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ORIGINAL ARTICLE

Sports practice is related to parasympathetic activity in adolescents

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KEYWORDS

Heart rate;
Autonomic nervous system;
Carotid intima-media thickness;
Adolescent;
Sports practice

Abstract

Objective: To analyze the relationship among sports practice, physical education class, habitual physical activity and cardiovascular risk in adolescents.

Methods: Cross-sectional study with 120 schoolchildren (mean: 11.7±0.7 years old), with no regular use of medicines. Sports practice and physical education classes were assessed through face-to-face interview, while habitual physical activity was assessed by pedometers. Bodyweight, height and height-cephalic trunk were used to estimate maturation. The following variables were measured: body fatness, blood pressure, resting heart rate, blood flow velocity, intima-media thickness (carotid and femoral) and heart rate variability (mean between consecutive heartbeats and statistical index in the time domain that show the autonomic parasympathetic nervous system activity root-mean by the square of differences between adjacent normal R-R intervals in a time interval). Statistical treatment used Spearman correlation adjusted by sex, ethnicity, age, body fatness and maturation.

Results: Independently of potential confounders, sports practice was positively related to autonomic parasympathetic nervous system activity ($\beta=0.039$ [0.01; 0.76]). On the other hand, the relationship between sport practice and mean between consecutive heartbeats ($\beta=0.031$ [-0.01; 0.07]) was significantly mediated by biological maturation.

Conclusions: Sport practice was related to higher heart rate variability at rest.

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PALAVRAS-CHAVE

Frequência cardíaca;
Sistema nervoso
autônomo;
Espessura mediointimal
carotídea;
Adolescente;
Prática esportiva

Prática esportiva está relacionada à atividade parassimpática em adolescentes**Resumo**

Objetivo: Analisar a relação entre prática esportiva, educação física escolar, atividade física habitual e indicadores cardiovasculares de risco em adolescentes.

Métodos: Estudo transversal que selecionou 120 escolares (idade média 11,7±0,7 anos), sem consumo de medicamentos. Prática esportiva fora do ambiente escolar e educação física escolar foram avaliadas por entrevista face a face, enquanto a atividade física habitual foi avaliada por pedometria. Peso corporal, estatura e altura troncocefálica foram usados para estimar a maturação biológica. Foram avaliados: gordura corporal, pressão arterial, frequência cardíaca durante o repouso, velocidade do fluxo sanguíneo, espessura mediointimal das artérias (carótida e femoral), variabilidade da frequência cardíaca (média entre batimentos cardíacos consecutivos e o índice estatístico no domínio do tempo que representa atividade do sistema nervoso autônomo parassimpático por meio da raiz quadrada da média das diferenças sucessivas ao quadrado entre intervalos R-R consecutivos). Correlação de Spearman verificou relação entre as variáveis. Relacionamentos significativos foram ajustados por: sexo, etnia, idade, gordura corporal e maturação biológica.

Resultados: Prática esportiva, independentemente dos ajustes, apresentou correlação positiva com atividade do sistema nervoso autônomo parassimpático ($\beta=0,039$ [0,01; 0,76]). Por outro lado, a relação entre tal engajamento e a média entre os intervalos R-R ($\beta=0,031$ [-0,01; 0,07]) foi mediada pela maturação biológica.

Conclusões: A prática esportiva foi relacionada a uma maior variabilidade da frequência cardíaca durante o repouso.

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Introduction

It is known that cardiovascular diseases are associated with high morbidity and mortality in adults.¹ This fact has been the focus of several studies, mainly due to the subclinical manifestation of their potential indicators of cardiovascular risk factors, such as high blood pressure, intima-media thickness and changes in autonomic modulation,^{2,3} which tend to manifest since the first decades of life.⁴ During adolescence, the combination of some of these outcomes can be associated with endothelial dysfunction and early atherogenic process.³ However, it is worth mentioning the difficulty of monitoring the onset of these cardiovascular disorders in young individuals, as their clinical manifestation is observed predominantly in adulthood.³

In this context, the analysis of heart rate variability, which consists in the oscillation of the intervals between consecutive heart beats,⁵ can be an effective tool to study the association between cardiovascular risk factors³ and autonomic response.⁵ It is known that parasympathetic activity may be suppressed and closely related to oxidative stress due to cardiometabolic complications.^{6,7} On the other hand, the same activity can be stimulated by the increase in the cardiorespiratory capacity³ and physical training, both in adults and in children.⁸

Sports practice in the school environment, combined with Physical Education classes, can be beneficial to the autonomic modulation⁹; however, the possible effects stimulated by regular physical activity or sports practice out-

side of the school environment in adolescence are not yet clear. Thus, the aim of this study was to analyze the association between regular physical activity, Physical Education classes and sports practice outside of the school environment on some cardiovascular indicators of health risk among adolescents.

Method

This was a descriptive-analytical, cross-sectional study, developed with initial information from a cohort that was followed between the years 2013 and 2014 in the city of Presidente Prudente, São Paulo, Brazil. For sample calculation, due to the lack of previous studies indicating scores of correlation between pedometry and blood flow in young Brazilian individuals, we estimated a $r=0:26$.¹⁰ The sample calculation indicated the need to enroll at least 115 adolescents to obtain 80% power and $\alpha=5\%$, considering the estimated correlation. During enrollment, seven elementary schools (4 public and 3 private [the municipality has 82 schools, of which 27 are private]) were initially invited to participate in the study. The schools are close to the University and receive students from different areas of the city, due to the presence of important urban transport lines of the municipality. However, after the school principals were invited to participate, only three private schools agreed to participate (the public schools claimed excess of administrative work). In the school units that authorized

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