



ORIGINAL ARTICLE

# Leisure-time physical activity and cardiometabolic risk among children and adolescents<sup>☆</sup>



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## KEYWORDS

Leisure-time physical activity;  
Child;  
Adolescents;  
Metabolic syndrome

## Abstract

**Objective:** To assess the effect of Leisure-time physical activity (LTPA) on cardiometabolic risk by nutritional status in Mexican children and adolescents.

**Methods:** This was a cross-sectional study conducted with 1,309 participants aged between 5 and 17 years. Nutritional status was classified according to the BMI Z-score by age and gender. A previously validated questionnaire was used to evaluate LTPA; a cardiometabolic risk score was calculated. Multiple linear regression analysis was performed to assess the effect of LTPA on cardiometabolic risk.

**Results:** After adjusting for risk factors, mild LTPA were positively associated with cardiometabolic risk score ( $\beta_{\text{Mild vs Intense LTPA}}$ : 0.68; 95% CI: 0.18 to 1.18;  $p_{\text{for trend}} = 0.007$ ). This association became stronger when estimated for overweight ( $\beta_{\text{Mild vs Intense LTPA}}$ : 1.24; 95% CI: 0.24 to 2.24;  $p_{\text{for trend}} = 0.015$ ) and obese participants ( $\beta_{\text{Mild vs Intense LTPA}}$ : 1.02; 95% CI: 0.07 to 1.97;  $p_{\text{for trend}} = 0.045$ ).

**Conclusion:** Mild LTPA was positively associated with cardiometabolic risk in overweight and obese children and adolescents. Given the emerging childhood obesity epidemic in Mexico, these results may be useful in the design of strategies and programs to increase physical activity levels in order to achieve better health.

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**PALAVRAS-CHAVE**

Atividade física de lazer;  
Criança;  
Adolescentes;  
Síndrome metabólica

**Atividade física de lazer e risco cardiometabólico em crianças e adolescentes****Resumo**

**Objetivo:** Avaliar o efeito da prática de AFL sobre o risco cardiometabólico em crianças e adolescentes mexicanos de acordo com sua situação nutricional.

**Métodos:** Estudo transversal realizado com 1309 participantes de 5 a 17 anos de idade. A situação nutricional foi classificada de acordo com o escore z de IMC por idade e sexo. Um questionário validado anteriormente foi utilizado para avaliar a AFL; foi calculado um escore de risco cardiometabólico. A análise de regressão linear múltipla foi realizada para avaliar o efeito de AFL sobre o risco cardiometabólico.

**Resultados:** Após o ajuste de acordo com os fatores de risco, a AFL leve foi positivamente associada ao escore de risco cardiometabólico ( $\beta_{\text{AFL Leve} \times \text{Intensa}}$ : 0,68; IC 95%: 0,18 a 1,18;  $P_{\text{para tendência}} = 0,007$ ). Essa associação foi mais intensa quando estimada para participantes acima do peso ( $\beta_{\text{AFL Leve} \times \text{Intensa}}$ : 1,24; IC 95%: 0,24 a 2,24;  $P_{\text{para tendência}} = 0,015$ ) e obesos ( $\beta_{\text{AFL Leve} \times \text{Intensa}}$ : 1,02; IC 95%: 0,07 a 1,97;  $P_{\text{para tendência}} = 0,045$ ).

**Conclusão:** A AFL leve foi positivamente associada ao escore de risco cardiometabólico em crianças e adolescentes acima do peso e obesos. Considerando a epidemia de obesidade infantil emergente no México, esses resultados poderão ser úteis na elaboração de estratégias e programas para aumentar os níveis de atividade física a fim de obter uma saúde melhor.

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**Introduction**

The prevalence of overweight and obesity among children and adolescents presents an increasing trend, especially in developing countries.<sup>1</sup> According to the World Health Organization (WHO), by the year 2010 there were close to 42 million overweight children.<sup>2</sup> Conversely, the Americas are the region with the highest prevalence of overweight and obesity worldwide.<sup>3</sup> In Mexico, according to the National Health and Nutrition Survey 2012 (ENSANUT), the combined prevalence of overweight and obesity was 34.4% in school-age children (5-11 years) and 35% in adolescents (12 and 19 years);<sup>4</sup> these prevalences are slightly higher than those reported in 2006.<sup>5</sup>

Overweight and obesity in children and adolescents has been associated with alterations in the cardiometabolic profile or in its different components.<sup>6,7</sup> Likewise, it is associated with the early onset of diabetes mellitus and atherosclerotic processes that predispose young adults to cardiovascular diseases.<sup>6</sup> Alterations in the metabolic profile have been reported among children and adolescents in Mexico; according to the ENSANUT 2012, 0.7% of adolescents reported a previous diagnosis of diabetes, while 1.8% reported a previous diagnosis of hypertension.<sup>4</sup> Studies conducted among children have revealed a prevalence of abnormal glucose level close to 10%, and a prevalence of over 15% for lipid profile alterations.<sup>8</sup>

The protective role of physical activity on cardiometabolic risk in children and adolescents has been described in the literature.<sup>9</sup> Studies have demonstrated that vigorous physical activity improve levels of total cholesterol, low-density lipoproteins (C-LDL), triglycerides, high-density lipoproteins (C-HDL), insulin resistance, and blood pressure, and decrease waist circumference in this population group.<sup>9,10</sup> Meanwhile, leisure-time physical activity (LTPA)

has been inversely associated with a reduction in the prevalence of overweight and obesity among children and adolescents. Also, among obese subjects, LTPA improves the cardiometabolic profile.<sup>11,12</sup> International observational studies demonstrate that high levels of LTPA are significantly associated with a lower metabolic syndrome score in every body mass index (BMI) category.<sup>11,12</sup> In contrast, low levels of LTPA in overweight or obese children and adolescents increase the likelihood of developing metabolic syndrome or the alteration of its components.<sup>11</sup>

In Mexico, epidemiologic evidence about the association of LTPA on the metabolic profile in children and adolescents is scarce and inconclusive;<sup>13,14</sup> few cross-sectional studies reported a prevalence of metabolic disorders and metabolic syndrome, but found no associations with physical activity.<sup>8,15</sup>

This study aimed to assess the effect of the practice of LTPA on the cardiometabolic risk of Mexican children and adolescents according to their nutritional status.

**Materials and methods****Study design**

Between June of 2011 and July of 2012, a cross-sectional study was conducted with a representative sample of healthy children and adolescents residents of Mexico City. Its objective was to characterize and assess the association between genetics and lifestyle with obesity. Participants were recruited in four units of the Mexican Institute of Social Security (IMSS). Each unit was located in different geographical areas of Mexico City (Unit Morelos, North; Unit Independencia, South; Unit Netzahualcoyotl, East; and Unit Cuauhtémoc, West). The study was approved by the ethical

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