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Article Review

Physical Activity and Screen time, and Academic Concentration Among School Aged Adolescents in the Digital Age: A Systematic Review

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Abstract

In the digital age, the decline in academic concentration among school-aged adolescents has become a growing concern, often linked to a lack of physical activity and excessive screen time. This systematic review aims to examine how these two factors influence adolescents' concentration during the learning process. Following the PRISMA 2020 guidelines, a systematic search for articles was conducted in the PubMed, and ScienceDirect databases, and the results were screened based on titles, abstracts, and full texts according to the predefined inclusion criteria. Ten studies involving school-aged adolescents met the inclusion criteria and were included in the final analysis. The results indicate that consistent physical activity supports cognitive function and concentration, whereas high screen time is associated with reduced attention and decreased working memory capacity. Of particular note is that the combination of high physical activity and low screen time showed the most consistent association with cognitive function across all domains studied. However, since most of the included studies used cross-sectional designs, a causal relationship cannot yet be confirmed; experimental studies are needed to confirm the effectiveness of physical activity interventions and screen time restrictions in improving concentration during learning.

Keywords: physical activity, screen time, concentration.

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1. INTRODUCTION

In today's digital age, adolescents prefer to spend time in front of screens (*screen time*) rather than engaging in physical activities such as walking, jogging, or cycling (Putri et al., 2024). A lack of physical activity such as muscle strengthening exercises and low participation in physical education classes lead to impaired cognitive function in adolescents (Sun et al., 2025).

The average screen time for adolescents is 7.8 hours per day during the week and increases to 10.3 hours per day on weekends (Priambadha et al., 2025). Adolescents with 4 hours or more of screen time per day passively experience a 62% decrease in curiosity and nearly quadruple their risk of memory difficulties (Liao & Tian, 2025). Ultimately, low levels of physical activity and high screen time contribute to reduced concentration during learning, which can negatively impact adolescents' academic performance (J. Liu et al., 2022; Muhammad et al., 2025)

Concentration is the cognitive ability to selectively focus attention on relevant information, ignore distractions, and sustain that state throughout the learning process (Hobbiss & Lavie, 2024). Good concentration in the classroom is a determining factor in the academic achievement of adolescents a lack of concentration in the classroom correlates with a decline in academic achievement (Leigh et al., 2021). Furthermore, a scoping review of 33 studies demonstrates that the decline in adolescents' concentration in the current digital era is linked to high screen time duration (Leonhardt et al., 2025). Furthermore, a longitudinal study of 4,810 students aged 12–16 years showed that excessive screen time disrupts mental health and increases the risk of depression by reducing sleep quality (Hökby et al., 2025). Meanwhile, a lack of physical activity resulting from spending more time on screen has a greater impact on adolescents than on children (Wilhite et al., 2023).

Interventions aimed at increasing physical activity and managing screen time have been shown to be effective in addressing a decline in concentration during learning. Physical activity performed regularly over an extended period has a positive impact on cognitive flexibility and can help improve attention, concentration, processing speed, and response accuracy (Carcelén-Fraile et al., 2026; Mello et al., 2025). Moderate-intensity physical activity interventions, such as aerobic exercise or resistance training, result in significant improvements in cognitive function among adolescents (L. Liu et al., 2025). In fact, physical activity interventions involving endurance, strength, and coordination for 25 minutes have been shown to improve concentration (Altermann & Gröpel, 2023). More specifically, physical activity involving cognitive elements in adolescents has been shown to be more effective at improving executive function than conventional physical activity (Mao et al., 2024). On the other hand, excessive screen time negatively impacts the learning effectiveness of adolescents and leads to a decline in overall academic performance (Sunday et al., 2021). Limiting screen time, balanced with screen-free activities, along with parental guidance in selecting high-quality educational content, can actually provide positive benefits (Kar et al., 2025). Digital detox strategies have proven effective in reducing screen time a conscious practice of temporarily stepping away from digital devices. Scheduling 20–30-minute breaks to focus fully on learning can improve self-control, mental health, productivity, and concentration (Aldbyani et al., 2025). In addition, this approach also helps reduce overall screen time and improve adolescents' sleep quality (Pan et al., 2025)

However, previous studies have examined physical activity and screen time separately in relation to cognitive function in adolescents, and generally used a cross-sectional approach that cannot establish a causal relationship. Therefore, this systematic review analyzes the existing evidence regarding the effects of these two behaviors on the ability of school-aged adolescents to concentrate on their studies.

This review focuses its analysis on adolescents aged 10–18 years, using concentration during study as the primary cognitive indicator. Consequently, broader cognitive domains such

as executive function fall outside the scope of this discussion; this article does not address the effects of physical activity and screen time on physical health, sleep quality, or emotional well-being, unless these variables are directly related to academic concentration.

2. METHOD

This study employed a systematic review method that follow The 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used in this study which focused on physical activity, screen time, and concentration among school-aged adolescents.

Search Strategy. A systematic search was conducted in the PubMed and ScienceDirect databases for articles published between 2021 and 2026. The search combined keywords using Boolean operators, including ("physical activity" OR "exercise") AND ("screen time" OR "screen exposure" OR "smartphone use") AND (concentration OR attention OR "cognitive function") AND (adolescent* OR "school-aged"). The reference lists of relevant articles were also manually reviewed to identify additional eligible studies.

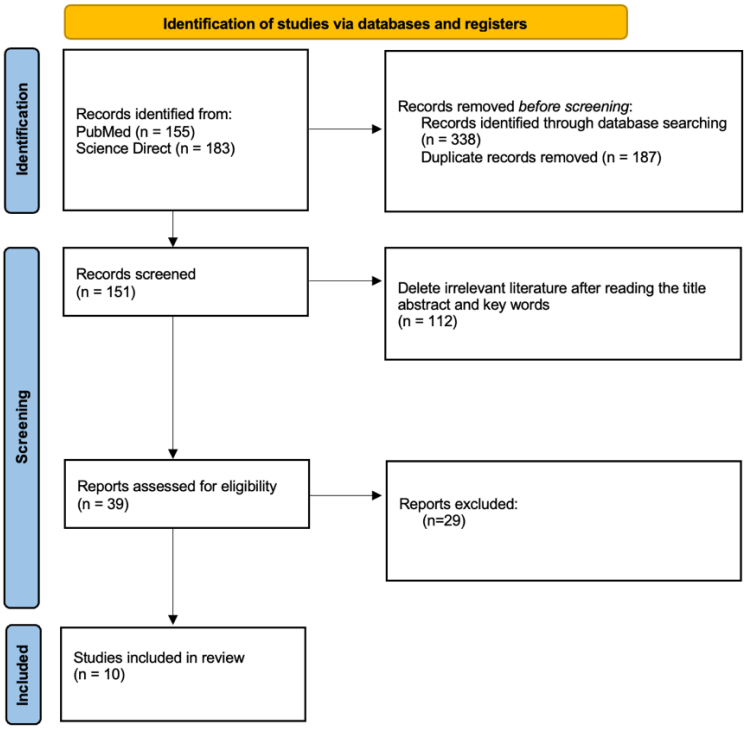
Inclusion and Exclusion Criteria. Studies were included if they involved school-aged adolescents, examined physical activity and/or screen time, and reported outcomes related to concentration or directly related cognitive functions (e.g., attention, working memory), using a cross-sectional, longitudinal, or randomized controlled trial. Studies were excluded if they involved populations other than adolescents, did not report outcomes related to concentration or attention, were not available in full text, or were published as conference abstracts, reviews, or opinion pieces.

Study Selection Process. Publications retrieved from the four databases were compiled, and duplicate entries were removed. Titles and abstracts were then screened based on inclusion and exclusion criteria, followed by a full-text review of the remaining articles. The selection process was conducted independently by the authors, and any disagreements regarding eligibility were resolved through discussion until a consensus was reached. Following this process, 10 articles met the inclusion criteria and were included in the final synthesis.

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Figure 1.

PRISMA flowchart of the article selection process



Data Extraction. For each included study, the following information was extracted: authors and year of publication; sample characteristics (size, age, gender distribution); study design; instruments used to measure physical activity; screen time; and cognitive concentration or outcomes; and main findings. The extracted data are summarized in Table 1.

3. RESULTS

The research findings used in this systematic review are as follows.

Table 1.

Result review article physical activity and screen time

Author	Sample Characteristics	Research Design	Instruments	Results
(Toth et al., 2025)	$N = 142$ students spanning ages 5 through 19, split roughly evenly by sex (52% female), who were sorted into three developmental brackets: early childhood, early	Cross-sectional	A questionnaire completed by parents and adapted from an existing media-use instrument was used to measure digital exposure. The instrument covered	As screen exposure increases, the frequency of attentional lapses also rises, accompanied by a decline in working memory performance among the

Author	Sample Characteristics	Research Design	Instruments	Results
	adolescence, and late adolescence.		four aspects: the duration of participants' screen use on school days compared with non-school days, the categories of devices used, and how closely parents monitored that use. .	adolescents studied.
(Yaakoubi et al., 2026)	$N = 270$ adolescents (54% male) between 14 and 16 years old, identified through screening on the Short Version of the Smartphone Addiction Scale (SAS-SV).	Cross-Sectional	Four separate cognitive-motor measures made up the testing protocol: sustained attention, Stroop-based selective attention, handwriting quality, and abstract reasoning. Rather than completing all four in a single session, participants were tested on each measure on a different day, always in the afternoon and always in a quiet room, without consuming caffeine or nicotine beforehand, and with each session supervised by a trained examiner.	Adolescents who depended more heavily on their smartphones and spent more time on screens performed worse on both sustained and selective attention tasks, and their handwriting quality declined measurably as well.
(Poujol et al., 2022)	$N = 632$ healthy adolescent mobile phone owners.	Cross-sectional	A school-based questionnaire, filled out by both the adolescents	Adolescents in the medium and high phone-use tiers were more inattentive than

Author	Sample Characteristics	Research Design	Instruments	Results
			themselves and their parents, placed each participant's screen time into one of three usage tiers. Researchers then used a separate, computer-administered attention network task to gauge attentional performance.	their lower-use peers, with inattentiveness rising alongside screen time.
(Kwon et al., 2024)	$N = 2{,}829$ Students were drawn from elementary, middle, and high school (53% male, 46.7% female).	Cross-Sectional	Self-report Likert items formed the basis for both measures in this study: physical activity duration was scored on a five-band scale, and in-class concentration on a five-point frequency scale, with participants completing each independently.	A pattern emerged linking daily activity levels to classroom focus: students reporting more physical activity generally reported concentrating better as well.
(Sun et al., 2025)	$N = 13{,}677$ students, aged 12–18, with a roughly even sex split (49% female, 51% male).	Cross-sectional	A self-administered survey asked participants three things: how often they attended physical education each week, whether they had played on a sports team in the past year, and whether they experienced difficulty	Cognitive difficulties were reported far less often by students attending physical education three to five times a week compared to their less active peers.

Author	Sample Characteristics	Research Design	Instruments	Results
			concentrating, remembering, or making decisions, answered as a simple yes or no.	
(Zhang et al., 2026)	$N = 62$ middle schoolers divided at random into three groups — Fitness ($n = 21$), Sports Skills ($n = 20$), and Interdisciplinary ($n = 21$).	Randomized Controlled Trial with Pre- and Post-Tests	The intervention ran for 12 weeks, with two 40-minute sessions scheduled each week. Depending on their assigned group, participants either followed a structured fitness-conditioning program, practiced soccer skills and mini-games, or took part in sport-based games and competitions built around an interdisciplinary theme.	Inhibitory control and working memory improved under all three formats. Cognitive flexibility, however, gained the most from the interdisciplinary format specifically, an effect most visible among the female participants.
(Caamaño-Navarrete et al., 2024)	$N = 150$ college students took part in this study (94 female, 54 male).	Cross-sectional	Three separate measures were combined in this study: the short-form International Physical Activity Questionnaire captured activity levels, self-reported weekly hours of video-watching and gaming stood in for screen time, and a 40-minute standardized battery evaluated executive	More hours of weekly physical activity tracked with stronger performance across a range of cognitive domains: attention, coordination, reasoning, perception, memory, and cognitive flexibility all showed a positive relationship with activity levels.

Author	Sample Characteristics	Research Design	Instruments	Results
			function.	
(Caamaño-Navarrete et al., 2025)	$N = 625$ adolescents between 10 and 17 years old took part in this study.	Cross-sectional	The Krece Plus index sorted participants into lifestyle categories based on how many hours they spent watching screens daily and being physically active after school each week; executive function was gauged with the same 40-minute cognitive battery used elsewhere in this line of research.	Attentional performance suffered most among adolescents whose lifestyle combined little physical activity with heavy screen use.
(Caamaño-Navarrete et al., 2026)	$N = 943$ children and adolescents, ranging in age from 10 to 17 (461 boys, 482 girls), made up this study's sample.	Cross-sectional	Activity levels, screen exposure, and cognitive performance were all evaluated together using the same Krece Plus lifestyle assessment and 40-minute executive-function battery applied in the studies above.	Neither activity level nor screen time alone predicted cognitive outcomes as well as the two combined: this joint lifestyle classification showed the steadiest positive relationship with cognitive performance across every domain examined.
(Lu & Zhao, 2023)	This study drew on a national dataset — the 2019 Youth Risk Behavior Surveillance (YRBS) — collected in the United States.	Cross-sectional	Its data came from a self-report questionnaire administered nationwide as part of the Youth Risk Behavior Surveillance system.	Cognitive difficulties were reported far less often by adolescents whose screen time stayed within the recommended limits.

The 10 studies, seven applied a cross-sectional design, while the remaining ones used a randomized controlled trial approach or pre-post intervention. The analysis results show that three studies indicated a positive relationship between physical activity and improved concentration or cognitive function, while four other studies found that high screen time duration was associated with decreased working memory and focus. Additionally, three studies that examined both variables simultaneously consistently found that a combination of good physical activity and low screen time resulted in optimal cognitive function, positively impacting learning concentration.

4. DISCUSSIONS

This systematic review aims to analyze the relationship between physical activity and screen time and academic concentration among school-aged adolescents. The ten articles reviewed will be discussed in detail in this chapter. A study examining physical activity and academic concentration found that the longer the duration of physical activity, the better the level of academic concentration, as indicated by the results of a questionnaire completed independently by students (Kwon et al., 2024). This is consistent with findings showing that regular participation in physical education three to five times per week is significantly associated with a reduction in cognitive impairments, including difficulty concentrating, among adolescents (Sun et al., 2025). This evidence is reinforced by research showing that a 12-week physical education intervention significantly improved working memory and cognitive flexibility, with the greatest improvements observed in the group that received interdisciplinary instruction (Zhang et al., 2026).

Furthermore, a study examining screen time and learning concentration found that the higher the daily screen time, the greater the attention deficits and decline in working memory capacity among children and adolescents aged 5–19 years (Toth et al., 2025). This research is supported by findings that smartphone addiction and high daily screen time are correlated with a decline in sustained and selective attention (Yaakoubi et al., 2026). Similarly, adolescents with moderate to high mobile phone screen time showed greater levels of inattention compared to the group with low screen time (Poujol et al., 2022).

Several studies in this research indicate that physical activity and screen time are also interrelated with cognitive functions that affect concentration in adolescents. Unhealthy lifestyles, such as low physical activity combined with high screen time, are inversely associated with adolescents' attention (Caamaño-Navarrete et al., 2025). Conversely, a group of adolescents with a lifestyle combining high physical activity and low screen time showed the most consistent relationship across all cognitive domains, compared to groups that practiced only one healthy lifestyle behavior (Caamaño-Navarrete et al., 2026). Furthermore, a study conducted on 150 college students demonstrated that hours of physical activity per week were positively associated with attention, coordination, reasoning, perception, memory, and cognitive flexibility consistently across all cognitive domains (Caamaño-Navarrete et al., 2024). These three consistent findings across three different samples indicate that low levels of physical activity tend to exacerbate the negative effects of screen time, whereas intense physical activity helps mitigate the negative impact of screen time on academic concentration. Thus, it has been proven that physical activity and screen time are associated with academic concentration.

According to the author, this article explains how physical activity contributes to adolescent learning in schools, not just focusing on physical fitness issues. By channeling excess

energy that can cause restlessness, adolescents who are more physically active tend to start learning in a calmer and more focused state. However, because the level of physical activity among adolescents is generally still below the recommended standards, the benefits of concentration have not been fully realized. From a practical standpoint, schools are advised to consider scheduling brief physical activities before starting lessons that require high concentration or to hold joint exercise activities once a week for about 60 minutes.

There is a negative relationship between screen time and concentration, proven to be a result of excessive stimulation and habits. Digital content such as short videos and social media provide quick stimuli with instant gratification, conditioning the brain to continuously seek new things. As a result, adolescents struggle to focus on academic tasks that require a longer process and more effort. Concentration worsens if screen use occurs before bedtime because it disrupts sleep quality, negatively impacting concentration the next day. Nevertheless, passive consumption (scrolling) has a worse impact compared to active use for learning purposes, even though most studies have not consistently distinguished between these two types of use.

Physical activity and screen time are interconnected in simultaneously influencing adolescents' cognitive functions. On one hand, there is a reinforcing effect where the benefits of physical activity and the negative impacts of screen time strengthen each other. On the other hand, when adolescents are engaged in physical activity, their time spent in front of screens naturally decreases. This indicates that encouraging adolescents to engage in regular physical activities is a more sustainable strategy compared to merely limiting screen time duration, as it can intervene in both behaviors simultaneously without relying on the adolescents' self-control.

These findings indicate a significant relationship between physical activity, screen time, and learning concentration that operates through complementary cognitive and behavioral mechanisms. However, the limitations of this systematic review mainly stem from the analyzed studies being cross-sectional, which means that causal relationships between variables have not been confirmed.

5. CONCLUSIONS

Based on a systematic review of 10 articles, a consistent relationship was found between adolescents' concentration levels and their physical activity patterns and screen time duration. Regular exercise such as aerobics, weight training, and physical activities that stimulate brain function has been shown to optimize attention, executive function, and information processing speed. Conversely, excessive screen time poses a risk of disrupting focus and reducing working memory capacity. Interestingly, the combination of physical activity and limiting screen time duration showed the most significant positive impact across all cognitive domains, suggesting a reciprocal effect between these two variables. The implications of these findings underscore the importance of integrating regular exercise programs in schools and social media education to maintain concentration during learning. However, the reviewed articles still employ a cross-sectional approach, so a definitive cause-and-effect relationship cannot yet be concluded. Future research is expected to use an experimental approach with more specific measures of learning concentration to produce valid findings.

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