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Systematic review of active transportation to school in youth – an update from Brazil's Report Card

Revisão sistemática do transporte ativo para a escola em jovens - atualização do Report Card do Brasil

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Abstract – The aim of this study was to update a systematic review on the use of active transportation to school in Brazilian children and adolescents. All studies were extracted from the LILACS; BIREME; SCIELO and MEDLINE. The search was carried out on manuscripts published in the period 2018-2019. The descriptors were used in Portuguese, English and Spanish. In overall, 8 manuscripts were included in this systematic review, with 1 presenting data from three periods (2009, 2012 and 2015). The study data were obtained between 2009 and 2015 and the age group found between 7 to 19 years old. Of the selected articles, 2 presented national data, 1 from the north, 2 from the northeast, 1 from the southeast and 2 from the south of Brazil. The use of active transportation was superior to passive transportation on 6 occasions and its use was common in boys than in girls (4 of 6 articles). The use of active transportation is still more common than passive transportation in most Brazilian regions, although some cities have the opposite. The results suggest that the prevalence of active transportation is higher in boys than girls. Public policies must be created to favor the use of active transportation among Brazilian youth.

Keywords: Adolescents; Brazil; Children; Motor activity; Sedentary lifestyle.

Resumo – *O objetivo deste estudo foi atualizar uma revisão sistemática sobre o uso de transporte ativo para a escola em crianças e adolescentes brasileiros. Todos os estudos foram extraídos da LILACS; BIREME; SCIELO e MEDLINE. A busca foi realizada em manuscritos publicados no período de 2018-2019. Os descritores foram utilizados em português, inglês e espanhol. No geral, 8 manuscritos foram incluídos nesta revisão sistemática, com 1 apresentando dados de três períodos (2009, 2012 e 2015). Os dados do estudo foram obtidos no período de 2009 a 2015 e a faixa etária encontrada entre 7 a 19 anos. Dos artigos selecionados, 2 apresentaram dados nacionais, 1 do Norte, 2 do Nordeste, 1 do Sudeste e 2 do Sul do Brasil. O uso de transporte ativo foi superior ao transporte passivo em 6 ocasiões e seu uso foi comum em meninos do que em meninas (4 de 6 artigos). O uso de transporte ativo ainda é mais comum do que o passivo na maioria das regiões brasileiras, embora algumas cidades tenham o oposto. Os resultados sugerem que a prevalência de transporte ativo é maior em meninos do que em meninas. Políticas públicas devem ser criadas para favorecer o uso do transporte ativo entre os jovens brasileiros.*

Palavras chaves: *Adolescentes; Atividade motora; Brasil; Crianças; Comportamento sedentário.*

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INTRODUCTION

The potential health effects caused by the use of active transportation and the factors associated with its use are increasingly being investigated[1,2]. A multicenter study, carried out in 12 countries in the world, including Brazil, showed that children who reported the use of active transportation were less likely to be obese, in addition to having a lower body mass index, lower fat percentage and waist circumference[1]. In addition, active transportation is a strong determinant of the level of physical activity at school age and enhances compliance with recommendations of physical activity[3,4]. Knowing its favorable health effects, the interest of researchers in the area of physical activity grows for strategies and interventions that promote the use of active transportation in cities[2,5]. However, these interventions are generally made in high-income countries and data on countries low and middle income groups are scarce.

In Brazil, most and the main studies on active transportation are descriptive. Recently, a systematic review was carried out with Brazilian data, of articles published between 2007 and 2017, on the use of active transportation in the country, showing very different results between regions[6]. Note that the pattern of transportation varies from according to the demographic and cultural context, such as in rural, urban or even island areas, in addition to socioeconomic differences and human development index between cities[6].

As it is a continental, multicultural country with great socioeconomic inequality, a large amount of information from each region, state or city is essential so that federal and state governments can detect the most deprived areas of active transportation and target possible and interventions that favor the use of active transportation. The present study aims to update this systematic review[6], with data from publications made in the years 2018 and 2019, describing the use of active transportation in Brazil and providing differences between sex.

METHOD

This study was conducted and reported according to the recommendations and guidelines for conducting systematic reviews for observational studies.[7] The review protocol was prepared following the PROSPERO International prospective register of systematic reviews protocols (https://osf.io/sjgv9/; number: DOI 10.17605/OSF.IO/SJGV9) and published on figshare[8].

This revision was carried out from August to September of 2020 by searching the main databases in the area, governmental policies and research and by contacting researchers from this area. A systematic search of Latin American and Caribbean Health Sciences Literature (LILACS), Regional Library of Medicine (BIREME), Scientific Electronic Library Online (SCIELO), Medical Literature Analysis and Retrieval System Online (MEDLINE), through PubMed was conducted by the authors (ERV, TKFF, and GF). For the investigation of potential manuscripts, we used the advanced search tool in each of the databases (searches performed using "keywords"), based on building blocks of descriptors created by the authors. The descriptors were entered in Portuguese, English and Spanish. The search string used was as follows:

- The first block (result) was composed of terms referring to active transportation: "physical activity"; "transportation"; "commute"; "travel"; "use of time"; "active

travel"; "active transportation"; "active commute"; "mobility"; "walk"; "biking"; "bike"; "bicycle"; "pedestrian"; "origin and destination"; "lifestyle".

- The second block included terms related to the target population of the study (children and adolescents): "child"; "children"; "adolescent"; "adolescents"; "preschool student"; "preschool students".

The Boolean operator "OR" was used to add to the advanced search at least one word from each block and the operator "AND" to associate the blocks of keywords to one another. Moreover, the specific filters available in each of the databases searched were used. Each search was conducted separately and then downloaded as a separate file using Endnote® X9[9] which enabled the identification and exclusion of duplicate studies, the division and organization of the results from each database. To be included in the present review, the inclusion criteria were: original articles published in indexed scientific journals; articles that measured active transportation; articles that measured active transportation and described the method used; and articles that evaluated Brazilian children and/or adolescents with ages ranging between 0 and 19 years of age (and/ or average age included in this range), without specific clinical conditions, without diagnoses of any diseases, non-athletes and those of both sex. The article selection process was performed by a team of three researchers (ERV, TKFF, and GF).

With the references retrieved from each database, a reading of the titles was performed. Among references selected as possibly eligible, the abstracts were read. Based on the selected abstracts, a search was conducted for each article's full text to assess whether it met the inclusion criteria. Among the selected articles, the references were examined to identify any other publication that met the study's entrance requirements. When there was more than one article with data from the same study, the one pertaining to the original publication was selected.

The risk of bias evaluation/methodological quality of the studies included was done by all three authors (TKFF, ERV, GLMF), independently. The instrument used to evaluate the risk of bias/methodological quality was the questionnaire for cohort and transversal studies from the National Heart, Lung and Blood Institute[10], which has 14 criteria to determine the risk of bias/ methodological quality of the study. This instrument evaluates the internal validity of the studies and includes questions that help to identify the possible risk of selection bias, information bias, measurement bias and confounding factors[10]. For each criterion evaluated, the scores 0 "no" and 1 "yes" were given. A total score was given to each study based on the number of positive answers to the questions in relation to the total number of questions[11]. The questions on the questionnaire that could not be answered by the available information and/or, that were not applicable to the study evaluated and/or aspects that had not been reported were excluded from the calculation to determine the final score of the methodological quality/risk of bias[11].

According to the subjective evaluation of the reviewers, the studies were classified as having good methodological quality/low risk of bias (final score ≥ 0.70), moderate methodological quality/moderate risk of bias (final score < 0.70 and ≥ 0.50), low methodological quality/high risk of bias (final score < 0.50)[12]. The reviewers applied the evaluation instrument for methodological quality/ risk of bias to all the studies that met the inclusion criteria, while disagreements

between the reviewers in relation to the evaluation of a determined study was resolved through discussion.

In order to update the systematic review[6], the reference searches were opened on January 1, 2018 and closed on January 1, 2020. Thus, manuscripts that were published and/or indexed in the respective databases before and after this dates were not included in this study.

RESULTS

This systematic review presented manuscripts published between 2018 and 2019 on active transportation to Brazilian children's and adolescents' schools. The searches in the databases, according to the word blocks used, totaled 762 articles. Following the filtering process with the reading of the titles and abstracts, we obtained 14 articles. After reading these manuscripts in full, duplicate articles and omissions of information related to the topic were eliminated. Finally, the present study included 8 articles for review (Figure 1).

The manuscripts had year of publication between the period of 2018 and 2019 and the data of these were obtained between the years 2009 and 2015. One of the articles presented results from 3 periods (2009, 2012 and 2015). The age range of the selected studies ranged between 7 and 19 years (Table 1).

Among the 8 articles selected for this systematic review, 2 articles were a sample with national data from all geographic regions of Brazil (all Brazilian

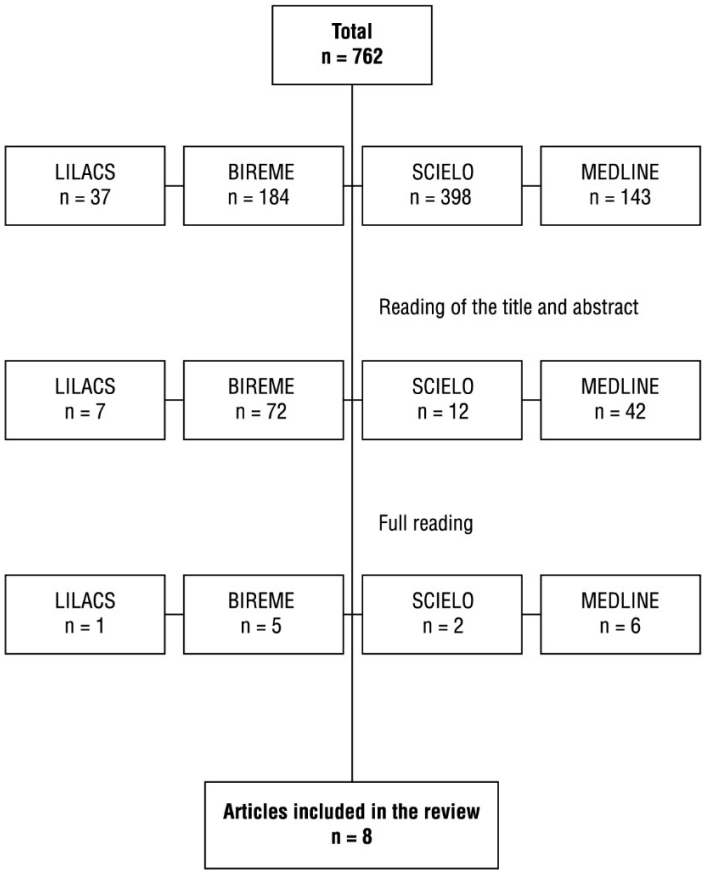

Figure 1. Search results for the data and criteria used in the selection of studies aimed at investigating active transportation for children and adolescents in Brazil.

states and the Federal District), 1 from the North (Rondônia), 2 from the Northeast (Paraíba and Maranhão), 1 in the Southeast (São Paulo) and 2 in the South (Paraná and Rio Grande do Sul). The use of active transportation was superior to passive transportation on 6 occasions (70.6% x 29.4%; 61.7% x 38.3%; 66.7% x 33.3%; 58% x 42%; 55.2% x 44.8%; 63% x 37%), passive transportation was higher in 4 (48% x 52%; 41.2% x 58.8%; 21.8% x 78.2%; 18.7% x 81.3%) (Table 1).

Information related to sex, regarding the use of active transportation, was presented in 6 articles. Among boys and girls, the use of active transportation was superior to passive transportation in most studies. When compared between sex, the use of active transportation was more common among boys than girls in 4 of the 6 articles (Table 1).

DISCUSSION

The present study is an update on the use of active transportation among Brazilian students. This systematic review with articles published in the period between 2018 and 2019 adds to another recent publication on the same subject that covered data from publications made in the period between 2007 and 2017[6].

As in the last review, 6 this study showed great variability between the percentages of active and passive transportation in different cities and regions of the country. The different methods for evaluating and classifying active transportation may be the main explanation for this high variability between studies. We can exemplify by the classification criterion of active transportation: the study by Ferreira et al.[13] considered as active transportation those who went and returned on foot or by bicycle to school on at least one day of the week.

Table 1. Transversal studies with data from active or passive transportation in Brazilian children and adolescents between 2018 and 2019.

Author (year of publication)	Year of study	Age range (years)	Location	Sample (n)	Active transportation			Passive transportation		
					Total (%)	Boys (%)	Girls (%)	Total (%)	Boys (%)	Girls (%)
Ferreira et al. (2018)[13]	2009	13-17	Brazil	62,353	70.6	72.9	68.6	29.4	27.1	31.4
Ferreira et al. (2018)[13]	2012	13-17	Brazil	61,042	61.7	63.2	60.3	38.3	36.8	39.7
Ferreira et al. (2018)[13]	2015	13-17	Brazil	51,112	66.7	70.1	63.5	33.3	29.9	36.5
Werneck et al. (2018)[14]	2015	14	Brazil	101,445	58	59.8	56.3	42	40.2	43.7
Mendonça et al. (2018)[15]	2009	14-19	João Pessoa – PB	2,350	55.2	45.5	63	44.8	54.5	37
Silva et al. (2018)[16]	2013/2014	12-17	Curitiba – PR	487	63	-	-	37	-	-
Burgos et al. (2019)[17]	2011/2012	7-17	Santa Cruz do Sul – RS	1,743	48	50.5	45.9	52	49.5	54.1
Ferrari et al. (2019)[18]	2012/2013	9-11	São Caetano do Sul – SP	328	41.2	39.6	42.8	58.8	60.4	57.2
Souza S et al. (2019)[19]	-	9-16	São Luís / São José de Ribamar – MA	101	21.8	25.5	18.5	78.2	74.5	81.5
Farias E. et al. (2019)[20]	2015	14-18	Porto Velho – RO	2,694	18.7	-	-	81.3	-	-

In contrast, Werneck et al.[14] categorized active transportation between < 5x/week and > 5x/week.

There is a great lack of standardization among studies for the classification of active transportation. The tools for evaluating active transportation should include: number of days of the week, going and / or returning from home to school and from school to home, the distance traveled on the route, among others. Even for those using public transportation, the distance traveled on foot between the house or school to the station or bus stop should be considered.

Investigations regarding the use of active transportation among youth are mainly justified by their potential contribution to increasing the level of physical activity and increasing energy expenditure[21]. A systematic review that evaluated the effects of the use of active transportation on health presented evidence strong for improving cardiovascular health, moderate for controlling body weight and weak for mental health.[22] Even so, the evidence is limited due to the lack of standardization between studies and the lack of experimental studies[22].

According to this systematic review, most studies still show a greater use of active transportation than of passive transportation in Brazil. The studies by Ferreira et al.[13] and Werneck et al.[14], for example, presented national data obtained from all Brazilian capitals and inner cities, with the supremacy of the use of active transportation to school. According to Ferreira et al.[13], the highest percentage of active transportation use was found in the northern region of Brazil, followed by the southern region. In contrast, among the studies selected for this review, the study that presented the lowest use of active transportation was precisely in a city located in the northern region of Brazil, Porto Velho-RO[20]. Despite the controversial results between the studies, both the study by Ferreira et al.[13] and that by Farias et al.[20] used data from youth in the network public and private education, however Ferreira et al.[13] considered data from all capitals in the northern region, while Farias et al.[20] only from the Porto Velho-RO region. Therefore, it is possible that youth in Porto Velho present a different reality from youth in other capitals in the northern region. This hypothesis may also explain the findings by Burgos et al.[17], where children from municipal and private schools in the city of Santa Cruz do Sul-RS, southern Brazil, were also evaluated, and the percentage of active transportation was lower compared the use of passive transportation. The results were also different from those presented by Ferreira et al.[13] referring to the southern Brazilian region, however, it is worth noting that in this case, it is a city (Santa Cruz do Sul) with less structure when compared to the capital Porto Alegre and the other capitals of the southern states, where the study was carried out. However, the study by Silva et al.[16], carried out with students from another capital city in the south of Brazil, Curitiba, presented results similar to those found by Ferreira et al.[13]. The authors of the present study believe that more developed and safer cities, with structured streets and sidewalks, favor active commuting as suggested by the literature[23,24]. Despite this, we also agree with the hypothesis that families with higher socioeconomic level and higher education have a lower relation with active transportation[13], probably because they own cars, thus opting for the use of their own transportation. This second hypothesis could justify the results of youth in the city of São Caetano do Sul, in São Paulo, where the use of passive transportation was more present[18]. As it is the city with the highest Human Development Imdex in Brazil[18], it was believed that the active transportation

was the most common, due to favorable conditions and structures, but the results were the opposite of what was expected. In view of this, we raised a third hypothesis, in which we believe that just a favorable environment is not enough, awareness of family members and the neighborhood is necessary, in addition to a multifaceted approach directed to the community[23].

The study by Ferreira et al.[13] analyzed Pesquisa Nacional de Saúde do Escolar (PeNSE) data in different years (2009, 2012 and 2015). In 2009, the use of active transportation was the highest, in 2012 there was a drop and had the lowest values, and in 2015, there was an increase, both for boys and girls. However, these changes between the years must be interpreted with caution, as a comparison test was not carried out to confirm whether there were significant differences between this period. A study carried out in Toronto, Canada's largest city/region, showed a reduction in active transportation between 1986 and 2006[25]. The study's authors explain that during this period the city experienced rapid suburbanization, economic growth and conditions for owning and using cars, which possibly affected the patterns of families in the region[25]. In a heterogeneous country like Brazil, it is difficult to draw any conclusions about changes in the pattern of displacement of youth in recent years, since there are regions in rapid development and others that develop more slowly. And, furthermore, we do not know exactly what the impacts of these changes on the displacement pattern are, as discussed in the previous paragraph. Finally, it is worth noting that in all years, the use of active transportation was greater than that of passive in Brazil[13].

As for the use of active transportation compared between the sexes, most of the selected studies had higher percentages in boys[13,14,17,19], although others showed the opposite[15,18]. In the last review on the use of active transportation in Brazil[6] commented that boys and girls showed similar displacement behaviors, however, in this update, we noticed higher values in boys. We can consider that the influence of sex, in the use of active transportation, will depend on the socio-cultural and sociodemographic context of the region where the sample is inserted. Therefore, the literature highlights the importance of investigating the different barriers and patterns of behavior related to physical activity differently between sex, as the adoption of habits and practices will be related to the perceptions of the different environments and cultural context in which they live[26-28].

This systematic review presents strengths, such as the search in the 4 main databases and the search made in 3 languages (English, Portuguese and Spanish), in addition to being a revision update already made recently and strictly following the due criteria. revision[6]. However, the instruments for evaluating active transportation and the different criteria for classifying active transportation still generate many biases and remain the main limitations of the studies and consequently of this review, becoming a challenge for researchers on this subject.

Studies that standardize an instrument and classification for the use of active transportation are suggested. In addition, studies that investigate changes in transportation patterns in recent years according to the development of the region are needed. Data on the socio-cultural and sociodemographic relationship with active transportation are still scarce.

CONCLUSION

According to the results of this review and update, the use of active transportation is still more common than passive transportation in most Brazilian regions, however, some cities already demonstrate the opposite. In addition, the results suggest that boys use active transportation more than girls. Public policies must be created to favor the use of active transportation among Brazilian children, with structuring of neighborhoods and awareness of the population.

COMPLIANCE WITH ETHICAL STANDARDS

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Ethical approval

This research is in accordance with the standards set by the Declaration of Helsinki.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conceived and designed the experiments: GF. Performed the experiments: ERV, TKFF, GF. Analyzed the data: ERV, TKFF, GF. Contributed reagents/materials/analysis tools: GF, DS. Writing-review and editing: ERV, TKFF, AOW, DRS, GF. All authors have read and agreed to the published version of the manuscript.

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