Prevalence of global physical activity among young people: an updated systematic review for the Brazil's Report Card

Prevalência de atividade física global entre jovens: uma atualização de revisão sistemática para o Report Card - Brasil

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Abstract – This study aimed to update the review of Brazil's Report Card on the prevalence of global physical activity (PA) among Brazilian children and adolescents. This systematic review included an electronic search of eight databases (PubMed, Scopus, Web of Science, LILACS, SPORTDiscus, BIREME, Scielo, and Google Scholar) and a manual search of the references of retrieved studies. Studies published in 2018 and 2019 that assessed global PA among Brazilian youth were included. A narrative approach to the results was adopted. The initial search retrieved 1,892 potentially relevant titles (1,244 titles after duplicate analysis), of which 62 (47 different studies) met all the inclusion criteria. Most updated studies were carried out in Southern (40.4%) and Southeastern (25.5%) Brazil. Six studies provided data from national surveys (12.8%), and one study included preschool children (< 5 years old). Ten studies objectively measured PA (accelerometer or pedometer devices). In the updated studies, the overall proportion of young people who were physically active ranged from 9.8% to 79.6%. Three national surveys reported the prevalence of physically active students, ranging from 18.4% to 78.8%. There was an increase of surveys that objectively measured PA and with children under 12 years of age in the 2018 and 2019 studies. However, important research gaps (e.g., variations in the measurement of global PA), even in the same study, should be considered to improve the monitoring and evaluation of global PA in Brazil.
Keywords: Adolescent; Adolescent health; Brazil; Exercise; Public health.

Resumo – *Este estudo objetivou atualizar a revisão do documento Report Card do Brasil, sobre a prevalência de atividade física (AF) global entre crianças e adolescentes brasileiros. A revisão sistemática incluiu uma busca eletrônica em 8 bases de dados (PubMed, Scopus, Web of Science, LILACS, SPORTDiscus, BIREME, Scielo e Google Scholar) e uma busca manual nas referências de estudos recuperados. Estudos publicados em 2018 e 2019 e que avaliaram a AF global entre jovens brasileiros foram incluídos na atualização. Uma abordagem narrativa em relação aos resultados foi adotada. A busca inicial atingiu 1892 títulos potencialmente relevantes (1244 títulos após análise duplicada); 62 (47 estudos diferentes) preencheram todos os critérios de inclusão. A maioria dos estudos da atualização foi realizada nas regiões Sul (40.4%) e Sudeste (25.5%) do Brasil. Seis estudos trouxeram dados sobre levantamentos nacionais (12,8%), e um estudo incluiu crianças pré-escolares (< 5 anos de idade). Dez estudos realizaram a medida objetiva de AF (acelerômetros ou pedômetros). Nos estudos da atualização, a proporção geral de jovens que eram fisicamente ativos variou de 9,8% a 79,6%. Três pesquisas nacionais relataram a prevalência de estudantes fisicamente ativos, variando de 18,4% a 78,8%. Observou-se um avanço nos levantamentos com medidas objetivas de AF e com crianças menores de 12 anos de idade com os estudos de 2018 e 2019. Contudo, lacunas importantes de pesquisa (p.ex., variações na mensuração da AF global até no mesmo estudo) devem ser consideradas para aprimorar o monitoramento e a avaliação da AF global no Brasil.*
Palavras-chave: *Adolescente; Saúde do adolescente; Brasil; Exercício; Saúde pública.*

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INTRODUCTION

In 2020, the importance of physical activity (PA) as one of the major health behaviors among people of different ages and health conditions has been reinforced by the publication of the World Health Organization (WHO) guidelines on PA[1]. In particular, the benefits of the regular practice of PA for children and adolescents aged 5–18 years, including physical/metabolic (e.g., cardiovascular fitness, blood pressure, and glucose), cognitive (e.g., academic performance and executive function), and mental (reduced symptoms of depression) health outcomes were summarized, and it was recommended that people from this age group spend at least an average of 60 minutes per day of moderate-to-vigorous-intensity PA (MVPA) throughout the week.

The Active Healthy Kids Global Alliance is a network focused on advancing PA among children and adolescents worldwide. To foster this initiative, PA indicators (e.g., meeting PA guidelines, active transportation, and others) have been monitored and described in a document called "Report Card," intended to serve as a useful tool for the advocacy of PA[2] among young people. In 2018, data from 49 countries were compiled, including Brazil[3,4], where the global PA levels (prevalence rate of 31.1%) had a grade of D (grades ranged from A to E) based on data from 94 studies with Brazilian children and adolescents[3,4]. Global PA monitoring allows us to estimate the proportion of the population that "complies" with the PA guidelines. However, this monitoring can be affected in different ways by the instrument used and data analysis, for example[5]. Hence, the present study aimed to update the systematic review[4] on the prevalence of global PA among Brazilian children and adolescents.

METHOD

This study is an updated systematic review of Barbosa Filho et al.,[4] which included information on studies published from January 2018 to December 2019. The previous search, selection criteria, and synthesis strategies were considered in the updated review. The summarized data were used to define the grades and recommendations for the global PA indicator. The umbrella project of Brazil's Report Card was registered at the Open Science Framework (ID: sjgv9/).

Measured outcome and selection criteria

In this systematic review, a "PA outcome" was defined as any bodily movement produced by skeletal muscles that requires energy expenditure[6]. Studies were considered based on whether they measured global PA (e.g., different domains combined (leisure, transportation, home, and/or school) in accordance with the global PA guidelines[1].

Eligible for inclusion in this review were (I) articles published in 2018 or 2019 in peer-reviewed journals; (II) samples with Brazilian children and adolescents aged 0–18 years (or a mean age within this range, or separated data for individuals in this age range); (III) studies (observational or intervention studies with pre-experimental data) showing the prevalence or mean estimate of at least one of the global PA indicators (e.g., mean time per day or percentage of children and adolescents who accumulate at least 60 minutes of daily

moderate- to vigorous-intensity PA), regardless of whether the study dealt with this behavior as an exposure or an outcome; (IV) studies using different methods for PA assessment (e.g., self-report, structured interviews, objectively measured PA, and steps per day); and (V) school- or population-based surveys with information about the methodological procedures of representation of the target population (e.g., random sampling).

Identification of eligible studies

A systematic search was conducted in electronic databases Medline (PubMed), Scopus, Web of Science (Web of Knowledge), LILACS (*Literatura Latino-Americana em Ciências da Saúde*), SPORTDiscus, BIREME (Biblioteca Regional de Medicina), Scielo, and Google Scholar on August 18, 2020. The search strategy included four groups of descriptors: outcome (PA), PA evaluation methods, population (young people), and Brazil (see Supplementary File 1). The Boolean operator "OR" was used for intragroup combinations, and the "AND" operator was used for intergroup combinations. The truncation symbols ($, *, or " ") specific to each database were also used to increase the range of searches for descriptor variations. Searches were conducted with the descriptors in English and Portuguese, when required. The search of the electronic databases was supplemented by screening the reference list of retrieved articles to find potentially relevant titles and personal libraries.

Selection process

The initial analysis was performed based on the reading of titles and abstracts. After this analysis, articles were obtained in the full-text version and subsequently analyzed according to the established selection criteria. The reference list was then screened. All the processes were conducted by independent peers (RC and BO), and a third author (VB or KS) helped with disagreements.

Data extraction and synthesis

Information from each study was extracted by an independent coauthor (VC) and revised by another coauthor (RC or BO); a third author (VB or KS) helped with disagreements. Extracted information included authors and year of publication, location of the study, year of data collection, age range, sample type, sample size, percentage of girls, instrument description, instrument characteristics and mode of administration, and PA cut-off definitions. A narrative approach for the results was adopted because of the heterogeneity of the study's data (no meta-analysis was performed), and the results were presented considering the results from Brazil's Report Card 3.0 and 4.0 (Table 1).

The results of the studies were presented in alphabetical order by first author name. Publications from the same study were combined: the publication with the largest sample size would represent the particular study; if all publications had the same sample size, the oldest publication was preferred to represent the study. The results were organized according to methodological aspects (Supplementary File 2) and the prevalence of global PA (Supplementary File 3). For this, the proportion of young people who were considered physically active (based on

the PA definition in each study) was described, as well as the proportion of this outcome for boys and girls separately, when presented.
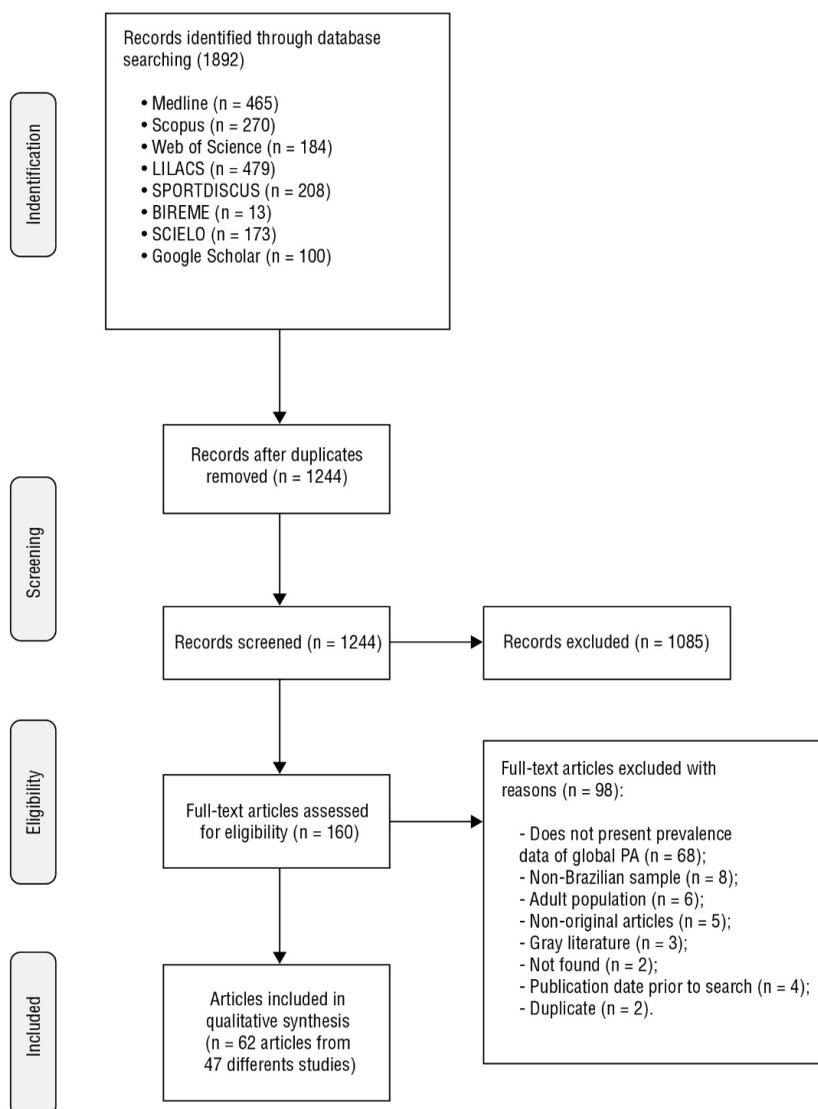
RESULTS

Figure 1. Search process results according PRISMA flow diagram.

The initial database search identified a total of 1,892 eligible studies (1,244 references after duplicate analysis). After title and abstract screening, 1,085 references were excluded, and 160 references were taken for full-text screening. In the full-text analysis, 98 references were excluded (exclusion reasons detailed in Figure 1), and 62 met the inclusion criteria (which included data from 47 different studies). When merging the studies with 92 articles (from 62 different studies) from Brazil's Report Card, 104 different studies were presented in this systematic review. Thus, to avoid overestimation of prevalence, the results are presented by the number of studies (total = 104, Report Card 3.0 = 62, Report

Card 4.0 = 47) and not by the number of articles included. Information on each study is presented in the Supplementary File 2 to 5).

Most of the studies were published between 2011 and 2018 (59.6%). Few studies have been conducted in Northern (1.9%) and Midwestern (2.9%) Brazil. Most studies were school-based (95.2%), with more than 500 participants (73.1%), and the adolescent stage was the most studied (56.1%). Most studies used self-reported measures (61.5%), and only 5.8% of studies adopted more than 420 minutes/week of MVPA as the cut-off point (Table 1).

When analyzed separately, most studies of Report Card 3.0 (up to 2017) and 4.0 (2018–2019 update) were published between 2011–2014 and 2019, respectively. Both reviews included more studies developed in southern Brazil (35.5% and 40.4%, respectively), using school-based design (95.2% and 91.5%, respectively), involving more than 500 participants (82.3% and 63.8%, respectively), and including adolescents (62.9% and 48.9%, respectively). Most of the studies used self-reported questionnaires (61.3% and 63.8%, respectively), and the cutoff point of ≥300 minutes/week of MVPA was frequently used to define global PA categories (43.6% and 29.8%, respectively). However, a relevant part of the studies (27.4% and 38.2%, respectively) considered cut-off points that were not based on meeting the PA recommendations (Table 1). The methodological characteristics (age groups, sample size, description of the instrument, and data collection) of each study are described in Supplementary File 2.

Only 21 of 104 (22.5%) studies reported a prevalence of physically active children and adolescents of 50% or higher. When they were analyzed separately, a higher number of studies from Brazil's Report Card 3.0 were concentrated in the prevalence range from 30% to 49% (32.2%); from Brazil's Report Card 4.0, the preponderance of studies had a prevalence estimate of 50% or higher (29.8%, Table 1). In the updated studies, the overall proportion of young people who were physically active ranged from 9.8% to 79.6%. Three national surveys reported the prevalence of physically active students, ranging from 18.4% to 78.8%. It is noteworthy that 25 studies (24.0%) did not describe the general prevalence of physical activity (mainly because they reported mean time of global PA, daily energy expenditure on PA, or other global PA indicators). The global PA estimate in each study from Brazil's Report Card Brazil is described in Supplementary File 3.

Table 1. Publications and methodological characteristics of included studies in the evidence synthesis for Brazil's Report Card – Global Physical Activity.

Publication/ methodological characteristics	Report Card (Up to 2017) (papers = 92)	Report Card (2018-2019) (papers = 62)	Total (papers = 154)
	n of studies (% of 62)	n of studies (% of 47)	n of studies (% of 104)
Year of publication			
Up to 2010	17 (27.4)	-	17 (16.4)
2011-2014	28 (45.2)	-	28 (26.9)
2015-2017	16 (25.8)	-	16 (15.4)
2018	1 (1.6)	22 (46.8)	18 (17.3)
2019	-	25 (53.2)	25 (24.0)
Region			
North	-	2 (4.3)	2 (1.9)
Northeast	19 (30.7)	8 (17.0)	26 (25.0)
Midwest	3 (4.8)	-	3 (2.9)
Southeast	15 (24.2)	12 (25.5)	27 (26.0)
South	22(35.5)	19 (40.4)	39 (37.5)

Table 1. Continued...

Publication/ methodological characteristics	Report Card (Up to 2017) (papers = 92)	Report Card (2018-2019) (papers = 62)	Total (papers = 154)
	n of studies (% of 62)	n of studies (% of 47)	n of studies (% of 104)
National	3 (4.8)	6 (12.8)	7 (6.7)
Sample type			
Population-based	3 (4.8)	2 (8.5)	5 (4.8)
School-based	59 (95.2)	45 (91.5)	99 (95.2)
Sample size (n)			
< 500	11 (17.7)	17 (36.2)	28 (26.9)
501-1000	17 (27.4)	10 (21.3)	27 (25.7)
1001-1500	10 (16.1)	6 (12.8)	15 (14.4)
1501-2000	9 (14.6)	1 (2.1)	10 (9.6)
> 2000	15 (24.2)	13 (27.6)	24 (23.1)
Age stage (years)			
Pre-school children (up to 4 years-old)	-	-	-
Children (5-12 years-old)	4 (6.5)	4 (8.5)	8 (7.7)
Adolescents (13 or more years-old)	39 (62.9)	23 (48.9)	59 (56.7)
Children and Adolescent	19 (30.6)	19 (40.4)	36 (34.6)
Pre-school children and Children	-	1 (2.2)	1 (1.0)
Type of the PA measurement			
Self-report	38 (61.3)	30 (63.8)	64 (61.5)
PA device (accelerometer or pedometer)	2 (3.2)	10 (21.3)	12 (11.5)
Not Describe	22 (35.5)	7 (14.9)	28 (27.0)
Cutoff points for global PA			
> 60 minutes/day of MVPA	18 (29.0)	9 (19.2)	25 (24.0)
> 300 minutes/week of MVPA	27 (43.6)	14 (29.8)	39 (37.5)
> 420 minutes/week of MVPA	-	6 (12.8)	6 (5.8)
Others	17 (27.4)	18 (38.2)	34 (32.7)
Range of the estimated prevalence range (% of physically active participants)			
< 10%	2 (3.2)	1 (2.1)	3 (2.9)
10-19%	8 (12.9)	9 (19.1)	17 (16.3)
20-29%	6 (9.7)	3 (6.4)	7 (6.7)
30-39%	10 (16.1)	6 (12.8)	16 (15.4)
40-49%	10 (16.1)	4 (8.5)	13 (12.5)
50-59%	3 (4.8)	7 (14.9)	9 (8.7)
60% or more	7 (11.3)	7 (14.9)	14 (13.5)
Not Describe	16 (25.9)	10 (21.3)	25 (24.0)

DISCUSSION

This systematic review updated evidence on the prevalence of global PA in Brazilian children and adolescents, based on data from 62 documents that reported 47 different surveys; 43 of these were studies that were not reported in the previous reviews. Our findings showed improvements in research on

this topic in Brazil compared to the previous Brazil Report Card 3.0[4], such as 1) studies with preschool children and school-aged children, 2) objectively measuring PA, and 3) using the WHO's PA recommendations (more than 420 minutes/week of MVPA or > 60 minutes/day of MVPA) as a cut-off point for global PA.

Most studies reported a low estimate of global PA (see Table 1 and Supplementary File 3). Thus, increasing PA practice in order to reach the recommended levels for Brazilian children and adolescents is still a priority and a challenge, given the health benefits that this behavior can bring in the long term to this target population[7,8].

The WHO has recently updated the global PA recommendations (previously: 60 minutes/day of MVPA; updated: on average 60 minutes/day of MVPA)[1]. This update was a major advancement in PA monitoring without the use of objective measurements. When monitored by weekly PA volume, the update supports the cutoff point of 420 minutes/week of MVPA, since a young person performs 60 minutes/day of MVPA. However, even with this new "standardization," the same study may often report global PA differently, not considering all domains[1]. Thus, when studies do not clarify and/or justify this issue (choice of the cutoff point or which domains are considered to estimate global PA), they can generate misinterpretations about the real estimation of the prevalence of global PA in the young population.

Updating this review helped to find an article conducted with preschool children aged 3–6 years and objectively measured PA (see Supplementary File 2). Despite the complexity of evidence for preschool children,[1] it is urgent to conduct research focused on PA, surveillance, monitoring, and promotion among younger Brazilian children.

A substantial increase in studies with objectively measured PA was observed (from 2 to 10 studies, Supplementary File 2 and 3). Despite these important advances, the lack of standardization between different methodological aspects (e.g., type and model of equipment chosen, protocol and parameters of measures used, data collection logistic, cutoff point applied among others) makes comparisons between studies difficult, which results in a similar limitation to studies with subjective measures. Because of these divergences in the methods applied with the use of objective measures, specifically accelerometry, some authors have attempted to standardize the use of accelerometers to ensure better methodological quality and the quality of the report, in addition to enabling comparisons between studies[9,10].

It is worth mentioning that this review has some limitations. First, there is a large heterogeneity in the measurement of PA between studies, which limits the possibility of a quantitative synthesis (meta-analysis). Second, we were unable to conduct an assessment of risk bias. Third, the full reading and data extraction processes were initially conducted by two independent pairs, but no calibration process was performed to confirm that the interpretations were the same for all extracted information.

CONCLUSION

The present review found that great variability remains in the measurement of PA; in the cutoff points; and, consequently, in the prevalence of PA between studies with children and adolescents in Brazil. Thus, monitoring PA among Brazilian

children and adolescents remains a challenge for the country. There was an increase of surveys with objectively measured PA and with children under 12 years of age. However, important research gaps should be considered in the development of new research in Brazil, such as I) studies in areas where the global PA estimate is still unknown, including municipalities from Northern and Midwestern Brazil and II) studies with preschool children (under five years of age). Furthermore, III) due to the update of the WHO PA recommendations, the cutoff point of 420 minutes/week or 60 minutes/day is expected to be preferable for future studies that use self-reported measures, and IV) it is important to maintain standardization when using objective measurements such as accelerometers. Lastly, we recommend that future studies merge objective and subjective measures of PA in order to estimate compliance with the recommendations and identify PA patterns that can be considered in monitoring and intervention in PA policies and programs in the country.

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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 conflicts of interest to declare.

Author Contributions

Methodological design, searching and evaluation of studies, writing the text, and approval of the final version of the manuscript: VCBF; Study search and selection, data extraction and synthesis, and writing the text of the manuscript: RMC, BNO, VHSC; Methodological design, evaluation of studies, writing of the text, and approval of the final version of the manuscript: KSS.

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SUPPLEMENTARY MATERIAL

Supplementary material accompanies this paper.

Supplementary File 1. Free access in https://osf.io/naqku/
Supplementary File 2. Free access in https://osf.io/naqku/
Supplementary File 3. Free access in https://osf.io/naqku/
Supplementary File 4. Free access in https://osf.io/naqku/
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