

## Meta-analysis of the prevalence of physical inactivity among Brazilian adolescents

Meta-análise de prevalência de inatividade física entre adolescentes brasileiros

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### Abstract

*A systematic review and meta-analysis were carried out to investigate the prevalence of physical inactivity among adolescents in Brazil. We identified articles that had been published up to August 2010 and the search was conducted using six electronic databases. We did not enforce any search limitations. Forest plot-type graphs were generated using the prevalence of physical inactivity stratified by region and sex. Meta-regression models were fitted to identify possible sources of heterogeneity in the prevalence estimates. Of the 1,496 articles initially identified, 37 were deemed appropriate for the systematic review. Prevalence rates ranged from 2% to 80% for male and from 14% to 91% for female subgroups. The lowest prevalence rates of physical inactivity were found to be for the Southern region, whereas the highest rates were observed in the North-Northeast. The methods employed to evaluate physical inactivity in Brazilian adolescents also differed among the studies. This variation demonstrates the need for standardised and validated methods of measuring physical activity in epidemiological investigation.*

*Motor Activity; Adolescent; Meta-Analysis*

### Introduction

Childhood and adolescence are extremely important periods for the development of a healthy lifestyle because the behaviors acquired throughout these stages tend to be perpetuated along the course of a lifetime <sup>1</sup>. Health-risk behaviors, such as physical inactivity, low fruit consumption, alcoholic-beverage consumption and tobacco use are increasingly present in our society and are associated with the development of chronic non-communicable diseases (NCDs) <sup>2,3</sup>. Moreover, NCDs are increasingly prevalent among children and adolescents and are the leading cause of morbidity and mortality in Brazil as well as worldwide. NCDs can have serious personal, social and financial impacts <sup>4,5</sup>. Physical activity and healthy eating are two high-priority behaviors for the promotion of health and the prevention of NCDs <sup>4</sup>.

The most comprehensive study on physical activity was conducted between 2002 and 2003, with over 200,000 adults (18-69 years of age) from 51 countries (mostly of low to middle income), including Brazil <sup>6</sup>. Although the benefits of physical activity in relation to health are well established in the literature <sup>7</sup>, this study observed an average prevalence of physical inactivity of 18% (unweighed, i.e., for all countries), whereas the prevalence rates in Brazil were 25% and 30% for men and women, respectively <sup>6</sup>.

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In Brazil, several studies have examined physical activity. However, most of these studies have involved specific populations, i.e., representative samples of municipalities or states, not nationwide surveys.

According to a systematic review published in 2009, which described articles on the prevalence of physical activity (or inactivity) in Brazil, the number of studies on this topic has largely increased since 2000. Also, according to this review, most studies were conducted with adults. Among the studies that evaluated adolescents, the prevalences of physical inactivity were discrepant, ranging between 30% and 70%<sup>8</sup>.

Considering the importance of physical activity among adolescents and the dispersed information from Brazilian surveys, this article aims to describe the prevalence of physical inactivity among Brazilian adolescents through a systematic review and a meta-analysis of studies on this topic.

## Methodology

This systematic review and meta-analysis has sought to identify articles published up to August of 2010 that were searchable on the following electronic databases: MEDLINE (<http://www.ncbi.nlm.nih.gov/pubmed/>), SciELO (<http://www.scielo.org>), LILACS (<http://lilacs.bvsalud.org/>), Scopus (<http://www.scopus.com/home.url>), Web of Science (<http://apps.webofknowledge.com>) and Adolec (<http://www.adolesc.br/php/index.php>). References of said articles were also searched to identify studies that were not found in the original search.

The descriptors used in the review process were selected after consulting the DeCs (Health Sciences Descriptors, BIREME) and MeSH (Medical Subject Headings, PubMed) terms. The search was conducted in Portuguese and/or English (depending upon the database) using blocks of three concepts: the first with terms related to physical activity (“physical activity”, “exercise”, “fitness”, “motor activity”, “physical inactivity” and “sedentarism”), the second with terms related to adolescence (“adolescent” and “young”) and the third with terms related to Brazil (“Brazil”, “Brazilian” and each state separately). We used the logical operator “OR” to combine the descriptors within each block and the logical operator “AND” to combine the blocks. We also used a resource for term truncations, when necessary. We did not use search limits for the data, language, study-design or sample size.

The inclusion criteria were as follows: (a) the sample population included adolescents (10 to

20 years of age) and the data for adolescents were presented separately if other age groups were included, (b) an assessment of physical inactivity was conducted, (c) data collection was performed in Brazil. We excluded reviews or studies that exclusively included adolescents with specific health conditions (obesity, hypertension, diabetes, etc.). We chose not to include theses, dissertations and monographs because a systematic search for these works was not logistically feasible.

Articles were first selected by their title and abstract and then by reading the pre-selected articles in full. Each paper was reviewed and selected by two reviewers (L.A.B. and G.A.A.) and, when there was a disagreement, a third person was consulted (K.V.B.). In cases in which there was more than one publication using the data from the same study, the most comprehensive article was selected.

In addition to the prevalence of physical inactivity, we recorded information on the location and time period of the data collection, type of population, assessment method and classification of physical activity.

The heterogeneity between the studies was assessed using the  $I^2$  statistic<sup>9</sup>. In order to obtain the summary measures, we used random-effect models due to the substantial heterogeneity of the results. In order to combine the prevalence measures, logit transformations were made initially to address the asymmetrical distribution. These prevalences were weighted by the inverse of the variance of the logit. Forest plot-type graphs were constructed using the prevalence of physical inactivity by region and by sex. Meta-regression models were adjusted to identify possible sources of heterogeneity among the prevalences. The variables considered for this analysis were region, age, percentage by gender, type of population, sampling, sample size, method of evaluation and cut-off point.

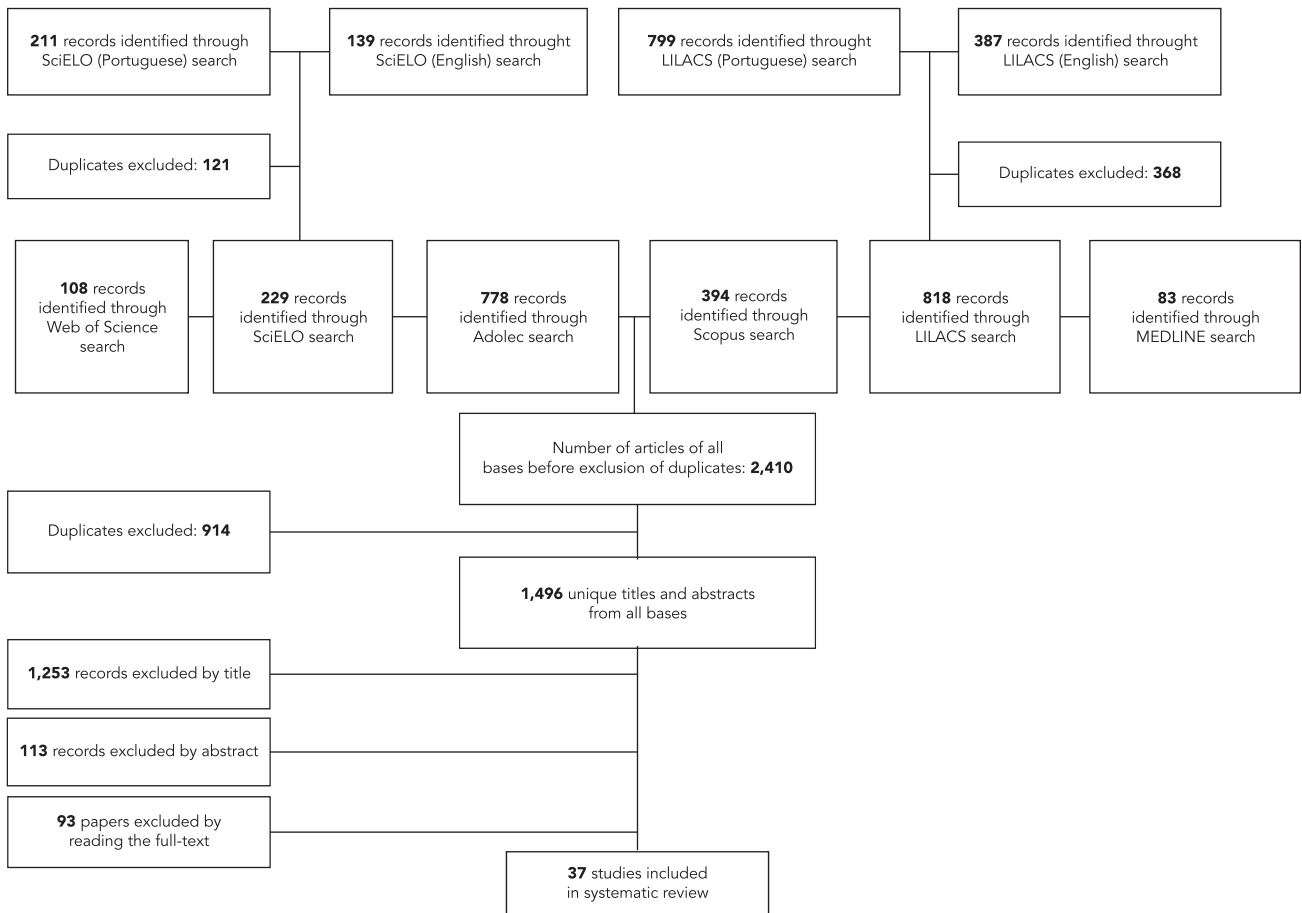
The analyses were performed using Stata version 10.0 (Stata Corp., College Station, USA) and StatsDirect 2.7.8b (StatsDirect Ltd., Altrincham, UK).

## Results

Figure 1 demonstrates the flowchart for the article selection process. Of the 1,496 articles initially identified (after removing duplicates), 37 were deemed eligible for the systematic review. The main objective of 18 of these articles was to analyse the prevalence of physical inactivity among adolescents. The remaining 19 articles had different primary goals although physical

Figure 1

Flow chart of studies.



activity was a covariate in the study. Of the 37 studies, 35 were cross-sectional studies and two included phases of cohort studies, which had a cross-sectional analysis.

The characteristics of the studies are shown in Table 1. Most studies were conducted in the Southern region (19 studies), followed by the Southeastern and Northeastern regions (9 studies each). Only one study was performed in the Northern region. We did not find any studies that were carried out in the Central-Western region.

Most of the studies were based on schools with only six based on households and two on specific population groups (trainees from a university and adolescents from families observed at a Primary Care Unit as well as from hypertensive families).

The sample size ranged from 49 to 5,028 teenagers; 12 of the 37 studies were performed with samples sizes of up to 500 individuals, 11 with sample sizes between 500 and 1,000 adolescents and 14 with sample sizes of more than 1,000 individuals.

In all studies, physical inactivity was measured indirectly (i.e. based on information provided by individuals). Questionnaires were the most commonly used instruments. However, some studies used daily logs to obtain information. Although most studies used previously validated questionnaires, 14 studies used questionnaires unique to their investigation.

There was a large amount of diversity in the areas considered in the assessment of physical activity. Some studies considered only vigorous

Table 1

Characteristics of included studies.

Reference	Data collection year	City (Region)	Base	Sampling	Assessment method	Areas of physical activity considered	Cut-off point for inactivity	% male	Age group (years)	Total (n)
Adami et al. <sup>38</sup>	2004	Florianópolis (South)	School-based	Non-random	Questionnaire (Pate et al. <sup>39</sup> )	Travel, leisure and sports	12 points	45.0	11-18	242
Araújo et al. <sup>40</sup>	2007	Fortaleza (Northeast)	School-based	Non-random	Self-assessment questionnaire	Not reported	3x/week, minimum 30 min/day	42.7	12-17	794
Arruda et al. <sup>41</sup>	-	Lages (South)	School-based	Cluster	Records (Bouchard et al. <sup>24</sup> )	N/A	37Kcal/kg/day	100.0	10-17	1,024
Bastos et al. <sup>42</sup>	2005	Pelotas (South)	Household	Cluster	Self-assessment questionnaire	Travel, leisure and sports (minimum of 10 min)	300 min/week	48.0	10-19	857
Bim et al. <sup>43</sup>	2004	Maringá (South)	Specific group	Non-random	Questionnaire (Pate RR, translated and modified by Nahas <sup>44</sup> )	Travel, leisure and sports	Inactive + less active	68.5	16-17	92
Castro et al. <sup>45</sup>	2003	Rio de Janeiro (Southeast)	School-based	Cluster	Self-assessment questionnaire	Travel, leisure and sports	300 min/week	47.2	13-18	1,684
Ceschini et al. <sup>46</sup>	2006	São Paulo (Southeast)	School-based	Non-random	Questionnaire (Florindo et al. <sup>47</sup> )	Travel, leisure and sports (excludes activity during school)	300 min/week	46.1	14-19	775
Ceschini et al. <sup>28</sup>	2006	São Paulo (Southeast)	School-based	Cluster	Questionnaire (IPAQ - short version)	Intense and/or moderate physical activities during or outside of school	300 min/week	47.4	14-19	3,845
Chaves et al. <sup>48</sup>	2006/2007	Fortaleza (Northeast)	Specific group	Non-random	Self-assessment questionnaire	Not reported	3x/week	-	12-18	49
Dumith et al. <sup>49</sup>	2008	Pelotas (South)	Household	Census	Self-assessment questionnaire	Travel, leisure and sports	300 min/week	49.0	14-15	4,325

(continues)

Table 1 (continued)

Reference	Data collection year	City (Region)	Base	Sampling	Assessment method	Areas of physical activity considered	Cut-off point for inactivity	% male	Age group (years)	Total (n)
Enes et al. <sup>26</sup>	2005	Piedade (Southeast)	School-based	Cluster	Questionnaire (Florindo et al. <sup>47</sup> )	Travel, leisure and sports (excludes activity during school)	300 min/week	37.0	10-14	105
Farias et al. <sup>29</sup>	2002	Porto Velho (North)	School-based	Non-random	Questionnaire (IPAQ)	Intense and/or moderate physical activities during or outside of school	300 min/week	50.8	11-14	303
Farias Jr. <sup>50</sup>	2001	Florianópolis (South)	School-based	Cluster	Records (Bouchard et al. <sup>24</sup> )	N/A	37Kcal/kg/day	49.41	12-18	1,949
Farias Jr. et al. <sup>51</sup>	2005	João Pessoa (Northeast)	School-based	Cluster	Records	N/A	37Kcal/kg/day	44.1	14-18	2,768
Freitas et al. <sup>52</sup>	2007	Fortaleza (Northeast)	School-based	Non-random	Self-assessment questionnaire	Not reported	3x/week, minimum 30 min/day	44.6	12-17	307
Guedes et al. <sup>53</sup>	1998	Londrina (South)	School-based	Non-random	Records (Bouchard et al. <sup>24</sup> )	N/A	37Kcal/kg/day	44.1	15-18	281
Guedes et al. <sup>54</sup>	2003	Londrina (South)	School-based	Non-random	Records (Bouchard et al. <sup>24</sup> )	N/A	37Kcal/kg/day	45.6	15-18	452
Guedes et al. <sup>55</sup>	2004/2005	Fortaleza (Northeast)	School-based	Non-random	Self-assessment questionnaire	Not reported	3x/week, minimum 30 min/day	53.6	12-18	56
Hallal et al. <sup>5</sup>	2004/2005	Pelotas (South)	Household	Census	Self-assessment questionnaire	Travel and leisure (excludes activity during school)	300 min/week	48.7	10-12	4,451
Larcarotte et al. <sup>56</sup>	1999-2001	São Paulo (Southeast)	School-based	Cluster	Self-assessment questionnaire	Not reported	Does not participate in any physical activity	49.5	10-19	2,125
Magalhães et al. <sup>57</sup>	1996/1997	N/A	Household	Cluster	Self-assessment questionnaire	Leisure-based physical activity	Does not participate in any leisure physical activity	52.39	15-19	1,027 + 824

(continues)

Table 1 (continued)

Reference	Data collection year	City (Region)	Base	Sampling	Assessment method	Areas of physical activity considered	Cut-off point for inactivity	% male	Age group (years)	Total (n)
Marini et al. <sup>30</sup>	-	Londrina (South)	School-based	Non-random	Questionnaire (IPAQ – short version)	Intense and/or moderate physical activities during or outside of school	Insufficiently active + sedentary	45.7	-	92
Melo et al. <sup>31</sup>	-	Belford Roxo (Southeast)	School-based	Non-random	Questionnaire (IPAQ – short version)	Intense and/or moderate physical activities during or outside of school	Insufficiently active + sedentary	23.7	15-19	93
Mendes et al. <sup>58</sup>	2004/2005	Recife (Northeast)	School-based	Non-random	Method not mentioned	Not reported	300 min/week	41.0	14-19	421
Moraes et al. <sup>32</sup>	-	Maringá (South)	School-based	Cluster	Questionnaire (IPAQ – short version)	Intense and/or moderate physical activities during or outside of school	300 min/week	45.5	14-18	991
Oehlschlaeger et al. <sup>59</sup>	-	Pelotas (South)	Household	Cluster	Self-assessment questionnaire	Travel, leisure and sports	3x/week, minimum 20 min/day	48.2	15-18	960
Pelegrini et al. <sup>33</sup>	2007	Florianópolis (South)	School-based	Non-random	Questionnaire (IPAQ – short version)	Intense and/or moderate physical activities during or outside of school	300 min/week	32.9	14-18	595
Romanzini et al. <sup>34</sup>	2005	Londrina (South)	School-based	Cluster	Questionnaire (IPAQ – short version)	Intense and/or moderate physical activities during or outside of school	300 min/week	38.4	15-18	664
Romero et al. <sup>27</sup>	2004	Piracicaba (Southeast)	School-based	Cluster	Questionnaire (Florindo et al. <sup>47</sup> )	Travel, leisure and sports (excludes activity during school)	300 min/week	45.7	10-15	328

(continues)

Table 1 (continued)

Reference	Data collection year	City (Region)	Base	Sampling	Assessment method	Areas of physical activity considered	Cut-off point for inactivity	% male	Age group (years)	Total (n)
Silva et al. <sup>60</sup>	1997/1998	Niterói (Southeast)	School-based	Cluster	Questionnaire (PAQ – C)	Travel, leisure and sports (moderate and intense)	Score 3	37.8	14-15	325
Santos et al. <sup>11</sup>	2006	Curitiba (South)	School-based	Cluster	Self-assessment questionnaire	Moderate to intense physical activity (minimum of 60 minutes)	300 min/week	40.31	14-18	1,615
Silva et al. <sup>22</sup>	-	Aracajú (Northeast)	School-based	Non-random	Questionnaire (PAQ – C)	Travel, leisure and sports	Score 3	43.02	≥13	774
Silva et al. <sup>61</sup>	2002	Santa Catarina State (South)	School-based	Cluster	Self-assessment questionnaire	Travel, leisure and sports (moderate and intense)	300 min/week	40.7	15-19	5,028
Campos et al. <sup>62</sup>	2008	Curitiba (South)	School-based	Cluster	Records (Bouchard et al. <sup>24</sup> )	N/A	37Kcal/kg/day	52.31	10-18	497
Suñé et al. <sup>63</sup>	2004	Capão da Canoa (South)	School-based	Cluster	Questionnaire (Pate RR, translated and modified by Nahas <sup>44</sup> )	Not reported	5 points	49.8	11-13	719
Tenório et al. <sup>10</sup>	2006	Paráíba State (Northeast)	School-based	Cluster	Questionnaire (version translated and adapted from GSHS)	Travel, leisure and sports (moderate and intense)	300 min/week	40.2	14-19	4,210
Vasconcelos et al. <sup>64</sup>	-	São Mateus do Sul (South)	School-based	Non-random	Records (Bouchard et al. <sup>24</sup> )	N/A	Quartile of the general population: Male: 35.71Kcal/kg/day and Female: 38.74Kcal/kg/day	45.0	12-16	240

GSHS: Global School-based Student Health Survey; IPAQ: International Physical Activity Questionnaire; PAQ: Physical Activity Questionnaire.

and/or moderate-intensity physical activities (during or outside of school), whereas other studies considered travel, leisure and sports activities as physical activities, excluding activities during school. Finally, some studies considered all travel, leisure and sports activities, whether during or outside of school, as physical activity. Some articles did not specify the areas considered in the analysis.

With respect to the cut-off points for classifying physical inactivity, the most commonly used cut-off was < 300 minutes per week of moderate to vigorous activity. However, the cut-off values varied widely between studies.

The overall prevalence of physical inactivity, as well as the prevalence stratified by sex, are shown in Table 2. There was a wide variation in these estimates: the lowest was 5.42%<sup>10</sup>, and the highest was 91%<sup>11</sup>.

The heterogeneity of the results expressed by the  $I^2$  statistic was 99%. Prevalence rates ranged from 2% to 80% for male and from 14% to 91% for female subgroups. Among females, 69.7% of the prevalences were above 50% whereas, among men, 29.4% were above 50%.

When we evaluated the characteristics of the studies as a source of heterogeneity in the results, using meta-regression models, we observed that the region in which the study was conducted partially explained the inconsistency among prevalence rates for inactivity, both for males ( $p = 0.08$ ) and females ( $p = 0.02$ ). Figure 2 shows that the South has the lowest prevalence of inactivity, whereas the North and Northeast have the highest estimated prevalences.

The figures representing gender-specific data in the meta-analysis were constructed from 34 studies. One study was exclusively conducted in male adolescents, and, thus, female-specific data were gleaned from 33 studies. Of the 37 studies in the systematic review, three did not have any information on the prevalence of physical inactivity according to sex and are therefore not represented in Figure 2.

In the female group, we identified other possible sources of heterogeneity through there was a decline in the average prevalence found in studies using non-random sampling compared with studies with random sampling (by cluster,  $p = 0.02$ ) and among studies with sample sizes over 1,000 adolescents ( $p = 0.07$ ).

None of the other variables, for both of the overall population and stratified by gender, were associated with inter-study variations in the prevalence of physical inactivity.

Table 2

Prevalence rates of physical inactivity among Brazilian adolescents – total and by gender.

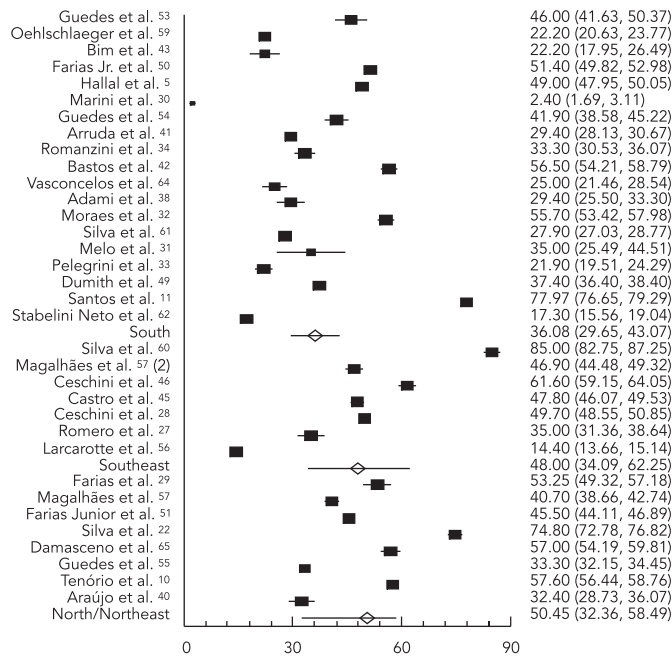
Study	Total	Prevalence (%)		
		Total	Male	Female
Adami et al. <sup>38</sup>	242	36.7	29.4	43.0
Araújo et al. <sup>40</sup>	794	63.9	-	-
Arruda et al. <sup>41</sup>	1,024	29.4	29.4	-
Bastos et al. <sup>42</sup>	857	69.8	56.5	82.1
Bim et al. <sup>43</sup>	92	31.5	22.2	51.7
Castro et al. <sup>45</sup>	1,684	59.9	47.8	73.9
Ceschini et al. <sup>46</sup>	775	64.3	61.6	66.5
Ceschini et al. <sup>28</sup>	3,845	62.5	49.7	71.6
Chaves et al. <sup>48</sup>	49	71.6	-	-
Dumith et al. <sup>49</sup>	4,325	51.8	37.4	65.5
Enes et al. <sup>26</sup>	105	18.0	-	-
Farias et al. <sup>29</sup>	303	58.4	53.2	63.7
Farias Jr. <sup>50</sup>	1,949	62.6	51.4	73.5
Farias Jr. et al. <sup>51</sup>	2,768	55.9	45.5	64.2
Freitas et al. <sup>52</sup>	307	67.4	32.4	67.6
Guedes et al. <sup>53</sup>	281	56.6	46.0	65.0
Guedes et al. <sup>54</sup>	452	49.1	41.9	55.4
Guedes et al. <sup>55</sup>	56	19.6	3.3	38.4
Hallal et al. <sup>5</sup>	4,451	58.2	49.0	67.0
Larcarotte et al. <sup>56</sup>	2,125	23.2	14.4	32.1
Magalhães et al. <sup>57</sup>	1,027	59.4	40.6	80.0
	824	58.9	46.9	70.7
Marini et al. <sup>30</sup>	92	8.6	2.4	14.0
Melo et al. <sup>31</sup>	93	31.0	35.0	15.0
Mendes et al. <sup>58</sup>	421	41.6	-	-
Moraes et al. <sup>32</sup>	991	56.9	55.7	57.9
Oehlschlaeger et al. <sup>59</sup>	960	39.0	22.2	54.5
Pelegri et al. <sup>33</sup>	595	25.4	21.9	27.1
Romanzini et al. <sup>34</sup>	664	39.2	33.3	42.8
Romero et al. <sup>27</sup>	328	54.9	35.0	65.0
Silva et al. <sup>60</sup>	325	91.0	85.0	94.0
Santos et al. <sup>11</sup>	1,615	85.3	77.9	90.9
Silva et al. <sup>22</sup>	774	83.1	74.8	89.3
Silva et al. <sup>61</sup>	5,028	28.5	27.9	28.8
Campos et al. <sup>62</sup>	497	19.7	17.3	22.6
Suñé et al. <sup>63</sup>	719	5.4	-	-
Tenório et al. <sup>10</sup>	4,210	65.1	57.6	70.2
Vasconcelos et al. <sup>64</sup>	240	25.0	25.0	25.0



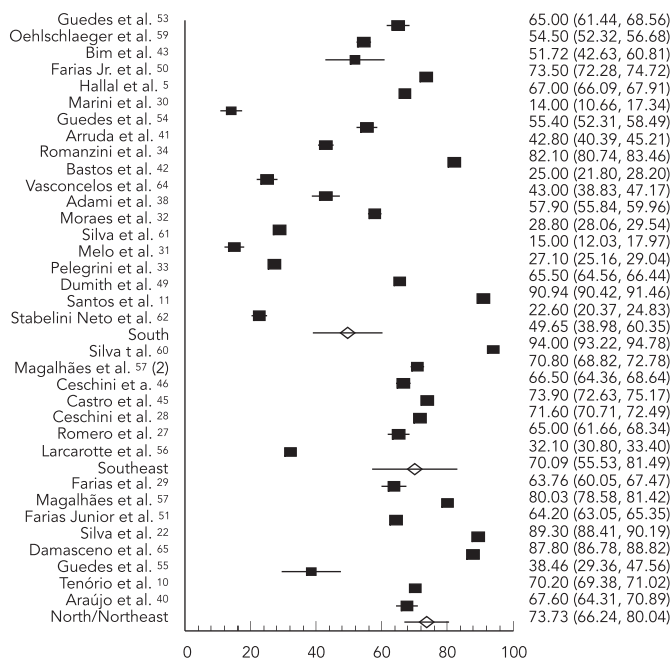
Figure 2

Forest plot of the prevalence rates of physical inactivity among Brazilian adolescents, by region and gender.

2a) Male prevalence



2b) Female prevalence



## Discussion

This systematic review showed a wide range in prevalence of physical inactivity, as well as in the methods used to assess it, in studies conducted among Brazilian adolescents. We observed that the majority of studies were conducted in the Southern region. Although we investigated the profile of physical inactivity by region, this was not sufficient to explain the heterogeneity of the findings.

Most studies found a higher prevalence of physical inactivity among women, similar to findings in international studies<sup>12,13,14</sup>. Researchers have reported that this gender difference is related to cultural, behavioral, psychological and maturation factors<sup>13,15</sup>. However, there have been no studies conducted in Brazil to assess the possible explanations for this difference.

Despite the progress in developing tools to assess physical activity, there are still many limitations in these methods, which are amplified among children and adolescents. The patterns of physical activity among young people can be influenced by cognitive, physiological and biomechanical changes that occur during development<sup>16,17</sup>. Physical activity among young people tends to be intermittent and of a more variable intensity than among adults, usually consisting of activities that involve less planning and less time<sup>18,19</sup>.

A major challenge for researchers is to obtain a reliable and valid instrument to measure physical activity<sup>20</sup>. For logistical reasons, questionnaires are used in most studies although efforts are being made to use direct measurements more frequently. Therefore, accurate and valid methods for measuring physical activity among adolescents, as well as among other age groups, are needed to determine the dose-response associations between physical activity and health, in order to monitor temporal trends in populations and to make cross-cultural comparisons also determining the effect of interventions<sup>21</sup>.

In Brazil, there are no standardised instruments, direct or indirect, to estimate physical inactivity among young people<sup>22</sup>. All studies have used indirect methods to assess physical activity (i.e., methods that use reports from the individuals themselves). The accuracy of self-reporting is influenced by the respondent's ability to accurately recall all relevant activities, retrospectively. Therefore, indirect methods are subject to recall bias<sup>23</sup>.

Only seven studies used physical activity logs, an instrument in which the individual registers any and all activities performed during the day in short time intervals (typically 15-minute peri-

ods)<sup>24</sup>. Most researchers opted to use questionnaires, of which 16 were validated and 14 were unique to the individual study. Although validation studies have low correlation values between the questionnaires evaluated and a gold standard, their use is still recommended over unique, non-validated questionnaires<sup>25</sup>. The use of validated instruments allows for comparisons between different studies.

The use of different methods to assess physical activity could affect the results of the studies. Some authors found higher prevalences when their questionnaires included all domains (commuting to work, leisure-time and sports) and different environments of physical activity (inside or outside school) when compared with other studies that excluded some domains or activities at school. For example, some authors defined physical activity as the practice of sports outside school as well as going to school by bike or walking<sup>26,27</sup>. Other authors considered any kind of vigorous and/or moderate physical activity, inside or outside school, in a structured way or not<sup>28,29,30,31,32,33,34</sup>. The lack of a homogeneous definition of physical activity is an important limitation for pooling, or even comparing, results among different studies.

Another factor that complicates comparisons between the studies of Brazilian adolescents is the lack of standardization for the cut-off point used to classify individuals as "inactive". Most public health authorities agree that adolescents should accumulate at least 60 minutes of moderate-to-vigorous physical activity at least five days a week<sup>7,35,36</sup>, resulting in a cut-off point of 300 minutes per week. However, when addressing cut-off points, studies had noted variability using different values for this classification.

The difficulties in explaining the observed heterogeneity can be attributed to the dispersed nature and small number of studies related to the characteristics analysed. For example, although 16 studies used the same cut-off point for inactivity, 300 min/week, these 16 studies used different questionnaires and considered different areas of physical activity.

Sisson & Katzmarzyk<sup>37</sup> performed a review of studies presenting national prevalences of physical activity (more than 300 min/week). In their review they reported that women were more inactive than men, considering both adults (> 18 years) and adolescents (< 18 years). In studies with young subjects, the prevalence of physical inactivity varied widely among populations. The countries with highest prevalences were Belgium, France, and Tonga.

To the best of our knowledge, there had been no previously published studies using systematic

review and meta-analysis tools to investigate the prevalence of physical activity/inactivity among adolescents.

## Conclusion

Despite the noted challenges, we believe that this study is the first effort to systematise information regarding physical inactivity, which is largely relevant to the health of adolescents in Brazil. This review highlights the urgent need to use standardised and validated methods in order to measure physical activity. As such, we shall be able to identify specific groups for intervention action, increasing their physical activity and its beneficial effects.

## Resumo

*Foram realizadas revisão sistemática e meta-análise para investigar a prevalência de inatividade física entre adolescentes no Brasil. Identificou-se artigos publicados até agosto de 2010. A busca foi realizada em 6 bases de dados eletrônicas, não tendo sido utilizados quaisquer limites. Gráficos do tipo forest-plots foram gerados usando-se a prevalência de inatividade física estratificada por região e sexo. Modelos de metarregressão foram ajustados para identificar as possíveis fontes de heterogeneidade nas estimativas. Dos 1.496 artigos identificados inicialmente, 37 foram considerados adequados. As taxas de prevalência variaram de 2% a 80% para o gênero masculino e de 14% para 91% para o feminino. As menores taxas de prevalência foram encontradas na Região Sul, e as maiores nas regiões Norte e Nordeste. Os métodos utilizados para avaliar a inatividade física em adolescentes brasileiros também diferiram entre os estudos. Essa variação demonstra a necessidade de métodos padronizados e validados para medir a atividade física na pesquisa epidemiológica.*

*Atividade Motora; Adolescente; Metanálise*

## Contributors

L. A. Barufaldi, G. A. Abreu participated in the literature search, article selection, extraction and analysis of the data and in the drafting of the manuscript. E. S. F. Coutinho participated in the analysis of the data and in the drafting of the manuscript. K. V. Bloch participated in article selection, analysis of the data and in the drafting of the manuscript.

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