



ORIGINAL ARTICLE

Physical activity in adolescents: analysis of the social influence of parents and friends[☆]

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PALAVRAS-CHAVE

Atividade motora;
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País;

Abstract

Objective: to analyze the association between physical activity and social support from parents and friends on the physical activity level among adolescents.

Methods: data from 2,361 adolescents (56.6% females; mean age 16.4; SD = 1.2), from public and private high schools were analyzed. The physical activity level of the adolescents, parents, and friends were measured through a questionnaire. Parents' and friends' support and self-efficacy were measured using two previously tested scales. Data analysis was performed using the structural equation modeling in IBM® SPSS® Amos™ 20.0.

Results: physical activity of friends was directly associated with physical activity level of adolescents. Physical activity of the father was associated with that of their sons, and the physical activity of mother was associated with that of their daughters. An indirect association was identified between the physical activity of parents and friends with physical activity level of the adolescents, mediated by social support. Social support was directly associated with physical activity in adolescents of both genders and indirectly mediated by self-efficacy.

Conclusions: parents and friends have a social influence on adolescents' level of physical activity through the mechanism of behavior modeling or through social support, mediated by self-efficacy.

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Atividade física em adolescentes: análise da influência social de pais e amigos

Resumo

Objetivo: analisar a associação da prática de atividade física e do apoio social dos pais e dos amigos com o nível de atividade física dos adolescentes.

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Amigos;
Apoio social

Métodos: foram analisados dados de 2,361 adolescentes (56,6% do sexo feminino, média de idade = 16,4; dp = 1,2) do ensino médio de escolas públicas e privadas. A atividade física dos adolescentes, dos pais e dos amigos foi mensurada por questionário. O apoio social dos pais e dos amigos e a autoeficácia foram mensurados por duas escalas previamente testadas. A modelagem por equações estruturais foi utilizada para análise dos dados, recorrendo-se ao programa AMOS 20.0.

Resultados: a prática de atividade física dos amigos se associou diretamente ao nível de atividade física dos adolescentes, enquanto a prática do pai se associou diretamente com a do filho e a da mãe com a da filha. Também foi identificada uma relação indireta entre a prática de atividade física dos pais e dos amigos e o nível de atividade física dos adolescentes, sendo parcialmente mediada pelo apoio social desses dois grupos. O apoio social dos pais e dos amigos se associou diretamente à atividade física do adolescente, e foi mediado, indiretamente pela percepção de autoeficácia.

Conclusões: pais e amigos exercem influência social sobre a prática de atividade física dos adolescentes por meio da modelação do comportamento e do fornecimento de apoio social.

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Introduction

Social influence is one of the factors associated with practice of physical activity in adolescents,¹ and is characterized by the influence exerted by parents, friends, teachers, and relatives, among other groups, on physical activity. This influence may occur either directly - through social support, and indirectly - through behavior modeling.^{2,3}

The practice of physical activity and social support from parents and friends represent forms of social influence most often studied in adolescents.^{4,5} The modeling of human behavior is one of the constructs of the theory of social learning and assumes that human behavior is acquired and modified from the observation of the behavior of and learning experiences from socially important people.^{5,6} In this sense, it is understood that the physical activity of parents and friends would act as a model for the practice of adolescents.^{7,8} Thus, adolescents with physically active parents and/or friends are more likely to be more active. However, study results are still inconclusive in this regard.^{4,5}

The physical activity of these two groups can also indirectly influence the physical activity of adolescents through social support. There is evidence that more physically active parents and friends offer more social support,⁴ and that social support is positively associated with physical activity among adolescents.⁶ Parents and friends may influence the adolescents' participation in physical activities by providing different types of social support (by encouraging, stimulating, practicing together, providing transportation for the adolescents to the practice sites).⁹ Social support can also exert an indirect influence, increasing the perception of self-efficacy.^{4,5} Higher levels of self-efficacy have been observed among adolescents who received more social support from parents and friends.^{10,11} This construct has been consistently associated with higher levels of physical activity among adolescents.¹² However, few studies have assessed these associations simultaneously.^{5,11}

Therefore, identifying the mechanisms by which parents and friends can influence the physical activity of adolescents is important for the construction of more effective interventions to increase physical activity levels in this group.^{4,5} This

study assessed direct and indirect associations of physical activity and social support of parents and friends with the level of physical activity among adolescents.

Methods

This was a cross-sectional study involving adolescents aged 14 to 19 years, of both genders, from public and private high schools in the city of João Pessoa, state of Paraíba, Brazil. An outcome prevalence of 50%, a confidence interval of 95%, a maximum tolerable error of three percentage points, a design effect (deff) equal to 2, and a 30% increase in the sample size to compensate for possible losses and refusals were considered in order to determine the sample size.

The sample was selected by two-stage cluster sampling. In the first stage, 30 high schools were systematically selected, proportionally distributed by type (public or private) and geographic region of the municipality (north, south, east, west). In the second phase, 135 classes were selected, proportionately distributed by shift (day and night) and grade (10th, 11th, and 12th grades, since in Brazil, elementary school comprises 1st to 9th grades).

All data were collected through a questionnaire, completed by the students in the classroom, during a regular class. Data collection took place between May and September of 2009, by a previously trained staff consisting of six undergraduate students of physical education.

Adolescents who were outside the age range studied (< 14 or > 19 years old), who left several questions unanswered, or those who had any physical or mental impairment were excluded from the study.

The sociodemographic variables were gender, age, and socioeconomic class. The methodology of the Brazilian Association of Research Companies (Associação Brasileira de Empresas de Pesquisa - ABEP)¹³ was used in order to determine the socioeconomic class of the adolescents. This proposal groups the families of the adolescents in the following classes: A (highest), B, C, D, and E (lowest).

Nutritional status was verified by body mass index (BMI = body weight [kg]/height [m]²), using self-reported measures

of body mass (kg) and height (m). The adolescents were classified as “non-overweight” (low weight and normal weight) and “overweight” (overweight and obesity).¹⁴

The measure of physical activity was performed through a previously tested questionnaire (reproducibility: [ICC] = 0.88, 95% CI: 0.84 to 0.91; validity: the measure of the current questionnaire was compared to the measure of four 24-hour recalls on physical activity; Spearman’s rho = 0.62; $p < 0.001$; kappa = 0.59).¹⁵ The adolescents reported the frequency (days per week) and duration (hours/minutes per day) of moderate and vigorous physical activities practiced during 10 minutes or more per day in the week before data collection from a list of 24 activities, with the possibility of adding up to two activities. The level of physical activity was determined by adding the product of the times of practice by the frequency of practice, resulting in a score in minutes per week. The adolescents were classified according to the recommendations of the World Health Organization – were considered as physically active those who reported physical activity ≥ 300 minutes a week.¹⁶

Social influence was characterized by two measures: physical activity practice and social support from parents and friends. The physical activity of the father, mother, and friends was measured by the question “During a typical or normal week, how many days does/do (your mother/father/friends) practice physical activities, e.g., walking, running, going to the gym, bodybuilding, cycling, sports?”, with response categories ranging from none to five or more days a week. The following levels of reproducibility were identified for these questions: father - ICC = 0.92 (95% CI: 0.90 to 0.94); mother - ICC = 0.90 (95% CI: 0.87 to 0.92), friends - ICC = 0.82 (95% CI: 0.76 to 0.86).

Social support from parents and friends was measured by a scale with ten items, five for each group. Adolescents reported at which frequency (never, rarely, often, always) their parents and friends provided some kind of social support (stimulating, practicing together, watching, inviting, commenting on the practice, providing transportation) during a typical week (internal consistency: $\alpha = 0.81$ to 0.90; reproducibility: ICC = 0.89-0.91).¹⁷

The perceived self-efficacy was measured by a scale with ten items that considered how adolescents perceived themselves as capable of practicing physical activity even in the presence of obstacles. An example of a question used was: “I can practice physical activity on most days of the week even when my friends invite me to do other things.” All items were anchored by a four-point Likert scale, ranging from “strongly disagree” to “strongly agree” (internal consistency: $\alpha = 0.76$; reproducibility: ICC = 0.75).¹⁷

The chi-squared test was used to compare the results of sociodemographic variables and physical activity, and Student’s *t*-test for independent samples was used to compare mean values of social support and self-efficacy among male and female adolescents. These analyses were performed using Stata software, release 12.0.

The structural equation modeling was used to assess the direct and indirect associations of physical activity and social support from parents and friends with the level of physical activity among adolescents.¹⁸ The parameters were estimated by the maximum likelihood method, using the IBM® SPSS® Amos™ 20.0 software, release 20.0. The results were shown as standardized regression coefficients (β), and

the results of mediated associations were established by multiplying the beta coefficients of the direct association between each variable with the level of physical activity among adolescents.

The assessment of model fit was performed using the following parameters: the chi-squared test (X^2); root mean square error of approximation (RMSEA) - values < 0.05 indicate proper fit, considering the confidence interval of 90%; root mean square residual (RMSR) - values below 0.05 indicate proper fit; and goodness of fit index (GFI), adjusted goodness of fit index (AGFI), and comparative fit index (CFI) - values for the last three indicators must be greater than or equal to 0.90 to indicate adequate model fit. The assessment of changes in model fit was performed by Akaike information criterion (AIC) and expected cross-validation index (ECVI).¹⁸

The initial model that served as the basis for comparison of measurement included three constructs (social support from parents, social support from friends, and perceived self-efficacy) and four directly measured variables, which were not treated as constructs (physical activity of the father, of the mother, of friends, and of the adolescents).

The covariates age, socioeconomic class, and nutritional status were included in the models to assess their associations with physical activity among adolescents. The association of socioeconomic class with social support and physical activity of parents was also considered. Covariates that had p -value < 0.05 or promoted improvement in their quality of fit were maintained in the final model.

The study was approved by the Ethics Committee on Human Health Research of the Universidade Federal da Paraíba (0062/2009). Adolescents < 18 years of age who participated in the study were authorized by the parents or guardians, and those aged ≥ 18 years signed an informed consent.

Results

Of the 2,859 adolescents who were part of the final sample (losses and refusals amounted to 17.8%), 498 were excluded for not having complete information for the variables analyzed in this study. There were no significant differences regarding sociodemographic, physical activity level, social support, self-efficacy, and parents’ and friends’ physical activity characteristics between those included and those excluded from the analyses. Data from 2,361 adolescents with a mean age of 16.4 years ($SD = 1.2$), of which 56.6% were females and 53.2% belonged to low and medium economic classes were analyzed.

Approximately five in ten adolescents practiced 300 minutes or more of moderate to vigorous physical activity per week (51.1%); males were more active (53% vs. 47%, $p < 0.01$) and had higher scores of social support from parents and friends than females ($p < 0.05$) (Table 1).

The results of the analysis of structural equation modeling reached acceptable values for fit indexes, even after making adjustments in the initial model such as exclusion of covariance between physical activity of parents and friends and associations with the p -value > 0.05 (Figs. 1 and 2).

The physical activity of friends was directly and significantly associated with the level of physical activity among adolescents of both genders (males $\beta = 0.11$, $p < 0.001$;

Table 1 Sociodemographic characteristics, physical activity of parents and friends, activity level of activity of adolescents, and psychosocial factors, João Pessoa, PB, Brazil, 2009.

Variables	Male % (n)	Female % (n)	p-value
Age			0.025 ^a
14-16 years	66.3 (680)	70.7 (944)	
17-19 years	33.7 (345)	29.3 (392)	
Socioeconomic class			0.020 ^a
A	11.3 (104)	9.2 (111)	
B	40.1 (368)	35.6 (431)	
C	41.6 (382)	47.8 (579)	
D, E	7.0 (64)	7.4 (90)	
Level of physical activity practice			< 0.001 ^a
0 min/week	9.8 (101)	21.1 (282)	
10 to 149 min/week	9.8 (100)	21.1 (282)	
150 to 299 min/week	13.3 (136)	18.9 (253)	
≥ 300 min/week	67.1 (688)	38.9 (519)	
Father's level of physical activity practice			0.047 ^a
<i>Does not practice regular physical activity</i>	49.1 (491)	50.4 (653)	
One to two days/week	25.9 (259)	21.9 (284)	
Three to four days/week	11.9 (119)	11.5 (147)	
≥ five days/week	13.1 (131)	16.2 (211)	
Mother's level of physical activity practice			< 0.007 ^a
0 days/week	50.9 (518)	50.5 (668)	
One to two days/week	24.5 (250)	19.9 (264)	
Three to four days/week	12.6 (127)	13.9 (184)	
≥ Five days/week	12.0 (122)	15.7 (208)	
Friends' level of physical activity practice			< 0.001 ^a
0 days/week	5.9 (60)	15.5 (204)	
One to two days/week	28.5 (289)	37.7 (497)	
Three to four days/week	36.8 (374)	29.6 (390)	
≥ Five days/week	28.8 (293)	17.2 (224)	
	M (SD)	M (SD)	
Self-efficacy	27.7 (6.6)	27.4 (6.7)	0.194 ^b
Friends' social support	16.8 (5.0)	13.4 (4.8)	0.001 ^b
Parents' social support	12.7 (4.2)	11.8 (4.2)	0.001 ^b

M, mean; SD, standard deviation.

^a Chi-squared test for heterogeneity.

^b Student's *t*-test for independent samples.

females $\beta = 0.07$, $p < 0.05$). The father's physical activity was associated with that of the son ($\beta = 0.10$, $p < 0.01$) and the mother's to that of the daughter's ($\beta = 0.08$, $p < 0.05$).

An indirect association was identified between physical activity of the father (males $\beta = 0.03$, $p < 0.05$; females $\beta = 0.04$, $p < 0.01$), of the mother (males $\beta = 0.02$, $p < 0.05$; females $\beta = 0.03$, $p < 0.01$), and of the friends (males $\beta = 0.11$, $p < 0.01$; females $\beta = 0.07$, $p < 0.01$) with the level of physical activity among adolescents, with part of the associations mediated by social support.

The provision of social support from parents and friends was directly associated (parents - males $\beta = 0.14$, $p < 0.01$, and females, $\beta = 0.17$, $p < 0.01$; friends - males $\beta = 0.22$, $p < 0.01$, and females $\beta = 0.20$, $p < 0.01$) and indirectly associated, mediated by the perceived self-efficacy (parents - males $\beta = 0.002$, $p < 0.05$, and females $\beta = 0.01$, $p < 0.05$;

friends - males $\beta = 0.011$, $p < 0.05$, and females, $\beta = 0.01$, $p < 0.05$) with the level of physical activity among adolescents.

Discussion

The results of this study demonstrated that parents and friends have social influence on the level of physical activity of adolescents, both through modeling behavior and by providing social support. The physical activity of parents and friends was shown to be directly associated with the level of physical activity among adolescents and indirectly, partially mediated by the social support of these groups. Social support from parents and friends was directly associated with the level of physical activity among adolescents, and part of the associations were mediated by the perceived self-efficacy.

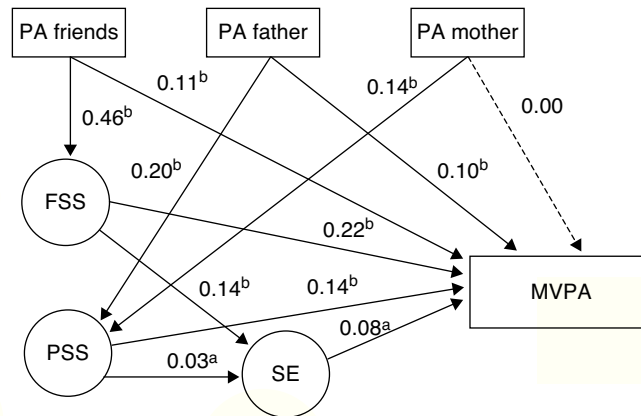


Figure 1 Final model for the analysis of the association between physical activity (PA) and parents' (PSS) and friends' (FSS) social support and self-efficacy (SE) perception and moderate to vigorous physical activity (MVPA) level in adolescents in the northeast of Brazil, for the male gender ($X^2 = 1,539.571$; $p < 0.001$; SRMR = 0.045, GFI = 0.912, AGFI = 0.891, CFI = 0.859, RMSEA = 0.063; 90% CI: 0.060-0.066).

AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; CI, confidence interval; GFI, Goodness-of-fit statistic; RMSEA, root mean square error of approximation; SRMR, standardised root mean square residual.

^a $p < 0.05$.

^b $p < 0.01$.

→, Non-significant association ($p > 0.05$).

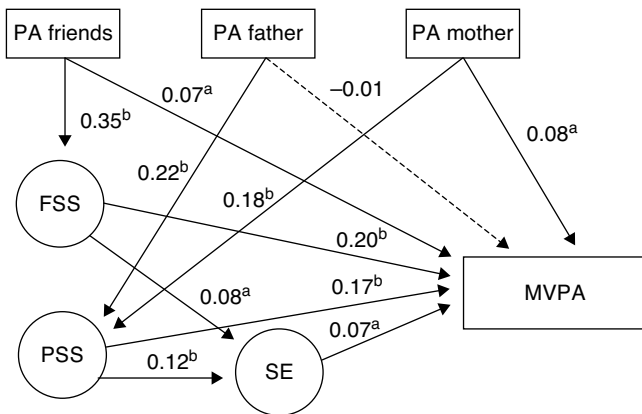


Figure 2 Final model for the analysis of the association between physical activity (PA) and parents' (PSS) and friends' (FSS) social support and self-efficacy (SE) perception and moderate to vigorous physical activity (MVPA) level in adolescents in the northeast of Brazil, for the female gender ($X^2 = 1,539.571$; $p < 0.001$; RMR = 0.045, GFI = 0.912, AGFI = 0.891, CFI = 0.859, SRMR = 0.063; 90% CI: 0.060-0.066).

AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; CI, confidence interval; GFI, Goodness-of-fit statistic; SRMR, standardised root mean square residual.

^a $p < 0.05$.

^b $p < 0.01$.

→, Non-significant association ($p > 0.05$).

In this study, it was observed that adolescents who perceived that their parents and friends participated in physical activities more frequently had higher levels of physical activity. Reviews by Seabra et al.¹⁹ and by Edwardson et al.⁴ observed that in general, physically active parents were more likely to have physically active children.¹⁹ However, Trost and Loprinzi⁵ did not identify any evidence of an association between physical activity of parents and their children's (adolescents aged 13 to 18 years). These differences can be attributed to physical activity measures, statistical analyses, and differences in participants' ages.^{4,19}

One particularity of the present study was the fact that the father's physical activity was positively associated to that of the son, and the mother's to that of the daughter. One explanation for this finding is that male adolescents usually identify more with their fathers and their practices, while females tend to identify with their mothers. However, study results are conflicting on the alignment between the gender of the parents and the children regarding the association of physical activity practice.¹⁹

Adolescents who had friends who were more physically active had higher levels of physical activity, corroborating the findings of other studies.^{3,20} Among older adolescents, it is expected that the physical activity of parents will have less direct influence on the physical activity of their children as, in general, the activities of the parents are performed in the absence of adolescents, thus reducing the opportunities for learning by observation.²⁰

In contrast, adolescents tend to rely more on their friends as age increases, since during adolescence, friends naturally become the closest people with whom they share attitudes, standards, values, and preferences that ultimately influence several behaviors, including physical activity.^{3,8} This association can also be related to the need to belong to friends' social groups. Thus, adopting similar behaviors would be one way to be accepted into the group.^{3,21}

The physical activity of parents and friends is also indirectly associated with the level of physical activity among adolescents, as one of the associations mediated by social support. These results indicate that parents and friends with higher level of physical activity were more likely to provide social support, reinforcing the results of previous studies.^{3,11} It is possible that active parents and friends give greater importance to physical activity and to the act of providing social support.^{7,22}

Similar to the results of other studies,^{2,21} social support provided by parents and friends was directly, positively, and significantly associated with the level of physical activity among adolescents. Systematic reviews have identified a positive and consistent association between social support and level of physical activity in adolescents.^{6,9}

The present study demonstrated that the association between social support from parents and friends and the level of physical activity among adolescents was mediated by self-efficacy. Similar results were reported in other studies with adolescents.^{23,24} It has been observed that adolescents who perceive more social support from parents and friends feel more capable of overcoming obstacles to physical activity.^{12,23} In addition to directly influencing participation in physical activity, social support helps teenagers feel more able to perform physical activity even in the presence of obstacles. According to Bandura,²⁵ the support from parents and friends can reduce the perceived obstacles, increasing the chances of physical activity practice.

This study has some limitations, which include: incapacity to establish a causal association between physical activity and social support of parents and friends and the level of physical activity among adolescents, as it was a cross-sectional study; the measurement of physical activity of parents and friends was based on the adolescents' self-reports and did not consider the duration of the practice. However, the questions used achieved satisfactory levels of reproducibility and have been used in other studies.^{11,22} This study also has strengths: the use of a representative sample of high school students with adequate statistical power; analysis conducted using structural equation modeling in order to evaluate direct and indirect associations of independent variables; and use of validated tools applied by previously trained professionals.

It is concluded that parents and friends exert social influence on physical activity of adolescents. Physically active parents and friends, in addition to serving as role models for the physical activity of adolescents, also tend to provide more social support. Additionally, when parents and friends provided more social support, adolescents reported higher levels of physical activity. Finally, greater social support from the parents and friends was associated with higher levels of self-efficacy, which were associated with higher levels of physical activity.

Interventions to increase physical activity among adolescents should include actions to stimulate the participation of parents and friends in physical activities with adolescents, the facilitation and creation of opportunities for joint practices of these groups with adolescents, education regarding the importance of their social support for the physical activity of adolescents, and guidance on how to provide different forms of social support.

Conflicts of interest

The authors declare no conflicts of interest.

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References

1. Davison KK, Cutting TM, Birch LL. Parents' activity-related parenting practices predict girls' physical activity. *Med Sci Sports Exerc.* 2003;35:1589–95.
2. Beets MW, Vogel R, Forlaw L, Pitetti KH, Cardinal BJ. Social support and youth physical activity: the role of provider and type. *Am J Health Behav.* 2006;30:278–89.
3. Wu TY, Pender N. Determinants of physical activity among Taiwanese adolescents: an application of the health promotion model. *Res Nurs Health.* 2002;25:25–36.
4. Edwardson CL, Gorely T. Parental influences on different types and intensities of physical activity in youth: a systematic review. *Physical Sport Exerc.* 2010;11:522–35.
5. Trost SG, Loprinzi PD. Parental influences on physical activity behavior in children and adolescents: a brief review. *Am J Lifestyle Med.* 2011;5:171–81.
6. Pugliese J, Tinsley B. Parental socialization of child and adolescent physical activity: a meta-analysis. *J Fam Physiol.* 2007;21:331–43.
7. Raudsepp L. The relationship between socio-economic status, parental support and adolescent physical activity. *Acta Paediatr.* 2006;95:93–8.
8. Salvy SJ, Haye K, Bowker JC, Hermans RC. Influence of peers and friends on children's and adolescents' eating and activity behaviors. *Psychol Behav.* 2012;106:369–78.
9. Beets MW, Cardinal BJ, Alderman BL. Parental social support and the physical activity-related behaviors of youth: a review. *Health Educ Behav.* 2012;37:621–44.
10. Motl RW, Dishman RK, Saunders RP, Dowda M, Pate RR. Perceptions of physical and social environment variables and self-efficacy as correlates of self-reported physical activity among adolescent girls. *J Pediatr Psychol.* 2007;32:6–12.
11. Trost SG, Sallis JF, Pate RR, Freedson PS, Taylor WC, Dowda M. Evaluating a model of parental influence on youth physical activity. *Am J Prev Med.* 2003;25:277–82.
12. Dishman RK, Saunders RP, Motl RW, Dowda M, Pate RR. Self-efficacy moderates the relation between declines in physical activity and perceived social support in high school girls. *J Pediatr Psychol.* 2009;34:4411–51.

13. Associação Brasileira de Empresas de Pesquisa (ABEP). Critério de classificação econômica Brasil. [cited May 2012]. Available from: <http://www.abep.org/novo/Default.aspx>
14. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ*. 2000;320:1240–3.
15. Farias Júnior JC, Lopes AS, Mota J, Santos MP, Ribeiro JC, Hallal PC. Validity and reproducibility of a physical activity questionnaire for adolescents: adapting the Self-Administered Physical Activity Checklist. *Rev Bras Epidemiol*. 2012;15:198–210.
16. WHO. Global recommendations on physical activity for health. [cited Jan 2012]. Available from: http://whqlibdoc.who.int/publications/2010/9789241599979_eng.pdf2012
17. Farias Júnior JC, Lopes AS, Reis RS, Nascimento JV, Borgatto AF, Hallal PC. Development and validation of a questionnaire measuring factors associated with physical activity in adolescents. *Rev Bras Saúde Matern Infant*. 2011;11:301–12.
18. Kline R. Principles and practice of structural equation modeling. 2nd ed. New York: Guild Ford Press; 2005.
19. Seabra AF, Mendonca DM, Thomis MA, Anjos LA, Maia JA. Determinantes biológicos e socio-culturais associados à prática de atividade física de adolescentes. *Cad Saude Publica*. 2008;24:721–36.
20. Kirby J, Levin KA, Inchley J. Parental and peer influences on physical activity among Scottish adolescents: a longitudinal study. *J Phys Act Health*. 2011;8:785–93.
21. Duncan SC, Duncan TE, Strycker LA. Sources and types of social support in youth physical activity. *Health Psychol*. 2005;24:3–10.
22. Robbins LB, Stommel M, Hamel LM. Social support for physical activity of middle school students. *Public Health Nurs*. 2008;25:451–60.
23. Peterson MS, Lawman HG, Wilson DK, Fairchild A, Van Horn ML. The association of self-efficacy and parent social support on physical activity in male and female adolescents. *Health Psychol*. 2013;32:666–74.
24. Shields C, Spink K, Chad K, Muhajarine N, Humbert L, Odnokon P. Examining self-efficacy as a mediator of the relationships between family social influence and physical activity. *J Health Psychol*. 2009;13:121–30.
25. Bandura A. Social cognitive theory: an agentic perspective. *Annu Rev Psychol*. 2001;52:1–26.