Rev Bras Cineantropom Desempenho Hum

review article

https://doi.org/10.1590/1980-0037.2026v28e108149

Prevalence of Brazilian children and adolescents meeting recommended aerobic fitness criteria: a systematic review update for the Report Card Brazil Project

Prevalência de crianças e adolescentes brasileiros que atenderam aos critérios recomendados para aptidão aeróbica: uma atualização de revisão sistemática para o Projeto Report Card Brasil

Priscila Custódio Martins[1]
https ://orcid.org/0000-0002-6388-5550
Carlos Alencar Souza Alves Junior[2]
https ://orcid.org/0000-0002-5928-0567
Andressa Ferreira da Silva[3]
https ://orcid.org/0000-0002-8154-5664
Tiago Rodrigues de Lima[4]
https ://orcid.org/0000-0003-4568-2255
Leandro Narciso Santiago[3]
https ://orcid.org/0000-0003-1347-5198
Matheus Silveira Pedroso[3]
https ://orcid.org/0000-0002-7611-3795
Joni Marcio de Farias[1]
https ://orcid.org/0000-0003-2843-6482
Diego Augusto Santos Silva[3]
https ://orcid.org/0000-0002-0489-7906

Abstract – This study aimed to update the Brazilian evidence on the prevalence of children and adolescents who met the health-related criteria for aerobic fitness. This systematic review is part of the Report Card Brazil Project, and the search for relevant information was conducted in nine databases, limited to the period from January 2020 to January 2025. Studies with different designs were included, provided they allowed the extraction of prevalence data for children and adolescents (aged up to 19 years or with a mean age up to 19 years) who met the health criteria for aerobic fitness. A total of 501 articles were identified, and six studies were included based on their compliance with the eligibility criteria. The prevalence of children and adolescents classified as meeting health-related criteria for aerobic fitness was 43.68% (29.81% for males and 28.55% for females). Regarding age groups, children (six to nine years) showed higher prevalence rates of adequate aerobic fitness (61.02%; n = 1,088) compared to adolescents (10 to 17 years) (31.42%; n = 1,075). When comparing the current findings with those of the previous systematic review from this project, a 62.32% improvement was observed in the prevalence of children and adolescents classified as meeting health criteria for aerobic fitness (26.9% in the previous review). However, despite this increase, more than half of the investigated children and adolescents still do not meet the health criteria for aerobic fitness.

Key words: Adolescent health; Brazil; Child health; Oxygen consumption; Physical fitness.

Resumo – *O objetivo deste estudo foi atualizar as evidências brasileiras sobre a prevalência de crianças e adolescentes que atendem aos critérios de saúde para a aptidão aeróbica. Esta revisão sistemática integra o Projeto Report Card Brazil, e a busca por informações sobre o tema foi realizada em nove bases de dados, limitada ao período de janeiro de 2020 a janeiro de 2025. Foram incluídos estudos com diferentes delineamentos, desde que permitissem a extração de informações sobre a prevalência de crianças e adolescentes (com idade até 19 anos ou média de idade até 19 anos) que preenchiam os critérios de saúde para a aptidão aeróbica. Identificaram-se 501 artigos, dos quais seis foram incluídos por atenderem aos critérios de elegibilidade. A prevalência de crianças e adolescentes classificados com base em critérios de saúde para a aptidão aeróbica foi de 43,68% (29,81% no sexo masculino e 28,55% no sexo feminino). Quanto à faixa etária, crianças (de seis a nove anos) apresentaram maiores prevalências de aptidão aeróbica adequada (61,02%; n = 1.088) em comparação aos adolescentes (de 10 a 17 anos) (31,42%; n = 1.075). Ao comparar os resultados desta revisão com os da revisão sistemática anterior do mesmo projeto, observou-se uma melhora de 62,32% na prevalência de crianças e adolescentes classificados conforme os critérios de saúde para aptidão aeróbica (26,9% na revisão anterior). No entanto, apesar desse avanço, mais da metade das crianças e adolescentes avaliados ainda não atende aos critérios de saúde para a aptidão aeróbica.*

Palavras-chave: *Saúde do adolescente; Brasil; Saúde da criança; Consumo de oxigênio; Aptidão física.*

1 Universidade do Extremo Sul Catarinense. Criciúma, SC. Brasil.
2 Instituto Federal do Rio Grande do Sul. Canoas, RS. Brasil.
3 Universidade Federal de Santa Catarina. Florianópolis, SC. Brasil.
4 Universidade do Estado de Santa Catarina. Florianópolis, SC. Brasil.

Received: July 28, 2025
Accepted: March 11, 2026

How to cite this article
Martins PC, Alves Junior CAS, Silva AF, Lima TR, Santiago LN, Pedroso MS, Farias JM, Silva DAS. Prevalence of Brazilian children and adolescents meeting recommended aerobic fitness criteria: a systematic review update for the Report Card Brazil Project. Rev Bras Cineantropom Desempenho Hum 2026, 28:e108149. DOI: https://doi.org/10.1590/1980-0037.2026v28e108149

Corresponding author
Priscila Custódio Martins.
Universidade do Extremo Sul Catarinense – UNESC
Avenida Universitária, n. 1105, Bloco T, 88806-000, Bairro Universitário, Criciúma (SC), Brasil.
E-mail: priscilaamartins@unesc.net, priscilaamartinsc@gmail.com

Scientific Editor:
Kelly Samara da Silva

INTRODUCTION

Aerobic fitness is a key health marker for children and adolescents and is considered a relevant indicator of cardiovascular disease risk[1]. A secular trend study compiled data from 965,264 children and adolescents across 19 countries between 1981 and 2014, identifying a moderate decline of 7.3% in aerobic fitness over the period. Additionally, the decline was found to be greater among male adolescents than females, while patterns were similar between children and adolescents[2]. It was also observed that countries with more equitable income distribution exhibited more favorable patterns of aerobic fitness[2].

In Brazil, a study involving 11,083 children aged six to nine years identified that approximately 8,866 of them, equivalent to nearly 80%, exhibited low levels of aerobic fitness between 1999 and 2010, with these results remaining consistent throughout the investigated period. Low aerobic fitness levels were more prevalent among children older than six years, those living in economically more developed regions of the country, in rural areas, and among those classified as overweight[3].

The Report Card Brazil: Health Indicators for Children and Adolescents initiative has gathered information on the proportion of Brazilian children and adolescents meeting recommended levels of aerobic fitness[4]. The first review, which compiled data from 2005 to 2017, found that 67.8% of participants did not meet health-related criteria, with a slight difference between sexes (female: 71.6%; male: 72.3%)[4]. An update covering 2018 and 2019 revealed that 73.1% of children and adolescents failed to meet aerobic fitness recommendations. The prevalence of this outcome was higher among females (70.1%) compared to males (55.4%)[5]. These data reinforce the downward trend in meeting aerobic fitness guidelines over the decades. Moreover, the findings highlight sex-based disparities and suggest a potential association with various factors, particularly economic ones[5].

In 2020, the World Health Organization (WHO) officially declared the COVID-19 pandemic, which led to substantial changes in the daily routines of children and adolescents. One of the most significant impacts was a reduction in physical activity levels. A systematic review identified a 20% decrease in the duration of total daily physical activity, with a larger reduction observed for higher-intensity activities, corresponding to a decline of 17 minutes in daily moderate-to-vigorous physical activity among children and adolescents[6]. Given the direct relationship between physical activity and aerobic fitness (i.e., greater physical activity leads to increased cardiovascular demand and cardiorespiratory system stimulation), it is plausible to infer that the prevalence of meeting aerobic fitness recommendations may also have been affected during and after the COVID-19 pandemic.

Therefore, the objective of the present study was to update the Brazilian evidence on the prevalence of children and adolescents meeting health-related aerobic fitness criteria and to determine whether changes occurred after the COVID-19 pandemic. The findings of this study may inform the development of school-based physical activity programs aimed at promoting regular aerobic activity, especially in the post-pandemic context, guide public health policies, and support the monitoring and assessment of children's and adolescents' health.

METHOD

This systematic review is part of the research project Report Card Brazil: Health indicators for children and adolescents (4th edition). The macro-project protocol is registered on an open access platform and can be accessed at Silva et al.[7]. The method followed complies with the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.

Information sources

This systematic search is an update of the study by Martins et al.[5] which contributed to the third edition of the Report Card Brazil: Health Indicators for Children and Adolescents project. At that time, the literature review included studies available in pre-selected databases up to December 2019[5]. Therefore, the current review covered the period from January 2020 to January 2025. The search was conducted in nine databases: (1) Medical Literature Analysis and Retrieval System Online (MEDLINE), via PubMed; (2) Web of Science (Core Collection); (3) Scopus; (4) ScienceDirect; (5) MEDLINE, via EBSCOhost; (6) SportDiscus, via EBSCOhost; (7) Latin American and Caribbean Health Sciences Literature (LILACS), via the Virtual Health Library (VHL); (8) Scientific Electronic Library Online (SciELO), via Web of Science; and (9) Cumulative Index to Nursing and Allied Health Literature (CINAHL), via EBSCOhost.

Search strategy, descriptors, and keywords

The search for articles in the selected databases was conducted using the advanced search tool, based on the construction of keyword and descriptor blocks related to the topic. Descriptor selection was guided by consultation with the Medical Subject Headings (MeSH) and Health Sciences Descriptors (DeCS) platforms. Keywords were also selected through consensus based on published sources, including original and systematic review articles. Depending on the database, descriptors and keywords were entered in Portuguese, English, or Spanish.

The first block (outcome) included terms related to aerobic fitness: "physical fitness", "aerobic capacity", "aerobic fitness", "cardiorespiratory capacity", "cardiovascular fitness", "aerobic power", "aerobic endurance", "cardiorespiratory endurance", "oxygen consumption", "maximum oxygen consumption", "maximal oxygen uptake", and "VO2 maximal". The second block referred to the target population (children and adolescents): child*, schoolchildren, adolescent*, student, teen, teenager, young, "school-age", childhood, scholar, "school children", and "school teenager". The third block included terms related to the location of the studies: Brazil*.

The Boolean operator "OR" was used to combine at least one keyword or descriptor from each block, while "AND" was used to connect the blocks. Quotation marks were applied for multi-word terms and to search for exact phrases. Parentheses were used to group terms by category (outcome, exposure, population), and the asterisk was applied to search for all word derivatives from the same prefix.

Eligibility criteria

The inclusion criteria were as follows: (a) studies involving a population composed of children and/or adolescents (aged 0 to 19 years or with a mean age up to 19 years); (b) studies conducted with samples of Brazilian children and/or adolescents; and (c) studies with cross-sectional, longitudinal, case-control, or randomized controlled trial designs that allowed for the extraction of data on the prevalence of children and adolescents meeting health-related criteria for aerobic fitness (based on cut-off points, tertiles, quartiles, or other forms of categorization using any physical fitness test battery).

The exclusion criteria were: (a) athletes (members of competitive sports teams); (b) children and/or adolescents with special needs (diagnosed with acute or chronic diseases, physical or intellectual disabilities); (c) theses, dissertations, monographs, abstracts, book chapters, opinion or review articles, validation and/or reliability studies, and studies aimed at determining cut-off points; and (d) studies that did not present numerical data classifying individuals according to aerobic fitness (such as the number or prevalence of fit and/or unfit individuals, regardless of the classification criteria used).

Study selection

Two reviewers (CASAJ and PCM) independently screened each database to identify potentially relevant articles. After retrieving the records, duplicate entries were removed. Subsequently, titles and abstracts were screened to exclude studies that did not meet the eligibility criteria. The remaining articles were read in full to determine final inclusion. In addition, reference lists of the included studies were examined to identify potentially eligible studies not retrieved through the initial database search. Disagreements between the two reviewers were resolved through consensus meetings. When necessary, a third reviewer (DASS) was consulted to resolve unresolved disagreements.

The Zotero® reference management software, version 5.0 (Roy Rosenzweig Center for History and New Media, Fairfax, Virginia, USA), was used to create specific libraries, enabling the identification and removal of duplicates as well as the organization of search results from each database.

Data extraction

Data were extracted independently by two reviewers (CASAJ and PCM), and consistency between their extractions was verified. The following information was collected: authors' names, year of publication, methodological quality score, study location, investigated age group, study population and sample, study design, stratification, test used to estimate aerobic fitness, estimated aerobic fitness measure (e.g., VO_2max, VO_2peak, number of laps), cut-off point, and the physical fitness test battery used to classify aerobic fitness and estimate the prevalence or number of individuals meeting recommended criteria for aerobic fitness.

Methodological quality/Risk of bias

Methodological quality/risk of bias were independently assessed by two reviewers (CASAJ and PCM). This assessment was conducted using the

National Heart, Lung, and Blood Institute (NHLBI) quality assessment tool for observational cohort and cross-sectional studies[8]. Disagreements between reviewers regarding the evaluation of any study were resolved through consensus meetings, and if disagreement persisted, a third reviewer (DASS) was consulted. This tool is designed to support the evaluation of internal validity by identifying potential sources of selection, information, and measurement bias, as well as confounding. It includes 14 criteria to assess risk of bias and methodological quality, such as whether the study population was clearly specified and defined. Each criterion was rated as "Yes" (Y), "No" (N), "Not Reported" (NR), or "Not Applicable" (NA). The option "NR" was used when no relevant information was provided in the study, while "NA" was selected when the criterion could not be evaluated due to the study design[8].

RESULTS

A total of 501 articles were identified, of which 43 were duplicates, resulting in 458 records. After screening titles and abstracts, 447 studies were excluded, and 11 full-text articles were assessed for eligibility. Of these, six studies met the eligibility criteria and were included in the review. Reference lists of the included articles were also screened, but no additional studies were identified for inclusion (Figure 1).

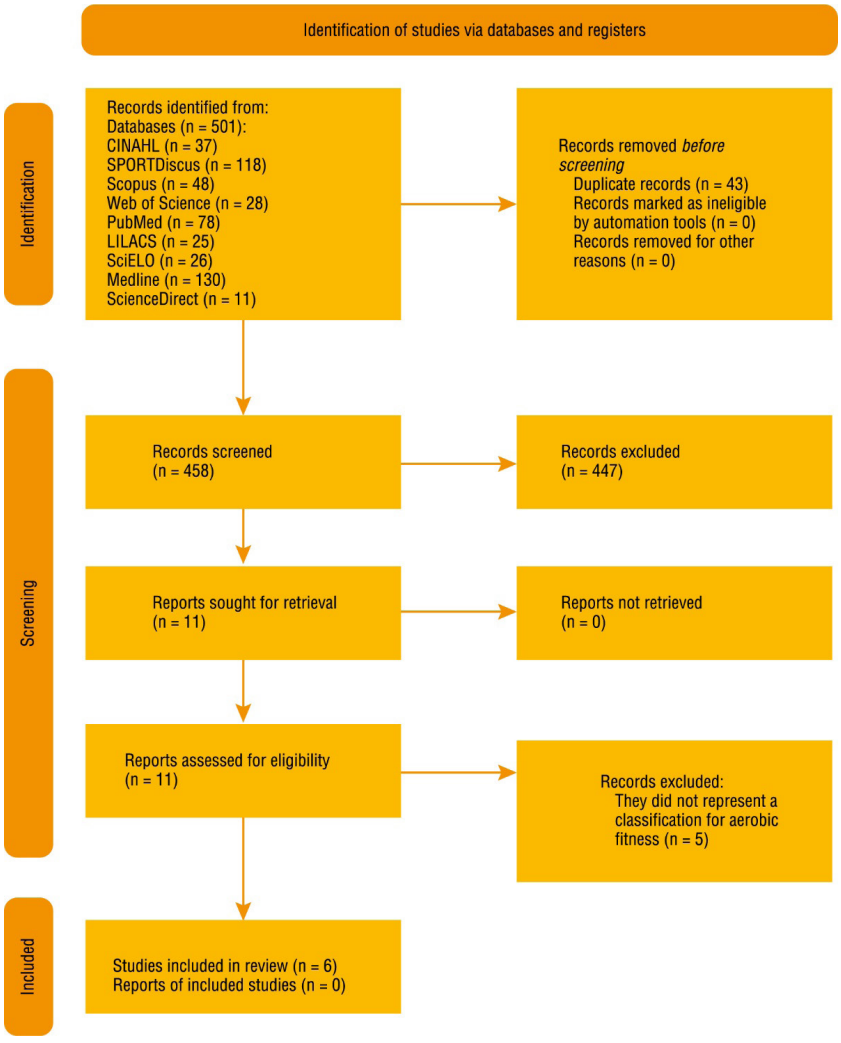

Figure 1. Flowchart of article identification, screening, and exclusion.

The characteristics of the six studies included in the review are presented in Table 1. One study was conducted in the Southeast region of Brazil, in the state of Rio de Janeiro[11], while the remaining five studies were carried out in the Southern region of the country, four in the state of Rio Grande do Sul[9,10,13,14] and one in the state of Santa Catarina[12].

The study populations comprised individuals aged six to 17 years, and the included studies were published between 2020 and 2024. All selected studies employed a cross-sectional design[9-14] (Table 1).

The prevalence of children and adolescents meeting the recommended criteria for aerobic fitness varied across studies. The lowest reported prevalence was 5.10%[11] while the highest was 57.39%[12]. Regarding sex-specific data, the prevalence among males ranged from 5.5%[11] to 46.42%[12], and among females from 4.7%[11] to 67.79%[12]. Additionally, two studies reported prevalence by age group, indicating that children showed higher levels of aerobic fitness within the recommended criteria when compared to adolescents[10,14] (Table 2).

Table 1. Description of studies on the prevalence of aerobic fitness among Brazilian children and/or adolescents.

Author(s), Year, and Location	Design	Sample	Age range	Study objective
Bagatini et al.[9] RS**	Cross-sectional	49 ♂: 33 ♀: 15	10-17 years	To investigate the effect of cardiorespiratory fitness and body mass index on cardiometabolic risk factors in children and adolescents.
Brand et al.[10] Santa Cruz do Sul – RS	Cross-sectional	2,786 (1,616 adolescents) ♂: 1,201 ♀: 1,585*	6-17 years	To examine the role of the combination of physical fitness and fatness in the relationship between physical activity and cardiometabolic risk in children and adolescents.
Franceschin and Veiga[11] Rio de Janeiro – RJ	Cross-sectional	1,015 ♂: 473 ♀: 542	14-18 years	To investigate the association between physical activity level or cardiorespiratory fitness and sedentary behavior, as well as a combination of both, with overweight among adolescents.
Borges et al.[12] Criciúma – SC	Cross-sectional	575 ♂: 280 e ♀: 295	11-17 years	To estimate the prevalence of and factors associated with low aerobic fitness among adolescents.
Saldanha-Filho et al.[13] Santa Cruz do Sul, RS	Cross-sectional	1,200 ♂: 545 ♀: 655	7-17 years	To examine whether there are associations between performance-related physical fitness levels and clustered cardiometabolic risk scores among children and adolescents.
Sehn et al.[14] Santa Cruz do Sul – RS	Cross-sectional	2,418 (children = 613; adolescents aged 10 to 12 years = 876; adolescents aged 13 to 17 years = 929) ♂: 1,071 ♀: 1,347*	6-17 years	To investigate the influence of cardiorespiratory fitness as a moderator in the association between neck circumference and cardiometabolic risk in children and adolescents.

Note. RJ = Rio de Janeiro, RS = Rio Grande do Sul, SC = Santa Catarina, ♀ = Female, ♂ = Male, *Calculated parameters; **City not informed.

Table 2. Studies on the prevalence of aerobic fitness among Brazilian children and/or adolescents.

Author(s), year	Physical fitness test used	Reference for cutoff point	Prevalence of adolescents who met the aerobic fitness criteria
Bagatini et al.[9]	20-m shuttle run test	Tomkinson et al.[15]	Total: 24.40% (n=11)*
Brand et al. [10]	6-minute walk/run	Gaya[16]	Total: 38.2% (n=1,064) Children: 54.4% (n=637) Adolescents: 26.4% (n=427)
Franceschin and Veiga[11]	9-minute walk/run	PROESP-BR[15]	Total: 5.1% (n=43)* ♂: 5.5% (n=23) ♀: 4.7% (n=20)
Borges et al.[12]	9-minute walk/run	Silva et al.[17]	Total: 57.39% (n=330)* ♂: 46.42% (n=130) ♀: 67.79% (n=200)
Saldanha-Filho et al.[13]	9-minute walk/run	Gaya[18]	Total: 36.66% (n=440)* ♂: 42.9% (n=234) ♀: 31.5% (n=206)
Sehn et al.[14]	6-minute walk/run	Gaya and Gaya[16]	Total: 45.45% (n=1,099)* Children (6 to 9 years): 73.6% (n=451) Adolescents (10 to 12 years): 42.7% (n=374) Adolescents (13 to 17 years): 29.5% (n=274)
Total number of studies (n = 6; 6,843 participants assessed)			Total: 43.68% (n=2,987)† ♂: 29.81% (n=387)‡ ♀: 28.55% (n=426)‡ Children: 61.02% (n=1,088) Adolescents: 31.42% (n=1,075)

Note. *Calculated values. PROESP-BR: Projeto Esporte Brasil (Brazil Sports Project). ♀ = Female, ♂ = Male. †Value calculated based on the total number of individuals assessed and the number of individuals who met the criteria for adequate aerobic fitness across the different studies; ‡Values calculated based on the total number of individuals (♂: 6,843; ♀: 1,492) assessed in the three studies that reported sex-stratified results, and on the number of individuals who met the criteria for adequate aerobic fitness in those studies.

Overall, 43.68% of Brazilian children and adolescents were classified as meeting the recommended criteria for aerobic fitness. Among the studies that presented data stratified by sex[11-13], 29.81% of males and 28.55% of females met the recommended aerobic fitness standards. Furthermore, two studies presented results stratified by age group[10,14]. In both studies, children (61.02%; n = 1,088) had higher prevalence rates of adequate aerobic fitness compared to adolescents (31.42%; n = 1,075) (Table 2).

Aerobic fitness was assessed using various field tests, including the six-minute walk/run test[10], the nine-minute walk/run test[11-13] and the 20-meter shuttle-run test[9]. Different cut-off points were identified in the reviewed literature. The most frequently used criterion was from the 2009 PROESP-BR[15], applied in two studies[11,13]. (Tables 2 and 3). Regarding the units used for classification, most studies (n = 5) employed meters, while only one study used peak oxygen consumption[2] (Table 3).

The methodological quality/risk of bias of the included studies are presented in Table 4. In summary, the majority of studies met the criteria outlined by the NHLBI.

Table 3. Cut-off points used in the included studies to identify the prevalence of adequate aerobic fitness in children and adolescents.

Age	PROESP-BR 9-minute walk/run test[15]	PROESP-BR 6-minute walk/run test[18]	20-m shuttle run test Peak VO_2[2]	6-minute walk/run[16]
Male				
5	-	-	-	-
6	-	675m		1190m
7	1157m	730m	-	1190m
8	1157m	768m	-	1300m
9	1174m	820m	46.1 mL/kg/min	1300m
10	1208m	856m	44.6 mL/kg/min	1300m
11	1384m	930m	43.2 mL/kg/min	1300m
12	1425m	966m	42.3 mL/kg/min	1380m
13	1500m	995m	41.7 mL/kg/min	1380m
14	1560m	1060m	41.0 mL/kg/min	1380m
15	1634m	1130m	40.1 mL/kg/min	1520m
16	1660m	1190m	39.1 mL/kg/min	1520m
17	1660m	1190m	38.2 mL/kg/min	1520m
17+	-	-	-	-
Female				
5	-	-	-	-
6	-	630m	-	1070m
7	1090m	683m	-	1070m
8	1101m	715m	-	1070m
9	1103m	745m	-	1160m
10	1157m	790m	43.20 mL/kg/min	1160m
11	1179m	840m	41.40 mL/kg/min	1160m
12	1210m	900m	39.6 mL/kg/min	1200m
13	1210m	940m	37.9 mL/kg/min	1200m
14	1220m	985m	36.2 mL/kg/min	1200m
15	1240m	1005m	34.5 mL/kg/min	-
16	1256m	1070m	32.8 mL/kg/min	-
17	1256m	1110m	31.1 mL/kg/min	-
17+	-	-	-	-

Note. PROESP-BR: *Projeto Esporte Brasil* (Brazil Sports Project).

Table 4. Methodological quality/risk of bias of the studies.

Author(s)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Bagatini et al.[9]	Y	Y	NR	Y	NR	Y	NA	Y	Y	NA	Y	NA	NA	Y
Brand et al.[10]	Y	Y	Y	Y	Y	Y	NA	Y	Y	NA	Y	NA	NA	Y
Franceschin and Veiga[11]	Y	Y	Y	Y	Y	Y	NA	Y	Y	NA	Y	NA	NA	Y
Borges et al.[12]	Y	Y	Y	Y	Y	Y	NA	Y	Y	NA	Y	Y	Y	Y
Saldanha-Filho et al.[13]	Y	Y	Y	Y	Y	Y	NA	Y	Y	NA	Y	Y	Y	Y
Sehn et al.[14]	Y	Y	Y	Y	Y	Y	NA	Y	Y	NA	Y	NA	NA	Y

Note. Q = question; Y = yes; N = no; NR = not reported; NA = not applicable. Q1: Was the research question or objective clearly stated? Q2: Was the study population clearly specified and defined? Q3: Was the participation rate of eligible individuals at least 50%? Q4: Were all individuals selected or recruited from the same or similar populations (including the same time period), and were inclusion/exclusion criteria prespecified and uniformly applied? Q5: Was a sample size justification, power description, or estimates of variance and effect size provided? Q6: Were exposures measured prior to outcomes? Q7: Was the timeframe sufficient to reasonably expect an association between exposure and outcome? Q8: For exposures varying in quantity/level, did the study examine different levels in relation to the outcome? Q9: Were exposure measures clearly defined, valid, reliable, and consistently implemented? Q10: Was exposure assessed more than once over time? Q11: Were outcome measures clearly defined, valid, reliable, and consistently implemented? Q12: Were outcome assessors blinded to exposure status? Q13: Was loss to follow-up ≤20%? Q14: Were key potential confounders measured and statistically adjusted?

DISCUSSION

The present study identified a prevalence of 43.68% of Brazilian children and adolescents meeting the health-related criteria for aerobic fitness between 2020 and 2024. This result is encouraging, as the previous review from this project reported a prevalence of 26.9%[5]. Regarding age groups, children showed higher prevalence rates of adequate aerobic fitness compared to adolescents. When stratified by sex, males presented slightly higher prevalence rates than females.

The increase of nearly 17 percentage points in the prevalence of children and adolescents meeting the recommended aerobic fitness criteria between 2020 and 2024 represents a relevant improvement compared to the previous edition of the Report Card Brazil project, which covered data from 2018 to 2019[5].This finding contradicts the initial hypothesis of the present study, which anticipated a decline in aerobic fitness levels due to lifestyle changes brought about by the COVID-19 pandemic, such as school closures, mobility restrictions, and suspension of organized sports[6,19]. However, upon analyzing the data sources of the studies included in this review, it was found that Brand et al.[10] used data collected between 2014–2015 and 2016–2017. Similarly, Franceschin and Veiga[11] analyzed data from 2010, Borges et al.[12] used data from 2015, and Saldanha-Filho et al.[13] collected data between 2011 and 2012. Sehn et al.[14] used data from 2016–2017, and the data collection period for the study by Bagatini et al.[9] was not identified. Therefore, although there has been progress in the publication of studies on aerobic fitness, there are notable gaps in the scientific literature addressing critical population periods, such as the COVID-19 pandemic or recent changes in aerobic fitness trends among Brazilian youth.

Despite the overall improvement observed over the analyzed period, more than half of Brazilian children and adolescents still do not meet the recommended criteria for aerobic fitness. These findings may be limited by the geographic concentration of studies in the state of Rio Grande do Sul and by the lack of data from other regions, affecting national representativeness. Combined with the high prevalence of physical inactivity and sedentary behavior, this scenario raises significant concerns from a public health perspective[20,21].

Among the studies reviewed, two stratified their results by age group[12,14] revealing a downward gradient in aerobic fitness with increasing age. In the study by Borges et al.[12], the prevalence of low aerobic fitness increased from 46.0% (male) and 40.5% (female) among those aged 11–13 years to 59.6% and 46.6%, respectively, in the 14–17-year group. A similar pattern was found in the study by Sehn et al.[14], although different fitness tests were used. In this case, the proportion of adolescents classified with healthy fitness declined from 73.6% (10-12 years) to 42.7% (13-17 years), reaching only 29.5% in the 14-17 age group. These findings indicate a progressive decline in aerobic fitness during adolescence, with a more pronounced trend beginning at the onset of puberty. This pattern underscores the importance of age-specific stratification in studies on physical fitness, as the changes observed do not occur linearly but intensify during specific stages of pubertal development[22].

Marked differences between pre-adolescents (aged 10-12 years) and older adolescents (aged 13-17 years) have been reported in the literature but may be obscured in analyses that do not apply stratification[14]. Additionally, risk factors change across maturational stages, with puberty introducing alterations in body composition and energy metabolism that affect each age group differently[23,24].

Therefore, the systematic adoption of detailed age stratification and its standardization in population-based studies is essential to identify critical intervention periods and to design targeted strategies appropriate for each stage of adolescent development.

Regarding sex-stratified values, the present review found that 29.81% of males and 28.55% of females met the health criteria for aerobic fitness. Although the absolute difference between sexes is small, this finding reinforces previous literature indicating a global trend of better cardiorespiratory test performance among males compared to females[2,4,5]. Biological, behavioral, and sociocultural factors contribute to this disparity. From a biological perspective, males tend to have greater muscle mass, higher maximal oxygen uptake (VO_2max), and lower body fat percentage after the onset of puberty, which directly influences aerobic performance[2,24]. Behaviorally, previous studies have shown that boys participate more frequently in moderate-to-vigorous physical activity, particularly through team sports and active play, whereas girls tend to engage in lighter or intermittent forms of physical activity[25]. Moreover, sociocultural barriers, such as gender norms, stigmas associated with female participation in sports, limited opportunities for girls, and family expectations, also negatively affect girls' engagement in more intense physical activities[25]. This combination of factors results in a lower proportion of females meeting aerobic fitness criteria, underscoring the need for public policies, school-based strategies, and community interventions that consider gender-specific aspects in the promotion of physical activity among children and adolescents.

Although various cutoff points were identified in the reviewed literature, the PROESP-BR criteria remained the most frequently used, having been adopted in four of the six analyzed studies[10,11,13,14]. This prevalence reflects its broad acceptance within the Brazilian school context, where it was originally validated. However, recent studies have incorporated additional criteria, such as Bagatini et al.[9] used the reference values proposed by Tomkinson et al.[15], which are notable for their large sample size (over one million participants), while Borges et al.[12] applied parameters developed by Silva et al.[17], specifically designed to identify cardiometabolic risk in adolescents. These variations in reference standards reflect not only methodological differences but also distinct evaluative focuses. While PROESP-BR emphasizes educational fitness classification, Silva et al.[17]'s criteria are linked to health outcomes, and Tomkinson et al.[15] provide a broad population-level perspective. Although such diversity enriches the field, future studies should clearly justify the selection of cutoff points, considering the study population and the comparability with existing literature.

The absence of longitudinal studies represents a major gap in the literature on aerobic fitness among Brazilian children and adolescents. Most investigations conducted in the country rely on cross-sectional designs, which, while useful for estimating prevalence, limit the understanding of individual trajectories during growth and biological development[5]. This limitation hinders the identification of temporal patterns and stronger determinants related to the maintenance or decline of aerobic fitness. Longitudinal studies are essential to detect critical transitional periods, such as puberty, during which interventions may be more effective[26,27]. Furthermore, the lack of national cohorts with repeated measures of aerobic performance complicates the development of evidence-based public policies and the evaluation of health promotion programs during childhood and adolescence.

The implementation of regular fitness surveillance systems, such as those already established in countries like Canada and Finland, is recommended to address this gap and support more effective actions in the Brazilian context[26].

This systematic review has certain limitations that should be considered. The heterogeneity among the included studies, such as differences in age groups, sample sizes, test protocols, and cutoff points used to assess aerobic fitness, may partially affect the estimated national prevalence of children and adolescents meeting aerobic fitness recommendations. Furthermore, some studies did not report prevalence estimates for the total sample or stratified by sex, which influenced the overall calculation for the Report Card Brazil project. Despite these limitations, the study presents notable strengths, including a comprehensive search strategy encompassing nine different databases and the inclusion of studies rigorously peer-reviewed using a methodological quality assessment tool. This approach allowed for the evaluation of both internal and external validity of the included studies.

CONCLUSION

This review represents an update of the study by Martins et al.[5] and aimed to describe the aerobic fitness profile of Brazilian children and adolescents based on studies published in the past five years. In summary, the findings indicate that only half of Brazilian children and adolescents met the health-related criteria for aerobic fitness, with even more concerning results observed among females and adolescents. Various cutoff points and three different test protocols were used to assess aerobic fitness. Additionally, the present review identified a lack of studies assessing aerobic fitness in children and adolescents from the North and Northeast regions of Brazil during the investigated period.

COMPLIANCE WITH ETHICAL STANDARDS

Funding

This research did not receive any specific grant from funding agencies in thepublic, commercial, or not-for-profit sectors. This study was funded by the authors.

Data Availability Statement

Research data is only available upon request.

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

Carried out the planning, extraction and analysis of the data: PCM, CASAJ, DASS; Interpreted and wrote the manuscript: PCM, CASAJ, AFS, LNS, MSP, JMF, DASS; Conceived the idea of the manuscript: DASS. All authors read and approved the final manuscript.

REFERENCES

1. Andersen LB, Riddoch C, Kriemler S, Hills AP. Physical activity and cardiovascular risk factors in children. Br J Sports Med 2011;45(11):871-6. https://doi.org/10.1136/bjsports-2011-090333. PMid:21791456.
2. Tomkinson GR, Lang JJ, Tremblay MS. Temporal trends in the cardiorespiratory fitness of children and adolescents representing 19 high-income and upper middle-income countries between 1981 and 2014. Br J Sports Med 2019;53(8):478-86. https://doi.org/10.1136/bjsports-2017-097982. PMid:29084727.
3. Silva DAS, Petroski EL, Gaya ACA. Secular changes in aerobic fitness levels in Brazilian children. Rev Bras Med Esporte 2017;23(6):450-4. https://doi.org/10.1590/1517-869220172306150424.
4. Gonçalves ECDA, Alves CAS Jr, Nunes HEG, Souza MCD, Silva DAS. Prevalência de crianças e adolescentes brasileiros que atenderam critérios de saúde para aptidão cardiorrespiratória: uma revisão sistemática. Rev Bras Cineantropom Desempenho Hum 2018;20(4):446-71. https://doi.org/10.5007/1980-0037.2018v20n4p446.
5. Martins PC, Alves CAS Jr, Lima TR, Silva AF, Moraes MS, Zanlorenci S, et al. Prevalência de crianças e adolescentes brasileiros que atenderam aos critérios de saúde para aptidão aeróbia: atualização de revisão sistemática para o Projeto Report Card Brasil. Rev Bras Cineantropom Desempenho Hum 2021;23:e78858. https://doi.org/10.1590/1980-0037.2021v23e78858.
6. Neville RD, Lakes KD, Hopkins WG, Tarantino G, Draper CE, Beck R, et al. Global changes in child and adolescent physical activity during the COVID-19 pandemic: a systematic review and meta-analysis. JAMA Pediatr 2022;176(9):886-94. https://doi.org/10.1001/jamapediatrics.2022.2313. PMid:35816330.
7. Silva DAS, Pelegrini A, Pinto AA, Christofaro DGD, Ferrari GLM, Nunes HEG, et al. Report Card Brazil: Health indicators for children and adolescents [Internet]. 4th ed. Charlottesville (VA): Center for Open Science; 2026 [cited 2026 Apr 1]. Available from: https://osf.io/y2q8z/
8. National Institutes of Health. Study quality assessment tools. Bethesda (MD): National Institutes of Health; 2024.
9. Bagatini NC, Feil Pinho CD, Leites GT, da Cunha Voser R, Gaya AR, Santos Cunha GD. Effects of cardiorespiratory fitness and body mass index on cardiometabolic risk factors in schoolchildren. BMC Pediatr 2023;23(1):454. https://doi.org/10.1186/s12887-023-04266-w. PMid:37689621.
10. Brand C, Sehn A, Fochesatto C, Villa-González E, Gaya AR, Renner J, et al. Fitness and fatness in children and adolescents: investigating their role in the association between physical activity and cardiometabolic health. Biol Sport 2024;41(2):147-54. https://doi.org/10.5114/biolsport.2024.129473. PMid:38524808.
11. Franceschin MJ, Veiga GVD. Associação da aptidão cardiorrespiratória, do nível atividade física e do comportamento sedentário com o estado nutricional de adolescentes. Rev Bras Cineantropom Desempenho Hum 2020;22:e60449. https://doi.org/10.1590/1980-0037.2020v22e60449.
12. Borges LL, Silva DAS, Silva AF, Santos GDCF, Pedroso MS, Pereira EV, et al. Low aerobic fitness among adolescents: prevalence and associated factors. Motricidade 2021;17(2):129-39. https://doi.org/10.6063/motricidade.19951.

13. Saldanha Filho N, Reuter CP, Renner JDP, Barbian CD, de Castro Silveira JF, de Borba Schneiders L, et al. Low levels of cardiorespiratory fitness and abdominal resistance are associated with metabolic risk in schoolchildren. J Pediatr Endocrinol Metab 2019;32(5):455-60. https://doi.org/10.1515/jpem-2018-0236. PMid:31042640.

14. Sehn AP, Brand C, Welser L, Gaya AR, Agostinis-Sobrinho C, Cristi-Montero C, et al. Neck circumference and cardiometabolic risk in children and adolescents: the moderator role of cardiorespiratory fitness. BMC Pediatr 2021;21(1):234. https://doi.org/10.1186/s12887-021-02696-y. PMid:34001053.

15. Tomkinson GR, Lang JJ, Tremblay MS, Dale M, LeBlanc AG, Belanger K, et al. International normative 20 m shuttle run values from 1 142 026 children and youth representing 50 countries. Br J Sports Med 2017;51(21):1545-54. https://doi.org/10.1136/bjsports-2016-095987. PMid:27208067.

16. Gaya A, Gaya AR. Projeto Esporte Brasil: manual de testes e avaliação. Porto Alegre: UFRGS; 2016.

17. Silva DAS, Lang JJ, Petroski EL, Mello JB, Gaya ACA, Tremblay MS. Association between 9-minute walk/run test and obesity among children and adolescents: evidence for criterion-referenced cut-points. PeerJ 2020;8:e8651. https://doi.org/10.7717/peerj.8651. PMid:32110499.

18. Gaya A. Projeto Esporte Brasil: manual de aplicação de medidas e testes, normas e critérios de avaliação. Porto Alegre: PROESP-RS; 2009.

19. Rossi L, Behme N, Breuer C. Physical activity of children and adolescents during the COVID-19 pandemic: a scoping review. Int J Environ Res Public Health 2021;18(21):11440. https://doi.org/10.3390/ijerph182111440. PMid:34769956.

20. Silva DAS, Aubert S, Ng K, Morrison SA, Cagas JY, Tesler R, et al. Association between physical activity indicators and human development index at a national level: information from Global Matrix 4.0 Physical Activity Report Cards for Children and Adolescents. J Phys Act Health 2022;19(11):737-44. https://doi.org/10.1123/jpah.2022-0321. PMid:36280230.

21. Malina RM, Silva MJC. Physical activity, growth, and maturation of youth. In: Lukaski HC, editor. Body composition: Health and performance in exercise and sport. Boca Raton: CRC Press; 2017. p. 69-88.. https://doi.org/10.1201/9781351260008-5.

22. Cumming SP, Hill M, Johnson D, Parr J, Teunnissen JW, Malina RM. Growth and maturation. In: Williams AM, Ford P, Drust B, editors. Science and soccer: Developing elite performers. London: Routledge; 2023. p. 329-45.. https://doi.org/10.4324/9781003148418-25.

23. Payne VG, Isaacs LD. Growth and maturation. In: Payne VG, Isaacs LD, editors. Human motor development: A lifespan approach. London: Routledge; 2020. p. 159-94.. https://doi.org/10.4324/9780429327568-9.

24. Hunter SK, Angadi SS, Bhargava A, Harper J, Hirschberg AL, Levine BD, et al. The biological basis of sex differences in athletic performance: consensus statement for the American College of Sports Medicine. Med Sci Sports Exerc 2023;55(12):2328-60. https://doi.org/10.1249/TJX.0000000000000236. PMid:37772882.

25. Brazo-Sayavera J, Silva DR, Lang JJ, Tomkinson GR, Agostinis-Sobrinho C, Andersen LB, et al. Physical fitness surveillance and monitoring systems inventory for children and adolescents: a scoping review with a global perspective. Sports Med 2024;54(7):1755-69. https://doi.org/10.1007/s40279-024-02038-9. PMid:38710913.

26. Ljungmann CK, Christensen JH, Johnsen HR, Klinker CD, Pawlowski CS. Perceived barriers to sports participation among adolescent girls from low socioeconomic status neighbourhoods. Sport Soc 2024;27(7):1037-56. https://doi.org/10.1080/17430437.2023.2286013.

27. Ortega FB, Ruiz JR, Castillo MJ, Sjöström M. Physical fitness in childhood and adolescence: a powerful marker of health. Int J Obes 2008;32(1):1-11. https://doi.org/10.1038/sj.ijo.0803774. PMid:18043605.