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Muscle endurance of Brazilian children and adolescents: a systematic review update of published studies from 2020 to 2024

Resistência muscular de crianças e adolescentes brasileiros: uma atualização de revisão sistemática de estudos publicados entre 2020 e 2024

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Abstract – Muscle endurance is an important indicator of health-related fitness in childhood and adolescence. The present study aimed to identify and summarize the evidence on the prevalence of adequate muscle endurance among Brazilian children and adolescents (6 to 18 years) to update the evidence of previously published by the Report Card Brazil project. A systematic search of studies published from 2020 to 2024 was performed in five databases (LILACS, SciELO, Medline/PubMed, Web of Science, Scopus). We identified 20,202 articles; 16 met the eligibility criteria and were included in this review for data extraction and risk-of-bias assessment. Among the 4,613 children and adolescents participating in the studies was estimated at 55.9% (range 29.1% to 76.7%), had adequate abdominal muscle endurance. Different test batteries were reported, the most used were PROESP/BR® and FITNESSGRAM®. Most studies were carried out in the South (62.5%) and Southeast (25.0%) regions of Brazil. We conclude that more than half of Brazilian children and adolescents of both genders have an abdominal muscle endurance adequate for health, with similar values among boys and girls.

Key words: Adolescent; Child; Physical fitness.

Resumo – *A resistência muscular é um importante indicador de aptidão física relacionada à saúde na infância e na adolescência. O presente estudo teve como objetivo identificar e sumarizar as evidências sobre a prevalência de resistência muscular adequada entre crianças e adolescentes brasileiros (6 a 18 anos) para atualizar as evidências publicadas anteriormente pelo projeto Report Card Brasil. Uma busca sistemática de estudos publicados de 2020 a 2024 foi realizada em cinco bases de dados (LILACS, SciELO, Medline/PubMed, Web of Science, Scopus). Identificamos 20.202 artigos, dos quais 16 atenderam aos critérios de elegibilidade e foram incluídos nesta revisão para extração de dados e avaliação do risco de viés. Entre as 4.613 crianças e adolescentes participantes dos estudos, estimou-se que 55,9% (variação de 29,1% a 76,7%) apresentavam resistência muscular abdominal adequada. Diferentes baterias de testes foram reportadas, sendo as mais utilizadas o PROESP/BR® e o FITNESSGRAM®. A maioria dos estudos foi realizada nas regiões Sul (62,5%) e Sudeste (25,0%) do Brasil. Concluímos que mais da metade das crianças e adolescentes brasileiros de ambos os sexos possuem resistência muscular abdominal adequada para a saúde, com valores semelhantes entre meninos e meninas.*

Palavras-chave: *Adolescente; Criança; Aptidão física.*

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INTRODUCTION

Physical fitness is considered essential for health, and high levels during childhood and adolescence tend to have positive repercussions in adulthood, reducing the risk of future comorbidities and expanding opportunities for engagement in physical activity[1]. Within this context, muscular fitness stands out as an important component, being related to motor performance but also to mental, bone, and metabolic health[2].

As an integral part of this construct, muscle endurance is defined as the ability to sustain repeated contractions over time[3]. Although it has historically been associated with athletic performance, muscle endurance is now recognized as an essential component for functional capacity, enabling individuals to perform activities of daily living more effectively and with less fatigue[3].

The importance of monitoring this attribute lies in its robust long-term association with health outcomes[4]. Evidence suggests an inverse relationship between muscle endurance and cardiovascular risk factors, such as adiposity, insulin resistance, and systemic inflammation[5,6]. Additionally, the tracking phenomenon has been observed, in which the muscle endurance profile observed in the pediatric phase tends to persist into adulthood[4]. Consequently, low muscle endurance in youth increases the risk of all-cause morbidity and mortality as well as the development of chronic diseases in the future[7]. Conversely, maintaining adequate levels from an early age may provide lasting protection against these conditions[4].

Despite the health benefits, a concerning trend is observed in Brazil, where more than half of children and adolescents exhibit inadequate levels of abdominal muscle endurance[2]. This situation is further aggravated by the increase in sedentary behavior, especially screen time, physical inactivity, and excess body fat[8]. To mitigate this cycle, global guidelines from the World Health Organization[9] and the Physical Activity Guidelines for the Brazilian Population[10] recommend, in addition to 60 minutes of daily activity, the specific inclusion of muscle- and bone-strengthening exercises on at least three days of the week.

Updating this evidence base is important both to identify new findings and to support the continuous surveillance of this relevant health-related indicator. This study aimed to identify and summarize the evidence on the prevalence of adequate muscle endurance among Brazilian children and adolescents (6 to 18 years) to update the evidence previously published by the Report Card Brazil project.

METHODS

This systematic review is part of the Global Matrix 5.0 initiative of the Active Healthy Kids Global Alliance[11] based on the "Report Card Brazil: Health Indicators for Children and Adolescents" (4rd edition) project, which updates previous systematic reviews[12,13] by expanding the number of bibliographic databases, the search strategy, and the temporal window of published articles. The systematic reviews of the health indicators covered by the "Report Card Brazil" protocol were registered on the OSF platform[14], which provides further details about the project.

Eligibility criteria

The inclusion criteria were original studies involving Brazilian children and adolescents (6 to 19 years) that measured muscle endurance in the trunk region (abdominal) using flexion tests and upper limbs using curl-up, push-up, or modified pull-up tests– most used in previous research[2] if they reported the interpretation of the adequacy of this physical fitness component, and the prevalence of participants who met the muscle endurance criteria. Studies of any design (observational or intervention) published in Portuguese, English, or Spanish.

Studies were excluded if: 1) issue was outside the scope of this review; 2) participants were younger (< 6 years) or older (> 19 years); 3) they involved participants of nationalities other than Brazilian; 4) children and adolescents had chronic conditions (HIV infection, congenital heart disease, cancer or chromosomal abnormalities) or were athletes. The Rayyan Platform (QCRI, Qatar) was utilized to identify and exclude duplicate studies across various bibliographic databases. Narrative and systematic reviews, case reports, monographs, dissertations, and theses were also excluded.

Sources

Five bibliographic databases were searched for studies published between January 2020 and December 2024: Latin American and Caribbean Literature in Health Sciences (LILACS) through the Bireme platform, Scientific Electronic Library Online (SciELO), SCOPUS, and Medical Literature Analysis and Retrieval System Online (MEDLINE) through PubMed and the Web of Science.

Search strategy

Procedures such as search, selection, inclusion, and exclusion of original studies were carried out by two pairs of independent researchers (MRA and FAG; MA and KS). All conflicts and disagreements were discussed in a consensus meeting, and a third reviewer resolved them with a casting vote (ECM). The research in the bibliographic databases utilized descriptors related to the outcome and the population of interest, organized into separate blocks, as presented in the Supplementary Table 1. Boolean operators "AND" for addition and "OR" for substitution were used. All searches were conducted on July 14, 2025, using English-language descriptors.

Study selection

The studies identified in the databases were downloaded and analyzed using the Rayyan® platform to exclude duplicates. Two pairs of researchers (MRA and FAG; MA and KS) independently read titles and abstracts to screen studies for eligibility using the Rayyan platform. The full texts of the remaining studies were read, considering the eligibility criteria (Figure 1). Eligible studies had their reference list checked to find potential studies that the initial search strategy had not identified. If these studies met the eligibility criteria, they were included in this review.

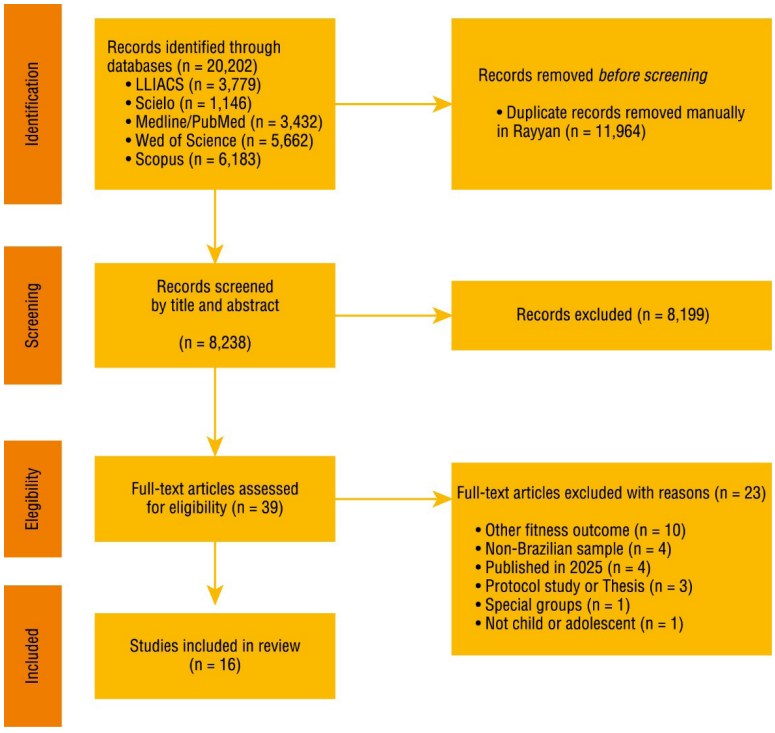

Figure 1. Flowchart of identification, selection, inclusion and exclusion of studies.

Data collection process

Information about authorship, year of publication, study site, sample size, and percentage of participants by sex and age group was extracted from eligible studies (Table 1). In addition, information was extracted on muscle endurance tests used, cutoff points, and the total prevalence of participants who met the muscle endurance criteria, stratified by sex and their classifications, if available (Table 2). For studies that did not present prevalence data, mean and standard deviation information were extracted from muscle endurance tests (Table 3). All data extraction procedures were performed independently by pairs of researchers (MRA and FAG; MA and KS) and subsequently validated by another independent researcher (LRAL).

Table 1. Characteristics of the included studies (n=16) about muscular endurance with Brazilian children and adolescents, Brazil, 2025.

Author	City, State (year of assessment)	n	% (female)	Age (years)
Aimi et al.[15]	Porto Alegre, RS (NR)	173	43.0	12 to 17
Arruda et al.[16]	Londrina, PR (NR)	81	55.5	12
Almeida et al.[17]	Vitória de Santo Antão, PE (NR)	106	NA	07 to 09
Chagas & Barnett[18]	Rio de Janeiro, RJ (2018 and 2019)	128	55.5	12 to 14
De Marco et al.[19]	Florianópolis, SC (2017)	981	48.6	14 to 18
Ferreira et al.[20]	Campinas, SP (2018)	152	55.0	11 to 16
Freitas et al.[21]	Montes Claros, MG (NR)	2049	50.0	11 to 14
Legey et al.[22]	Búzios, RJ (NR)	257	52.9	13 to 19
Mendonça et al.[23]	Santo Antonio da Platina, PR (2018)	63	60.3	13 to 19
Moraes et al.[24]	Curitiba, Paraná (NR)	28	32.1	13 to 16

Note. Not Reported (NR); Sample Size (n); Not Applicable (NA).

Table 1. Continued...

Author	City, State (year of assessment)	n	% (female)	Age (years)
Pedretti et al.[25]	Tramandaí, RS (NR)	91	37.3	9 to 12
Reis et al.[26]	Porto Alegre, RS (2018)	50	48.0	6 to 11
Silva et al.[27]	Iguatu, CE (2018)	179	47.5	11 to 15
Silva et al.[28]	Jacarezinho, PR (2014 and 2017)	93	60.0	13 to 16
Sordi et al.[29]	Lebon Régis, SC (NR)	120	41.6	9 to 12
Tadiotto et al.[30]	Curitiba, PR (2019)	62	48.4	10 to 16

Note. Not Reported (NR); Sample Size (n); Not Applicable (NA).

Table 2. Protocol, Fitness Battery, and Prevalence of adequate muscle endurance in Brazilian children and adolescents, Brazil, 2024.

Author	Protocol Protocol (curl-ups)	Physical Fitness Battery	% who met the muscle endurance criteria		
			Total (n)	Male (n)	Female (n)
Aimi et al.[15]	Maximum curl-ups in 60 s	PROESP-BR	69.0 (119)	64.6 (64)	74.3 (55)
Arruda et al.[16]	Curl-up to exhaustion	FITNESSGRAM Physical best	59.1 (48) 91.3 (74)	58.3 (21) 86.1(31)	60.0 (27) 95.6 (43)
De Marco et al.[19]	Maximum curl-ups cadence*	CSEP	76.7 (752)	87.7 (442)	65.0 (310)
Pedretti et al.[25]	Maximum curl-ups in 60 s	PROESP-BR	31.9 (91)	31.6 (57)	32.4 (34)
Reis et al.[26]	Maximum curl-ups in 60 s	PROESP-BR	70.0 (35)	73.1 (19)	66.7 (16)
Silva et al.[27]	Maximum curl-ups in 60 s	PROESP-BR	29.1 (52)	21.2 (20)	37.6 (32)
Arruda et al.[16]	Modified Pull-up	FITNESSGRAM	62.9 (51)	61.1 (22)	64.4 (29)
Arruda et al.[16]	Maximum push-ups to exhaustion	FITNESSGRAM Physical test	20.0 (17) 13.5 (11)	36.1(13) 19.4 (7)	8.8 (4) 8.8 (4)

Note. *The rhythm was set at 50 beats per minute.

Table 3. Protocol, Fitness Battery, and mean value of muscle endurance in Brazilian children and adolescents, Brazil, 2024.

Author	Protocol (curl-ups)	Physical Fitness Battery	Groups	
			Control Group Mean ± SD (n)	Intervention Group Mean ± SD (n)
Almeida et al.[17]	Maximum curl-ups in 60 s	FITNESSGRAM and EUROFIT	20.8±8.5 (40)	18.0±7.5 (40)
Sordi et al.[29]	Maximum curl-ups in 60 s	Pollock and Wilmore, 1993	20.3±9.6 (60)	27.3±8.5 (60)
[a]Mendonça et al.[23]	Maximum curl-ups in 60 s	FITNESSGRAM	23.6 [19.2-28.1] (24)	20.3 [15.2-25.3] (19) 22.6 [17.8-27.3] (20)
			Boys Group Mean ± SD (n)	Female Group Mean ± SD (n)
Chagas & Barnett[18]	Maximum curl-ups in 60 s	PROESP-Br	33.5±8.9 (57)	20.8±96 (71)
Ferreira et al.[20]	Maximum curl-ups in 60 s	PROESP-Br	35.9±1.31 (68)	24.6±1.00 (84)
Legey et al.[22]	Cult-up: 1 repetition every 3 s (total correct repetitions)	FITNESSGRAM	35.0±20.8 (121)	25.5±19.2 (136)

Note. [a]Mean and 95%IC; [b]Time 1 - immediate return to school classes and Time 2 - three months of usual activities; [c]time 1 - 2014 and time 2 – 2017; [d]Median and interquartile range.

Table 3. Continued...

Author	Protocol (curl-ups)	Physical Fitness Battery	Groups	
			Control Group Mean ± SD (n)	Intervention Group Mean ± SD (n)
			11 and 12 years Group Mean ± SD (n)	13 and 14 years Group Mean ± SD (n)
Freitas et al.[21]	Maximum curl-ups in 60 s	Pitanga (2008)	25.7±13.63 (565) 25.1±12.70 (494)	24.9±12.6 (501) 26.6±13.6 (489)
			Fast Group Mean ± SD (n)	Intermediate and Slow group Mean ± SD (n)
Tadiotto et al.[30]	Maximum curl-ups in 60 s	FITNESSGRAM	32.3±9.0 (20)	22.9±8.4 (21) 14.5±9.5 (21)
			Immediate Return Group Mean ± SD (n)	
[b]Moraes et al.[24]	Maximum curl-ups in 60 s	FITNESSGRAM	24.2±8.4 (28)	
			2014 Group	2017 Group
[c],[d]Silva et al.[28]	Maximum curl-ups in 60 s	FITNESSGRAM	16.5 [9.0-27.7] (93)	23.0 [14.0-36.5] (93)
Author	**Protocol (push-ups)**	**Physical Fitness Battery**	**Control Group Mean ± SD (n)**	**Intervention Group Mean ± SD (n)**
Sordi et al.[29]	Maximum push-ups in 60 s	Pollock and Wilmore, 1993	14.3±8.7 (60)	19.1±8.8 (60)
			2014 Group Mean ± SD (n)	2017 Group Mean ± SD (n)
[c],[d]Silva et al.[28]	Maximum push-ups in 60 s	FITNESSGRAM	0.0 [0.0 - 1.0] (93)	6.0 [0.0-12.0] (93)

Note. [a]Mean and 95%IC; [b]Time 1 - immediate return to school classes and Time 2 - three months of usual activities; [c]time 1 - 2014 and time 2 – 2017; [d]Median and interquartile range.

Risk of bias assessment

The risk of bias was analyzed using the National Heart, Lung, and Blood Institute Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies[31]. This instrument contains 14 questions regarding the internal validity of the study, 10 of which refer to cross-sectional observational studies. The analysis process was conducted by one researcher (ECM) and validated by another independent researcher (PFRB), with conflicts being resolved by a third researcher (LRAL). A score of 0 (no) and 1 (yes) was assigned to each item evaluated, and the arithmetic mean of the valid questions was obtained to calculate the final score of the instrument, excluding the questions that could not be answered by the information available in the study and/or did not apply to it. The final score was classified as low (score ≥ 0.70), moderate (≥ 0.50-0.69), or high (< 0.50) risk of bias.

Summary of results

When summarizing the results, the prevalence of children and adolescents who met the recommended health criteria for muscle endurance was based on the cutoff points and classifications used in the eligible studies. As a summary indicator, the mean prevalence of adequate muscle endurance was calculated from the available data from the included studies.

RESULTS

Based on the search strategy, 20,202 studies were identified in the databases. From these, 11,964 duplicate studies were manually removed using Rayyan®. The remaining 8,238 studies were assessed for eligibility, and 8,199 were excluded based on title and abstract review. Furthermore, 39 studies were reviewed in full-text assessment for eligibility, resulting in 16 studies included in the present review. Figure 1 summarizes the analysis steps and shows the reasons for exclusion.

The characteristics of the 16 studies included in the review are shown in Table 1. Ten studies (62.5%) were conducted in the South region, five in the state of Parana[16,23,24,28,30], three in Rio Grande do Sul[15,25,26], and two in Santa Catarina[19,29]. Four studies (25.0%) were carried out in the Southeast region, two in the state of Rio de Janeiro[18,22], one in Minas Gerais[21], and one in Sao Paulo[20]. Two studies (12.5%) were conducted in the Northeast region (Pernambuco[17] and Ceará[27]). No studies have been conducted in the northern and central-western regions of the country. Most studies investigated both sexes (n = 15)[15,16,18-30], the age group 6-19 years, and, together, included a total of 4,613 Brazilian children and adolescents (Table 1).

Different tests were used to assess abdominal muscle endurance in Brazilian children and adolescents, but, in general, most studies used the curl-ups maximum in 60 seconds (n = 13)[15,17,18,20,21,23-30]. There are different cutoff points in the literature for assessing muscle endurance using curl-ups. The following physical fitness batteries were used: PROESP-BR (n = 06)[15,18,20,25-27], FITNESSGRAM (n = 07)[16,17,22-24,28,30], and others (n = 05)[16,17,19,21,29]. From included studies, only six (n = 06) reported data on the overall prevalence of adequate muscle endurance[15,16,19,25-27].

The overall prevalence of children and adolescents with adequate abdominal muscle endurance was estimated at 55.9% (range 29.1%[27] to 76.7%[19]) according to the health criteria defined by the physical fitness batteries. The overall prevalence of adequate muscle endurance for health was 56.0% (range: 21.2%[27] to 87,7%[19]) for males and 56.0% (range: 32.4%[25] to 74.3%[15]) for females (Table 2). Additionally, for studies without prevalence values, we calculated average values and observed that, in general, the average number of repetitions (per minute or total repetitions, depending on the test protocol) across the studies was 25.11, ranging from 14.5[30] to 35.86[20] (Table 3).

The studies showed a moderate risk of bias (n = 10; 62.5%)[15,17,18,21,24-27,29,30] and low risk of bias (n = 6; 37.5%)[16,19,20,22,23,28]. Details of the studies regarding the risk of bias are presented in Table 4.

DISCUSSION

This systematic review aimed to identify and synthesize the most recent evidence on the prevalence of adequate muscle endurance among Brazilian children and adolescents, covering studies published between 2020 and 2024. Sixteen original studies were included, with a total of 4,613 children and adolescents aged 6 to 19 years. We found a geographical disparity of the included studies, since ahigh number in the South (n = 11)[15-17,19,23-26,28-30] and Southeast (n = 4)[18,20-22] regions, with low representation from the Northeast (n = 2)[17,27] and an absence of studies from the North and Midwest regions. Regarding the analyzed construct, the main findings revealed that most studies

Table 4. Risk of bias assessment in the studies included in the systematic review on muscle endurance in Brazilian children and adolescents, Brazil, 2025.

Author	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Final Score	Classification
Aimi et al.[15]	1	1	1	1	0	0	NA	NA	1	NA	1	0	NA	0	0.60	Moderate risk of bias
Arruda et al.[16]	1	1	1	1	1	0	NA	NA	1	NA	1	0	NA	0	0.70	Low risk of bias
Almeida et al.[17]	1	1	0	1	0	0	NA	NA	1	NA	1	0	NA	0	0.50	Moderate risk of bias
Chagas & Barnett[18]	1	1	0	1	0	0	NA	NA	1	NA	1	0	NA	1	0.60	Moderate risk of bias
De Marco et al.[19]	1	1	1	1	1	0	NA	NA	1	NA	1	0	NA	1	0.80	Low risk of bias
Ferreira et al.[20]	1	1	0	1	1	0	NA	NA	1	NA	1	0	NA	1	0.70	Low risk of bias
Freitas et al.[21]	1	1	0	1	0	0	NA	NA	1	NA	1	0	NA	0	0.50	Moderate risk of bias
Legey et al.[22]	1	1	1	1	0	0	NA	NA	1	NA	1	0	NA	1	0.70	Low risk of bias
Mendonça et al.[23]	1	1	1	1	1	0	NA	NA	1	NA	1	1	NA	1	0.90	Low risk of bias
Moraes et al.[24]	1	1	1	1	0	1	1	NA	0	1	1	0	0	0	0.57	Moderate risk of bias
Pedretti et al.[25]	1	1	1	1	0	0	NA	NA	1	NA	1	0	NA	0	0.60	Moderate risk of bias
Reis et al.[26]	1	1	0	1	0	0	NA	NA	1	NA	1	0	NA	0	0.50	Moderate risk of bias
Silva et al.[27]	1	1	0	1	0	0	NA	NA	1	NA	1	0	NA	0	0.50	Moderate risk of bias
Silva et al.[28]	1	1	0	1	0	1	1	1	1	1	1	0	0	1	0.71	Low risk of bias
Sordi et al.[29]	1	1	0	1	0	0	NA	NA	1	NA	1	0	NA	0	0.50	Moderate risk of bias
Tadiotto et al.[30]	1	1	0	1	1	0	NA	NA	1	NA	1	0	NA	0	0.60	Moderate risk of bias

Note. Q1. Was the research question or objective in this paper clearly stated? Q2. Was the study population clearly specified and defined? Q3. Was the participation rate of eligible persons at least 50%? Q4. Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants? Q5. Was a sample size justification, power description, or variance and effect estimates provided? Q6. For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured? Q7. Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed? Q8. For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)? Q9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants? Q10. Was the exposure(s) assessed more than once over time? Q11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants? Q12. Were the outcome assessors blinded to the exposure status of participants? Q13. Was loss to follow-up after baseline 20% or less? Q14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?; Not Applicable (NA); 0: No; 1: Yes; 0.70: low risk of bias; ≥ 0.50: moderate risk of bias; <0.50 high risk of bias; To determine the total score, we considered the following equation: (total of positive answers / total of questions considered for that study).

assessed the abdominal region, predominantly evaluated by abdominal curl-up tests, indicating that approximately 55.9% of the evaluated youth reached the recommended health levels, with values ranging from 29.1%[27] to 76.7%[19]. Moving forward from previous review, this incorporated four studies that assessed upper-limb muscular endurance using push-ups. In this body segment, the muscular endurance profile was substantially lower, with a prevalence of 32.1%, varying between 13.5%[16] and 62.9%[16].

In the most recent overall Report Card Brazil 2022, the global physical fitness indicator was graded as D+, indicating that fewer than half of Brazilian children and adolescents met the established health criteria[13]. Compared to the last national survey[2], conducted in 2021, an increase in the adequacy of abdominal muscular endurance was observed (57.0% vs. 43.5%). However, the Brazilian prevalence remains lower than international scores[32,33]. This comparison becomes even more relevant, as in recent decades a global trend of continuous decline in muscular fitness among youth has been observed, especially affecting abdominal and upper limb muscular endurance[1].

These findings should be interpreted considering the broader epidemiological context. Most studies included in this review collected their data before the COVID-19 pandemic. Therefore, the higher prevalence of adequate muscular endurance observed in the present review may partly reflect the pre-pandemic period rather than the current national scenario. This interpretation is consistent with Eberhardt et al.[34], who reported that the previous downward trend in muscular endurance had stabilized and that improvements were already being observed before the pandemic. The same study also suggested that the onset of the pandemic interrupted this favorable trajectory. Such an interpretation is plausible, given that pandemic-related restrictions were associated with increased physical inactivity and sedentary behavior, contributing to greater adiposity. In turn, excess adiposity may impair performance in tests that require supporting or repeatedly moving one's own body mass and penalize obese and overweight individuals[35]. In addition, muscular endurance has been shown to be inversely associated with obesity indicators in young populations[5].

Differences in abdominal and upper-limb muscular endurance may be partly explained by the distinct functional roles and movement demands associated with these muscle groups. Trunk musculature is primarily involved in postural control and locomotion and is more consistently during everyday activities[36]. In contrast, the development of upper limb endurance depends on neuromuscular stimuli and specific overload, which occur mainly during active play that involves supporting and pulling one's own body weight[37]. From this perspective, reduced engagement in such activities may disproportionately affect upper-limb muscular endurance, highlighting the importance of promoting movement experiences that specifically challenge this body segment throughout childhood and adolescence. In the Brazilian context, schools may represent a particularly strategic setting for this purpose. The School indicator was among the highest-rated components in Report Card Brazil 2022, receiving a grade of B, largely due to the mandatory inclusion of physical education in the school curriculum[13]. Accordingly, school-based strategies may play a central role in aligning practice with the recommendations of the World Health Organization[9] and the Brazilian Physical Activity Guidelines[10], both of which emphasize the regular inclusion of muscle-strengthening activities.

When analyzing muscular endurance by gender, the findings revealed differences across body segments. In upper limb tests, a superiority of the male gender was observed. This superiority in this specific region stems from both the biological sexual dimorphism of puberty and sociocultural barriers, which historically direct boys more toward practices requiring greater strength. In contrast, when observing abdominal endurance, the scenario appears more balanced, suggesting an equilibrium in the muscle group responsible for stabilization, where biological and cultural differences are attenuated.

Continuous monitoring of muscular endurance is necessary because adequate levels of muscular endurance and a lower risk of cardiometabolic diseases during childhood and adolescence[5]. However, the present systematic review presents limitations: 1) the strong concentration of studies in the South and Southeast regions, with an absence of data from the North and Midwest, limiting generalizability to the national scenario; 2) the heterogeneity of protocols and cut-off points, making direct comparisons between studies difficult; and 3) the predominance of data collected in the pre-pandemic period, which prevents observing the acute impact of COVID-19 isolation on current prevalence.

CONCLUSION

This systematic review updates the study by Silva et al.[2] and shows that more than half (57.0%) of Brazilian children and adolescents met the health criteria for abdominal muscular endurance. In contrast, the inclusion of upper-limb muscular endurance revealed substantially lower prevalence estimates (32.1%), highlighting an imbalance across body segments and, more importantly, the need for targeted activities to improve upper-limb fitness. In addition, the scientific evidence on this topic remains concentrated in the South and Southeast regions and is characterized by heterogeneous assessment protocols, which limit both cross-study comparability and the national representativeness of the findings. Therefore, future studies that include all regions of the country and adopt more standardized procedures are needed to strengthen the monitoring of this indicator in the Brazilian context. From a practical perspective, the findings of this review may support the development of interventions and public policies, especially in the school setting, to promote muscular fitness and reduce health inequalities among children and adolescents.

COMPLIANCE WITH ETHICAL STANDARDS

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author, upon reasonable 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

Participated in the analysis, interpretation and writing of the work: MCPSJ, ECM, MRAS, MAA, FGTA, KCS, PFRB, LRAL; Participated in the collection of information, analysis and interpretation, literature survey and critical review: ECM, MRAS, MAA, FGTA, KCS, PFRB, LRAL; Participated in conception and development, methodological design, supervision, data collection, analysis and interpretation, writing and critical review: MCPSJ, ECM, MRAS, MAA, FGTA, KCS, PFRB, LRAL.

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Supplementary Material

Supplementary material accompanies this paper.

Supplementary File 1: Free access in https://osf.io/8c53j/overview

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