

Sedentary behavior in schools: the state of the art
Comportamento sedentário em escolares: o estado da arte
Comportamiento sedentario en escolares: estado del arte

Received: 02/10/2017
Approved: 19/04/2017
Published: 05/04/2018

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The aim of this study was to analyze the "state of the art" of the sedentary behavior in schoolchildren from 2012 to 2014. The databases used for the research were the Biblioteca Virtual em Saúde (BVS) and the Scielo - Scientific Electronic Library Online. The term "sedentary behavior" was used in the initial search, and the result was later refined involving the words "artigos" (articles), "português" (Portuguese) and "2012-2014". Two authors read, independently, the titles of the articles. Five articles were included in the state of the art. The articles discussed two main themes: factors associated to sedentary behavior and validity and reproducibility of questionnaires to evaluate sedentary behavior. It was noted that there is no standardization in the literature when it comes to the markers used to characterize sedentary behavior. There is also no consensus regarding what is the time of exposure to sedentary behavior that can be associated to negative effects in the lives of the schoolchildren.

Descriptors: Sedentary lifestyle; Adolescent; Child.

O objetivo deste estudo foi analisar o "estado da arte" acerca do comportamento sedentário em escolares no período entre 2012-2014. As bases de dados utilizadas para a pesquisa foram Biblioteca Virtual em Saúde (BVS) e Scielo - Scientific Electronic Library Online. O termo "comportamento sedentário" foi usado na busca inicial, sendo o resultado refinado posteriormente em "artigos", "português", "2012-2014". Dois autores realizaram a leitura de títulos dos artigos de forma independente. Cinco artigos foram incluídos no estado da arte. Os artigos encontrados abordavam dois temas principais: fatores associados ao comportamento sedentário e validade e reprodutibilidade de questionários para avaliação do comportamento sedentário. Percebe-se que não há padronização na literatura acerca dos marcadores utilizados para caracterizar o comportamento sedentário. Também não há consenso em relação a qual tempo de exposição ao comportamento sedentário poderia estar associado aos efeitos deletérios à saúde dos escolares.

Descritores: Estilo de vida sedentário; Adolescente; Criança.

El objetivo de este estudio fue analizar el "Estado del Arte" del comportamiento sedentario en jóvenes de edad escolar en el periodo de 2012-2014. Las bases de datos utilizados para la investigación fueron la Biblioteca Virtual en salud (BVS) y Scielo-Scientific Electronic Library Online. El término "sedentarismo" fue utilizado en los primeros resultados de la búsqueda, el ser refinado más adelante en "artículos", "Portugués", "2012-2014". Dos autores realizaron la lectura de los títulos de los artículos independientemente. Cinco artículos fueron incluidos en el estado de la arte. Los artículos encontraron dos temas principales: factores asociados con el sedentarismo y la validez y la reproducibilidad de los cuestionarios para la evaluación de la conducta sedentaria. Se observa que no hay una estandarización en la literatura acerca de los marcadores utilizados para caracterizar el comportamiento sedentario. No hay consenso en cuanto a que el tiempo de exposición comportamiento sedentario podría estar asociada con efectos nocivos para la salud jóvenes de edad escolar.

Descritores: Estilo de vida sedentario; Adolescente; Niño.

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INTRODUCTION

Since the epidemiological transition resulting from a reduction in the frequency of infectious diseases and an increase in chronic diseases¹, there has been a growing interest in researches related to lifestyle, especially when it comes to the aspects of modifiable life aspects, such as exposure to sedentary behavior.

The sedentary behavior is a public health problem² and is characterized by activities that require low energy expenditure (≤ 1.5 metabolic equivalents), while sitting or lying. These include watching TV, playing video game, using the computer, reading and driving³.

All age groups are known to be exposed to these health-impairing behaviors, especially children and adolescents. According to data from the World Health Organization⁴, from 40 countries in North-America and Europe, 66% of boys and 68% of girls from 13 to 15 years of age spend ≥ 2 hours/day watching TV while seated.

"State of the art" researches may present a general panorama of a specific subject in any contexts, in a previously determined period of time⁵. Additionally, the state of the art can contribute to identify the limitation of previously published studies⁶, analyzing the evolution of the researches and the gaps in the knowledge on a certain subject⁷, making it possible to develop new studies with better methodological accuracy.

Thus, the need to analyze the state of the art of the sedentary behavior in schoolchildren is justified, as to verify what aspects have been discussed in different fields, and in what proportion. Therefore, the aim of this study was to analyze the "state of the art" of the sedentary behavior in schoolchildren from 2012 to 2014.

METHOD

The state of the art on the sedentary knowledge of schoolchildren was conducted through a research of articles published from 2012 to 2014 in the databases Biblioteca Virtual em Saúde (BVS) and Scientific Electronic Library Online (Scielo).

The guiding question was: What is the state of the art on the sedentary behavior of schoolchildren between 2012 and 2014? Initially, the expression "comportamento sedentário" (sedentary behavior) was used to search for articles. The filters used to select the articles were "artigo" (articles), "português" (Portuguese) and "período de publicação entre 2012-2014" (publication period between 2012-2014), in this order.

The articles that did not have the terms "sedentary behavior" or "sedentary behaviors" in their title, combined with the words "schoolchildren", "adolescents", "young adults" or any other term that indicated school age, were excluded.

Two reviewers (BFC, JFXS) read, independently, the titles of the selected articles. The differences between their decisions were settled after the article was re-evaluated and a consensus was reached.

The aspects analyzed in the analysis of the studies were: author; year of publication; setting of the study; age group; sample size; type of study; objective of study; instrument to evaluate sedentary behavior; marker and cut off point to determine sedentary behavior; adjustment variables.

RESULTS

Image 1 is a flowchart of article selection. Initially, 166 publications were identified in the databases. From these, 133 were indexed in BVS and 33 in Scielo. After using the filter "artigo", 110 articles were selected at BVS and 30 articles from Scielo were maintained. With the inclusion of the "português" filter, 57 articles were maintained in BVS and 23 at Scielo. The last filter considered articles published from 2012 to 2014. Considering this filter, 23 articles were found in BVS and 4 in Scielo. The articles that did not have the expression "sedentary behavior" or similar, combined with the word "schoolchildren" or any other term that indicated school age, were excluded. In addition, articles that were duplicated or were not freely available for download were excluded from the analysis, leaving 5 articles to be included in the state of the art of sedentary behavior among

schoolchildren, three of which were from Scielo and two from BVS.

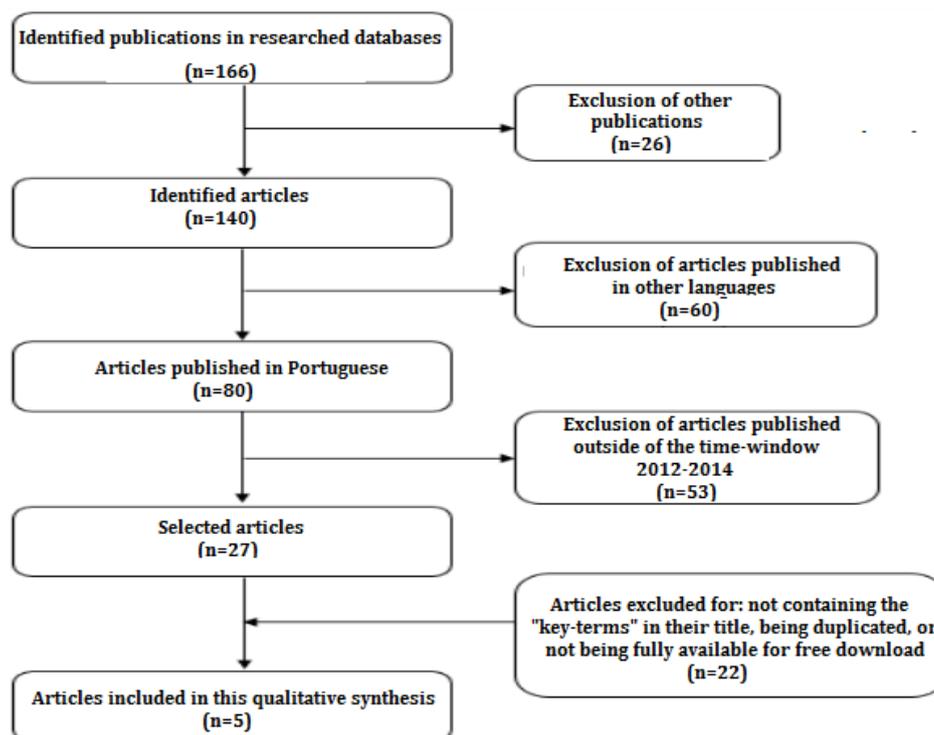


Image 1 - Flowchart identifying the articles about sedentary behavior in schoolchildren, Brazil, 2012-2014.

The characteristics of the studies are in Table 1. The five articles included in this study were cross-sectional. The sample of the study varied from 112 to 4207 individuals, to a total of 5900 people involved in the study. The age of the participants varied from 9 to 18 years of age. The settings of the researches were in the Southeast, Northeast and Midwest.

All studies evaluated the sedentary behavior through questionnaires. The temporal markers used to define sedentary behavior were time watching TV^{8,9} and screen time¹⁰⁻¹². The cut off points to determine the exposure time to sedentary behavior varied among students. Regarding the adjustment variables, only two studies were found to conduct adjusted analysis^{8,11}.

From the five evaluated studies four conducted their analysis with female and male adolescents^{8-10,12}, and just one analyzed only male individuals¹¹. The objectives of the analyzed studies were varied. Three of them evaluated the association between the time spent in sedentary behavior and other outcomes^{8,10,11}, and two were questionnaire validations^{9,12}.

Table 1. Characteristics of the studies included in the state of the art about sedentary behavior in schoolchildren 2012-2014. Brazil, 2016.

Authors and Year	State	Age	Sample	Type of study	Objective	SB Definition	Adjustment
Melo et al. ⁸ 2012	Pernambuco	14-19	4207	Cross-sectional	Analyzing the association between religiosity and the PAL, SB and participation in physical education	Watching TV <3h/dia (not exposed) ≥3h/dia (exposed)	Sex, age group, shift of classes, school year, school size, place of residence, living with parents, maternal educational level and occupational status.
Militão et al. ⁹ 2013	Federal District	10-13	112	Cross-sectional	Investigating the reproducibility and viability of a questionnaire to assess PAL and SB.	Watching TV hours/week	Not used
Santos et al. ¹⁰ 2013	Minas Gerais	9-12	649	Cross-sectional	Investigating factors associated to SB	Screen time* <2h/dia (not exposed) ≥ 2h/dia (exposed)	Not informed
Smith-Menezes et al. ¹¹ 2012	Sergipe	18	758	Cross-sectional	Verifying the socioeconomic links between physical inactivity, SB and excessive body weight	Screen time* <2h/dia (not exposed) ≥ 2h/dia (exposed)	Educational level, work, social class and marital status.
Tavares et al. ¹² 2014	Rio de Janeiro	13-17	174	Cross-sectional	Analyzing the relative validity of the indicators of the SB module and sedentary leisure in the PeNSE questionnaire.	Screen time* <2h/dia (not exposed) ≥ 2h/dia (exposed)	Not used

Screen time = watch TV, play video games and using the computer; PA = Physical activity; PAL = physical activity level; SB = sedentary behavior.

DISCUSSION

From the survey conducted in this work, it was found that three studies^{8,10,11} evaluated the factors associated to the sedentary behavior in adolescents, involving epidemiological, physical, socioeconomic and religious aspects, and that in two studies^{9,12}, the validity and reproducibility of questionnaires to evaluate sedentary behavior were analyzed.

Another study¹⁰, whose objective was investigating factors associated to sedentary behavior in schoolchildren in the city of Uberaba-MG, did not find any correlation between sociodemographic, health and behavior variables and sedentary behavior. A similar result was found by Smith-Menezes et al.¹¹, who analyzed a sample of 758 young people from the city of Aracaju. The study found no association between socioeconomic factors and sedentary behavior.

As opposed to the aforementioned studies, a research evaluated a sample of 2405 adolescent who lived in Mato Grosso and found associations between sociodemographic variables (age, social class, educational level of the mother, and place of residence). In another study, involving a sample of 571 children from Florianópolis, in the south of Brazil, from 7 to 12 years of age, an association was found between the time spent in sedentary behavior and sex, age, weight, and participation in the physical education classes¹⁴. Therefore, it can be noted that there is no consensus in the literature regarding the association between sociodemographic aspects and sedentary behavior in schoolchildren.

Regarding sedentary behavior markers, three studies analyzed the screen time¹⁰⁻¹². It was found that many authors have been using screen time as a marker of time spent exposed to sedentary behavior among children and adolescents^{15,16}, since it is one of the most common behaviors in this age group¹⁷.

Characteristics of the studies included in the state of the art about sedentary behavior in schoolchildren 2012-2014. In other two studies included in this state of the art, the analysis of the exposure time to

sedentary behavior was conducted only according to the time spent watching TV^{8,9}. Despite the validity of using time spent watching TV as a marker for sedentary behavior⁹, other sedentary activities, such as time spent playing video games, using the computer or the telephone, are not included in the analysis, which may lead the total time of exposure to the behavior to be underestimated.

Some authors have been evaluating time expenditure with sedentary behavior in an objective and subjective way. LeBanck et al.¹⁸ evaluated a sample of 5844 children in twelve countries, and the time exposed to sedentary behavior was measured according to accelerometer and screen real time. In another study, involving 4459 children and adolescents from 5 to 15 years of age, the time spent in sedentary behaviors was evaluated by accelerometers and by the time spent watching TV, DVD or videos¹⁹. Thus, it can be observed that there is not a specific marker to determine the time exposure to sedentary behavior in this age group.

Another important aspect found in this survey is the relation between religiosity and SB. Only the study conducted by Melo et al.⁸ evaluated the association between these variables. In this analysis of 4207 students from Pernambuco, between 14 and 19 years of age, an association was found between religiosity and sedentary behavior, as the latter was more common among adolescents who reported not to practice any religion. These findings may be justified due to the fact that religiosity is extremely relevant in the sociocultural context, and its practice may be considered to be a mediator for the adoption of healthier lifestyles²⁰.

This state of the art also found that two studies^{9,12} analyzed the validity and reproducibility of questionnaires to evaluate sedentary behavior in adolescents. In the study conducted by Tavares et al.¹² with 174 teenagers from Rio de Janeiro, indicators were found to present the most satisfactory validity for physical activity, regarding sensitivity, specificity and accuracy, when compared to the indexes of sedentary behavior.

A similar investigation was conducted by Militão et al.¹² in a sample of 112 students of a Federal District school. The validity and reproducibility of the physical activity levels and sedentary behavior assessment in the evaluated sample were considered to be satisfactory. Corroborating these previous findings, Hardy et al.²¹ analyzed the test-retest reliability of a questionnaire that evaluates the sedentary activities among young people. This study, involving 250 students from 11 to 15 years of age, showed good results when it comes to test-retest reliability.

One of the strengths of this study was that the evaluation of the articles was conducted independently by two authors (BFC and JFXS). The existence of publication bias and the lack of consensus on the markers and cut off points that characterize the sedentary behavior in schoolchildren make it difficult to generalize the results.

CONCLUSION

Most of the studies found in this survey had conducted a subjective measurement of the sedentary behavior in schoolchildren. It was noted that there is no standardization when it comes to the markers used to characterize sedentary behavior. There is also no consensus regarding what is the time of exposure to sedentary behavior that can be associated to negative effects in the lives of the schoolchildren. In addition, it is not possible to establish cause-effect relations between the variables, since no study included in this state of the art conducted longitudinal analyses.

Therefore, more studies should be conducted to investigate the theme "sedentary behavior in schoolchildren" - especially longitudinal studies, that may elucidate the influence of these behaviors in the health and quality of life of these individuals.

REFERENCES

1. Rosenthal NA. Infections, chronic disease, and the epidemiological transition: a new perspective. *Clin Infect Dis*. 2015; 61(3):489-90.
2. Hallal PC, Andersen LB, Bull FC, Guthold R, Haskell W, Ekelund U, et al. Global physical activity levels: surveillance progress, pitfalls,

- and prospects. *Lancet*. 2012; 380(9838):247-57.
3. Sedentary Behaviour Research Network. Standardized use of the terms "sedentary" and "sedentary behaviours" [letter to the editor]. *Appl Physiol Nutr Metab*. 2012; 37(3):540-2.
4. World Health Organization. Inequalities in young people's health: HBSC international report from the 2005/2006 survey. Copenhagen: WHO Regional Office for Europe; 2008.
5. Ferreira NSA. As pesquisas denominadas "Estado da Arte". *Educ Soc*. 2002; 23(79): 257-72.
6. Matos JMC, Schneider O, Mello AS, Ferreira Neto A, Santos W. A produção acadêmica sobre conteúdos de ensino na educação física escolar. *Movimento*. 2013; 19(2):123-48.
7. Romanowski JP, Ens RT. As pesquisas denominadas do tipo "estado da arte" em educação. *Rev Diálogo Educ*. 2006; 6(19):37-50.
8. Melo EM, Meneses AS, Silva Junior AG, Wanderley Junior RS, Barros MVG. Associação entre religiosidade, atividade física e comportamento sedentário em adolescentes. *Rev Bras Ativ Fís Saúde*. 2012; 17(5):359-69.
9. Militão AG, Silva FR, Peçanha LM, Souza JW, Militão ESG, Campbell CSG. Reprodutibilidade e validade de um questionário de avaliação do nível de atividade física e comportamento sedentário de escolares de 10 a 13 anos de idade, Distrito Federal, Brasil, 2012. *Epidemiol Serv Saúde*. 2013; 22(1):111-20.
10. Santos A, Andaki ACR, Amorim PRS, Mendes EL. Fatores associados ao comportamento sedentário em escolares de 9-12 anos de idade. *Motriz*. 2013; 19(3 Supl):S25-34.
11. Smith-Menezes A, Duarte MFS, Silva RJS. Inatividade física, comportamento sedentário e excesso de peso corporal associados à condição socioeconômica em jovens. *Rev Bras Educ Fís Esp*. 2012; 26(3):411-8.
12. Tavares LF, Castro IRR, Cardoso LA, Levy RB, Claro RM, Oliveira AF. Validade de indicadores de atividade física e comportamento sedentário da Pesquisa Nacional de Saúde do Escolar entre adolescentes do Rio de Janeiro, Brasil. *Cad Saúde Pública*. 2014; 30(9):1861-74.
13. Dias PJP, Domingos IP, Ferreira MG, Muraro AP, Sichert R, Gonçalves-Silva RMV. Prevalência e fatores associados aos comportamentos sedentários em adolescentes. *Rev Saúde Pública*. 2014; 48 (2):266-74.

14. Costa BGG, Silva KS, George AM, Assis MAA. Sedentary behavior during school-time: sociodemographic, weight status, physical education class, and school performance correlates in Brazilian schoolchildren. *J Sci Med Sport*. 2016; 20(1):70-4.
15. Groth SW, Rhee H, Kitzman H. Relationships among obesity, physical activity and sedentary behavior in young adolescents with and without lifetime asthma. *J Asthma*. 2015; 53(1):19-24.
16. Romero A, Borges C, Villar B. Patterns of physical activity and sedentary behavior associated with overweight in Brazilian adolescents. *Rev Bras Ativ Fís Saúde*. 2015; 20(1):26-35.
17. Arundell L, Fletcher E, Salmon J, Veitch J, Hinkley T. A systematic review of the prevalence of sedentary behavior during the after-school period among children aged 5-18 years. *Int J Behav Nutr Phys Act*. 2016; 13(1):93.
18. Leblanc AG, Katzmarzyk PT, Barreira TV, Broyles ST, Chaput JP, Church TS, et al. Correlates of total sedentary time and screen time in 9-11 year-old children around the world: the international study of childhood obesity, lifestyle and the environment. *PLoS ONE*. 2015; 10(6):e0129622.
19. Coombs NA, Stamatakis E. Associations between objectively assessed and questionnaire-based sedentary behaviour with BMI-defined obesity among general population children and adolescents living in England. *BMJ Open*. 2015; 5(6):e007172.
20. Santos ARM, Dabbicco P, Oliveira Cartaxo HG, Silva EAPC, Souza MRM, Freitas CMSM. Revisão sistemática acerca da influência da religiosidade na adoção de estilo de vida ativo. *Rev Bras Promoç Saúde*. 2013; 26(3):419-25.
21. Hardy LL, Booth ML, Okely AD. The Reliability of the Adolescent Sedentary Activity Questionnaire (ASAQ). *Prev Med*. 2007; 45(1):71-4.

CONTRIBUTIONS

Bruno de Freitas Camilo was responsible for the design of the study, data survey and interpretation, and for its writing. **Jéssica de Fátima Xavier Santos** aided in the design of the study, data survey and interpretation, and in reviewing the text. **Regina Simões** supervised the research and performed a critical review. **Alynne Christian Ribeiro Andaki, Álvaro da Silva Santos and Renata Damião** took part in the critical review.

How to cite this article (Vancouver)

Camilo BF, Santos JFX, Andaki ACR, Simões R, Santos AS, Damião R. Sedentary behavior in schools: the state of the art. *REFACS* [Internet]. 2018 [cited in insert day, month and year of access]; 6(2):249-255. Available from: insert access link. DOI: insert DOI link.

How to cite this article (ABNT)

CAMILO, B. F. et al. Sedentary behavior in schools: the state of the art. *REFACS*, Uberaba, MG, v. 6, n. 2, p. 249-255, 2018. Available from: <insert access link>. Access in: insert day, month and year of access. DOI inserir link do DOI:

How to cite this article (APA)

Camilo, B. F., Santos, J. F. X., Andaki, A. C. R., Simões, R., Santos, A.S. & Damião, R. (2018). Sedentary behavior in schools: the state of the art. *REFACS*, 6(2), 249-255. Recovered in: insert day, month and year of access from insert access link. DOI: insert DOI link.