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ORIGINAL ARTICLE

## Influence of a physical exercise programme on VO<sub>2</sub>max in adults with cardiovascular risk factors<sup>☆</sup>

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### KEYWORDS

Cardiovascular risk;  
Fitness;  
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### Abstract

**Objective:** The aim of the study was to assess the influence of a physical exercise programme on VO<sub>2</sub>max in sedentary subjects with cardiovascular risk factors.

**Materials and methods:** The sample was composed of 214 patients (80 males, 134 females) with an average age of 52 years, who were referred to a physical exercise programme from 2 primary care centres of Spanish southeast. It was implemented a 10 week programme (3 training × 1 h/week) combining strength with cardiorespiratory fitness. The VO<sub>2</sub>max was analysed through the *Rockport Walk Test (RWT)* comparing the pre and post programme measurements.

**Results:** The results show significant improvements on VO<sub>2</sub>max for both genders ( $p < 0.05$ ). The most pronounced increase in VO<sub>2</sub>max was among males in the highest age band (56–73 years).

**Conclusions:** Prescribing and referral exercise programmes from primary care centres must be considered as a resource for improving cardiorespiratory fitness in the population studied.

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**PALABRAS CLAVE**

Riesgo cardiovascular;  
Condición física;  
Atención primaria;  
Ejercicio físico

## Influencia de un programa de ejercicio físico terapéutico sobre el consumo máximo de oxígeno en adultos con factores de riesgo cardiovascular

**Resumen**

**Objetivo:** El objetivo de la presente investigación fue valorar la influencia de un programa de ejercicio físico terapéutico en el  $VO_2$ máx en sujetos sedentarios que presentan factores de riesgo cardiovascular.

**Materiales y métodos:** La muestra estuvo formada por 214 pacientes (80 varones y 134 mujeres) con una media de edad de 52 años, derivados de 2 centros de atención primaria del sureste español. Se llevó a cabo un programa de 10 semanas (3 sesiones  $\times$  1 h/sem) que combinaba fuerza muscular con resistencia cardiorrespiratoria. El nivel de  $VO_2$ máx se analizó mediante el test de campo *Rockport Walk Test (RWT)*, comparando las 2 mediciones efectuadas al inicio y final del programa.

**Resultados:** Los resultados indican que se producen mejoras significativas sobre el  $VO_2$ máx en ambos sexos ( $p < 0,05$ ). El aumento más pronunciado en el  $VO_2$ máx se produce en varones en la franja de edad analizada superior (56-73 años).

**Conclusiones:** La prescripción y derivación a programas de ejercicio físico desde los centros de atención primaria se debe de valorar como recurso para la mejora del fitness cardiorrespiratorio en la población estudiada.

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**Introduction**

Cardiovascular risk diseases are the world's leading cause of death, accounting for around 31% of all deaths. These diseases can, however, be prevented by acting on risk factors of a behavioural nature, such as smoking, alcohol consumption, diet and physical activity.<sup>1</sup>

A number of different studies found that physical activity and cardiovascular fitness, assessed quantitatively through maximum oxygen consumption ( $VO_2$ max),<sup>2</sup> were associated with improvements in health, quality of life and cardiovascular risk factors.<sup>3-5</sup>

In a study conducted with adults, it was observed that physical activity and cardiovascular fitness were independently associated, with a lower risk of developing cardiovascular disease.<sup>6</sup> Other research suggests that cardiovascular fitness induces improvements greater than those of physical activity in different cardiovascular risk parameters.<sup>7,8</sup>

For the improvement of cardiovascular fitness ( $VO_2$ max), an increase in the level of physical activity<sup>9</sup> has generally been recommended, and continuous physical exercise for cardiorespiratory endurance has been shown to be an effective resource for increasing  $VO_2$ max in some studies.<sup>10</sup> However, a recent study indicates that in adults who are overweight and obese, the modalities of high-intensity interval training (HIIT) lead to better improvements in  $VO_2$ max than those of continuous endurance training at moderate intensity.<sup>11</sup> HIIT has also shown superior benefits in patients with coronary artery disease<sup>12</sup> and heart failure,<sup>13</sup> in subjects who have just recovered from a myocardial infarction<sup>14</sup> and when simply prescribed to improve vascular function.<sup>15</sup>

However, physical exercise for muscle strength has also been related to slight improvements in  $VO_2$ max,<sup>16,17</sup> although recent studies indicate that muscle strength exercise has a greater influence on cardiovascular fitness when performed in combination with cardiovascular endurance exercise.<sup>18-20</sup>

In a study with healthy adults, improvements in  $VO_2$ max were evaluated after two training protocols; one where HIIT was combined with strength training and the other with strength training only. The results showed improvements in the concurrent training group (strength and HIIT), while no significant improvements were found in the strength-only group.<sup>21</sup>

In addition to the mentioned benefits, power or muscle strength training has also been used in physical exercise protocols with adults and older people to improve functional capacity<sup>22</sup> and achieve neuromuscular adaptations.<sup>23</sup>

There are very few studies available in the international literature on physical exercise intervention programmes in adults or older people. In general, regardless of the type of training used (endurance, strength or concurrent) all the studies we were able to find showed benefits in terms of the cardiovascular fitness of subjects who had diligently followed the programmes.<sup>24-29</sup>

In a study with older adults with obesity, it was observed that the monitored physical exercise programmes in sports centres led to better improvements over  $VO_2$ max than those centred around the recommendation of the general practitioner or the prescription of exercise to be performed autonomously at home.<sup>30</sup> Significant improvements were also observed with American adults in  $VO_2$ max as well as in various cardiovascular risk factors after a 6-month programme of directed physical exercise.<sup>31</sup>

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