



# Steps per day and health-related quality of life in schoolchildren: the mediator role of cardiorespiratory fitness

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## Abstract

To analyse the relationship between steps per day and health-related quality of life (HRQoL) and cardiorespiratory fitness (CRF) and to examine whether the relationship between steps per day and HRQoL is mediated by CRF in schoolchildren. This was a cross-sectional study including 501 schoolchildren (aged 9–12 years, 47% girls), from Cuenca, Spain. Steps per day were measured using the Xiaomi Mi Band 3 Smart Bracelet, HRQoL was estimated by the KIDSCREEN-27 questionnaire, and CRF was assessed using the 20-m shuttle run test. Analysis of covariance and multivariate analysis of covariance models showed that children with a higher mean number of steps per day (> 9000 steps/day) had better HRQoL (global score, and physical and psychological well-being) and higher CRF levels than their peers with a lower number of steps per day ( $p < 0.05$ ); however, these differences were no longer significant when controlling for sex, age, mother's education level, and CRF ( $p > 0.05$ ). Linear regression models estimated that each 1000-step increment was associated with better CRF ( $\beta = 0.350$ ; 95% CI, 0.192 to 0.508). In addition, the relationship between steps per day and HRQoL was mediated by CRF ( $p < 0.05$ ).

**Conclusion:** Steps per day are a good metric to estimate daily physical activity because of its positive relationship with CRF. Moreover, those children taking more than 9000 steps per day are associated with higher levels of physical and psychological well-being. Finally, a substantial part of the improvement in HRQoL achieved through the increase in physical activity (steps per day) is mediated by CRF.

## What is Known:

- Physical activity is known to have a positive impact on health-related quality of life in children. Steps per day are commonly used as a measure of physical activity.
- Cardiorespiratory fitness is a recognized indicator of overall health in youth.

## What is New:

- Increments of steps per day were associated with better CRF, with a nonlinear association after approximately 9000 steps/day.
- Schoolchildren with > 9000 steps/day showed better HRQoL.

**Keywords** Physical activity · Wearables · Physical fitness · Children · Daily steps

## Abbreviations

WHO	World Health Organization
HRQoL	Health-related quality of life
PA	Physical activity
CRF	Cardiorespiratory fitness
MVPA	Moderate to vigorous physical activity
LOESS	Locally weighted scatterplot smoothing

ANCOVA	Analysis of covariance
MANCOVA	Multivariate analysis of covariance

## Introduction

Physical inactivity increases the risk of major noncommunicable diseases [1], rated by the World Health Organization (WHO) as the 4th leading cause of mortality [2]. This issue extends to children, where physical inactivity has been associated with worse cardiometabolic profile

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