

Tracking of physical activity in adolescents between 2010 and 2014

Tracking da atividade física em adolescentes entre 2010 e 2014

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Abstract – Even though the benefits of regular physical activity (PA) are well established, national tracking studies are still scarce. The aim of the study was to analyze the tracking of physical activity (PA) in 2010, 2012 and 2014 of adolescents from Jacarezinho, Paraná. Adolescents (ages: 15.6 ± 0.6 years) were evaluated in 2014, who had participated in the 2010 and 2012 surveys. The Baecke questionnaire was used to evaluate the physical activity fields: school, sports and leisure time. ANOVA for repeated measures was used to compare the physical activity index (PAI) in years 2010, 2012 and 2014. The Spearman correlation coefficient was used to relate PAI obtained in 2014 with previous years. Significant reduction was observed in both sexes in the total and school index in 2012 and 2014 in relation to 2010. The leisure time index also presented a significant reduction in male sex from 2012 to 2014 ($p < 0.05$). In the correlation between 2014 and the previous years, boys demonstrated weak association in the leisure index in 2010 ($\rho = 0.292$). In the female sex, values were significant in the leisure time and total indexes ($\rho = 0.263$; $\rho = 0.307$) in 2010 and in the sports and total indexes ($\rho = 0.337$; $\rho = 0.332$) in 2012. The research indicates that PA of adolescents decreased with age advancement, resulting in low to moderate tracking.

Key words: Adolescents; Motor activity; Sedentary lifestyle.

Resumo – Embora os benefícios da prática regular de atividade física (AF) estejam bem estabelecidos na literatura, estudos nacionais de rastreamento (tracking) ainda são escassos. O objetivo do estudo foi analisar o tracking da atividade física entre 2010, 2012 e 2014 em adolescentes de Jacarezinho, Paraná. Foram avaliados em 2014 adolescentes (idades: $15,6 \pm 0,6$ anos) que já tinham participado do levantamento em 2010 e 2012. A atividade física foi avaliada pelo questionário de Baecke nos domínios: escolar, esportivo e lazer. ANOVA para medidas repetidas foi adotada para comparar os índices de atividade física (IAF) entre 2010, 2012 e 2014. O coeficiente de correlação de Spearman foi empregado para associar os IAF obtidos em 2014 com os anos anteriores. Foi observada redução significativa em ambos os sexos nos índices total e escolar de 2012 e 2014 em comparação ao ano de 2010. O índice lazer também apresentou redução significativa no sexo masculino de 2012 a 2014 ($p < 0,05$). Na correlação entre 2014 e os anos anteriores, os meninos demonstraram fraca associação no índice lazer em 2010 ($\rho = 0,292$). Já no sexo feminino, os valores foram significativos nos índices lazer e total ($\rho = 0,263$; $\rho = 0,307$) em 2010 e nos índices esportivo e total ($\rho = 0,337$; $\rho = 0,332$) no ano de 2012. Os achados indicam que a AF dos adolescentes diminuiu com o avanço da idade, tendo como resultado o tracking fraco a moderado.

Palavras-chave: Adolescentes; Atividade motora; Sedentarismo.

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INTRODUCTION

The benefits of regular physical activity (PA) for health are well reported in literature¹⁻³, especially, the adherence of this behavior is considered an important protective factor against chronic non-communicable diseases, among them cardiovascular diseases, the leading cause of death worldwide^{1,4}.

Studies have shown that the practice of PA during adolescence may act against the onset and evolution of precursor dysfunctions of these diseases, such as atherosclerosis, because fatty streaks are formed in the coronary arteries during this period of life; however, arterial detriments are noticed later, and may lead to the occurrence of cardiovascular events^{3,5-7}.

Adequate PA levels in this age group may promote bone health benefits, improve lipid and metabolic profile, and reduce body fat percentage⁷⁻⁹. In addition, exposure to physical activity in adolescence seems to increase the likelihood of the individual becoming physically active in adulthood^{3,7-9}.

Despite these evidences, research has shown a decline in this behavior according to age, and the prevalence of inactive Brazilian adolescents ranges from 25.4% to 96.7% according to the geographic location, instrument used and cutoff point adopted⁹⁻¹¹.

The identification of information regarding the practice of PA is of fundamental importance to contribute in the attempt to guide the conceptualization of future interventions^{7,8,12}. However, longitudinal studies are still scarce in this area¹⁰, since most studies developed in Brazil is the result of cross-sectional studies.

Tracking studies of PA in different periods of adolescence are necessary to obtain information about this behavior in the long term. In this perspective, the aim of this study was to analyze tracking of PA during four years of tracking, comparing PA indexes in years 2010, 2012 and 2014 of adolescents from the city of Jacarezinho, Paraná.

METHODOLOGICAL PROCEDURES

Study characterization and sample

This is a longitudinal tracking study. The population of this study was composed of 11 to 15 year-old students from elementary and high schools of the city of Jacarezinho, State of Paraná, considered a small town, with approximately 40,000 inhabitants¹³.

All students enrolled in the 6th grade of the seven schools of Jacarezinho participated in the first sample (2010), of these, two private schools and five public schools, both in the morning and evening shifts ($n = 603$ adolescents, mean of 11.2 ± 0.7 years of age). Volunteers who had participated in the previous survey were included in the subsequent surveys, and in 2012, those enrolled in the 8th grade of elementary school ($n = 321$ adolescents, mean of 13.6 ± 0.5 years of age), and in 2014, those enrolled in the 1st grade of high school ($n = 143$ adolescents, mean of 15.6 ± 0.6 years of age), among these 53% females and 47% males. All collections occurred in the second

semester of school years, between August and October. Data between 2010 and 2012 were previously presented¹¹, so, due to the absence on the days of collection, refusal to participate in the study and change of school and city, there was a decline in the number of volunteers over the years.

This project was approved by the Ethics Committee of Research with human beings of the State University of Maringá (UEM), protocol No. 668/2010, being in agreement with the Declaration of Helsinki and with resolution 196/96 and complementary of the CNS / MS and by the Research Ethics Committee of the State University of Northern Paraná, protocol No. 060/2012. All parents or guardians signed the free and informed consent form.

Physical activity

PA was measured using questionnaire proposed by Baecke et al.¹⁴, validated and translated for assessment of habitual PA in adolescents by Guedes et al.¹⁵. This questionnaire contains 16 questions divided into three sessions, with the first question being an open question and the remaining objective questions, with scores from one to five points. Multiple choice questions are ranked among never, rarely, sometimes, often, and always. Session 1 - Work and school activity, in which volunteers were instructed to answer regarding school activity, is composed of eight questions; Session 2 - Sports activities, physical exercise programs and leisure: composed of four questions; Session 3 - Leisure Activity: composed of four questions. The calculation for determination of activity indexes in school, sports, leisure and total was performed according to equations developed by the author and previously described¹¹.

Data analysis

Data were described using means and standard deviations. ANOVA for repeated measures was used for comparisons of physical activity indexes (PAI) in 2010, 2012 and 2014 and between sexes. If the Mauchly's sphericity test was violated, the Greenhouse-Geisser correction was used. When the F test identified statistical significance, the Bonferroni post hoc was applied to locate differences. Spearman's correlation coefficient was used to relate PAI obtained in 2014 with previous years (2012 and 2010). Data analysis was performed using the statistical package SPSS version 22.0, with significance level of $p < 0.05$.

RESULTS

Table 1 describes the PAI of students in the follow-up period. It is observed that there was a decline in the indexes between 2010 and the subsequent years (2012 and 2014). This reduction was statistically significant for the total and school indexes in both sexes. The leisure index presented a significant reduction in 2014 in relation to 2010 for both sexes, and from 2014 to 2012 only for males ($p < 0.05$). When comparing sexes, girls present the

majority of indexes significantly lower than boys in the year of 2012, and in 2014 only in the sport index.

Table 1. Description of physical activity indexes of students from Jacarezinho in 2010, 2012 and 2014 stratified by sex.

	2010	2012	2014
Total (n = 143)			
School index	2.92 ± 0.47	2.40 ± 0.53*	2.37 ± 0.51*
Sports index	2.42 ± 0.67	2.29 ± 0.53	2.26 ± 0.61
Leisure index	2.62 ± 0.79	2.57 ± 0.72	2.41 ± 0.63*
Total index	7.92 ± 1.35	7.22 ± 1.28*	7.01 ± 1.25*
Males (n = 67)			
School index	2.91 ± 0.54	2.39 ± 0.50*	2.35 ± 0.55*
Sports index	2.51 ± 0.66	2.46 ± 0.53	2.42 ± 0.65
Leisure index	2.69 ± 0.88	2.70 ± 0.78	2.45 ± 0.72¥
Total index	8.08 ± 1.44	7.52 ± 1.28*	7.17 ± 1.42*
Females (n = 76)			
School index	2.93 ± 0.41	2.40 ± 0.55*	2.40 ± 0.47*
Sports index	2.33 ± 0.68	2.14 ± 0.49#	2.12 ± 0.54#
Leisure index	2.55 ± 0.69	2.45 ± 0.64#	2.38 ± 0.53
Total index	7.78 ± 1.25	6.95 ± 1.22*#	6.86 ± 1.07*

* significant difference compared to 2010 (p < 0.05); ¥ significant difference compared to 2012 (p < 0.05); # significant difference compared to boys (p < 0.05)

Tables 2 and 3 present the correlation coefficients of PAI of 2014 with previous years (2012 and 2010). It was observed that the correlations presented significant positive values for boys in the leisure index in 2010 and in all indexes in 2012 with 2014. For girls, values were significant in the leisure and total indexes in 2010, and in sports and total indexes in 2012.

Table 2. Spearman correlation coefficients of physical activity indexes between 2014 and previous years (2012 and 2010) of males

	2012	2010
School index 2014	0.248*	0.124
Sports index 2014	0.250*	0.146
Leisure index 2014	0.429*	0.292*
Total index 2014	0.469*	0.213

* p < 0.05.

Table 3. Spearman correlation coefficients of physical activity indexes between 2014 and previous years (2012 and 2010) of females

	2012	2010
School index 2014	0.196	0.125
Sports index 2014	0.337*	0.200
Leisure index 2014	0.216	0.263*
Total index 2014	0.332*	0.307*

* p < 0.05

DISCUSSION

The findings of the present study demonstrate that PAI significantly decreased during the periods of analysis, regardless of sex, being the largest decline observed between 2010 and 2012, the transition phase from childhood to adolescence.

Despite the health benefits, the decline in PA during adolescence is consistent with literature¹⁶⁻¹⁸. Review studies and meta-analysis^{16,19} have shown declines varying by around 7% per year, in order to infer around 60-70% in practice throughout adolescence. However, although the decline is consistent, it is still unclear what factors are related to this decline.

In this sense, there are few studies that investigate the possible predictors of this change. Results^{20,21} have identified that biological alterations that occur in a marked manner at puberty may justify the decrease in the practice of PA in this population, as well as environmental, social, economic and cultural factors that may be directly associated. In addition, sports practice and the amount of PA practiced has also been highlighted^{16,22,23}. Thus, specific interventions related to behavior change should focus on these factors, encouraging the practice from childhood, since the maintenance of a physically active lifestyle tends to remain in adulthood²³.

When comparing sexes, it was observed that girls had significantly lower PA indexes than boys. Often, authors^{21,24-26} have corroborated these findings, and the comparison can be justified by the fact that girls tend to strongly respond to changes associated with puberty, as well as motivational factors of socio-cultural origin that can also negatively contribute to PA practice^{12,21}.

When analyzing the PAI correlation coefficients between assessment periods, significant associations were identified for males in all indexes in 2012 and in the leisure index of 2010 in relation to 2014. For females, significant associations were identified in leisure and total indexes between 2010 and 2014, and in sports and total indexes from 2012 to 2014. However, the strength of association varied from weak to moderate.

Similar to the present research, weak correlations were observed by Dumith et al.²⁵ in leisure PAI after two years of follow-up ($\rho = 0.22$). Likewise, Kjønnsen et al.²³ also found weak correlations in leisure indexes after eight years of follow-up for both males ($r = 0.21$) and females ($r = 0.23$).

Corroborating our findings, Potter et al.²⁷ observed moderate follow-up ($\rho = 0.30$) of total physical activity over three years of follow-up. Combined, these findings reinforce the need to promote regular PA practice in this age group in order to establish and maintain this behavior in adulthood²². Thus, since one of the functions of the physical education professional in the school is the promotion of healthy habits^{28,29}, school-based intervention programs should be encouraged, due to the great concentration of adolescents, the existence of physical spaces, security and professionals to supervise and encourage activities.

It is important to highlight the strengths and limitations of this study.

Among limitations, the study refers to a non-probabilistic sampling, in addition to the method of measuring PA, which although reproduced and validated for habitual PA in adolescents¹⁵, may have influences on the level of understanding and interpretation of the respondent. The longitudinal monitoring of participants since the age of 11 years can be highlighted as study strength, considering that these analyses are scarce in Brazil. In this sense, given the country's wide geographic range and cultural diversity, more studies need to be carried out in other locations so that the results can be generalized.

CONCLUSION

In view of these findings, it could be concluded that the PAI of students evaluated decreased significantly during the follow-up period, and the greatest decline was observed between 2010 and 2012. In addition, girls presented significantly lower PA indexes compared to boys, and the results of the association analysis revealed weak to moderate tracking.

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