

EVALUATION OF PHYSICAL ACTIVITY IN THE HEALTH PROMOTION FOR BRAZILIAN TEENAGERS: A SYSTEMATIC REVIEW

Avaliação da atividade física na promoção da saúde de adolescentes brasileiros: revisão sistemática

Evaluación de la actividad física para la promoción de la salud de adolescentes brasileños: revisión sistemática

Review Article

ABSTRACT

Objective: To analyze the methodological designs of national studies that assessed the level of physical activity for promoting adolescent health. **Methods:** a systematic literature review of original researches and publications of MEDLINE, LILACS, SCOPUS and ADOLEC electronic databases. It focused on determinant aspects of physical activity for health promotion using the following keywords: physical activity, physical fitness, physical activity, physical exercise, motor activity, sedentary and sedentariness, adolescent, adolescence, young, youth, teenager, and teenage, Brazil, Brazilian, South America, Low-middle income and country(ies). Data analysis covered the period from 2005 to 2011. First, 449 studies were identified. After analyzing the titles of the manuscripts, 130 articles were eligible for abstract evaluation and subsequent full text analysis. In the end, 31 articles met all inclusion criteria. **Results:** A total of 93.6% (n=29) of the evaluated studies used cross-sectional design, with samples ranging from 92 to 5028 subjects, and all of them used questionnaires for measuring physical activity. The main analysis of the studies was based on the association between physical activity, biodemographic data (age, gender) and socioeconomic data (income, social class and parental education). **Conclusion:** The national studies assessing the level of physical activity for promoting adolescent health appear with great methodological variability since there is no standardization in the methodological design, instrument and definition of variables, highlighting the need for longitudinal studies in this area.

Descriptors: Motor Activity; Adolescent; Health; Brazil.

RESUMO

Objetivo: Analisar as abordagens metodológicas de estudos nacionais que avaliaram o nível de atividade física na promoção da saúde de adolescentes. **Métodos:** Revisão da literatura de forma sistemática, respaldada nos estudos de originais e em publicações nas bases de dados eletrônicas MEDLINE, LILACS, ADOLEC e SCOPUS, enfatizando-se os aspectos determinantes da atividade física na promoção da saúde por meio dos seguintes descritores em inglês: physical activity; physical fitness, physical activity, physical exercise, motor activity, sedentary and sedentarines, adolescent, adolescence, young, youth, teenager, and teenagen, Brazil, brazilian, South America, Low-middle income and country(ies); a análise de dados abrange o período de 2005 a 2011. Identificaram-se, inicialmente, 449 estudos. Após a avaliação dos títulos dos manuscritos, 130 artigos foram considerados elegíveis para a leitura dos resumos e análise na sua íntegra. Ao final, 31 artigos preencheram todos os critérios de inclusão. **Resultados:** Entre os trabalhos avaliados, 93,6% (n=29) dos estudos utilizaram delineamento transversal, com amostragens que variaram de 92 a 5.028 sujeitos, e todos utilizaram questionários como instrumentos de mensuração da atividade física. A principal análise dos estudos se baseou na associação entre atividade física, dados demográfico-biológicos (idade, gênero) e socioeconômicos (renda, classe econômica e escolaridade dos pais). **Conclusão:** Os estudos nacionais que avaliam o nível de atividade física na promoção da saúde de adolescentes se apresentam com grande variabilidade metodológica, uma vez que não há uma padronização metodológica no delineamento, instrumento e definição das variáveis, ressaltando-se a necessidade de estudos longitudinais na área.

Descritores: Atividade motora; Adolescente; Saúde; Brasil.

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RESUMEN

Objetivo: Analizar los abordajes metodológicos de estudios nacionales que evaluaron el nivel de actividad física para la promoción de la salud de adolescentes. **Métodos:** Revisión de literatura de forma sistemática respaldada en estudios originales y en publicaciones de las bases de datos electrónicas MEDLINE, LILACS, ADOLEC y SCOPUS, destacándose los aspectos determinantes de la actividad física para la promoción de la salud a través de los siguientes descriptores en inglés: *physical activity; physical fitness; physical activity; physical exercise; motor activity; sedentary and sedentariness; adolescent; adolescence; young; youth; teenager; and teenagen; Brazil; brazilian; South America; Low-middle income and country(ies)*; el análisis de datos fue en el periodo de 2005 a 2011. Inicialmente se identificaron 449 estudios. Después de la evaluación de los títulos de los manuscritos, 130 artículos fueron considerados elegibles para la lectura de los resúmenes y el análisis en su totalidad. Al final, 31 artículos cumplieron todos los criterios de inclusión. **Resultados:** De los trabajos evaluados, el 93,6% (n=29) de los estudios utilizaron delineamiento trasversal con muestras que variaron de 92 a 5.028 sujetos, y todos utilizaron cuestionarios como instrumentos de medición de la actividad física. El principal análisis de los estudios se basó en la asociación entre la actividad física, datos demográfico-biológicos (edad, género) y socioeconómicos (renta, clase económica y escolaridad de los padres). **Conclusión:** Los estudios nacionales que evalúan el nivel de actividad física para la promoción de la salud de adolescentes presentan grande variabilidad metodológica ya que no hay una estandarización metodológica en el delineamiento, instrumento y definición de variables, destacándose la necesidad de estudios longitudinales en el área.

Descriptor: Actividad Motora; Adolescente; Salud; Brasil.

INTRODUCTION

The practice of regular physical activity is considered an important element in health promotion and quality of life of the population⁽¹⁾. Concerning teenagers, it plays a fundamental role in the prevention and control of obesity, cardiovascular disease, colon cancer in women, gall bladder disease and metabolic syndrome^(2,3). Nevertheless, physical inactivity has a high prevalence and seems to affect children and adolescents in different Brazilian regions^(4,5). These data are worrisome, since the tendency of this population is to show a decline in physical activity levels in the transition to adulthood⁽⁶⁾.

Accordingly, the combination among the factors “high costs”, “physical inactivity” and “benefits of regular physical activity practice to adolescent population” has represented a major focus of the discussions on health promotion in countries with different socioeconomic development levels. Therefore, it has been observed an

increasing interest in the development of physical activity programs aimed at providing a behavioral change towards a healthier life style. Despite this concern, they have shown to be inefficient⁽⁷⁾, because the improvement depends not only on teenage behavior, but on the influence of some biological and functional factors arising from the social context in which they live^(8,9).

Those factors are recognized in the international literature as demographic-biological aspects (age, gender, family socioeconomic status), psychological (motivation) and sociocultural (family, school and friends) that influence the phenomenon described here, demonstrating the complexity and diversity of those aspects on behavioral changes⁽¹⁰⁾. Meanwhile, physical activity has received emphasis in health-related research, because it has been shown to be effective when it predisposes to establish habits by the stability of a behavior of an active lifestyle from childhood to adulthood⁽¹¹⁾.

However, in order to achieve the outlined objectives in a scientific investigation, the use of appropriate methodological procedures is essential, ranging from sample selection to the result analysis. When it comes to physical activity for teenagers, a current and recent theme, this issue is remarkable because the study findings may come up with new knowledge production. Therefore, it is an urge to question all the methodological aspects involved in the investigation.

Thus, the objective of this investigation is to analyze the methodological approaches of national studies that evaluated the physical activity level in health promotion of adolescents.

METHODS

This is a systematic review study conducted through MEDLINE, LILACS, SCOPUS and ADOLEC databases related to the determinant aspects of physical activity in health promotion, using the following descriptors in English: *physical activity; physical fitness; physical exercise; motor activity; sedentary and sedentariness; adolescent; adolescence; young; youth; teenager; teenager; Brazil; Brazilian; South America; Low-middle income and country(ies)*, comprising the publication period between January 2005 and June 2011.

As a complimentary research tool, the recommendations for communication of systematic review and meta-analysis studies from PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*) were applied to our study. The filters “*humans*” and “*all adolescents*” were assigned to increase the specificity of the research. In order to ensure the inclusion of all relevant articles to our investigation, a handsearching scanning was applied

through the reference list of review articles, consensus and articles found with this search strategy.

At first, 449 publications were selected, being 259 from MEDLINE, 85 from LILACS, 60 from SCOPUS and 45 from ADOLEC database. After the first analysis, by evaluating the manuscript titles, 130 articles were considered eligible for the second stage of this review, which consisted of abstract readings. After reviewing these, studies that met the inclusion criteria received a full-blown analysis. In the end, 31 articles met all inclusion criteria, being 05 from MEDLINE, 10 from LILACS, 11 from SCOPUS and 05 from ADOLEC.

The inclusion criteria were as follows: (a) adolescent samples ranging from 10 to 20 years old, (b) longitudinal and cross-sectional study designs, (c) direct (pedometers, accelerometers, frequency meters) and indirect instruments (questionnaires/surveys) for physical activity measurement, (d) data collection held in Brazil, (e) original research with humans, (f) publication period between 2005 and 2011, resulting in 31 articles. Review articles, thesis, dissertations and monographs were not included, since conducting their systematic search is logistically unfeasible. The selection process is illustrated in Figure 1.

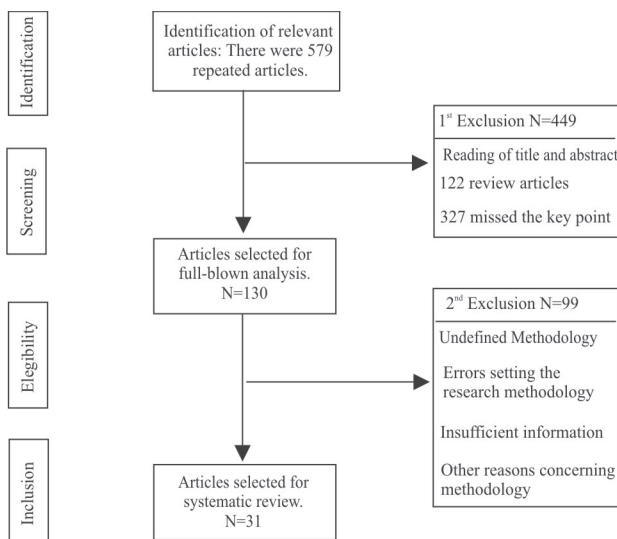


Figure 1 – Flow chart of identification, screening, eligibility and inclusion of selected articles.

For the studies that met the inclusion criteria, the analysis included the following items: a) type of study design; b) type of instrument used in the physical activity measurement; c) sample size; d) publication year; e) location and f) aspects of behavioral complexity related to physical activity.

RESULTS

In all, 449 studies were identified, from which 7% (n=31) were included in the review. The summary of studies about methodological approaches to physical activity and associated factors among Brazilian adolescents included in the review are presented in Table I. The analysis revealed that the cross-sectional study design was the most performed, comprising 93.6% (n=29) of the reviewed papers. The longitudinal, ethnographical and case-control approaches accounted for a smaller amount of studies, being each of them only 3.1% (n=1) from the total.

Regarding the development site of research, the greatest number of studies were performed in the South, Southeast and Northeast regions, with 41.6% (n=13) of them performed in the South⁽¹²⁻¹⁶⁾, 41.6% (n=13) in the Northeast⁽¹⁷⁻²¹⁾, followed by 12.8% (n=4) in the Southeast⁽²²⁻²⁴⁾ and 3.1% (n=1) performed with samples from both Southeast and South regions⁽²⁵⁾. No studies were found to involve adolescents from the Midwest and North regions according to the limits established by the inclusion criteria.

Concerning the evaluation of the period in which the studies were conducted, it was noticed a substantial increase in articles published during the last three years. About 81% (n=25) of the articles were published in the period between 2009 and 2011, and 19% (n=6) between 2006 and 2008. The study samples ranged between 92 and 5,028 individuals of both genders. The methodological procedures used in the sampling design showed that 87% (n=27) of the studies were developed with probabilistic sampling and 13% (n=4) with convenience sampling, being 3.2% (n=1) voluntary and 6.5% (n=2) through school and household census.

The methodology used to measure physical activity level showed that, in Brazil, there was a preference of researchers for the use of surveys for the operational definition of frequency, type and intensity of physical activity, such as a classifying criteria for individuals in the following categories: sedentary, moderately active, active and very active. Among the studies that used surveys, 71% (n=23) were performed with instruments created by the authors. The questionnaire Global School-based Student Health Survey (GSHS) was applied in 16% (n=5) of the studies^(19,20,26), the International Physical Activity Questionnaire (IPAQ) in 16% (n=5)⁽²⁷⁻²⁹⁾ also, and the Physical Activity Questionnaire for Older Children (PAQ-C) in 3.1% (n=1)⁽³⁰⁾ only.

The analysis regarding the methodological approaches related to the measurement criteria and classification of physical activity level and its association with aspects of adolescent behavioral complexity comprised the following factors: a) demographic and biological (age, gender and

Table 1 - Summary of studies about methodological approaches to physical activity and associated factors among Brazilian adolescents. Brazil, 2013.

Reference	Study Design	Sampling Methodological Procedures	Physical Activity Measurement	Publication Year	Age Group	N	Location	Associated Factors
Farias Junior JC, Mendes JKF, Barbosa DBM, Lopes AS, Fernandes RA, Christofaro DGD, Milanez VF <i>et al.</i>	Cross-sectional	Randomly proportional	Demographic, socioeconomic and practiced physical activities Questionnaire	2011	14-17	782	João Pessoa-PB	Socioeconomic and Sociodemographic
Silva DAS, Pelegrini A, Grigollo LR, Silva AF, Petroski EL, Fernandes RA, Christofaro DGD, Casonatto J <i>et al.</i>	Cross-sectional	Proportional by clusters	Evaluation of habitual physical activity practice Questionnaire	2011	11-17	1111	Presidente Prudente-SP	Socioeconomic and Demographic
Santos MS, Hino AAF, Reis RS, Añez RCR, Oliveira TC, Silva AAM, Santos CJN, Silva JS, Conceição SIO.	Cross-sectional	Stratified by clusters	Stages of Change Questionnaire (SCQ)	2011	14-17	1065	Western Santa Catarina and Northern Minas Gerais	Socioeconomic, Sociodemographic and Behavioral
Sousa TF, Silva KS, Garcia LMT <i>et al.</i>	Cross-sectional	Random selection	Evaluation of habitual physical activity practice Questionnaire Stages of Change Questionnaire (SCQ)	2011	11-17	1630	Presidente Prudente-SP	Socioeconomic and Behavioral
Tenório MCM, Barros MVG, Tassitano RM <i>et al.</i>	Cross-sectional	Proportional by clusters	Physical activity and 24-hour recall Questionnaire	2010	14-18	1609	Curitiba-PR	Socioeconomic and Behavioral
Viana, MS, Andrade A.	Cross-sectional	Random by clusters	Santa Catarina's Adolescents' Behavior Questionnaire (COMPAQ)	2010	10-16	1130	São Luís-MA	Demographic and Socioeconomic
Silva DAS, Smith MA, Gomes MA, Sousa TF.	Cross-sectional	Stratified by clusters	Global School-based Student Health Survey (GSHS) Stages of Change Questionnaire (SCQ)	2010	15-19	5028	Santa Catarina	Demographic, Economic and Behavioral
Fermino RC, Rech CR, Hino AAF, Añez RCR, Reis RS.	Cross-sectional	Random stratified	Stages of Change Questionnaire (SCQ)	2010	14-19	4210	Pernambuco	Socioeconomic and Demographic
		Selection by cluster	Habitual Physical Activity Questionnaire (AFH)	2010	15-19	400	Florianópolis-SC	Motivational and Behavioral
				2010	17	756	Simão Dias-SE	Socioeconomic, Demographic and Behavioral
				2010	14-18	1518	Curitiba-PR	Socioeconomic, Socio-environmental and Sociocultural

Lippo BRS, Silva IM, Aca CRP <i>et al.</i>	Case - Control	Selection by convenience	International Physical Activity Questionnaire (IPAQ)	2010	15-19	597	Recife-PE	Sociodemographic and Behavioral
Freitas RWJF, Silva RV, Araújo MFM, Marinho NBP, Damasceno MMC, Oliveira MR.	Cross-sectional	Random selection	Sociodemographic and physical activity practice Questionnaire	2010	10-18	307	Fortaleza-CE	Sociodemographic and Behavioral
Griz LH, Viégas MM, Barros M <i>et al.</i>	Cross-sectional	Random selection	Global School-based Student Health Survey (GSHS)	2010	18-20	1824	Recife-PE	Sociocultural and Behavioral
Rivera IR, Silva MAM, Silva RDTA, Oliveira BAV, Carvalho AAC.	Cross-sectional	Sampling by cluster	Physical Activity Questionnaire for Older Children (PAQ-C)	2010	10-17	1253	Maceió-AL	Socioeconomic and Behavioral
Santos CM, Wanderley Júnior RS, Barros SSH, Farias Júnior JC, Barros MVG.	Cross-sectional	Sampling by cluster	Global School-based Health Survey (GSHS)	2010	14-19	4207	Pernambuco	Socioeconomic and Socio-environmental
Cavalcanti CBS, Barros MVG, Meneses AL <i>et al.</i>	Cross-sectional	Sampling by cluster	Global School-based Health Survey (GSHS)	2010	14-19	4138	Pernambuco	Socioeconomic and Behavioral
Dumith SC, Domingues MR, Gigante DP <i>et al.</i>	Cross-sectional	Selection by cluster	Physical activity and leisure time Questionnaire	2010	14-15	4325	Pelotas-RS	Demographic, Socioeconomic and Behavioral
Copetti J, Neutzling MB, Silva MC.	Cross-sectional	Probabilistic by clusters	Most prevalent barriers to physical activity practice Questionnaire	2010	10-19	598	Pelotas-RS	Demographic and Socioeconomic
Gordia AP, Silva RCR, Quadros TMB, Campos W.	Cross-sectional	Voluntary selection	International Physical Activity Questionnaire (IPAQ)	2010	14-18	608	Lapa-PR	Socioeconomic, Sociodemographic and Behavioral
Silva KS, Nahas MV, Peres KG, Lopes AS.	Cross-sectional	Proportional by clusters	Catarinense Adolescent Behavior Questionnaire (COMPAQ)	2009	15-19	5028	Santa Catarina	Demographic, Socioeconomic, Psychological and Behavioral
Gomes BMIR, Alves AJB.	Cross-sectional	Random stratified	Global School-based Student Health Survey (GSHS)	2009	14-20	1878	Recife-PE	Sociodemographic and Behavioral

Moraes ACF, Fernandes CAM, Elias RGM <i>et al.</i>	Cross-sectional	Proportional probabilistic	International Physical Activity Questionnaire (IPAQ)	2009	14-18	734	Maringá-PR	Demographic, Socioeconomic and Behavioral
Enes CC, Pegolo GE, Silva MV.	Cross-sectional	Random probabilistic	Habitual Physical Activity Questionnaire (AFH)	2009	10-14	105	Piedade-SP	Demographic and Socioeconomic
Ceschini FL, Andrade DR, Oliveira LC, Araújo Júnior JF, Matsudo VKR.	Cross-sectional	Random selection	International Physical Activity Questionnaire (IPAQ)	2009	14-19	3845	São Paulo-SP	Sociodemographic and Behavioral
Farias Júnior, JC.	Cross-sectional	Random and proportional	Practiced physical activities Questionnaire	2008	14-18	2566	João Pessoa-PB	Socioeconomic and Demographic
Arruda, EL, Lopes, AS.	Cross-sectional	Simple random selection and random by clusters	Habitual physical activity level check Questionnaire	2007	10-17	1024	Lages-SC	Socioeconomic and Behavioral
Gonçalves H, Hallal Amorim TC, Araújo CLP, Menezes AMB.	Longitudinal and Ethnographical	School and household census	Socioeconomic indicators and lifestyle Questionnaire	2007	12	4452	Pelotas-RS	Demographic, Socioeconomic, Behavioral and Sociocultural
Nunes MMA, Figueiroa JN, Alves JGB.	Cross-sectional	Random selection	Physical activity, leisure and eating habits Questionnaire	2007	10-19	588	Campina Grande-PB	Socioeconomic and Behavioral
Marani F, Oliveira AR, Guedes DP.	Cross-sectional	Random selection	Healthy Habits Perception Questionnaire (HHPQ), International Physical Activity Questionnaire (IPAQ)	2006	18	92	Londrina-PR	Socioeconomic and Motivational
Hallal PC, Bertoldi AD, Gonçalves H, Victora CG.	Cross-sectional	School and household census	Socioeconomic status and physical activity Questionnaire	2006	10-12	452	Pelotas-RS	Socioeconomic and Demographic

socioeconomic status), b) sociocultural (family, friends and physical education school classes), c) environmental, d) psychological (behavioral attributes). Among these variables, the authors assessed the prevalence of obesity and personal and environmental barriers as determinants of the level under investigation. These indicators show a direct association of overweight, alcohol consumption in any quantity, smoking, hypertension and physical inactivity^(17,19,20,30,31) with factors that reduced participation in physical activity^(12,32). Concerning the criteria for measuring the physical activity level, 71 % (n=23) of the studies included time, frequency, type and intensity as variables⁽³³⁻³⁹⁾.

DISCUSSION

This review aimed to investigate the methodological approaches of national studies that assessed the physical activity level in health promotion of teenagers. From these data, it becomes possible to identify the gaps that need to be filled in this study area, providing a background knowledge for future research on public health and obtaining a reliable and valid methodology.

The assessment of physical activity levels allows the study of prevalence and incidence of this variable in different populations, as well as the observation of the outcome of interventions that aim to promote health among adolescents⁽⁴⁰⁾.

According to the results found in this review, the majority of studies were descriptive, resulting from cross-sectional study designs. These study designs are the most indicated for physical activity epidemiological studies due to the feasible study of large samples, fast execution and low cost⁽⁴¹⁾. However, the analyzed studies only provide the distribution pattern of physical activity at a given point in time and suggest hypotheses about possible associations between physical inactivity and certain disease risk factors⁽¹⁰⁾. For further knowledge and better understanding on this issue, the use of longitudinal study designs becomes crucial⁽¹⁰⁾. However, these investigations also have some limitations, such as the difficulty of its use in large samples, operational complexity, delays in obtaining results and higher costs⁽⁴²⁾.

The sample sizes ranged from 92 to 5,028 subjects in the current evaluation. This sample size dispersion impairs possible inferences and generalizations drawn from certain adolescent population parameters for physical activity levels and sedentary behaviors⁽⁴³⁾.

Regarding the measuring instruments, surveys were used in all studies analyzed in this review. Its composition is formed by an ordered list of questions whose answers must be written down by the subject. The questionnaires must be

objective, limited in extension and followed by instructions. These should clarify the application purposes, highlight the importance of the subject collaboration and facilitate the filling. The survey questions can be subjective, objective, or multiple choice.

Despite important advantages, such as low cost and fast data collection, surveys are subjective methods, therefore holding a greater margin of error when compared to direct measures of physical activity, such as laboratory (calorimetric and physiological markers) and ground assessments (motion sensors)⁽⁴⁴⁾.

When answering a questionnaire, the most accurate determination of the physical activity level always depends on the individual's ability to recall the physical activities performed during a period of time⁽⁴⁴⁾. In order to reduce measurement errors, the surveys should be validated. However, only 38% (n=12) of the studies were conducted adopting internationally validated questionnaires. The remainder investigations applied evaluation tools developed by the authors not reporting in their studies its validation process.

It is worth mentioning the existence of an effect related to the subjectivity of surveys regarding the prevalence of physical inactivity: the ethnic and cultural differences. Some countries may have leisure activities that are exclusively practiced in some regions⁽¹¹⁾. Factors such as, interviewer variability, questions to be included, and the nature of the response that is sought also influence the collected data. In addition, the questionnaires provide written answers to questions previously presented, in a way that the respondents may have difficulties to understand them or to properly report the time and intensity of activities⁽⁴⁵⁾.

The rate of unanswered questions depends on the clarity of the questions, the nature of the research and the educational qualifications of the respondents. Regarding the research nature, it appears that if it is not useful to the individual, the lack of response rate increases. This all may indicate an overestimation of physical activity reported by participants directly influencing the measurement related to the prevalence of physical inactivity^(11,46).

It is also highlighted that the amplitude of samples does not impair the generalizations. The sample size is important, but the greatest importance resides in how the sample is obtained (whether at random or by convenience)⁽⁴³⁾.

In regard to the methodological approaches related to the measurement criteria and the physical activity level classification associated to the factors that influence aspects of behavioral complexity of teenagers, most^(4,13,24) of the reviewed studies analyzed the association among physical activity, demographic-biological factors (age, gender) and socioeconomic factors (income, economic

status and parent's education). However, there is a lack of investigations that evaluate the association among sociocultural factors, such as family (parents and siblings), friends/partners, school (physical education classes) and environment.

As such, physical activity must be considered a complex phenomenon, involving multifactorial aspects, holding meanings and sociohistorical values integrated to the ability of phylogenetic and ontogenetic adaptation of the human species⁽⁴⁷⁾, since environmental, sociocultural, behavioral, psycho-cognitive and health/disease factors seem to be determinants, in adolescents, to the adherence to healthy habits^(16,28,48,49).

Finally, the importance of sociocultural and environmental contexts is little considered in the approaches referring to the physical activity level evaluation in different population groups. Moreover, there is no standardized protocol on study designs, measuring instruments and definition of variables related to behavioral complexity, impairing the studies comparison. This issue was exposed in two review studies, the first aiming to determine the prevalence of overweight/obesity in Brazilian adolescents⁽⁵⁰⁾ and another that investigated physical activity measures and sedentary behaviors in that same population⁽⁵¹⁾. Although the analysis of these factors is complex, different mechanisms contribute to the impact on the level of physical activity in adolescents⁽⁴⁷⁾.

This current study presents some limitations. Despite the independent search for different sources of information by three researchers, the possibility that some articles may have been excluded from the current review cannot be ruled out. Another limitation was the data analysis of methodological approaches from only investigations in which these indicators were considered as factors in the study design, instrument and definition of risk variables for healthy behaviors.

Accordingly, the development of new investigations using other methodological approaches is an urge, which may suggest hypotheses about possible associations between physical activity and healthy behaviors in Brazilian adolescents.

CONCLUSION

The findings of this study show a preference by the authors for the cross-sectional study design, holding probability samples greatly varying in number. Concerning the measuring instrument to assess the physical activity level, the use of the questionnaires prevailed. Therefore, the lack of methodological standardization in study designs, instrument and variable definitions impaired the proposal

of inferences and generalizations regarding the physical activity levels and behaviors presented.

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REFERENCES

1. Silva GSF, Bergamaschine R, Rosa M, Melo C, Miranda R, Bara Filho M. Avaliação do nível de atividade física de estudantes de graduação das áreas saúde/biológica. *Rev Bras Med Esporte*. 2007;13(1):39-42.
2. Mora SS, Cook N, Buring JE, Ridker PM, Lee IM. Physical activity and reduced risk of cardiovascular events: potential mediating mechanisms. *Circulation*. 2007;116(19):2110-8.
3. Wolin KY, Glynn RJ, Colditz GA, Lee IM, Kawachi I. Long-term physical activity patterns and health-related quality of life in U.S. women. *J Prev Med*. 2007;32(6):490-9.
4. Farias Júnior JC, Mendes JKF, Barbosa DBM, Lopes AS. Fatores de risco cardiovascular em adolescentes: prevalência e associação com fatores sociodemográficos. *Rev Bras Epidemiol*. 2011;14(1):50-62.
5. Hallal PC, Knuth AG, Cruz DK, Mendes MI, Malta DC. Prática de atividade física em adolescentes brasileiros. *Cienc Saúde Coletiva*. 2010;15(2):35-42.
6. Nelson MC, Neumark-Stzainer D, Hannan PJ, Sirard JR, Story M. Longitudinal and secular trends in physical activity and sedentary behavior during adolescence. *Pediatrics*. 2006;118(6):1627-34.
7. Pate RR, Ward DS, Saunders RP, Felton G, Dishman RK, Dowda M. Promotion of physical activity among high-school girls: a randomized controlled trial. *Am J Public Health*. 2005;95:1582-7.
8. Morgan CF, McKenzie TL, Sallis JF, Broyles SL, Zive MM, Nader PR, *et al*. Personal, social, and environmental correlates of physical activity in a bi-ethnic sample of adolescents. *Pediatric Exerc Sci*. 2003;15(3):288-301.
9. Prochaska JJ, Sallis JF, Slymen DJ, McKenzie TL. A longitudinal study of children's enjoyment of physical education. *Pediatric Exerc Sci*. 2003;15(2):170-8.

10. Seabra AF, Mendonça DM, Thomis MA, Anjos LA, Maia JA. Determinantes biológicos e sócio-culturais associados à prática de atividade física de adolescentes. *Cad Saúde Pública*. 2008; 24(4):721-36.
11. Cafruni CB, Valadão RCD, Mello ED. Como avaliar a atividade física? *Rev Bras Ciên da Saúde*. 2012;10(33):61-71.
12. Santos MS, Hino AAF, Reis RS, Añez RCR. Prevalência de barreiras para a prática de atividade física em adolescentes. *Rev Bras Epidemiol*. 2010;13(1):94-104.
13. Fermino RC, Rech CR, Hino AAF, Añez CRR, Reis RS. Atividade física e fatores associados em adolescentes do ensino médio de Curitiba, Brasil. *Rev Saúde Pública*. 2010; 44(6):986-95.
14. Dumith SC, Domingues MR, Gigante DP, Hallal PC, Menezes AMB, Kohl HW. Prevalência de atividade física em adolescentes e fatores associados. *Rev Saúde Pública*. 2010;44(3):457-67.
15. Silva KS, Nahas MV, Peres KG, Lopes AS. Fatores associados à atividade física, comportamento sedentário e participação na educação física em estudantes do ensino médio em Santa Catarina, Brasil. *Cad Saúde Pública*. 2009;25(10):2187-200.
16. Hallal PC, Bertoldi AD, Gonçalves H, Victora CG. Prevalência de sedentarismo e fatores associados em adolescentes de 10-12 anos de idade. *Cad Saúde Pública*. 2006;22(6):1277-87.
17. Farias Júnior JC, Mendes JKF, Barbosa DBM, Lopes AS. Fatores de risco cardiovascular em adolescentes: prevalência e associação com fatores sociodemográficos. *Rev Bras Epidemiol*. 2011;14(1):50-62.
18. Oliveira TC, Silva AAM; Santos CJN, Silva JS, Conceição SIO. Atividade física e sedentarismo em escolares da rede pública e privada de ensino em São Luís. *Rev Saúde Pública*. 2010;44(6):996-1004.
19. Tenório MCM, Barros MVG, Tassitano RM, Bezerra J, Tenório JM, Hallal PC. Atividade física e comportamento sedentário em adolescentes estudantes do ensino médio. *Rev Bras Epidemiol*. 2010;13(1):105-17.
20. Griz LH, Viégas MM, Barros M, Griz AL, Freese E, Bandeira F. Prevalência de obesidade central em grande amostra de adolescentes de escolas públicas em Recife, Brasil. *Arq Bras Endocrinol Metab*. 2010;54(7):607-11.
21. Santos CM, Wanderley Júnior RS, Barros SSH, Farias Júnior JC, Barros MVG. Prevalência e fatores associados à inatividade física nos deslocamentos para escola em adolescentes. *Cad Saúde Pública*. 2010;26(7):1419-30.
22. Fernandes RA, Christofaro DGD, Milanez VF, Casonatto J, Cardoso JR, Ronque EVR, *et al*. Atividade física: prevalência, fatores relacionados e associação entre pais e filhos. *Rev Paul Pediatría*. 2011;29(1):54-9.
23. Fernandes RA, Christofaro DGD, Casonatto J, Kawaguti SS, Ronque VER, Cardoso JR, *et al*. Associação transversal entre hábitos alimentares saudáveis e não saudáveis e atividade física de lazer em adolescentes. *J Pediatr*. 2011;87(3):252-6.
24. Ceschini FL, Andrade DR, Oliveira LC, Araújo Júnior JF, Matsudo VKR. Prevalência de inatividade física e fatores associados em estudantes do ensino médio de escolas públicas estaduais. *J Pediatr*. 2009;85(4):301-6.
25. Silva DAS, Pelegrini A, Grigollo LR, Silva AF, Petroski EL. Diferenças e similaridades dos estágios de mudança de comportamento para atividade física em adolescentes de duas áreas brasileiras. *Rev Paul Pediatría*. 2011;29(2):193-201.
26. Gomes BMR, Alves AJB. Prevalência de hipertensão arterial e fatores associados em estudantes de ensino médio de escolas públicas da região metropolitana do Recife, Pernambuco, Brasil, 2006. *Cad Saúde Pública*. 2009;25(2):375-81.
27. Lippo BRS, Silva IM, Aca CRP, Lira PIC, Silva GAP, Motta MEFA. Fatores determinantes de inatividade física em adolescentes de área urbana. *J Pediatr*. 2010;86(6): 520-4.
28. Gordia AP, Silva RCR, Quadros TMB, Campos W. Variáveis comportamentais e sociodemográficas estão associadas ao domínio psicológico da qualidade de vida de adolescentes. *Rev Paul Pediatría*. 2010;28(1):29-35.
29. Marani F, Oliveira AR, Guedes DP. Indicadores comportamentais associados à prática de atividade física e saúde em escolares do ensino médio. *Rev Bras Ciên Mov*. 2006;14(4):63-70.
30. Rivera IR, Silva MAM, Silva RDTA, Oliveira BAV, Carvalho AAC. Atividade física, horas de assistência à TV e composição corporal em crianças e adolescentes. *Arq Bras Cardiol*. 2010;95(2):159-65.
31. Nunes MMA, Figueiroa JN, Alves JGB. Excesso de peso, atividade física e hábitos alimentares entre adolescentes de diferentes classes econômicas em Campina Grande (PB). *Rev Assoc Med Bras*. 2007;5(2):130-4.

32. Silva DAS, Smith MA, Gomes MA, Sousa TF. Estágios de mudanças de comportamento para atividade física em estudantes de uma cidade do Brasil. *Rev Salud Pública*. 2010;12(4):623-34.
33. Freitas RWJF, Silva RV, Araújo MFM, Marinho NBP, Damasceno MMC, Oliveira MR. Prática de atividade física por adolescentes de Fortaleza, CE, Brasil. *Rev Bras Enferm*. 2010;63(3):410-15.
34. Cavalcanti CBS, Barros MVG, Meneses AL, Santos CM, Azevedo AMP, Guimarães FJSP. Obesidade abdominal em adolescentes: prevalência e associação com atividade física e hábitos alimentares. *Arq Bras Cardiol*. 2010;94(3):371-7.
35. Copetti J, Neutzling MB, Silva MC. Barreiras à prática de atividades físicas em adolescentes de uma cidade do sul do Brasil. *Rev Bras Ativ Fis Saúde*. 2010;15(2):88-94.
36. Enes CC, Pegolo GE, Silva MV. Influência do consumo alimentar e do padrão de atividade física sobre o estado nutricional de adolescentes de Piedade, São Paulo. *Rev Paul Pediatría*. 2009;27(3):265-71.
37. Farias Júnior JC. Associação entre prevalência de inatividade física e indicadores de condição socioeconômica em adolescentes. *Rev Bras Med Esporte*. 2008;14(2):109-14.
38. Arruda ELM, Lopes AS. Gordura corporal, nível de atividade física e hábitos alimentares de adolescentes da região serrana de Santa Catarina, Brasil. *Rev Bras Cineantropom Desempenho Hum*. 2007;9(1):5-11.
39. Gonçalves H, Hallal PC, Amorim TC, Araújo CLP, Menezes AMB. Fatores socioculturais e nível de atividade física no início da adolescência. *Rev Panam Salud Pública*. 2007;22(4): 246-53.
40. Dollman J, Okely AD, Hardy L, Timperio A, Salmon J, Hills AP. A hitchhiker's guide to assessing young people's physical activity:deciding what method to use. *J Sci Med Sport*. 2009; 12(5):518-25.
41. Dishman RK, Heath GW, Washburn RA. *Physical activity epidemiology*. Champaign: Human Kinetics; 2004.
42. Van Mechelen W, Mellenbergh GJ. Problems and solutions in longitudinal research: from theory to practice. *Int J Sports Med*. 1997;18(1):238-45.
43. Caspersen CJ, Nixon PA, DuRant RH. Physical activity epidemiology applied to children and adolescents. *Exerc Sport Sci Rev*. 1998;26(1):341-403.
44. Hallal PC, Dumith SC, Bastos JP, Reichert FF, Siqueira FV, Azevedo MR. Evolução da pesquisa epidemiológica em atividade física no Brasil: revisão sistemática. *Rev Saúde Pública*. 2007;41(3):453-60.
45. Valanou EM, Bamia C, Trichopoulou A. Methodology of physical-activity and energy-expenditure assessment: a review. *J Public Health*. 2006;14:58-65.
46. Ribeiro EH, Costa EF, Sobral GM, Florindo AA. Desenvolvimento e validação de um recordatório de 24 horas. *Rev Bras Ativ Fis Saúde*. 2011;16(2):132-7.
47. Álvares LD, Figueira Júnior AJ, Ceschini FL, Ceschini RS. Fatores determinantes para um estilo de vida ativo: revisão da literatura. *Rev Bras Ciên Saúde*. 2010;8(24):68-76.
48. Ceschini FL, Figueira Jr, AJF. Barreiras e determinantes para a prática de atividade física em adolescentes. *Rev Bras Ciên Mov*. 2007;15(1):29-36.
49. Farias Jr JC, Lopes AS. Comportamentos de risco à saúde em adolescentes. *Rev Bras Ciên Mov*. 2004;12(1):7-12.
50. Araújo VC, Konrad LM, Rabacow FM, Graup S, Amboni R, Farias Jr JC. Prevalência de excesso de peso em adolescentes brasileiros: um estudo de revisão sistemática. *Rev Bras Ativ Fis Saúde*. 2007;12(3):79-87.
51. Tassitano RM, Bezerra J, Tenório MCM, Colares V, Barros MVG, Hallal PC. Atividade física em adolescentes brasileiros: uma revisão sistemática. *Rev Bras Cineantropom Desempenho Hum*. 2007;9(1):55-60.

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