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Original Article

Active mobility, physical activity and health in school children

Denise Moreira Cravo Linhares[1], William Alves Lima[2], Iransé Oliveira Silva[1] *

[1] Universidade Evangélica de Goiás – UniEVANGÉLICA
[2] Sociedade Brasileira para o Ensino e Pesquisa – SOBRESP
* Correspondence: iranse.silva@unievangelica.edu.br

Abstract

Background: Active mobility, particularly walking and cycling to school, represents an important opportunity to increase daily physical activity among children and adolescents. In addition to its potential contribution to physical health, active commuting may support psychosocial development, autonomy, and healthier lifestyle behaviors. However, its adoption depends on individual, social, environmental, and policy-related factors, especially in countries marked by urban and regional inequalities. **Objective:** To synthesize evidence on the relationship between active mobility, physical activity, and health among schoolchildren, with emphasis on the challenges and opportunities associated with urban infrastructure and public policies. **Methods:** This integrative review was conducted using the PubMed database in June 2024. Search terms were selected based on Health Sciences Descriptors and Medical Subject Headings terminology and combined using Boolean operators. Studies published between 2010 and 2024 were considered eligible when they addressed active mobility, active commuting, physical activity, health-related outcomes, environmental determinants, or public policies among children and adolescents. After screening 105 records, 12 studies were included in the final narrative synthesis. **Results:** The included studies indicate that active mobility is associated with higher levels of physical activity and may contribute to improved physical fitness, healthier body weight, motor development, autonomy, and social well-being among schoolchildren. However, adherence to active commuting is strongly influenced by contextual factors, including distance between home and school, parental perceptions of safety, traffic conditions, school infrastructure, and availability of sidewalks and bike lanes. Evidence also suggests that public policies and school-based initiatives can promote active mobility, although barriers remain more pronounced in peripheral, rural, and socioeconomically disadvantaged areas. **Conclusion:** Active mobility is a promising strategy to promote physical activity and health among children and adolescents. Nevertheless, its implementation requires more than individual behavioral encouragement. Safe infrastructure, supportive school environments, family engagement, and intersectoral public policies are essential to make active commuting a feasible, equitable, and sustainable practice.

Keywords: Active commuting; Active transportation; Adolescent; Child; Physical activity; Public policy; School health.

1. Introduction

Active mobility, defined as forms of transportation that rely on human effort, such as walking and cycling, has been increasingly recognized as an important strategy for promoting health and well-being among children and adolescents [1]. In the school context, active commuting may represent a practical opportunity to increase daily physical activity levels, particularly among young people who may not engage regularly in structured exercise or sports programs. Therefore, encouraging active mobility from childhood may contribute not only to healthier movement behaviors, but also to the development of habits that can persist throughout life.

Evidence indicates that active mobility is associated with several health-related benefits in children and adolescents. Previous studies have shown that active commuting contributes to the promotion of healthier behaviors [1,2], improved cardiovascular fitness [3], and reduced risk of obesity, which remains a growing public health concern in contemporary societies [3,4]. Beyond physical outcomes, active mobility may also favor social and emotional development by creating opportunities for interaction, autonomy, and disconnection from daily psychosocial pressures [5,6]. Thus, active commuting to school should be understood not merely as a mode of transportation, but as a potential health-promoting behavior embedded in the daily routine of schoolchildren.

Despite these benefits, the adoption of active mobility is not determined solely by individual choices. Socioeconomic conditions, urban infrastructure, perceived safety, distance between home and school, family support, and public policies may directly influence whether children and adolescents walk or cycle to school. In countries marked by regional and social inequalities, such as Brazil, these determinants may be even more relevant, since access to safe sidewalks, bike lanes, traffic-calming strategies, and supportive school environments is unevenly distributed across urban, peripheral, and rural areas.

Although the benefits of active mobility have been described in the literature [1], important gaps remain. In particular, few studies have examined how socioeconomic factors, urban conditions, and public policies interact to facilitate

or restrict active commuting among schoolchildren. Moreover, the Brazilian literature on this topic remains limited, especially regarding the integration between active mobility, physical activity, school health, and broader public policy strategies. This gap limits the development of more targeted and equitable interventions capable of promoting active lifestyles among children and adolescents in different social and territorial contexts.

Therefore, this review aims to gather and analyze evidence on active mobility, physical activity, and schoolchildren's health, with emphasis on the challenges and opportunities related to urban infrastructure and public policies. By synthesizing this evidence, the present study seeks to contribute to a better understanding of active mobility as a health-promoting strategy and to indicate possible pathways for encouraging healthier and more sustainable lifestyles among school-aged children and adolescents.

2. Methods

2.1 Study Design

This study was designed as an integrative review aimed at gathering and synthesizing evidence on active mobility, physical activity, public policies, and health-related outcomes among school-aged children and adolescents. This approach was adopted because it allows the inclusion and critical analysis of studies with different methodological designs, providing a broader understanding of the topic and its implications for health promotion in school settings.

2.2 Search Strategy

The literature search was conducted in June 2024 using the PubMed database. Search terms were selected based on the Health Sciences Descriptors/Medical Subject Headings terminology and combined using the Boolean operators "AND" and "OR". The search strategy was structured to identify studies addressing children and adolescents, physical activity or exercise, active mobility, and health-related outcomes.

The following search strategy was used and adapted for PubMed: ((children OR adolescent) AND ("active transport" OR "active commuting" OR "active mobility" OR "active travel to school") AND ("physical activity" OR exercise OR sports) AND health).

The search initially identified 105 records. After screening titles and abstracts according to the eligibility criteria, studies that did not address active mobility, schoolchildren, physical activity, or health-related outcomes were excluded. Full-text articles were then assessed for eligibility, and 12 studies were included in the final synthesis.

2.3 Eligibility Criteria

Studies were considered eligible when they met the following criteria: a) published between 2010 and 2024; b) available in full text in English or Portuguese; c) conducted with children and/or adolescents, preferably aged between 8 and 15 years; d) investigated active mobility, active commuting, or different modes of transportation to school; e) examined associations or effects related to physical activity, health, quality of life, public policies, or environmental determinants. Studies were excluded when they did not address active mobility or active commuting, were not focused on children or adolescents, did not report outcomes related to physical activity or health, or were not available in full text.

2.4 Study Selection and Data Synthesis

The selection process was conducted in sequential stages. First, titles and abstracts were screened to identify potentially relevant studies. Subsequently, full-text articles were assessed to confirm eligibility. Information extracted from the selected studies included author and year of publication, study objective, sample characteristics, and main findings. The results were synthesized narratively, with emphasis on the relationship between active mobility, physical activity, health outcomes, environmental barriers, and public policies. Given the heterogeneity of study designs, populations, and outcomes, no quantitative synthesis was performed.

3. Results

Regular engagement in active commuting may contribute to the development of motor coordination, balance, and agility, which are essential skills during childhood [7]. These repetitive and dynamic physical activities, especially when performed in varied environments such as streets, sidewalks, parks, and school surroundings, may stimulate motor development more broadly than sedentary behaviors or activities restricted to indoor spaces [8]. Active mobility also promotes greater body awareness, since children are required to adapt to different terrains, environmental conditions, and movement demands. This process may strengthen muscles and joints, improve fine and gross motor control, and support lateralization, spatial-temporal organization, and body schema development [9].

The continuous practice of active commuting may therefore provide immediate physical benefits while also establishing a foundation for more complex motor skills required in other physical activities throughout life [10]. From this perspective, active mobility should not be viewed only as a transportation behavior, but also as an everyday opportunity to promote physical literacy and healthy development among school-aged children.

Another relevant aspect is the potential influence of active mobility on growth and bone development. Regular physical activity, particularly weight-bearing activities such as walking and running, plays an important role in healthy bone development during childhood and adolescence. Previous evidence indicates that these activities may increase

bone mineral density and promote more robust bone growth when associated with adequate nutritional conditions [8,11,12]. This effect may be partly explained by the mechanical stimulus generated by repeated ground impact during walking and other locomotor activities.

In addition, regular exposure to sunlight during outdoor active commuting may contribute to vitamin D synthesis, which is essential for calcium absorption and, consequently, adequate bone development [13]. Therefore, active mobility may act through multiple pathways, combining mechanical loading, outdoor exposure, and increased daily energy expenditure, all of which are relevant to children's physical health.

Active mobility is also closely related to the development of autonomy in childhood. Walking or cycling to school, particularly when performed with progressive independence and adequate safety conditions, encourages children to develop decision-making, problem-solving, and time-management skills [2]. This daily independence may promote self-confidence and personal responsibility, which are important elements in the development of a positive and healthy self-image [12]. Thus, active mobility supports not only physical development, but also psychosocial maturation, contributing to resilience, autonomy, and preparation for future daily challenges [9].

3.1 Public Policies and Programs to Promote Active Mobility

Public policies aimed at promoting active mobility in Brazil have gained increasing attention in recent decades, particularly through initiatives designed to integrate regular physical activity into daily routines among children and adolescents [15]. Municipal and state governments have implemented programs that encourage active modes of transportation, such as walking and cycling, for daily commuting. These initiatives are often developed in partnership with schools, which play a central role in promoting healthy behaviors among young people.

For example, school-based active mobility programs implemented in several Brazilian cities have sought to improve safety and infrastructure for students who walk or cycle to school. These initiatives aim to reduce sedentary behavior and promote physical and mental health among schoolchildren [15,16]. In this context, schools represent a strategic setting for health promotion, since they can connect educational practices, family engagement, and public policy actions.

Programs encouraging active mobility in Brazil have shown promising results in terms of adherence and potential public health impact. In several municipalities, the implementation of bike lanes, safer walking routes, and awareness campaigns has been associated with an increase in the number of children and adolescents using active transportation to school [16,17]. These strategies may also contribute to reducing obesity and other health conditions related to sedentary behavior, reinforcing the importance of policies that encourage regular physical activity from childhood.

Previous studies suggest that active mobility may improve not only physical fitness, but also academic performance and overall quality of life among young people [17,18]. In addition, the inclusion of active mobility within the school curriculum, through physical education classes and extracurricular projects, may be an effective strategy to incorporate healthy behaviors into students' daily lives [19].

Despite these advances, the expansion of active mobility in Brazil still faces important challenges. The lack of adequate infrastructure, such as safe sidewalks, continuous bike lanes, traffic-calming strategies, and accessible public spaces, remains a major barrier, especially in peripheral and rural areas [20]. Moreover, the predominance of car-centered urban culture in large Brazilian cities makes it difficult for active transportation to become a regular and safe commuting option for children and adolescents.

To overcome these challenges, public policies must be accompanied by integrated urban planning that considers regional inequalities, environmental barriers, and the specific needs of children and adolescents [15]. The expansion of active mobility in Brazil depends on continuous efforts to educate and raise awareness among families, schools, and communities, as well as investments in infrastructure that ensure safety, accessibility, and equity. Only through coordinated action among government, schools, families, and communities will it be possible to transform active mobility into a sustainable daily practice for future generations [21].

3.2 Research Gaps on Active Mobility Among Children and Adolescents

One of the main gaps identified in the literature is the scarcity of longitudinal studies examining the long-term impact of active mobility on children's and adolescents' health. Most available studies are cross-sectional, and Brazilian studies on this topic remain particularly limited. Although international cross-sectional evidence is useful for describing associations, it does not allow a clear understanding of the long-term changes and cumulative benefits that active mobility may provide [8].

Another important gap refers to the lack of specific data on how active mobility influences different dimensions of physical health, such as cardiovascular development, bone health, and physical fitness among children and adolescents from different socioeconomic backgrounds [11]. The absence of more robust and context-sensitive studies limits the development of effective public policies and targeted interventions.

Environmental and contextual variables also remain insufficiently explored. Although some studies have examined the influence of urban environments on active mobility, few have focused on regional disparities and unequal access to safe infrastructure across different Brazilian territories. Rural and peripheral areas, for example, are often neglected in research, despite facing specific challenges such as poor sidewalk conditions, lack of bike lanes, limited public transportation integration, and reduced road safety [11].

In addition, few studies have investigated the role of parental and community perceptions regarding the safety and feasibility of active commuting among children and adolescents. These perceptions are essential for understanding barriers to active transportation, especially in countries with marked differences in urbanization models, social inequalities, and neighborhood safety conditions [13]. Therefore, future studies should consider not only individual behaviors, but also the social, environmental, cultural, and political determinants that shape active mobility among schoolchildren.

Table 1 summarizes studies that investigated the impact of active mobility among children and adolescents, particularly active transportation to school. Most studies focused on how factors such as distance to school, perceived safety, parental concerns, school infrastructure, and social barriers influence the use of active commuting. Overall, the findings indicate that although active transportation provides relevant benefits for physical activity and health, its adoption is often limited by perceived barriers among parents and children, including safety concerns, traffic conditions, and social factors such as bullying.

Table 1. Studies addressing active mobility among schoolchildren

Author (Year)	Main Objective	Sample Characteristics	Main Findings
Wilson et al. [21]	To examine how perceived barriers to active school transportation influence children's commuting behavior.	1,296 children/adolescents aged 9–14 years from 48 elementary schools in Ontario, Canada, living within 1.6 km of school.	Parents' perceptions of barriers to active transportation had a greater influence on children's commuting behavior than children's own perceptions.
Ward et al. [22]	To estimate the risk of adult obesity at 35 years of age based on children's current weight status in the United States.	41,567 children and adults in the United States, totaling 176,720 observations.	Most children with obesity were projected to remain obese at 35 years of age, reinforcing the importance of early prevention strategies, including active behaviors.
Everett Jones and Sliwa [23]	To analyze school characteristics associated with a higher proportion of students walking or cycling to school.	577 schools in the United States, using data from the 2014 School Health Policies and Practices Study.	Schools with crossing guards, bicycle racks, and promotional materials had higher proportions of students using active transportation.
Yang et al. [24]	To investigate variation in active transportation to school among children across different school contexts.	Data from the Health Behavior in School-aged Children study, 2009–2010; 21.4% of children in the United States reported active transportation to school.	Active transportation was less frequent on the way to school than on the way home. Distance to school was identified as a major barrier.
Duncan et al. [25]	To investigate the physical activity benefits associated with different distances between home and school.	595 children and adolescents aged 5–16 years from New Zealand.	Better physical fitness related to active transportation was associated with distances of approximately 2 km between home and school.
DeWeese and Ohri-Vachaspati [26]	To examine the association between active commuting to school and students' weight status, considering the distance traveled to school.	1,000 students from low-income cities in the United States, including diverse minority groups.	Walking more than 800 meters to school was associated with a 65% reduction in the odds of overweight/obesity.
Jáuregui et al. [27]	To analyze the prevalence and correlates of active commuting to school among Mexican adolescents.	2,952 Mexican adolescents aged 10–14 years from the 2012 Mexican National Health and Nutrition Survey.	A total of 70.8% of adolescents used active transportation to school, mainly walking. Active commuting was inversely related to socioeconomic and location-related variables.
Sadeghvaziri, Javid, and Jeihani [28]	To clarify active transportation patterns, barriers, and needs among underrepresented populations.	Final review including 60 studies conducted in the United States.	Walking was more common among women, whereas cycling was less frequent among individuals with lower income. Communities with limited access to cycling infrastructure had higher concentrations of African American, Hispanic, Asian, and low-income families.
Mendoza and Liu [29]	To examine the association between walking to school in kindergarten and adiposity in fifth grade.	7,938 children in the United States, nationally representative of the child population, followed from kindergarten to fifth grade.	Walking to school in kindergarten was associated with lower body mass index scores in fifth grade, particularly in less safe neighborhoods.
Oluyomi et al. [30]	To examine relationships between parental safety concerns and walking to school.	830 parents of fourth-grade children from 81 schools in Texas, United States.	Favorable perceptions of traffic and personal safety increased the likelihood of walking to school, whereas safety concerns reduced active commuting.
Lee and Li [31]	To investigate demographic and route characteristics associated with children's school trips.	112 children aged 7–12 years from schools in the Austin Independent School District, Texas, United States.	Walking to school provided more minutes of daily moderate-to-vigorous physical activity compared with not walking.
McDonald et al. [32]	To document school travel patterns in the United States and compare trends across decades.	150,147 households in the United States with students from kindergarten to eighth grade.	The percentage of students walking or cycling to school decreased from 47.7% in 1969 to 12.7% in 2009.

Analysis of the studies summarized in Table 1 shows considerable variability in sample size, ranging from small studies with 112 children to large population-based investigations including more than 150,000 households or 176,720 observations. The age range also varied substantially, from 5 to 19 years, although most studies focused on children and adolescents between 7 and 14 years of age.

The studies were conducted in different countries, including the United States, Canada, Mexico, and New Zealand. Overall, they addressed topics such as active transportation to school, body mass index, parental and child perceptions of safety, school infrastructure, and the influence of environmental conditions on active commuting. Taken together, these findings indicate that distance to school, parental perceptions of safety, traffic conditions, and available infrastructure are key determinants of active transportation among children and adolescents. In addition, most studies suggest that active commuting is associated with relevant benefits for physical activity and health, although awareness and behavioral change should be promoted not only within schools, but also through broader actions involving families, communities, and policymakers.

Active mobility, particularly among children and adolescents, is associated with meaningful benefits for physical, psychological, and social development. However, the Brazilian context presents specific challenges that were not fully addressed in the studies summarized in Table 1. These challenges differ between large urban centers and smaller inland or rural municipalities, reflecting inequalities in infrastructure, urban planning, and public policy implementation.

In large urban centers, such as São Paulo and Rio de Janeiro, there has been increasing awareness of the importance of active mobility, supported by governmental initiatives aimed at integrating walking and cycling into daily routines. Programs designed to improve safety along the route between home and school represent examples of efforts to create safer and more supportive environments for active commuting [15]. Nevertheless, the predominance of car use and the persistence of a motorized transport culture remain major barriers to the widespread adoption of active modes of transportation in densely populated metropolitan areas [16]. In addition, social barriers, such as bullying or stigma associated with arriving at school on foot or by bicycle, may further discourage active commuting among schoolchildren.

In contrast, inland cities and rural areas face a different set of challenges, although they may also offer unique opportunities. In these regions, infrastructure is often limited, with inadequate sidewalks, scarce bike lanes, and insufficiently safe public spaces for children and adolescents. These conditions may make active commuting less attractive and potentially unsafe [20]. However, lower traffic density and shorter distances between common destinations, such as homes and schools, may favor walking and cycling when supported by targeted investments in local infrastructure.

Moreover, stronger community ties in smaller cities may facilitate the development of a culture that values active mobility, health, and child well-being. Thus, the lack of specific public policies and educational programs focused on active mobility in schools remains an important gap. Addressing this gap is essential for these communities to fully benefit from active mobility in a planned, safe, and sustainable manner.

The disparities between large urban centers and inland or rural areas highlight the need for public policies adapted to regional specificities. In metropolitan areas, expanding bike lanes, improving sidewalks, and implementing traffic-calming zones may be essential strategies to encourage active commuting. In smaller municipalities and rural areas, the priority should be the improvement of basic infrastructure and the promotion of a local culture that values active transportation.

In addition, further research is urgently needed to examine the environmental, social, and economic variables that influence active mobility in different Brazilian contexts. Such evidence is necessary to support the development of more effective, inclusive, and context-sensitive interventions [12]. Only through an equitable and contextualized approach will it be possible to transform active mobility into a regular and sustainable practice among children and adolescents across Brazil.

The main opportunities lie in educational processes directed first toward children and adolescents, but with the broader aim of reaching families and the community as a whole. These opportunities also depend on the integration of public policies focused on creating safer, more accessible, and more inclusive environments. With adequate support from educators, families, public managers, and urban planners, schoolchildren may be more likely to incorporate active transportation into their daily routines.

4. Conclusions

This study gathered and analyzed evidence on active mobility and its relationship with physical activity among schoolchildren, highlighting the importance of public policies in promoting a healthy lifestyle. The current literature reinforces that active mobility, such as walking or cycling to school, is an effective strategy to increase physical activity levels among children and adolescents. In addition to contributing to physical health, active commuting may also support mental and social well-being.

However, the potential benefits of active mobility are closely linked to the availability of adequate infrastructure, including safe bike lanes, high-quality sidewalks, traffic-calming measures, and urban environments that favor safe and accessible commuting. In this context, public policies play a central role, since the creation of environments that support active mobility depends on coordinated action among public managers, urban planners, schools, families, and communities.

Interventions should therefore include both urban planning strategies and educational campaigns aimed at encouraging active commuting and increasing awareness among students, parents, and guardians regarding its health benefits. Accordingly, this review contributes to the understanding that promoting an active lifestyle among schoolchildren requires an intersectoral approach that integrates health, education, and urban infrastructure.

Promising pathways include strengthening public policies for active mobility, investing in safe and accessible infrastructure, and continuously encouraging physical activity as part of the school routine. Together, these elements are essential to promote health and well-being among schoolchildren and to support a healthier and more active future for younger generations.

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