Indonesia (n = 4), Chile (n = 2), and Brazil, China, Iran, Portugal, and the United Kingdom (n = 1 each), with samples ranging from 30 to 3,188 children. The other six were reviews: three systematic And three narrative. Eight articles dealt directly with screen time or sedentary behavior, five with physical activity or inactivity, and four with motor development status or psychosocial and conceptual questions; Table 1 gives the details.

For each article we filled in a standardized extraction sheet with authors, year, title, design, sample size and age, type of sedentary behavior or physical activity, motor outcome and assessment tool, main findings (including effect sizes or correlation coefficients), and DOI. One author extracted the data and checked it; disagreements were settled by discussion.

We synthesized the data narratively. Articles were grouped first by age (early childhood or school age) and then by exposure: screen time, general sedentary behavior, physical activity, or a situational factor such as COVID-19. Within each group we compared the direction of findings (negative, positive, or no association) and their strength (weak, moderate, or strong, judged from the reported coefficients), then checked whether design, sample size, measurement tools, or population could explain the differences. Because the reviews also contain some of the primary studies, we read the two types separately so the same evidence would not be counted twice. Given the heterogeneity, we did not pool results statistically.

We did not score risk of bias formally, and no study was excluded for quality, which fits the exploratory aim of a narrative review. Instead we judged quality descriptively: whether the article was peer-reviewed, how clear the design was, whether the sample was adequate, and whether the tools for sedentary behavior and motor outcomes were valid. Small samples, parent-reported screen time, non-standardized motor tests, and cross-sectional designs that cannot show causality all limit the evidence, so we weighed them when interpreting the results. The lack of a formal quality assessment is itself a limitation of this review.

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RESULTS AND DISCUSSION

Table 1. *Results of the journal review relevant to the topic of the problem*

No	Authors and Year	Title	Method	Sample	Findings	Link
1.	Sedaghati et al., 2022	Effects of COVID-19 related physical inactivity on motor skills in children with intellectual disability	In this prospective cohort study, 30 boys with ID were divided into two groups based on study inclusion criteria (mean age 10.86 ± 1.81 active, 10.20 ± 1.42 inactive).	30 boys with ID were divided into two groups based on study inclusion criteria (mean age 10.86 ± 1.81 active, 10.20 ± 1.42 inactive).	Results showed a significant difference between active and inactive groups in the total score of gross motor skills (P = 0.001), fine motor skills (P = 0.002), motor skills (P = 0.001), postural control (P = 0.01), and dynamic balance (P = 0.01).	https://doi.org/10.1186/s12889-022-14887-y
2.	Hurtado-Almonacid et al., 2024	Development of Basic Motor Skills from 3 to 10 Years of Age: Comparison by Sex and Age Range in Chilean Children	quantitative paradigm with a descriptive study	328 children (170 girls and 158 boys).	This study found that the majority of children in Chile (55.5%) fell into the low motor development category, with motor ages generally lower than their chronological ages. Additionally, significant differences in motor development were observed across age groups, but no significant differences were found between boys and girls.	https://doi.org/10.3390/children11060715
3.	Bakht et al., 2025	Assessing the Impact of Screen Time on the Motor Development of Children: A Systematic Review	systematic review	It involved 24 studies covering children aged 0 to 7 years from 12 countries across 4 continents.	Based on a systematic review of 24 global studies involving children aged 0–7 years, the findings indicate that the majority of studies (17 out of 24) identified a significant negative correlation between excessive screen time and motor development; this is characterized by lower scores in gross and fine motor skills and an increased risk of Developmental Coordination Disorder (DCD) resulting from reduced physical activity	https://onlinelibrary.wiley.com/doi/10.1002/pdi3.70002

No	Authors and Year	Title	Method	Sample	Findings	Link
					and social interaction. However, this relationship is complex, as a small number of studies noted that moderate use of interactive touchscreen devices could actually show a slight positive association with specific fine motor skills, making content, context, and limits on screen time duration key determining factors.	
4.	Ndun et al., 2025	The Effect of Screen Time Duration on Fine Motor Development in Children Aged 2–5 Years in Kupang, East Nusa Tenggara	This study employs an analytical correlational design with a cross-sectional approach.	A total of 55 children aged 24–60 months were recruited using consecutive sampling	The results showed that 54.5% of children were exposed to excessive screen time (>60 minutes/day), and 63.6% demonstrated fine motor development that was not appropriate for their age. A significant moderate negative correlation was observed between screen-time duration and fine motor development (r = −0.449; p = 0.001). Children with excessive screen time had a substantially lower proportion of age-appropriate fine motor development (16.7%) compared with children who adhered to recommended screen-time limits (60%).	https://dx.doi.org/10.47191/ijcsrr/v8-i12-76
5.	T. Istri et al., 2024	The effect of physical activity for the development of motor skill in children aged 3-12 years old: a narrative review.	tinjauan literatur (literature review)	Children aged 3 to 12 years.	Based on an analysis of five selected journals, this study demonstrates a significant positive relationship between physical activity and motor skill development in children aged 3–12 years, noting that the specific motor skills developed vary considerably depending on the form, type, and organization of the physical activity performed..	https://doi.org/10.62004/kpc.v3i1.30

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No	Authors and Year	Title	Method	Sample	Findings	Link
6.	Dutra et al., 2025	Association Between Exposure to Smartphones and Tablets and Motor Development in Early Childhood: A Systematic Review.	tinjauan sistematis (systematic review)	A total of 7 observational (cross-sectional) studies with a combined sample of 1,339 children aged 0 to 6 years.	Research findings indicate a complex and varied relationship between device usage and children's motor development; some studies report negative impacts on gross motor skills and visuomotor integration, while others note potential benefits for fine motor skills or find no statistically significant association, with the impact depending heavily on duration, frequency, age at initial exposure, and the context of use.	https://doi.org/10.1111/cch.70180
7.	Pratama & Naufal, 2024	The Relationship Between Screen Time and Gross Motor Skills in Children Aged 2–3 Years at the Nagari Sungai Pulai Integrated Health Post (Posyandu)	metode Cross Sectional Study	A total of 42 children aged 2–3 years at the Nagari Sungai Pulai Integrated Health Post (Posyandu).	Based on the Spearman's rho test, a significance value of p = 0.000 (p < 0.05) and a correlation coefficient of r = -0.546 were obtained, indicating a moderately strong negative relationship between screen time and gross motor skills; specifically, as the duration of screen time increases, a child's gross motor skills decline.	https://doi.org/10.52019/ijpt.v3i2.6248
8.	Syam, 2025.	*Sedentary Lifestyle* terhadap Tingkat Kesegaran Jasmani pada Siswa	This study employs a correlational research design with a survey method to examine the relationship between a sedentary lifestyle and the level of physical fitness.	A total of 31 primary school students aged 10–12 years at SD Negeri Bontorikong, Bontonompo District, Gowa Regency, were selected using a purposive sampling technique.	This study found that students' sedentary lifestyle levels fall into the low category, while their physical fitness levels fall into the moderate category. The correlation test results indicate a significant negative relationship (-0.382; p = 0.034 < 0.05), meaning that a higher level of sedentary lifestyle tends to be associated with a lower level of physical fitness, and vice versa.	https://ejurnal.ung.ac.id/index.php/tominisports/article/view/34200/11672.
9.	Zhou & Tolmie, 2024	Associations between Gross and Fine Motor	our study examined the	The sample was 3188 children	The results suggest that gross motor skills were positively associated with	https://doi.org/10.3390/brainsc

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		Skills, Physical Activity, Executive Function, and Academic Achievement: Longitudinal Findings from the UK Millennium Cohort Study	longitudinal relationship of early motor skills and physical activity with later cognitive skills.	from the United Kingdom Millennium Cohort Study, followed at 9 months and 5, 7, and 11 years.	spatial working memory, whereas fine motor skills were predictive of good English and science outcomes. Moderate-to-vigorous activity was found to be negatively associated with English performance, although self-reported activity frequency was positively linked to math.	i1402012 1
10.	Ramdini & Yaswinda, 2021	Motivation and Self-Confidence in Motor Activities in Kindergarten	metode tinjauan Pustaka (literature review)	The sample consists of review or conceptual articles that analyze various literature, theories, and findings from previous research.	This study concludes that motivation and self-confidence play a crucial role as primary drivers for young children engaging in physical or motor activities; specifically, motivation (both intrinsic and extrinsic) and high self-confidence help optimize physical and cognitive development while preventing psychological barriers—such as low self-confidence stemming from obesity or the negative impact of gadget usage.	https://doi .org/10.29 91/assehr. k.210322. 042
11.	Pranoto et al., 2023	The Effects of Inactivity During The COVID-19 Pandemic on the Psychomotor Skills of Kindergarten Students	quantitative approach using a descriptive survey method	80 kindergarte n students (comprising 45 boys and 35 girls) aged 4 to 5 years.	This study indicates that students' gross motor skill levels declined significantly during the COVID-19 pandemic—falling into the "poor" category compared to the "average" category prior to the pandemic—due to reduced physical activity and a lack of outdoor learning interactions during stay-at-home restrictions.	https://dx. doi.org/10 .52547/aa ssjournal. 1162
12.	Panjeti-Madan & Ranganath an, 2023	Impact of Screen Time on Children's Development: Cognitive, Language, Physical, and Social and Emotional Domains	systematic literature review	A total of 62 key studies passed the screening process, focusing on children under the	This study finds that the use of digital devices and screen time duration have mixed impacts (both positive and negative) on children; positive effects include enhanced learning capabilities through educational apps and remote communication,	https://doi .org/10.33 90/mti705 0052

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				age of eight.	while negative effects encompass cognitive impairment, language delays, sleep problems, obesity risks due to physical inactivity, and socio-emotional issues such as emotional dysregulation. Therefore, close parental supervision and adherence to screen time limit guidelines issued by health organizations are essential. to support optimal child growth and development.	
13.	Flores et al., 2023	Relationships between Math Skills, Motor Skills, Physical Activity, and Obesity in Typically Developing Preschool Children	A quantitative method employing multivariate analysis using the stepwise Multiple Linear Regression (MLR) method.	The sample consisted of 62 preschool children (32 males) with an average age of 4.63 ± 0.81.	The results of this study suggest that the implementation of structured physical activity programs can contribute to mathematical performance.	https://doi.org/10.3390/bs13121000
14.	Yuan et al., 2024	The relationship between screen time and gross motor movement: A cross-sectional study of pre-school aged left-behind children in China	quantitative method with a cross-sectional approach.	method was used to study 817 left-behind children aged 3-6 years in 15 kindergartens in Xiangcheng city, Henan province.	The average daily screen time of left-behind children aged 3-6 years old increased with age, and the reporting rate of >2 h/d ranged from 22.43% to 33.73%; gross motor movement of left-behind children aged 3-6 years old increased with age, with significant differences between age ($p<0.05$). There was a low to moderate negative correlation ($r = -0.133$ to -0.354, $p<0.05$) between screen time and gross motor movement in children aged 3-6 years, and multiple regression analysis showed that screen time was predictive of gross motor movement in children ($p<0.05$), with	https://doi.org/10.1371/journal.pone.0296862

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					an explanation rate of 21.4%.	
15.	Lopes et al., 2021	A Narrative Review of Motor Competence in Children and Adolescents: What We Know and What We Need to Find Out.	narrative review	Using research samples from previous studies relevant to the research title.	This study concludes that Motor Competence (MC) is a complex bio-cultural attribute that serves as a crucial foundation for an active lifestyle and is closely linked to weight status, physical fitness, mental health, and cognitive development in children and adolescents. However, current global MC levels remain suboptimal, showing a downward trend over time; consequently, this study highlights the urgent need to establish internationally standardized field assessment tools, create a global MC observatory, and strengthen interdisciplinary collaboration to translate research into practical policy.	https://doi.org/10.3390/ijerph18010018
16.	Paez-Herrera et al., 2025	Relationship Between the Use of Screens and the Motor Development of Children from 8 to 10 Years of Age	employs a non-experimental quantitative method with a cross-sectional design and a correlational scope.	206 children, consisting of 126 girls (61.17%) and 80 boys (38.83%).	Girls have a greater weekly time than females in the use of consoles (p = 0.004). Girls and boys who are in the very poor, poor, and low average levels of motor development have more time in front of TV, PC, consoles, and total time with screens. There is an inverse relationship between the level of motor development and weekly screen time (r = −0.252).	https://doi.org/10.3390/children12050584
17.	Broze et al., 2022	WHAT IS THE LEVEL OF MOTOR DEVELOPMENT IN SIX- AND SEVEN-YEAR-OLD CHILDREN IN A FULL-TIME SCHOOL?	This study employs a quantitative approach because the data generated consist of percentages representin	School-age children, 6 and 7 years old.	The results reveal that 21.43% are classified as very poor, 73.81% of the evaluated students presented the poor classification, the classifications below average and average obtained only 2.38% of the school children, and it	https://revista.cpaqv.org/index.php/CPAQV/article/view/1061/version/921

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			g motor performanc e figures.		stands out that none of the evaluated students had the motor performance classified as above average, skilled or very skilled.	

The Concept of a Sedentary Lifestyle and Children's Motor Development

The Sedentary Behavior Research Network treats sedentary behavior as any waking activity that burns little energy while a person sits, reclines or lies down, and screen time falls under that label as one particular type. The distinction matters because sedentary activities aren't all alike. A child watching television without doing anything is passive, whereas other activities make the child respond, play or learn, so researchers expect their effects on development to differ. (Panjeti-Madan & Ranganathan, 2023) reported that digital devices can help, for example when educational apps support learning, yet the same devices were tied to problems with cognition, language, sleep and socio-emotional development. (Bakht et al., 2025)found a slight positive link between moderate use of interactive touchscreens and some fine motor skills.

Motor development unfolds over time, shaped by the way biology and environment push on each other. Researchers who take that view describe motor competence as a bio-cultural attribute with many moving parts. They treat it as the base for an active lifestyle, linked to weight status, physical fitness, mental health and cognitive development in children and adolescents, and they point out that motor competence has declined worldwide over the years. (Zhou & Tolmie, 2024) show that early motor skills matter well beyond movement itself: across 3,188 children followed over time, better gross motor skills went with stronger spatial working memory, while fine motor skills predicted high results in English and science.

Screen Time and Motor Development in Early Childhood

(Bakht et al., 2025) reviewed 24 studies from 12 countries across four continents, all on children aged 0–7 years. Seventeen of them found a significant negative correlation between excessive screen time and motor development: children scored lower on gross and fine motor measures and faced a higher risk of developmental coordination disorder (DCD), which the authors tied to less physical activity and less social interaction. The picture isn't uniform, though. A few studies saw a slight positive association between moderate use of interactive touchscreens and specific fine motor skills, which suggests that content, context and time limits decide much of the outcome.

(Anindhita Mella Pratama & Adnan Faris Naufal, 2024) ran a cross-sectional study of 42 children aged 2–3 years at the Nagari Sungai Pulai integrated health post (posyandu). Spearman's rho gave $p = 0.000$ ($p < 0.05$) and $r = -0.546$, a moderately strong negative relationship between screen time and gross motor skills: the more screen time, the weaker the child's gross motor ability.

Fine motor skills in somewhat older preschoolers tell a similar story. (Ndun et al., 2025) used an analytical correlational, cross-sectional design with 55 children aged 24–60 months in Kupang, East Nusa Tenggara. Of these children, 54.5% had excessive screen time (over 60 minutes a day), and 63.6% had fine motor development that didn't match their age. Screen time

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duration correlated negatively and moderately with fine motor development ($r = -0.449$; $p = 0.001$). Among children with excessive screen time, just 16.7% had age-appropriate fine motor development, against 60% of those who stayed within the recommended limits. (Yuan et al., 2024) studied 817 left-behind children aged 3–6 years in 15 kindergartens in Xiangcheng, Henan Province, China, and found a low to moderate negative correlation between screen time and gross motor movement ($r = -0.133$ to -0.354, $p < 0.05$). Screen time also predicted gross motor movement, with an explanation rate of 21.4%.

(Dutra et al., 2025) pooled seven observational studies covering 1,339 children aged 0–6 years, and their systematic review shows how uneven the evidence gets once smartphones and tablets enter the picture. Some studies reported harm to gross motor skills and visuomotor integration. Others reported possible gains in specific fine motor skills, or no statistically significant association at all. Duration, frequency, age at first exposure and the context of use appear to explain the spread. (Panjeti-Madan & Ranganathan, 2023) took a wider view in a systematic literature review of 62 key studies on children under eight. Digital devices, they concluded, cut both ways. On the good side, educational apps can strengthen learning and devices allow remote communication. On the bad side, the review lists cognitive impairment, language delays, sleep problems, obesity risk from physical inactivity, and socio-emotional trouble such as emotional dysregulation. Given that balance, the authors treat close parental supervision and adherence to health organizations' screen time guidelines as essential for healthy development, motor skills included.

Physical Activity as a Protective Factor for Motor Development

Physical activity sits at the opposite end from sedentary behavior, and the research treats it as a protective factor for motor development. (Istri et al., 2024) reviewed five selected journals in a narrative review and concluded that physical activity goes hand in hand with better motor skills in children aged 3–12 years. Which skills improve, though, depends heavily on the form, type and organization of the activity.Longitudinal data complicate the picture. (Zhou & Tolmie, 2024) drew on the UK Millennium Cohort Study and followed 3,188 children at 9 months and again at ages 5, 7 and 11. Moderate-to-vigorous activity was negatively associated with English performance, yet self-reported frequency of activity was positively linked to math. Results this mixed suggest that what a study finds about later outcomes may hinge on how it measures activity and on which outcome it examines.

Preschoolers show a related pattern. (Flores et al., 2023) studied 62 preschool children (32 of them male) with a mean age of 4.63 ± 0.81 years, using a quantitative approach and stepwise multiple linear regression. Their results suggest that structured physical activity programs can contribute to mathematical performance, so the benefits may reach past motor skills.

Sedentary Lifestyle and Gross/Fine Motor Skills in School-Age Children

(Hurtado-Almonacid et al., 2024) turned to a somewhat older group: 328 children aged 3–10 years in Chile, 170 girls and 158 boys, in a descriptive quantitative design. A little over half (55.5%) landed in the low motor development category, and their motor ages mostly trailed their chronological ages. Motor development differed clearly between age groups but not between boys and girls. That pattern points toward environment and lifestyle, sedentary behavior among them, as a bigger influence than gender. Older children show the same direction, only weaker. (Páez-Herrera et al., 2025) surveyed 206 children aged 8–10 years (126

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girls, 80 boys) in a non-experimental, cross-sectional study with a correlational scope. Children whose motor development rated very poor, poor or low-average spent more time with the TV, computer and consoles and had more total screen time. Motor development level and weekly screen time moved in opposite directions ($r = -0.252$).

Low motor performance also shows up early in primary school. (Broze et al., 2022) assessed six- and seven-year-olds in a full-time school and classified 21.43% as very poor and 73.81% as poor in motor performance. Only 2.38% reached the below-average and average classifications, and nobody made it into the above-average, skilled or very skilled categories. The data I have here don't tie these figures to sedentary behavior, so they only show how limited motor performance can be at this age.

(Syam, 2025) used a correlational survey design with 31 elementary school students chosen by purposive sampling. The result was $p = 0.034$ ($p < 0.05$) and a Pearson coefficient of -0.382, a significant negative relationship between a sedentary lifestyle and physical fitness: more sedentary behavior, lower fitness. Across school-age children, then, screen time and sedentary habits go with poorer motor development or fitness, but only weakly to moderately ($r = -0.252$ in (Páez-Herrera et al., 2025); $r = -0.382$ in (Syam, 2025). The strength of the link shifts with the variables a study measures, its sample size and the population it draws from.

Psychosocial Factors: Motivation and Self-Confidence

Duration and type of activity aren't the whole story, because psychosocial factors also shape how a child's lifestyle relates to motor development. After reviewing the literature, (Ramdini & Yaswinda, 2021) concluded that motivation and self-confidence are what mainly push young children to move and practice motor skills. Motivation, whether it comes from the child or from outside, paired with solid self-confidence supports healthy physical and cognitive growth. It also guards against psychological barriers, such as the low self-esteem tied to obesity or the harm that comes with heavy device use. So an intervention that only caps screen time won't reduce sedentary behavior in children. The setting around them has to give them reasons to move and the confidence to do it, and that probably counts for as much as the limit itself, if not more.

Situational Impact: The COVID-19 Pandemic on Motor Development

The COVID-19 pandemic shows what happens when sedentary behavior jumps suddenly. (Pranoto et al., 2023) used a descriptive quantitative approach to survey 80 kindergarten students aged 4 to 5 years (45 boys and 35 girls), and their gross motor skills dropped significantly during the pandemic, sliding from the "average" category to the "poor" one. The likely causes were less physical activity, the near-total loss of outdoor learning interactions under pandemic restrictions, and the extra hours children had to spend sitting at home.

Children with intellectual disability show a similar pattern. (Sedaghati et al., 2022) ran a prospective cohort study of 30 boys with intellectual disability, split into an active group (mean age 10.86 ± 1.81 years) and an inactive group (10.20 ± 1.42 years). The two groups differed significantly in total gross motor skills ($P = 0.001$), fine motor skills ($P = 0.002$), overall motor skills ($P = 0.001$), postural control ($P = 0.01$) and dynamic balance ($P = 0.01$). COVID-19-related physical inactivity, then, affects both gross and fine motor outcomes, and vulnerable groups are no exception.

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Synthesis of Findings and Implications

The seventeen articles reviewed reveal a fairly consistent pattern. High levels of screen time and passive sedentary behavior are generally associated with lower gross and fine motor skill attainment, particularly in early childhood (Ndun et al., 2025); conversely, physical activity and active play emerge as protective factors (Istri et al., 2024).

However, this relationship is not always linear or uniform. Some studies included in the reviews found no significant association (Dutra et al., 2025), and the correlations reported in individual studies ranged from weak to moderately strong (Páez-Herrera et al., 2025). Other studies revealed that the type of sedentary activity influences the nature of the relationship: interactive and educational activities, such as moderate use of touchscreen devices or educational apps, can offer specific benefits, particularly for learning and certain fine motor skills (Bakht et al., 2025).

This variation in findings highlights a key point: the relationship between a sedentary lifestyle and children's motor development is multidimensional. Factors such as the duration, type, content, and context of sedentary activities play a role, as do the child's age group, the motor assessment methods used, and psychosocial factors like motivation and self-confidence.

For parents and educators, the implications are clear: simply limiting screen time in accordance with guidelines is insufficient. It is essential to actively provide opportunities for active play and structured physical activity, select educational and interactive sedentary content when screen use is unavoidable, and foster the child's motivation and confidence to engage in physical movement. And last for policymakers in education and child health, these findings underscore the importance of early detection programs for motor delays, particularly following unique situations like the pandemic, which was associated with reduced physical activity and lower motor performance among children (Pranoto et al., 2023).

CONCLUSION

Across the seventeen articles and literature reviews, one pattern keeps returning: children aged 2-12 who live more sedentary lives tend to show weaker gross and fine motor development, especially when the sitting involves screens or other passive, stationary activity. Physical activity and active play push the other way and protect development. The strength of that link shifts, though, and so does its direction. What a child does while sitting, how old the child is, and the social and physical setting all change the result, so the findings don't generalize cleanly. Motivation and self-confidence matter as well, since they decide whether children choose to move at all. The COVID-19 pandemic showed how quickly motor development can suffer when activity patterns change overnight.

For parents and educators, the findings point to a few concrete steps. Keep screen time within established health guidelines. Where screens can't be avoided, favor interactive, educational content over passive viewing. Then give children space and time to play actively and to join structured physical activity, regularly rather than now and then.

Future research has gaps to fill. More longitudinal studies would help, along with standardized motor assessment tools so results can be compared across studies. Researchers also need to test how psychosocial factors, socioeconomic status and the content of digital media moderate the link between sedentary lifestyles and children's motor development.

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